

Office of Environmental Management – Grand Junction



Moab UMTRA Project
August 2010 Validation Data Package
for Performance Assessment of the
Monthly Sampling for the Ground Water
Interim Action

October 2010



U.S. Department
of Energy

Office of Environmental Management

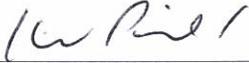
**Moab UMTRA Project
August 2010 Validation Data Package for Performance Assessment
of the Monthly Sampling for the
Ground Water Interim Action**

October 2010

**Moab UMTRA Project
August 2010 Monthly Ground Water Sampling Event**

Revision 0

Review and Approval


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TAC Ground Water Manager

10/27/10
Date


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10/27/10
Date

Revision History

Revision No.	Date	Reason/Basis for Revision
0	October 2010	Initial issue.

Table of Contents

Section	Page
Acronyms and Abbreviations	v
1.0 Introduction.....	1
1.1 Summary Criteria.....	1
1.2 Sampling Event Summary	2
1.3 Sampling and Analyses.....	12
2.0 Data Assessment Summaries	12
2.1 Water Sampling Field Activities Verification	12
2.2 Laboratory Performance Assessment	12
2.3 Field Analyses/Activities.....	16
2.4 Certification	16
3.0 Data Presentation.....	16
3.1 Minimums and Maximums Report.....	16
3.2 Anomalous Data Review	17
3.3 Water Quality Data	17
3.4 Water Level Data	17
3.5 Blanks Report.....	17

Figures

Figure 1. Map of Sample Locations for the August 2010 Monthly Sampling Event.....	3
Figure 2. CF4 Upgradient Observation Wells 0780, 0781, 0782, and 0783 Time Versus Ammonia Total as N Concentration Plot.....	4
Figure 3. CF4 Upgradient Observation Wells 0780, 0781, 0782, and 0783 Time Versus TDS Concentration Plot	5
Figure 4. CF4 Upgradient Observation Wells 0780, 0781, 0782, and 0783 Time Versus Uranium Concentration Plot.....	5
Figure 5. CF4 Downgradient Observation Wells 0784, 0785, 0786, and 0787 Time Versus Ammonia Total as N Concentration Plot.....	6
Figure 6. CF4 Downgradient Observation Wells 0784, 0785, 0786, and 0787 Time Versus TDS Concentration Plot.....	7
Figure 7. CF4 Downgradient Observation Wells 0784, 0785, 0786, and 0787 Time Versus Uranium Concentration Plot	7
Figure 8. CF4 Well Points 0791, 0792, and 0793 Time Versus Ammonia Total as N Concentration Plot	8
Figure 9. CF4 Well Points 0791, 0792, and 0793 Time Versus TDS Concentration Plot.....	9
Figure 10. CF4 Well Points 0791, 0792, and 0793 Time Versus Uranium Concentration Plot	9
Figure 11. Evaporation Pond Location 0548 Time Versus Ammonia Total as N Concentration Plot	10
Figure 12. Evaporation Pond Location 0548 Time Versus TDS Concentration Plot	11
Figure 13. Evaporation Pond Location 0548 Time Versus Uranium Concentration Plot.....	11

Tables

Table 1. Analytes and Methods.....	13
Table 2. Data Qualifiers	13
Table 3. Reason Codes for Data Flags.....	13

Appendices

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

Attachment

Attachment 1. August 2010 Monthly IA Well Field Monthly Sampling Trip Report

Acronyms and Abbreviations

bgs	below ground surface
CF	Configuration
cfs	cubic feet per second
COC	chain of custody
EB	equipment blank
EDD	electronic data deliverable
EPA	Environmental Protection Agency
ft	feet
gpm	gallons per minute
IA	interim action
ICP	inductively coupled plasma
LCS	laboratory control sample
MB	method blank
MS	matrix spike
MSD	matrix spike duplicate
RIN	report identification number
RL	reporting limit
RPD	relative percent difference
RS	replicate sample
SD	serial dilution
SDG	sample data group
TDS	total dissolved solids
UMTRA	Uranium Mill Tailings Remedial Action
USGS	U.S. Geological Survey
VDP	validation data package

1.0 Introduction

The purpose of this document is to summarize the results of the data validation process associated with ground water and/or surface water samples collected from the Moab Uranium Mill Tailings Remedial Action (UMTRA) site. This data validation follows the criteria according to the *Moab UMTRA Project Surface Water/Ground Water Sampling and Analysis Plan* (DOE-EM/GJTAC1830) and the “Standard Practice for Validation of Laboratory Data,” GT-9(P) (2006).

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

This validation data package (VDP) presents the results of the August 2010 monthly sampling event completed from August 3 through 5, 2010, in which ground water samples were collected from each of the Configuration (CF) 4 observation wells and three well points located in the river bed. The locations were sampled to collect baseline data prior to the initiation of freshwater injection in the CF4 remediation wells. The side channel off CF4 has the highest probability of developing into habitat. In addition, a sample of the water stored in the evaporation pond was also collected. Section 1.0 contains the Summary Criteria with a sample location map (Section 1.1), the Sampling Event Summary (Section 1.2), and the Sampling and Analyses (Section 1.3) for this August 2010 monthly sampling event.

1.1 Summary Criteria

Sampling Period: August 3 through 5, 2010

The purpose of this sampling was to collect data from the CF4 observation wells and well points prior to the instigation of freshwater injection into the CF4 remediation wells to protect the adjacent habitat area. This data will eventually provide information to evaluate the performance of freshwater injection into the subsurface in the vicinity of CF4 and the effectiveness of preventing ground water contaminants from discharging into the adjacent Colorado River side channel. All sampling locations are shown on Figure 1.

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

Yes. Of the locations sampled during this event, only the sample collected from well point 0793 (which had historically low manganese) was considered to be anomalous based on the criteria presented in Section 3.0. However, there is no indication this anomalous data point is related to pumping rate or river flow changes.

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

Yes. CF5 well PW02 was extracting ground water at a rate of approximately 27 gallons per minute (gpm) just prior to this sampling event.

3. Was the evaporation pond functioning properly?

Yes. The pond level was 8.8 feet (ft) on August 5, 2010.

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

No. It was not possible to collect samples from well points 0790, 0794, and 0795 because they did not recharge after the initial sample purging. Due to the fact that no extraction wells were operating during this event, it was not possible to collect a sample from evaporation pond location 0547.

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

No.

1.2 Sampling Event Summary

This VDP presents the validated data associated with the ground water collected during the August 2010 IA monthly sampling event at the former uranium tailings processing site in Moab, Utah. This VDP includes a discussion of the data validation process in Section 2.0, with a description of how these data are qualified based on field and laboratory verification assessments (Sections 2.1 and 2.2). Attachment 1 contains the trip report detailing the field events associated with this sampling event. In addition, time versus analyte concentration plots are provided where applicable.

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

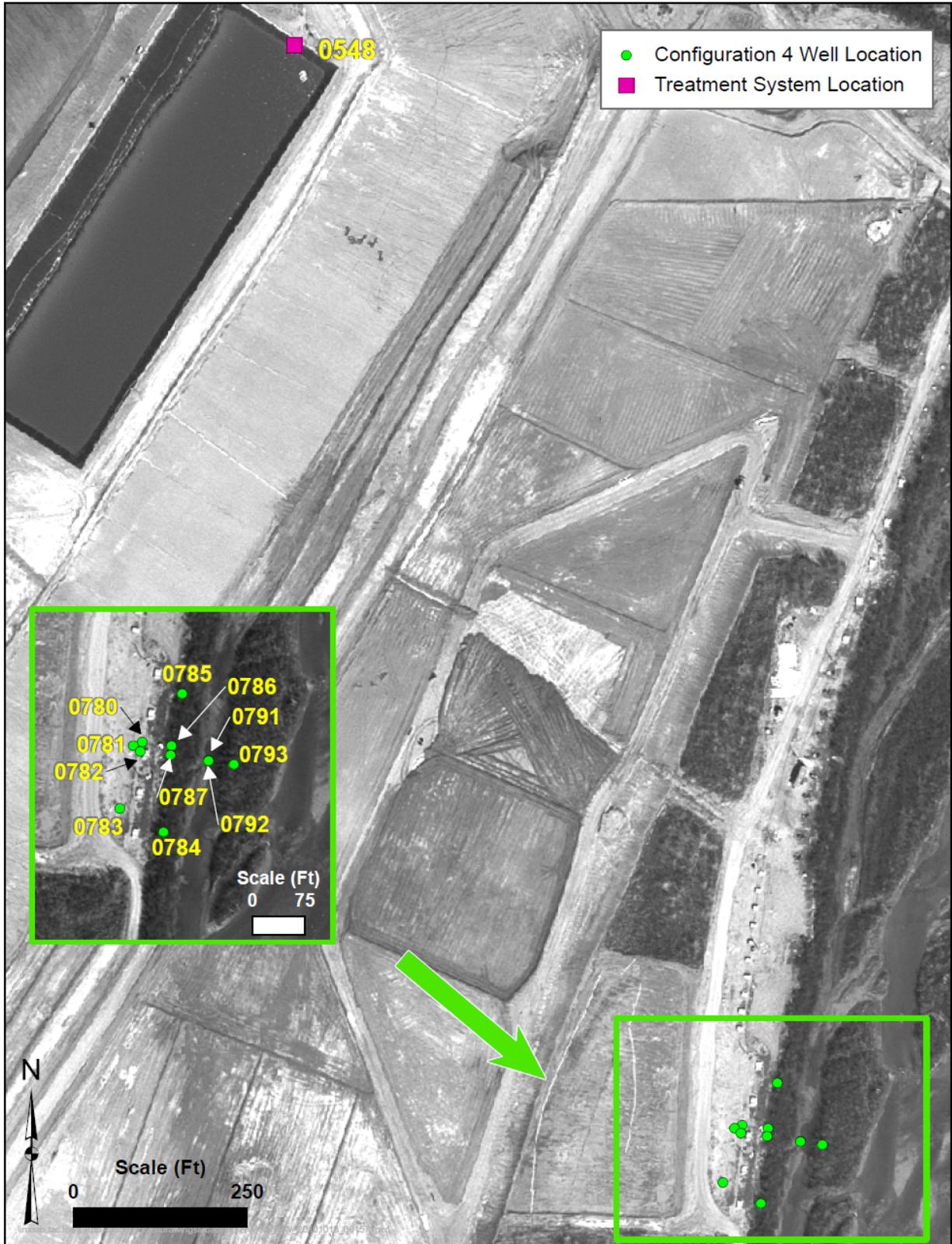


Figure 1. Map of Sample Locations for the August 2010 Monthly Sampling Event

CF4 Upgradient Observation Wells 0780, 0781, 0782, and 0783

Figures 2, 3, and 4 are the time versus ammonia, total dissolved solids (TDS), and uranium concentration (respectively) plots for CF4 upgradient observation wells 0780 through 0783. Ground water samples were collected from a depth of 28 ft below ground surface (bgs) from well 0780, 46 ft bgs from 0781, 33 ft bgs from 0782, and 18 ft bgs from 0783 during this event. Subsequent samples will be collected from these same depths after freshwater injection has been initiated to determine the vertical extent of freshwater injection into the CF4 remediation wells. Historically, samples have been frequently collected from 0780 and 0782; the samples indicate the analyte concentrations significantly decrease in response to the Colorado River spring runoff. The lack of sampling during peak runoff may actually influence the subsurface below 33 ft bgs, but the infrequency of sampling from well does not allow any interpretations to be made about the propagation of the freshwater lens inland from the river this year. During the August sampling period, concentrations appear to have begun to rebound to the low-flow river condition.

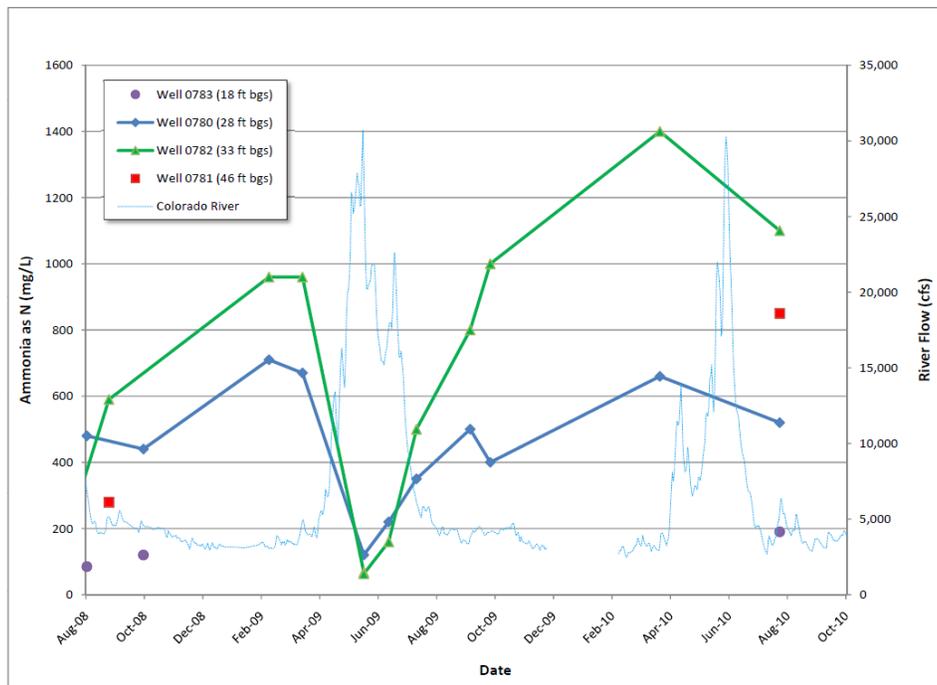


Figure 2. CF4 Upgradient Observation Wells 0780, 0781, 0782, and 0783 Time Versus Ammonia Total as N Concentration Plot

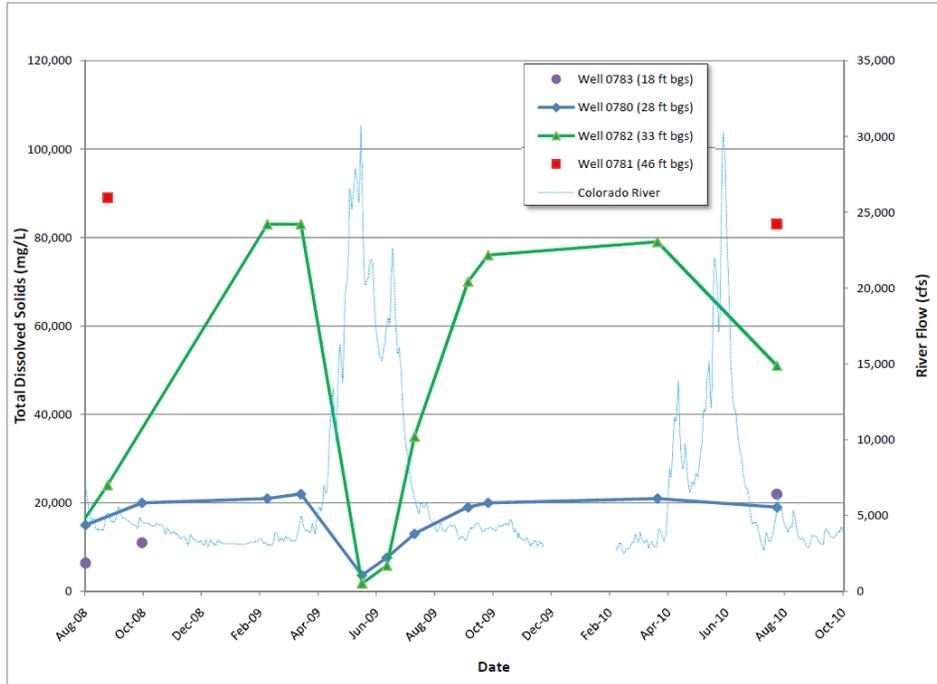


Figure 3. CF4 Upgradient Observation Wells 0780, 0781, 0782, and 0783 Time Versus TDS Concentration Plot

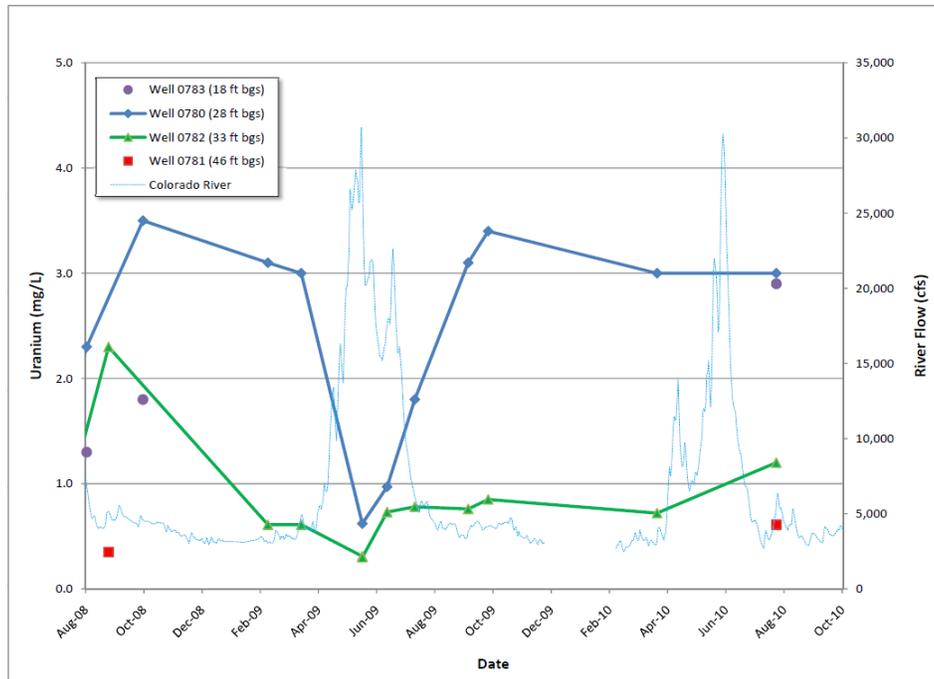


Figure 4. CF4 Upgradient Observation Wells 0780, 0781, 0782, and 0783 Time Versus Uranium Concentration Plot

CF4 Downgradient Observation Wells 0784, 0785, 0786, and 0787

The ammonia, TDS, and uranium concentration versus time plots are presented as Figures 5, 6, and 7 for CF4 downgradient observation wells 0784 through 0787. Ground water samples were collected from a depth of 18 ft bgs from wells 0784 and 0785, 28 ft bgs from 0786, and 36 ft bgs from 0787 during this event. Again, subsequent samples after freshwater injection has been initiated will be collected from these same depths to determine the subsurface impact of freshwater injection into the CF4 remediation wells.

Historically, samples have been frequently collected from wells 0786 and 0787; the samples indicate the analyte concentrations significantly decrease downgradient of CF4 in response to the Colorado River spring runoff. The lack of sampling during peak runoff does not allow any interpretations to be made about the propagation of the freshwater lens inland from the river this year. During the August sampling period, concentrations appear to have begun to rebound to the low-flow river condition.

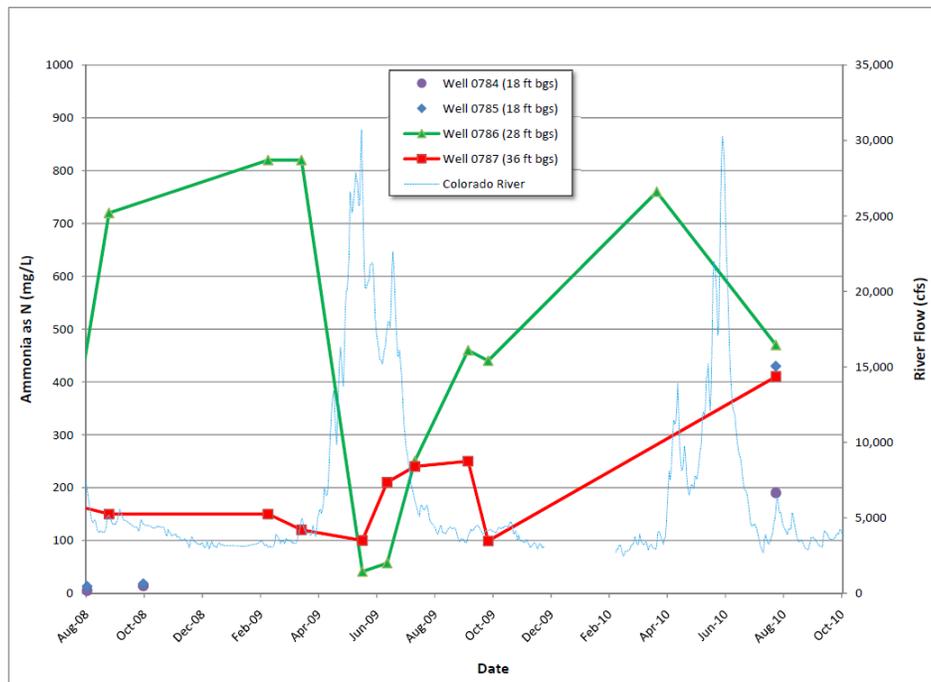


Figure 5. CF4 Downgradient Observation Wells 0784, 0785, 0786, and 0787 Time Versus Ammonia Total as N Concentration Plot

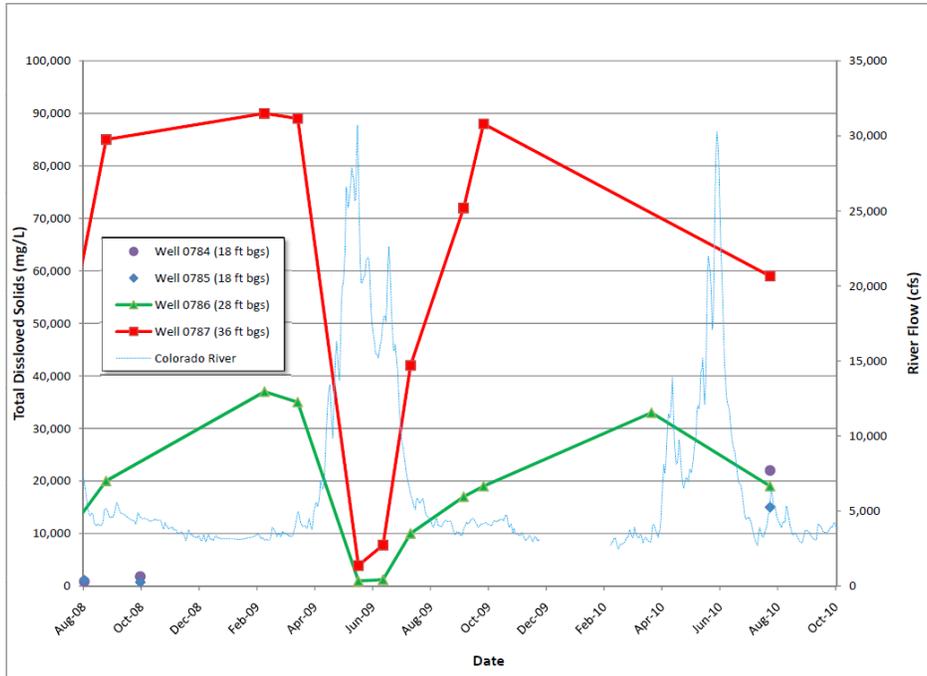


Figure 6. CF4 Downgradient Observation Wells 0784, 0785, 0786, and 0787 Time Versus TDS Concentration Plot

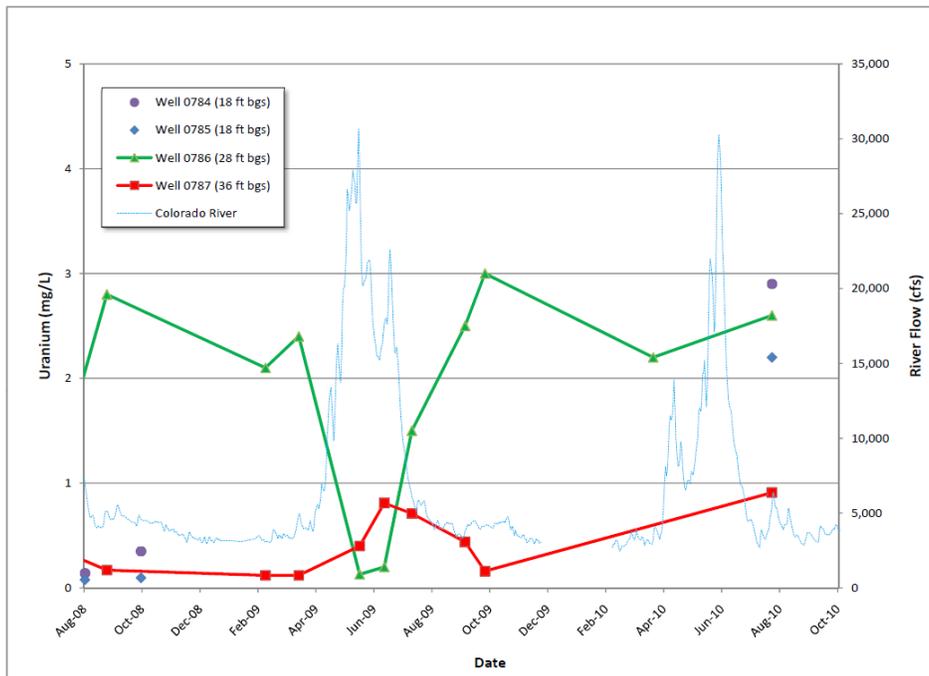


Figure 7. CF4 Downgradient Observation Wells 0784, 0785, 0786, and 0787 Time Versus Uranium Concentration Plot

CF4 Well Points 0791, 0792, and 0793

The ammonia, TDS, and uranium concentration versus time plots are presented as Figures 8, 9, and 10 for CF4 well points 0791, 0792, and 0793. Well point 0791 is screened from 4.3 to 5.3 ft bgs, 0792 is screened from 9.3 to 10.3 ft bgs, and 0793 is screened from 2 to 3 ft bgs. Ground water samples could not be collected from remaining well points 0790, 0794, and 0795 because they did not recharge after the initial purging. As the plots exhibit, ground water collected from well point 0793 has a chemical signature that resembles surface water, while the samples collected at depth are indicative of ground water concentrations.

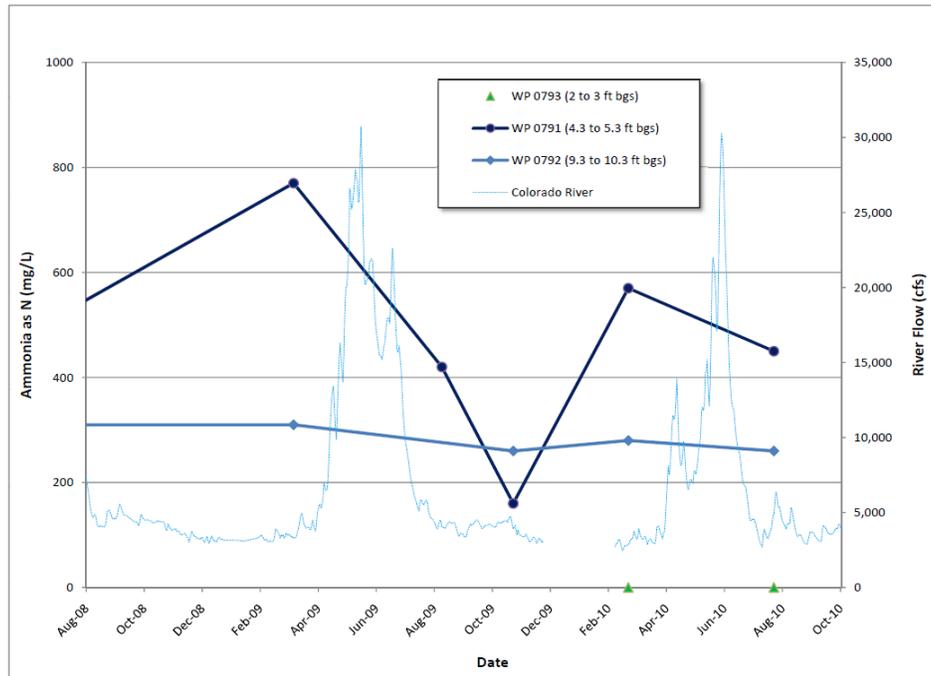


Figure 8. CF4 Well Points 0791, 0792, and 0793
Time Versus Ammonia Total as N Concentration Plot

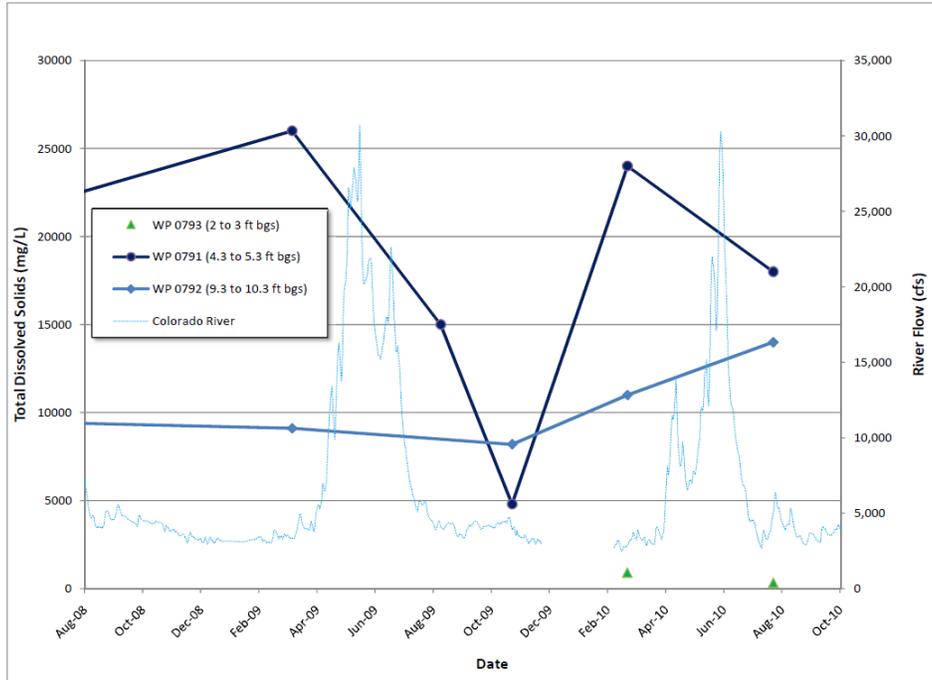


Figure 9 CF4 Well Points 0791, 0792, and 0793
Time Versus TDS Concentration Plot

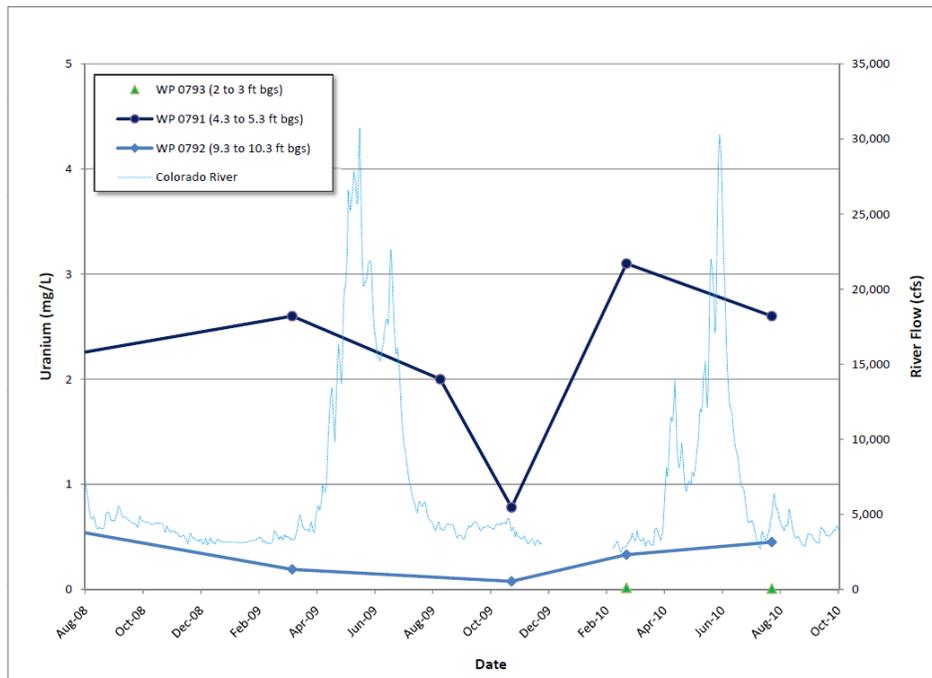


Figure 10 CF4 Well Points 0791, 0792, and 0793
Time Versus Uranium Concentration Plot

Evaporation Pond Location 0548

Figures 11, 12, and 13 are the time versus analyte concentration plots for the water collected from location 0548, which represents the water stored in the evaporation pond. The evaporation pond level is also included with these plots.

Starting in March 2010, tailings pore water originating from the excavation was transferred into the evaporation pond. Ground water from CF5 wells was added to the evaporation pond on a consistent basis starting mid-June 2010. By the time the pond was sampled during this event, the excavation area of operations had started moving away from areas impacted by the former wick system, and the analyte concentrations had started to rebound to pre-pore water addition levels.

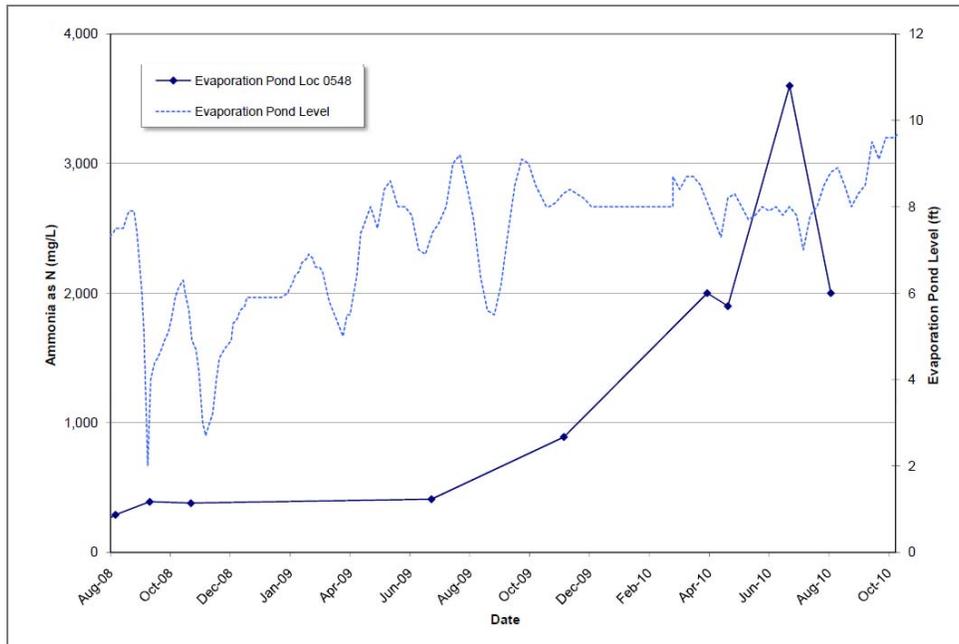


Figure 11. Evaporation Pond Location 0548
Time Versus Ammonia Total as N Concentration Plot

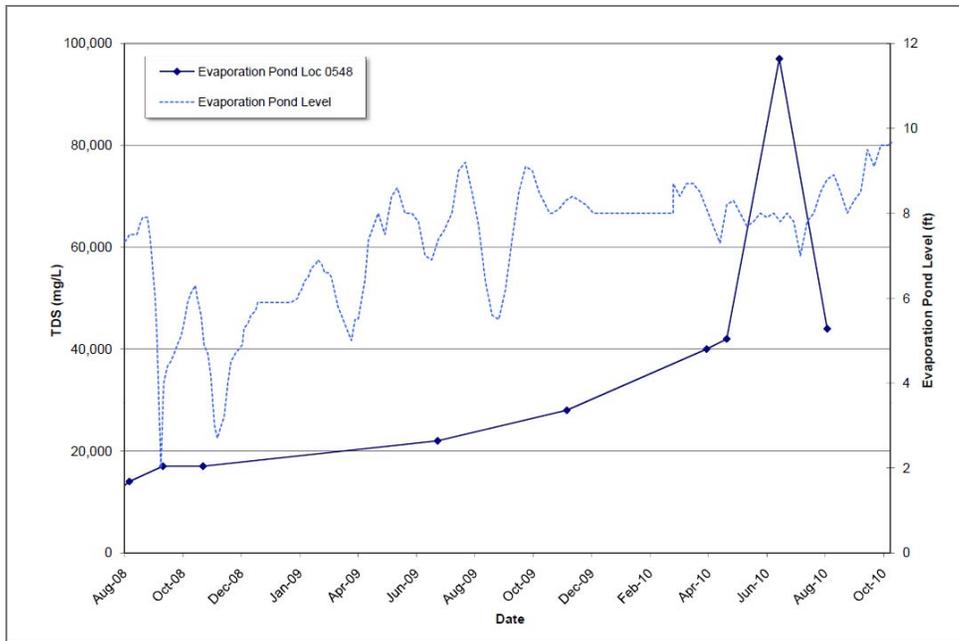


Figure 12. Evaporation Pond Location 0548
Time Versus TDS Concentration Plot

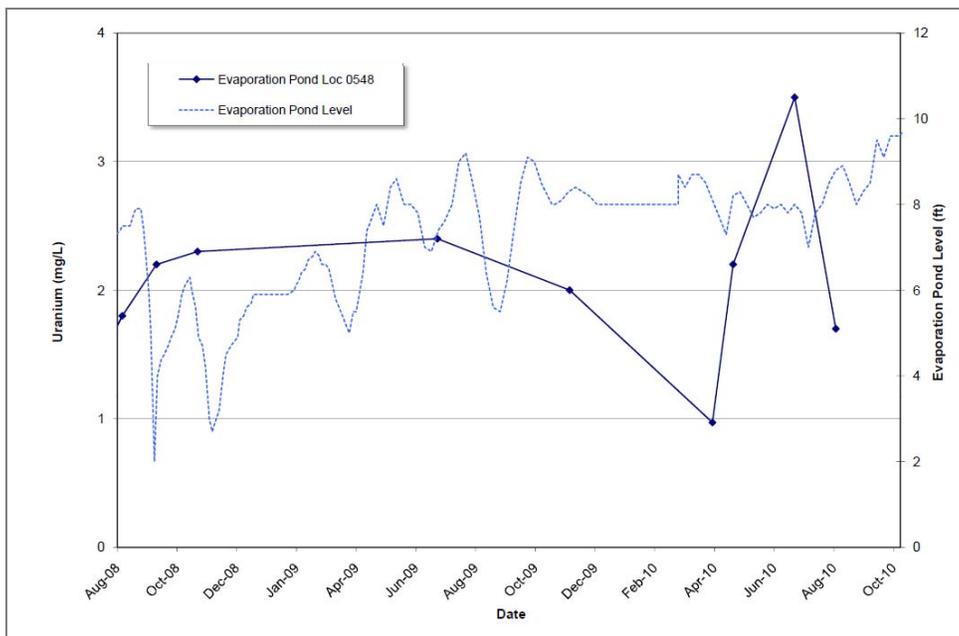


Figure 13. Evaporation Pond Location 0548
Time Versus Uranium Concentration Plot

Surface Water Sampling Results

There were no surface water locations sampled during this sampling event.

1.3 Sampling and Analyses

Sampling and analyses were conducted in accordance with the *Operations, Maintenance, and Performance Monitoring Plan for the Interim Action Ground Water Treatment System*, April 2008 (DOE-EM/GJ1220). Please refer to the attached trip report (Attachment 1) for specific sampled locations.

The data validations indicate that the data meet the quality-control criteria specified for this project. An adequate number of duplicates were collected, and all samples were collected using dedicated equipment; therefore, no equipment blanks (EBs) were required. All samples were analyzed within their prescribed holding times. No significant discrepancies were noted regarding chain of custody (COC), case narratives, presence of field and sample identifications, holding times, preservation, and cooler receipts, except as qualified or noted in the Laboratory Performance Assessment (Section 2.2).

There was one anomalous data point associated with this sampling event. According to the USGS Cisco gauging station, the mean daily Colorado River flow rates ranged from 5,530 to 6,340 cubic feet per second (cfs).

2.0 Data Assessment Summaries

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

2.1 Water Sampling Field Activities Verification

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

2.2 Laboratory Performance Assessment

General Information

Report Identification Number (RIN):	1008050
Sample Event:	August 2010 IA Interim Action Well Field Monthly Sampling
Site(s): Moab,	Utah
Laboratory: ALS	Laboratory Group, Fort Collins, CO
Sample Data Group (SDG) Number:	1008072
Analysis:	Metals and Inorganics
Validator: Rachel	Cowan
Review Date:	October 10, 2010

Table 1. Analytes and Methods

Analyte	Line Item Code	Preparation Method	Analytical Method
Ammonia as N, NH ₃ -N	WCH-A-005	EPA 350.1	EPA 350.1
Manganese	G17	SW-846 3005A	SW-846 6010B
Selenium	G14	SW-846 3005A	SW-846 6020A
TDS	WIC-A-033	EPA 160.1	EPA 160.1
Uranium	G1	SW-846 3005A	SW-846 6020A

Data Qualifier Summary

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

Table 2. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1008072-7 through -9	0785, 0786, 0787	Ammonia	J	MS1
1008072-11	0792	Selenium	J	LCS1, MS1, RS1, SD1

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

Table 3. Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-Detects)	Explanation
LCS1	J	UJ	A laboratory control sample was not analyzed.
MS1	J	UJ	Results for the affected analyte(s) are regarded as estimated (J) because the matrix spike sample was (a) from another client, (b) of dissimilar matrix, (c) a field blank or EB, or (d) not analyzed at the proper frequency as stated in the appropriate analytical method.
RS1	J	UJ	Replicate sample frequency criteria were not met.
SD1	J	NA	Serial dilution sample frequency criteria were not met.

Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received a total of 13 samples for RIN 1008050 in one shipment, which arrived on August 6, 2010 (UPS tracking number 1Z5W1Y510190007090). SDG 1008072 was accompanied by a COC form. The COC form was checked to confirm that all of the samples were listed on the form with sample collection dates and times and that signatures and dates were present, indicating sample relinquishment and receipt. The sample submittal documents, including the COC forms and the sample tickets, had no errors or omissions.

Preservation and Holding Times

SDG 1008072 was received intact and at an appropriate temperature of 3.6 degrees Centigrade. 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, performed at a frequency of one per 20 samples unless otherwise noted, is a measure of the ability to recover analytes in a particular matrix. Replicate sample (RS) analysis consists of matrix spike duplicate (MSD) samples and field duplicates, analyzed at a frequency of one per 20 samples per method or procedural requirements. These RSs are indicators of laboratory precision for each sample matrix.

Method EPA 350.1, Ammonia

The ammonia samples in SDG 1008072 did not have the appropriate number of MS samples as per method requirements, so ammonia results from samples 1008072-7 through -9 were “J”-flagged for MS1. In addition, the native ammonia concentration MS sample was too high. As per requirements, the ammonia results associated with this MS were not flagged for MS1, and since the ammonia field duplicate passed, no ammonia results in SDG 1008072 were “J”-flagged for reason RS1.

Method SW-846 6020A, Selenium

There was no selenium sample from SDG 1008072 selected for testing matrix-specific quality-control samples. Therefore, there was no MS for selenium, and the single SDG 1008072 selenium result was “J”-flagged for MS1. Additionally, since there were no selenium MSD and no field duplicate selenium samples, the SDG 1008072 selenium result was also flagged for RS1.

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, ALS Laboratory Group does not prepare LCSs for samples that are field-filtered and acidified and then run directly on the instrument without any additional sample preparation. Per national environmental laboratory accreditation requirements, an MS may be used in place of an LCS provided the acceptance samples are “J”-qualified for LCS failure.

The manganese and uranium MS results were acceptable, so no manganese and uranium results were “J”-flagged for reason LCS1. However, as there were no selenium samples from SDG 1008072 selected for testing matrix-specific quality-control samples, no selenium LCS was prepared, and the SDG 1008072 selenium result was flagged for LCS1.

Method and Calibration Blanks

Method blanks (MBs) are analyzed to assess any contamination that may have occurred during sample preparation. Initial calibration blanks and continuing calibration blanks are analyzed to assess instrument contamination prior to and during sample analysis. Detected sample results associated with blanks results greater than the method detection limit or instrument detection limit (depending on method requirements) were “J”-qualified when the detections were less than five times the associated blank concentration. Non-detects were not qualified. All blanks passed these criteria.

Metals Serial Dilution

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

There was no selenium SD sample in SDG 1008072, so the selenium result in SDG 1008072 was “J”-flagged for SD1. According to the case narratives, the manganese and uranium SDs in SDG 1008072 passed.

Field Duplicate Analysis

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory replicates, which measure only laboratory performance. One duplicate sample was collected from location 0787 (1008072-9) in the August 2010 sampling event. The duplicate results met the U.S. Environmental Protection Agency (EPA)-recommended laboratory duplicate criteria of less than 20 relative percent difference (RPD) for results that are greater than five times the reporting level.

Equipment Blanks

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

All the ground water samples and surface water samples were collected using dedicated equipment. Therefore, no EBs were collected.

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 for RIN 1008050 arrived on August 31, 2010. The contents of the EDD files were manually examined to verify that the sample results accurately reflected the data contained in the SDGs 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 August 2010 monthly sampling event.

Field Activities

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

2.4 Certification

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

3.0 Data Presentation

This section contains the Minimums and Maximums Report (Section 3.1), the Anomalous Data Review 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 reports are further screened, and the results are not considered anomalous if: (1) identified low concentrations are the result of low detection limits; (2) the concentration detected is less or more than 50 percent of historical minimum or maximum values; or (3) there were fewer than five historical samples for comparison.

3.2 Anomalous Data Review

There was one anomalous data point based on the Minimums and Maximums Report, as listed below.

<u>Loc. No.</u>	<u>Analyte</u>	<u>Type of Anomaly</u>	<u>Disposition</u>
0793	Manganese	Low	Ten or fewer samples collected; still establishing concentration range.

3.3 Water Quality Data

All water quality data are presented in Appendix C.

3.4 Water Level Data

All water level data are presented in Appendix D.

3.5 Blanks Report

Since all the samples were collected using dedicated equipment, it was not necessary to collect an EB during this sampling event.

Appendix A.
Water Sampling Field Activities Verification

Appendix A. Water Sampling Field Activities Verification (continued)

Sampling Event / RIN	August 2010 Monthly Sampling/ RIN 1008050	Date(s) of Water Sampling	August 3 - 5, 2010
Date(s) of Verification	October 18, 2010	Name of Verifier	Rachel Cowan
		Response (Yes, No, NA)	Comments
1.	Is the Sampling Analysis Plan the primary document directing field procedures? List other documents, standard operating procedures, instructions.	Yes <hr/> NA	
2.	Were the sampling locations specified in the planning documents sampled?	No	Three well points (0790, 0794, and 0795) were not sampled because they did not recharge after purging. Location 0547 was not sampled because no extraction wells were operating during the sampling time.
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 <hr/> 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?	Yesv	
7.	Were the following conditions met when purging a Category I well: Was one pump/tubing volume purged prior to sampling? Did the water level stabilize prior to sampling? Did pH, specific conductance, and turbidity measurements stabilize prior to sampling? Was the flow rate less than 500 milliliters per minute? If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	Yes <hr/> Yes <hr/> Yes <hr/> Yes <hr/> NA	
8.	Were the following conditions met when purging a Category II well: Was the flow rate less than 500 milliliters per minute? Was one pump/tubing volume removed prior to sampling?	Yes <hr/> Yes	
9.	Were duplicates taken at a frequency of one per 20 samples?	Yes	There were a total of 13 samples collected, including one duplicate.

Appendix A. Water Sampling Field Activities Verification (continued)

Sampling Event / RIN	August 2010 Monthly Sampling/ RIN 1008050	Date(s) of Water Sampling	August 3 - 5, 2010
Date(s) of Verification	October 18, 2010	Name of Verifier	Rachel Cowan
		Response (Yes, No, NA)	Comments
10. Were EBs taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?		NA	All samples were collected using dedicated sampling equipment; it was not necessary to collect an EB.
11. Were trip blanks prepared and included with each shipment of volatile organic compound samples?		NA	
12. Were quality-control samples assigned a fictitious site identification number?		Yes	
Was the true identity of the samples recorded on the quality assurance sample log?		Yes	
13. Were samples collected in the containers specified?		Yes	
14. Were samples filtered and preserved as specified?		Yes	
15. Were the number and types of samples collected as specified?		Yes	
16. Were COC records completed, and was sample custody maintained?		Yes	
17. Are field data sheets signed and dated by both team members?		Yes	
18. Was all other pertinent information documented on the field data sheets?		Yes	
19. Was the presence or absence of ice in the cooler documented at every sample location?		Yes	
20. Were water levels measured at the locations specified in the planning documents?		Yes	

Appendix B.
Minimums and Maximums Report

Appendix B. Minimums and Maximums Report

Data Validation Minimums and Maximums Report - No Field Parameters

Laboratory: ALS

RIN: 1008050

Comparison: All Historical Data

Report Date: 10/19/2010

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	0781	08/04/2010	Ammonia Total as N	850		630	J	25		24	0
MOA01	0781	08/04/2010	Manganese	8.8		8.3	J	6.1	F	16	0
MOA01	0787	08/04/2010	Ammonia Total as N	410		340		32	F	31	0
MOA01	0787	08/04/2010	Ammonia Total as N	360	J	340		32	F	31	0
MOA01	0787	08/04/2010	Uranium	0.91		0.81		0.11	J	31	0
MOA01	0787	08/04/2010	Uranium	0.89		0.81		0.11	J	31	0
MOA01	0793	08/03/2010	Manganese	0.29		1.57	QF	0.73		6	0
MOA01	0793	08/03/2010	Total Dissolved Solids	340		24000		605	F	8	0

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

Appendix B. Minimums and Maximums Report (continued)

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

LAB QUALIFIERS:

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

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 10/20/2010

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers		Detection Limit	Uncertainty
								Lab	Data QA		
Ammonia Total as N	mg/L	0548	TS	08/05/2010	0001	0 - 0	2000		#	100	
Ammonia Total as N	mg/L	0780	WL	08/04/2010	0001	28 - 28	520		#	20	
Ammonia Total as N	mg/L	0781	WL	08/04/2010	0001	46 - 46	850		#	20	
Ammonia Total as N	mg/L	0782	WL	08/04/2010	0001	33 - 33	1100		#	50	
Ammonia Total as N	mg/L	0783	WL	08/04/2010	0001	18 - 18	190		#	10	
Ammonia Total as N	mg/L	0784	WL	08/04/2010	0001	18 - 18	190		#	10	
Ammonia Total as N	mg/L	0785	WL	08/04/2010	0001	18 - 18	430		J #	20	
Ammonia Total as N	mg/L	0786	WL	08/04/2010	0001	28 - 28	470		J #	20	
Ammonia Total as N	mg/L	0787	WL	08/04/2010	0001	36 - 36	360		J #	20	
Ammonia Total as N	mg/L	0787	WL	08/04/2010	0002	36 - 36	410		#	20	
Ammonia Total as N	mg/L	0791	WL	08/03/2010	0001	4.3 - 5.3	450		#	20	
Ammonia Total as N	mg/L	0792	WL	08/03/2010	0001	9.3 - 10.3	260		#	20	
Ammonia Total as N	mg/L	0793	WL	08/03/2010	0001	2 - 3	0.1	U	#	0.1	
Dissolved Oxygen	mg/L	0548	TS	08/05/2010	0001	0 - 0	4.96		#		
Dissolved Oxygen	mg/L	0780	WL	08/04/2010	0001	28 - 28	3.97		#		
Dissolved Oxygen	mg/L	0781	WL	08/04/2010	0001	46 - 46	0.34		#		
Dissolved Oxygen	mg/L	0782	WL	08/04/2010	0001	33 - 33	0.43		#		
Dissolved Oxygen	mg/L	0783	WL	08/04/2010	0001	18 - 18	1.68		#		
Dissolved Oxygen	mg/L	0784	WL	08/04/2010	0001	18 - 18	1.77		#		
Dissolved Oxygen	mg/L	0785	WL	08/04/2010	0001	18 - 18	2.21		#		
Dissolved Oxygen	mg/L	0786	WL	08/04/2010	0001	28 - 28	1.34		#		
Dissolved Oxygen	mg/L	0787	WL	08/04/2010	0001	36 - 36	0.47		#		
Dissolved Oxygen	mg/L	0791	WL	08/03/2010	0001	4.3 - 5.3	6.21		#		
Dissolved Oxygen	mg/L	0792	WL	08/03/2010	0001	9.3 - 10.3	4.92		#		
Dissolved Oxygen	mg/L	0793	WL	08/03/2010	0001	2 - 3	2.6		#		

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 10/20/2010

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers		Detection Limit	Uncertainty
						Lab	Data	QA					
Manganese	mg/L	0548	TS	08/05/2010	0001	0	-	0	33		#	0.0057	
Manganese	mg/L	0780	WL	08/04/2010	0001	28	-	28	5.2		#	0.0011	
Manganese	mg/L	0781	WL	08/04/2010	0001	46	-	46	8.8		#	0.0057	
Manganese	mg/L	0782	WL	08/04/2010	0001	33	-	33	7.2		#	0.0057	
Manganese	mg/L	0783	WL	08/04/2010	0001	18	-	18	3.9		#	0.0023	
Manganese	mg/L	0784	WL	08/04/2010	0001	18	-	18	4.8		#	0.0023	
Manganese	mg/L	0785	WL	08/04/2010	0001	18	-	18	5.9		#	0.0023	
Manganese	mg/L	0786	WL	08/04/2010	0001	28	-	28	5.6		#	0.0023	
Manganese	mg/L	0787	WL	08/04/2010	0001	36	-	36	6.3		#	0.0057	
Manganese	mg/L	0787	WL	08/04/2010	0002	36	-	36	5.7		#	0.0057	
Manganese	mg/L	0791	WL	08/03/2010	0001	4.3	-	5.3	5.7		#	0.0023	
Manganese	mg/L	0792	WL	08/03/2010	0001	9.3	-	10.3	1.7		#	0.0023	
Manganese	mg/L	0793	WL	08/03/2010	0001	2	-	3	0.29		#	0.00011	
Oxidation Reduction Potential	mV	0548	TS	08/05/2010	0001	0	-	0	189.9		#		
Oxidation Reduction Potential	mV	0780	WL	08/04/2010	0001	28	-	28	136.4		#		
Oxidation Reduction Potential	mV	0781	WL	08/04/2010	0001	46	-	46	18.3		#		
Oxidation Reduction Potential	mV	0782	WL	08/04/2010	0001	33	-	33	23		#		
Oxidation Reduction Potential	mV	0783	WL	08/04/2010	0001	18	-	18	128.1		#		
Oxidation Reduction Potential	mV	0784	WL	08/04/2010	0001	18	-	18	108.4		#		
Oxidation Reduction Potential	mV	0785	WL	08/04/2010	0001	18	-	18	74.7		#		
Oxidation Reduction Potential	mV	0786	WL	08/04/2010	0001	28	-	28	-6.9		#		
Oxidation Reduction Potential	mV	0787	WL	08/04/2010	0001	36	-	36	50.2		#		
Oxidation Reduction Potential	mV	0791	WL	08/03/2010	0001	4.3	-	5.3	44		#		
Oxidation Reduction Potential	mV	0792	WL	08/03/2010	0001	9.3	-	10.3	-59		#		
Oxidation Reduction Potential	mV	0793	WL	08/03/2010	0001	2	-	3	-64.5		#		

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 10/20/2010

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA						
pH	s.u.	0548	TS	08/05/2010	0001	0	-	0	5.04			#		
pH	s.u.	0780	WL	08/04/2010	0001	28	-	28	6.85			#		
pH	s.u.	0781	WL	08/04/2010	0001	46	-	46	6.71			#		
pH	s.u.	0782	WL	08/04/2010	0001	33	-	33	6.83			#		
pH	s.u.	0783	WL	08/04/2010	0001	18	-	18	6.75			#		
pH	s.u.	0784	WL	08/04/2010	0001	18	-	18	6.74			#		
pH	s.u.	0785	WL	08/04/2010	0001	18	-	18	6.7			#		
pH	s.u.	0786	WL	08/04/2010	0001	28	-	28	6.81			#		
pH	s.u.	0787	WL	08/04/2010	0001	36	-	36	6.85			#		
pH	s.u.	0791	WL	08/03/2010	0001	4.3	-	5.3	6.95			#		
pH	s.u.	0792	WL	08/03/2010	0001	9.3	-	10.3	8.16			#		
pH	s.u.	0793	WL	08/03/2010	0001	2	-	3	7.87			#		
Selenium	mg/L	0792	WL	08/03/2010	0001	9.3	-	10.3	0.00035	B	J	#	0.00016	
Specific Conductance	µmhos/cm	0548	TS	08/05/2010	0001	0	-	0	54733			#		
Specific Conductance	µmhos/cm	0780	WL	08/04/2010	0001	28	-	28	25225			#		
Specific Conductance	µmhos/cm	0781	WL	08/04/2010	0001	46	-	46	115897			#		
Specific Conductance	µmhos/cm	0782	WL	08/04/2010	0001	33	-	33	77882			#		
Specific Conductance	µmhos/cm	0783	WL	08/04/2010	0001	18	-	18	25017			#		
Specific Conductance	µmhos/cm	0784	WL	08/04/2010	0001	18	-	18	25575			#		
Specific Conductance	µmhos/cm	0785	WL	08/04/2010	0001	18	-	18	20319			#		
Specific Conductance	µmhos/cm	0786	WL	08/04/2010	0001	28	-	28	24678			#		
Specific Conductance	µmhos/cm	0787	WL	08/04/2010	0001	36	-	36	82427			#		
Specific Conductance	µmhos/cm	0791	WL	08/03/2010	0001	4.3	-	5.3	20120			#		
Specific Conductance	µmhos/cm	0792	WL	08/03/2010	0001	9.3	-	10.3	142300			#		
Specific Conductance	µmhos/cm	0793	WL	08/03/2010	0001	2	-	3	649			#		

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 10/20/2010

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA						
Temperature	C	0548	TS	08/05/2010	0001	0	-	0	25.69			#		
Temperature	C	0780	WL	08/04/2010	0001	28	-	28	16.98			#		
Temperature	C	0781	WL	08/04/2010	0001	46	-	46	18.26			#		
Temperature	C	0782	WL	08/04/2010	0001	33	-	33	17.27			#		
Temperature	C	0783	WL	08/04/2010	0001	18	-	18	16.58			#		
Temperature	C	0784	WL	08/04/2010	0001	18	-	18	16.59			#		
Temperature	C	0785	WL	08/04/2010	0001	18	-	18	17.27			#		
Temperature	C	0786	WL	08/04/2010	0001	28	-	28	17.32			#		
Temperature	C	0787	WL	08/04/2010	0001	36	-	36	18.63			#		
Temperature	C	0791	WL	08/03/2010	0001	4.3	-	5.3	17			#		
Temperature	C	0792	WL	08/03/2010	0001	9.3	-	10.3	22.5			#		
Temperature	C	0793	WL	08/03/2010	0001	2	-	3	16.2			#		
Total Dissolved Solids	mg/L	0548	TS	08/05/2010	0001	0	-	0	44000			#	2000	
Total Dissolved Solids	mg/L	0780	WL	08/04/2010	0001	28	-	28	19000			#	200	
Total Dissolved Solids	mg/L	0781	WL	08/04/2010	0001	46	-	46	83000			#	2000	
Total Dissolved Solids	mg/L	0782	WL	08/04/2010	0001	33	-	33	51000			#	2000	
Total Dissolved Solids	mg/L	0783	WL	08/04/2010	0001	18	-	18	22000			#	1000	
Total Dissolved Solids	mg/L	0784	WL	08/04/2010	0001	18	-	18	22000			#	1000	
Total Dissolved Solids	mg/L	0785	WL	08/04/2010	0001	18	-	18	15000			#	1000	
Total Dissolved Solids	mg/L	0786	WL	08/04/2010	0001	28	-	28	19000			#	1000	
Total Dissolved Solids	mg/L	0787	WL	08/04/2010	0001	36	-	36	59000			#	2000	
Total Dissolved Solids	mg/L	0787	WL	08/04/2010	0002	36	-	36	58000			#	2000	
Total Dissolved Solids	mg/L	0791	WL	08/03/2010	0001	4.3	-	5.3	18000			#	400	
Total Dissolved Solids	mg/L	0792	WL	08/03/2010	0001	9.3	-	10.3	14000			#	400	
Total Dissolved Solids	mg/L	0793	WL	08/03/2010	0001	2	-	3	340			#	20	
Turbidity	NTU	0548	TS	08/05/2010	0001	0	-	0	32.8			#		
Turbidity	NTU	0791	WL	08/03/2010	0001	4.3	-	5.3	35.4			#		

Appendix C. Water Quality Data (continued)

General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 10/20/2010

Parameter	Units	Location ID	Location Type	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA						
Turbidity	NTU	0793	WL	08/03/2010	0001	2	-	3	0.38			#		
Uranium	mg/L	0548	TS	08/05/2010	0001	0	-	0	1.7			#	0.00029	
Uranium	mg/L	0780	WL	08/04/2010	0001	28	-	28	3			#	0.00058	
Uranium	mg/L	0781	WL	08/04/2010	0001	46	-	46	0.61			#	0.00015	
Uranium	mg/L	0782	WL	08/04/2010	0001	33	-	33	1.2			#	0.00029	
Uranium	mg/L	0783	WL	08/04/2010	0001	18	-	18	2.9			#	0.00058	
Uranium	mg/L	0784	WL	08/04/2010	0001	18	-	18	2.9			#	0.00058	
Uranium	mg/L	0785	WL	08/04/2010	0001	18	-	18	2.2			#	0.00058	
Uranium	mg/L	0786	WL	08/04/2010	0001	28	-	28	2.6			#	0.00058	
Uranium	mg/L	0787	WL	08/04/2010	0001	36	-	36	0.91			#	0.00015	
Uranium	mg/L	0787	WL	08/04/2010	0002	36	-	36	0.89			#	0.00015	
Uranium	mg/L	0791	WL	08/03/2010	0001	4.3	-	5.3	2.6			#	0.00058	
Uranium	mg/L	0792	WL	08/03/2010	0001	9.3	-	10.3	0.45			#	0.00058	
Uranium	mg/L	0793	WL	08/03/2010	0001	2	-	3	0.0081			#	2.9E-005	

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

Appendix C. Water Quality Data (continued)

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

LAB QUALIFIERS:

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

DATA QUALIFIERS:

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

QA QUALIFIER:

Validated according to quality-assurance guidelines.

Appendix D.
Water Level Data

Appendix D. Water Level Data

STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site
REPORT DATE: 10/27/2010

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
0780	O	3968.45	08/04/2010		15.50	3952.95	
0781	O	3968.56	08/04/2010		14.90	3953.66	
0782	O	3968.46	08/04/2010		15.45	3953.01	
0783	O	3968.82	08/04/2010		16.05	3952.77	
0784	O	3968.73	08/04/2010		15.95	3952.78	
0785	O	3969.24	08/04/2010		15.85	3953.39	
0786	O	3968.14	08/04/2010		15.29	3952.85	
0787	O	3968.43	08/04/2010		15.29	3953.14	
0790	O	3955.20	08/03/2010		Dry	NA	D
0791	O	3954.76	08/03/2010		5.40	3949.36	
0792	O	3954.84	08/03/2010		5.18	3949.66	
0793	O	3954.95	08/03/2010		2.24	3952.71	
0794	O	3954.48	08/03/2010		6.04	3948.44	
0795	O	3954.48	08/03/2010		1.87	3952.61	

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

Attachment 1.
August 2010 Monthly IA Well Field Monthly Sampling Trip Report

Attachment 1.
August 2010 Monthly Well Field Monthly Sampling Trip Report



DATE: August 09, 2010

TO: Ken Pill

FROM: James Ritchey

SUBJECT: August 2010 Monthly IA Well Field Sampling Trip Report

Site: Moab, Utah

Date of Sampling Event: August 03 - 05, 2010

Team Members: Elizabeth Glowiak, Tyler Meadows, James Ritchey

RIN Number Assigned: All samples were assigned to RIN 1008050.

Sample Shipment: All samples were shipped in one cooler overnight UPS to ALS Laboratory Group from Moab, Utah, on August 5, 2010 (Tracking Nos.0190007090).

August 2010 CF 4 Sampling

Number of Locations Sampled: Eight observation wells (0780, 0781, 0782, 0783, 0784, 0785, 0786, and 0787) and three well points (0791, 0792, and 0793) were sampled. Including one duplicate, a total of 12 samples were collected during the August 2010 monthly sampling event.

Locations Not Sampled: Three well points (0790, 0794, and 0795) were not sampled because they did not recharge after purging.

Field Variance: The turbidimeter was damaged while collecting a sample at location 0793. Turbidity readings were not collected from the observation wells on August 4, 2010.

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	0787	Duplicate from 36 ft bgs	Ground Water	AUG 009

ID = identification

Attachment 1.

August 2010 Monthly Well Field Monthly Sampling Trip Report (continued)

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

Well No.	Date	Time	Depth to Water (ft btoc)	Sample Depth (ft bgs)
0780	8/04/2010	9:24	15:50	28
0781	8/04/2010	9:46	14.90	46
0782	8/04/2010	10:06	15.45	33
0783	8/04/2010	14:56	16.05	18
0784	8/04/2010	14:34	15.95	18
0785	8/04/2010	13:42	15.85	18
0786	8/04/2010	11:06	15.29	28
0787	8/04/2010	11:20	15.29	36

btoc = below top of casing

Location-specific Information – Well Point Sampling: All well points were sampled using micropurge techniques with a peristaltic pump and dedicated downhole and pump-head tubing. The table below presents the water level, stick up height, and depth to the river surface prior to the initial purge.

WP No.	Date	Time	Depth to Water (ft btoc)	Stick Up Height (ft)	Depth to River Surface (ft btoc)
0790	08/03/2010	10:45	Dry	2.52	Dry
0791	08/03/2010	10:43	5.40	2.45	Dry
0792	08/03/2010	10:38	5.18	2.47	Dry
0793	08/03/2010	14:51	2.24	NA	2.29
0794	08/03/2010	14:40	6.04	NA	1.84
0795	08/03/2010	14:45	1.87	NA	1.85

btoc = below top of casing; NA = not available; WP = well point

August 2010 Evaporation Pond Sampling

Number of Locations Sampled: One sample was collected from the evaporation outlet (0548) during the August 2010 sampling event.

Locations Not Sampled: The outlet to the evaporation pond (0547) was not collected because no extraction wells were operating during the time of sampling.

Field Variance: None.

Location-specific Information – Evaporation Pond: Location 0548 was sampled in an open container and filtered through dedicated pump-head tubing.

Location No.	Date	Time	Pond Level
0548	8/05/2010	14:00	8.8 ft

Attachment 1.

August 2010 Monthly Well Field Monthly Sampling Trip Report (continued)

Site Issues: The mean daily Colorado River flows during this monthly sampling event, according to the USGS Cisco gauging station (station number 09180500), are provided below.

Date	Daily Mean Flow (cfs)
08/03/2010	NA
08/04/2010	5,530
08/05/2010	6,340

NA = not available

Equipment Issues: None.

Corrective Action Required/Taken: None.