

Office of Environmental Management – Grand Junction



Moab UMTRA Project
Ground Water and Surface Water
Monitoring 2011 Fourth Quarter

March 2012



U.S. Department
of Energy

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**Moab UMTRA Project
Ground Water and Surface Water Monitoring
2011 Fourth Quarter**

Revision 0

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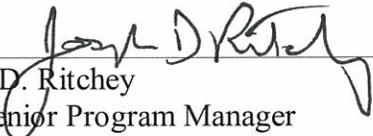
**Moab UMTRA Project
Ground Water and Surface Water Monitoring
2011 Fourth Quarter**

Revision 0

Review and Approval

 3/15/12

Kenneth G. Pill Date
TAC Ground Water Manager

 3/15/12

Joseph D. Ritchey Date
TAC Senior Program Manager

In concurrence:

 3-19-2012

Donald R. Metzler Date
Moab Federal Project Director

Revision History

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 Water Sampling Field Activities Verification
 Minimums and Maximums Report
 Water Quality Data
 Water Level Data
 Trip Report

Acronyms and Abbreviations

°C	degrees Centigrade
AES	atomic emission spectroscopy
bgs	below ground surface
BLS	below land surface
CCB	continuing calibration blank
CCV	continuing calibration verification
CF	Configuration
CFR	Code of Federal Regulations
cfs	cubic feet per second
COC	chain of custody
CRI	reporting limit verification
DOE	U.S. Department of Energy
EB	equipment blank
EDD	electronic data deliverable
EPA	Environmental Protection Agency
ft	feet
IA	interim action
ICB	initial calibration blank
ICP	inductively coupled plasma
ICSA	interference check sample A
ICSAB	interference check sample AB
ICV	initial calibration verification
IDL	instrument detection limit
LCS	laboratory control sample
MB	method blank
MDL	method detection limit or minimum detection limit
mg/L	milligrams per liter
µmhos/cm	micromhos per centimeter
MS	matrix spike or mass spectroscopy
MSD	matrix spike duplicate/replicate
r ²	correlation coefficient
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
TPU	total propagated uncertainty
UMTRA	Uranium Mill Tailings Remedial Action
USGS	U.S. Geological Survey

1.0 Introduction

1.1 Purpose

The purpose of this report is to summarize the results of the data validation process associated with ground water samples collected from the U.S. Department of Energy (DOE) Moab Uranium Mill Tailings Remedial Action (UMTRA) site during the fourth quarter of 2011. A total of three sampling events were completed between October and December 2011, with samples collected from Configurations (CFs) 4 and 5, the northeastern uranium plume area, and a variety of site-wide surface water and ground water locations. All ground water sample locations are shown on Figures 1 and 2, with the surface water locations shown on Figure 3.

The rationale for the sampling was to measure ammonia and uranium concentrations in the CF5 extraction wells for accurately determining contaminant mass removal rates from the ground water system. The sampling and water-level monitoring at the CF4 injection system was used to assess the effectiveness of the injection system at reducing concentrations in the adjacent riparian habitat channel. Samples were collected from the recently installed monitoring wells to further characterize the uranium plume in this area of the site. Surface water sampling was conducted to assess surface water quality adjacent to the site compared to the upstream and downstream water quality. Site-wide ground water sampling was conducted to assess any changes and trends in water quality.

1.2 Scope

This document presents the Summary of Sampling Events and Data Assessments (including a summary of the anomalous data generated by the validation process), and results for each of these events. Sampling and analyses were conducted in accordance with the *Moab UMTRA Project Operations, Maintenance, and Performance Monitoring Plan for the Interim Action Ground Water Treatment System* (DOE-EM/GJTAC1973) and the *Moab UMTRA Project Surface Water/Ground Water Sampling and Analysis Plan* (DOE-EM/GJTAC1830), and all data validation follows the criteria according to the *Moab UMTRA Project Standard Practice for Validation of Laboratory Data* (DOE-EM/GJTAC1855). Trip reports are also provided in appendices. All Colorado River flow discussed in this document is measured from the U.S. Geological Survey (USGS) Cisco gaging station number 09180500. River elevation data were collected on site.

Minimums and Maximums Reports were generated (by the Sample Management System and the SEEPro database) to determine if the applicable data are within a normal statistical range. Each new data set is compared to the historical data to determine if the new data fall outside the historical data range, 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.



Figure 1. Map of CF4 and CF5 Sample Locations for the 2011 Fourth Quarter Sampling Event (includes locations not sampled)



Figure 3. December 2011 Surface Water Sampling Locations

2.0 Summary of Sampling Events

2.1 October 2011 CF4, CF5, and Northeastern Uranium Plume Sampling Event

Samples were collected from CF4 monitoring wells and river bed well points, CF5 extraction wells, and monitoring wells located in the vicinity of the northeastern uranium plume between October 3 and 5. The CF4 samples were collected to monitor the effectiveness of the freshwater injection system, which had been actively injecting diverted Colorado River water into the CF4 remediation wells on a consistent basis since August 3

Only extraction wells 0810 through 0813 and SMI-PW02 (PW02) were actively extracting ground water during 2011, and samples were collected from these locations to determine the ammonia and uranium mass removal rates for the ground water extraction system. The samples collected from the recently installed monitoring wells in the vicinity of the northeastern uranium plume were used to further characterize the ground water plume in this area of the site. All samples were analyzed for ammonia, total dissolved solids (TDS), and uranium, with select samples also analyzed for copper and selenium. All sample locations are shown on Figure 1.

2.2 November 2011 Site-Wide Sampling Event

A total of 57 ground water samples were collected between November 7 and 22 as part of the site-wide event. As opposed to the site-wide event completed in May, when the Colorado River flows were peaking during the spring runoff, this event corresponds to the time period when the Colorado River flows were near base-flow conditions.

Ground water samples were collected from a variety of upgradient, downgradient, and cross-gradient locations at various depths. Also included were the locations in the vicinity of the northeastern uranium plume, with well UPD-22 sampled for the first time after it was installed in late October. All samples were analyzed for ammonia, TDS, and uranium, with select samples also analyzed for copper and selenium. All sample locations are shown on Figure 2.

2.3 December 2011 Surface Water, CF4, and CF5 Sampling Event

This event, completed between December 7 and 9, included the collection of six surface water samples collected upstream, downstream, and adjacent to the site. These surface water locations are presented on Figure 3. In addition, 11 ground water samples were collected from CF4 monitoring wells to document the impacts of the injection system on the ground water near the end of the time period in which the injection system was actively injecting freshwater.

In addition, ground water samples were also collected from monitoring well MW3 (located in the vicinity of CF5) and extraction well PW02. The sample results from PW02 were used to update the mass-removal rates for the ground water extraction system. All samples were analyzed for ammonia, TDS, and uranium, with select samples also analyzed for copper and selenium.

3.0 Data Assessments

3.1 October 2011 CF4, CF5, and Northeastern Uranium Plume Sampling Event

3.1.1 Laboratory Performance Assessment

This validation was performed according to the *Standard Practice for Validation of Laboratory Data*. The procedure was applied at Level 3, Data Deliverables Examination. All analyses were successfully completed.

General Information and Validation Results

Report Identification Number (RIN): 1110061

Laboratory: ALS Environmental, Fort Collins, Colorado

Sample Date Group (SDG) Number: 1110089

Analysis: Inorganics and Metals

Validator: Rachel Cowan

Review Date: December 30, 2011

The samples were prepared and analyzed using accepted procedures as shown in Table 1.

Table 1. October 2011 CF4, CF5, and Northeastern Uranium Plume Sampling Analytes and Methods

Analyte	Preparation Method	Analytical Method
Ammonia	EPA 350.1	EPA 350.1
Copper	SW-846 3005A	SW-846 6010B
Selenium	SW-846 3005A	SW-846 6020A
Uranium	SW-846 3005A	SW-846 6020A

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

Table 2. October 2011 CF4, CF5, and Northeastern Uranium Plume Sampling Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1110089-8	0787	Copper	J	IC-2; MS-1
1110089-11	0792	Selenium	J	LCS-1, MS-1, RS-1, SD-1
1110089-22	UPD-21	Ammonia	J	RS-1
1110089-21	UPD-20	Ammonia	U	B-2

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

*Table 3. October 2011 CF4, CF5, and Northeastern Uranium Plume
Sampling Reason Codes for Data Flags*

Reason Code	Qualifier (Detects)	Qualifier (Non-Detects)	Explanation
B-2	NA	U	If a blank value is greater than or equal to the IDL or the MDL, qualify all associated detects less than five times the blank concentration as "U."
IC-2	J	U	If the intercept value is negative and greater than the IDL, all results less than three times the IDL are qualified as "U."
LCS-1	J	U	An LCS was not analyzed.
MS-1	J	U	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.
RS-1	J	J or R	Results for the affected analyte(s) are regarded as estimated (J) because replicate samples were not analyzed at the frequency stated in the procedure.
SD-1	J	N/A	Frequency requirements for serial dilution were not met.

IDL = instrument detection level; LCS = laboratory control sample; MDL = method detection limit; NA = not applicable

Sample Shipping/Receiving

ALS Environmental in Fort Collins, Colorado, received a total of 22 samples for RIN 1110061 in one shipment. SDG 1110089 of 22 samples arrived on October 7. The SDG was accompanied by a chain of custody (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 1110089, packed in one cooler, was received intact with the temperature in the cooler being 0.8 degrees Centigrade (°C), which complies with requirements. All samples were received in the correct container types, had been preserved correctly for the requested analyses, and were analyzed within the applicable holding times.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run and of producing a linear curve. Compliance requirements for continuing calibration checks are established to ensure the instrument continues to be capable of producing acceptable qualitative and quantitative data.

All laboratory instrument calibrations were performed correctly in accordance with the cited methods. Calibration standards were prepared from independent sources. In addition, for inductively coupled plasma (ICP) analytes (copper, selenium, and uranium), reporting limit verifications (CRIs) verify the linearity of the calibration curve near the reporting limit (RL).

For ICP-mass spectrometry (MS) analytes (selenium and uranium), instrument tuning and performance criteria are checked for mass calibration and resolution verifications. Also, for ICP-MS analytes selenium and uranium, internal standards are analyzed to indicate stability of the instruments.

Method EPA 350.1, Ammonia

Initial calibrations for ammonia as N were performed using six calibration standards and a blank on October 25. The calibration curve had a correlation coefficient (r^2) value greater than 0.995 and an intercept less than three times the method detection limit (MDL). Initial calibration verification (ICV) and continuing calibration verification (CCV) checks were made at the required frequency. All calibration check results for all SDGs were within the acceptance criteria.

Method SW-846 6010B, Copper

The calibrations for the copper analyses were performed on October 27. The initial calibration for copper was performed using eight calibration standards and one blank, resulting in a calibration curve with an r^2 value greater than 0.995. The value of the calibration curve intercept for copper was negative, and the absolute value was more than three times the instrument detection limit (IDL). This resulted in qualifying one of the copper results (1110089-8) as “J.” The other copper result was already qualified as “U.”

ICV and continuing calibration verification CCV checks were made at the required frequency. All calibration checks met the acceptance criteria. The CRI was made at the required frequency to verify the linearity of the calibration curve near the RL. The CRI verifications were within the acceptance-criteria range for all SDGs.

Method SW-846 6020A, Selenium and Uranium

The calibrations for the uranium and selenium analyses were performed on October 25. The initial calibrations for both analytes were performed using eight calibration standards and one blank, resulting in calibration curves with r^2 values greater than 0.995. The values of the calibration curve intercepts for selenium and uranium were positive and less than three times the IDL.

ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria. CRIs were made at the required frequency to verify the linearity of the calibration curve near the RL. The CRI verifications were within the acceptance-criteria range for all SDGs. Mass-calibration and resolution verifications were performed at the beginning of each analytical run in accordance with the analytical procedure. Internal standard recoveries were stable and within acceptable ranges.

Method and Calibration Blanks

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

One uranium CCB result was greater than the uranium IDL. However, all associated uranium results were greater than five times the highest associated blank's concentration, so no results needed to be qualified. The selenium ICB and one CCB had results that were greater than the IDL; however, all associated selenium results were greater than five times the highest blank's concentration, so no results were qualified.

One ammonia CCB had a result that was greater than the ammonia MDL. One associated ammonia-sample result (1110089- 21) was less than five times the highest blank's concentration, so it was flagged "U" for reason B-2.

Equipment Blanks

An equipment blank (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 samples were collected using dedicated equipment, so no EBs were collected and analyzed.

Inductively Coupled Plasma Interference Check Sample Analysis

ICP interference check samples (ICSA and ICSAB) are analyzed to verify the instrument inter-element and background correction factors. For the copper analyses, all results for calcium, magnesium, aluminum, and iron were less than the ISCA calcium, magnesium, aluminum, and iron results, so no copper results were flagged for this reason. The percent recoveries of the ICSAB samples were provided and were acceptable for all copper analyses.

For the uranium and selenium analyses, the ICSA values for calcium, magnesium, aluminum, and iron were not provided for verification of the instrument's inter-element and background-correction factors. The percent recoveries of the ICSAB samples were provided and were acceptable for all uranium and selenium analyses.

Matrix Spike Analysis

Matrix spike (MS) samples were prepared and analyzed for all analytes as a measure of method performance in the sample matrix. Laboratory-spike standards are prepared from independent sources. The spike recoveries met the recovery and precision criteria for all analytes, with the following exceptions.

- One of the ammonia MSs failed because the native concentration was too high. Per validation procedure, the samples were not flagged for MS-1. However, because there was only one alternate replicate sample (RS) (field duplicate 1110089-16), two ammonia results were flagged "J" for reason RS-1 (1110089-1 and -2).
- There was no selenium MS in SDG 1110089, so the selenium result was qualified "J" for reason MS-1.

Laboratory Replicate Analysis

The laboratory replicate results demonstrate acceptable laboratory precision. The relative percent difference (RPD) values for the reported matrix spike duplicate (MSD) results for all other analytes were less than 20 percent for results greater than five times the RL, with the following exception: There was no selenium RS, so selenium results were qualified "J" for reason RS-1.

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. A duplicate sample was collected from location SMI-PW02 (1110089-16). The duplicate results met the U.S. Environmental Protection Agency (EPA) recommended laboratory duplicate criteria of less than 20 RPD for results that are greater than five times the RL.

Laboratory-Control Samples

Laboratory-control samples (LCSs) provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. LCS results were acceptable for all analyses with the following exceptions.

- LCSs were not reported for selenium or uranium. As a standard practice, ALS Environmental does not prepare LCSs for samples that were field-filtered and acidified and run directly on the instrument without any additional sample preparation. Per national environmental laboratory accreditation requirements, an MS may be used in place of an LCS provided the acceptance criteria are as stringent.
- For the uranium results, no qualification was required due to lack of LCS results, because all of the MS results for uranium were acceptable. However, since there was no selenium MS, all selenium results are qualified “J” for reason LCS-1. See Matrix-Spike Analysis section for required qualification.

Metals Serial Dilution

Serial dilution (SD) samples were prepared and analyzed for the metals analyses to monitor chemical or physical interferences in the sample matrix. ICP-MS SD data are evaluated when the concentration of the undiluted sample is greater than 100 times the RL. All evaluated SD data were acceptable with the following exception.

- There was no selenium sample selected as the quality control samples for the selenium analytical run. Therefore, the selenium results were flagged “J” for reason SD-1.

Detection Limits/Dilutions

Dilutions were prepared in a consistent and acceptable manner when dilutions were required. The required-detection limits were achieved for all analytes.

Completeness

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

Electronic Data Deliverable Files

The Electronic Data Deliverable (EDD) files arrived on October 31. The contents of the EDD files were manually examined to ensure all and only the requested data were delivered in compliance with requirements and that the sample results accurately reflected the data contained in the sample-data package.

3.1.2 Minimums and Maximums Report and Anomalous Data Review

The Minimums and Maximums Report for this sampling event is located in Appendix A. Based on the results, there were six anomalous data points (from five separate locations), all of which were more than 50 percent below the historical minimum, as shown in Table 4.

Table 4. Anomalous Data Associated With the October 2011 CF4, CF5, and Northeastern Uranium Plume Sampling Event

Location	Sample Date	Analyte	Concentration (mg/L)	Historical Minimum (mg/L)	Disposition
0780	10/04/2011	Ammonia	0.48	73	Concentration reduced in response to CF4 freshwater injection
0782	10/04/2011	Ammonia	21	53	Concentration reduced in response to CF4 freshwater injection
0782	10/04/2011	Uranium	0.021	0.049	Concentration reduced in response to CF4 freshwater injection
0784	10/03/2011	Ammonia	1.4	3.6	Concentration reduced in response to CF4 freshwater injection
0785	10/03/2011	Ammonia	0.28	6.7	Concentration reduced in response to CF4 freshwater injection
0786	10/03/2011	Ammonia	4.3	27	Concentration reduced in response to CF4 freshwater injection

mg/L = milligrams per liter

3.2 November 2011 Site-Wide Sampling Event

3.2.1 Laboratory Performance Assessment

This validation was performed according to the *Standard Practice for Validation of Laboratory Data*. The procedure was applied at Level 1, Data Deliverables Examination. All analyses were successfully completed.

General Information and Validation Results

RIN: 1110062
 Laboratory: ALS Environmental, Fort Collins, Colorado
 SDG Numbers: 1111136, 1111228, 1111304, and 1111326
 Analysis: Inorganics and Metals
 Validator: Rachel Cowan
 Review Date: January 27, 2011

The samples were prepared and analyzed using accepted procedures, which are shown in Table 5.

Table 5. November 2011 Site-Wide Sampling Analytes and Methods

Analyte	Preparation Method	Analytical Method
Ammonia	EPA 350.1	EPA 350.1
Selenium	SW-846 3005A	SW-846 6020A
TDS	EPA 160.1	EPA 160.1
Uranium (Total)	SW-846 3005A	EPA 6020A

TDS = total dissolved solids

Analytical results were qualified as listed in Table 6. Refer to Table 7 for an explanation of the data qualifiers applied.

Table 6. November 2011 Site-Wide Sampling Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1111304-11 through -17	SMI-PW03, SMI-PZ1S, SMI-PZ3D2, SMI-PZ3M, SMI-PZ3S, TP-17, TP-19	Ammonia	J	MS-1

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

Table 7. November 2011 Site-Wide Sampling Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-Detects)	Explanation
MS-1	J	UJ	MS criteria for the analyte were not met.

MDC = minimum detectable concentration

Sample Shipping/Receiving

ALS Environmental in Fort Collins, Colorado, received a total of 57 samples for RIN 1110062 in four shipments of one cooler each. SDG 1111136 arrived on November 10, SDG 1111228 arrived on November 16, SDG 1111304 arrived on November 19, and SDG 1111326 arrived on December 23. Each SDG 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 1111136 was received intact in one cooler with a temperature of 0.4°C, and SDG 1111228 was received intact in one cooler with temperatures of 1.6°C, both of which comply with requirements. In addition, SDG 1111304 was received intact in one cooler with a temperature of 1.6°C, and SDG 1111326 was received intact in one cooler with temperatures of 1.4°C, both of which comply with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses, except for sample 1111228-7, which had a pH of 10 in its second split bottle and sample 1111326-10, which had a pH of 2.2 in its second split bottle. ALS corrected these pHs as appropriate.

In addition, 1111304-4 had an incorrect time label, which ALS corrected as per field notes. All samples were analyzed within the applicable holding times.

Case Narratives

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

Matrix-Spike and Replicate Analysis

MS-sample analysis, performed at a frequency of one per 20 samples unless otherwise noted, is a measure of the ability to recover analytes in a particular matrix. RS analysis consists of 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 MS samples from SDG 1111228, SDG 1111304, and SDG 1111326, selected for testing matrix-specific quality-control, all had too high an ammonia concentration for the analytical range. As per procedure, the ammonia results were not flagged for MS-1 for this reason. The three field duplicates (RSs) did pass criteria; thus, those results met RS requirements, so no samples were flagged for RS.

In addition, there were not enough MS samples for SDG 1111304, so samples 1111304-11 through -17 were qualified “J” for reason MS-1.

Laboratory Control Samples

An 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 uranium. As a standard practice, ALS 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 uranium results were not flagged for LCS-1 because each of the SDGs had one uranium MS that passed requirements.

Method and Calibration Blanks

MBs are analyzed to assess any contamination that may have occurred during sample preparation. ICBs and CCBs are analyzed to assess instrument contamination before and during sample analysis. Detected sample results associated with blanks results greater than the MDL or IDL (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 with the following exceptions. According to the case narratives, all ICBs and CCBs for all analytes passed requirements.

Metals Serial Dilution

SD samples were prepared and analyzed for the metals analyses to monitor chemical or physical interferences in the sample matrix. ICP-MS SD data are evaluated when the concentration of the undiluted sample is greater than 100 times the RL. ICP-atomic emission spectroscopy (AES) SD data are evaluated when the concentration of the undiluted sample is greater than 100 times the RL. According to the case narratives, all SDs passed requirements.

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 samples were collected using dedicated equipment. As a result, it was not necessary to collect any EBs.

Completeness

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

Electronic Data Deliverable Files

The EDD files for both SDG 1111136 and 1111228 arrived on November 30. The EDD files for SDG 1111304 and SDG 1111326 arrived on December 19 and December, respectively. The contents of all four EDD files were manually examined to verify that the sample results accurately reflected the data contained in the sample-data package and that all and only the requested data were delivered.

3.2.2 Minimums and Maximum Reports and Anomalous Data Review

The Minimums and Maximums Report for this sampling event is located in Appendix B. Based on the results, there were two anomalous data points, both of which were more than 50 percent below the historical minimum, as shown in Table 8.

Table 8. Anomalous Data Associated With the November 2011 Site-Wide Sampling Event

Location	Sample Date	Analyte	Concentration (mg/L)	Historical Minimum (mg/L)	Disposition
0403	11/16/2011	Ammonia	3	10	Concentration reduced in response the flooding of this area
0492	11/16/2011	Ammonia	0.1	1.1	Concentration reduced in response the flooding of this area

mg/L = milligrams per liter

3.3 December 2011 Surface Water, CF4, and CF5 Sampling Event

3.3.1 Laboratory Performance Assessment

This validation was performed according to the *Standard Practice for Validation of Laboratory Data*. The procedure was applied at Level 1, Data Deliverables Examination. All analyses were successfully completed.

General Information and Validation Results

RIN: 1112063
Laboratory: ALS Environmental, Fort Collins, Colorado
SDG Number: 1112132
Analysis: Inorganics and Metals.
Validator: Rachel Cowan
Review Date: February 12, 2011

The samples were prepared and analyzed using accepted procedures, which are shown in Table 9.

Table 9. December 2011 Surface Water, CF4, and CF5 Sampling Analytes and Methods

Analyte	Preparation Method	Analytical Method
Ammonia	EPA 350.1	EPA 350.1
Copper	SW-846 3005A	SW-846 6010B
Selenium	SW-846 3005A	SW-846 6020A
TDS	EPA 160.1	EPA 160.1
Uranium	SW-846 3005A	SW-846 6020A

TDS = total dissolved solids

Data Qualifier Summary

Analytical results were qualified as listed in Table 10. Refer to Table 11 for an explanation of the data qualifiers applied.

Table 10. December 2011 Surface Water, CF4, and CF5 Sampling Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1112132-14	0792	Selenium	J	MS-1, RS-1, SD-1

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

Table 11. December 2011 Surface Water, CF4, and CF5 Sampling Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-Detects)	Explanation
MS-1	J	UJ	MS criteria for the analyte was not met.
RS-1	J	U	No RSs were analyzed.
SD-1	J	NA	SD samples were not analyzed.

NA = not applicable

Sample Shipping/Receiving

ALS Environmental in Fort Collins, Colorado, received a total of 20 samples for RIN 1112063 in one shipment of one cooler. SDG 1112132 arrived on December 10. The SDG 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 1112132 was received intact in one cooler with a temperature of 2.6°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 results were found to be within quality-control procedures except for the following.

Matrix Spike and Replicate Analysis

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

Method EPA 350.1, Ammonia

One of the two ammonia MS samples (1112132-20) selected for testing matrix-specific quality-control had too high an ammonia concentration for the analytical range. As per procedure, the ammonia results were not flagged for MS-1. The field duplicate (RS) did pass criteria; thus, those results met RS requirements, and no samples were flagged for RS.

Laboratory Control Samples

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

The copper and uranium results were not flagged for LCS-1 because both the copper and the uranium MSs passed requirements.

Method and Calibration Blanks

MBs are analyzed to assess any contamination that may have occurred during sample preparation. ICBs and CCBs are analyzed to assess instrument contamination before and during sample analysis. Detected sample results associated with blanks results greater than the MDL or IDL (depending on method requirements) were “J”-qualified when the detections were less than five times the associated blank concentration. Non-detects were not qualified. According to the case narratives, all ICBs and CCBs for all analytes passed requirements.

Metals Serial Dilution

SD samples were prepared and analyzed for the metals analyses to monitor chemical or physical interferences in the sample matrix. ICP-MS SD data are evaluated when the concentration of the undiluted sample is greater than 100 times the RL. ICP-AES SD data are evaluated when the concentration of the undiluted sample is greater than 100 times the RL. All evaluated SD data were acceptable with the following exception.

- According to the case narratives, the copper and uranium SDs passed requirements. However, there was no selenium SD, so the selenium result is flagged for SD-1.

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 samples were collected using dedicated equipment. As a result, it was not necessary to collect any EBs.

Completeness

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

Electronic Data Deliverable Files

The Electronic Data Deliverable (EDD) files for SDG 1112132 arrived on December 29. The contents of the EDD files were manually examined to verify that the sample results accurately reflected the data contained in the sample data package and that all and only the requested data were delivered.

3.3.2 Minimums and Maximums Report and Anomalous Data Review

The Minimums and Maximums Report for this sampling event is located in Appendix C. Based on the results, there were two anomalous data points, both of which were more than 50 percent above the historical maximum, as shown in Table 12.

Table 12. Anomalous Data Associated With the December 2011 Surface Water, CF4, and CF5 Sampling Event

Location	Sample Date	Analyte	Concentration (mg/L)	Historical Maximum (mg/L)	Disposition
0781	12/7/2011	Ammonia	2300	850	Ground water system apparently started to rebound in the upgradient zone below the impact of the injection system
0787	12/8/2011	Ammonia	910	410	Ground water system apparently started to rebound in the downgradient zone below the impact of the injection system

mg/L = milligrams per liter

4.0 Results

Based on the results of the Minimums and Maximums Report, there were a total of 10 anomalous data points, eight of which established a new historic minimum; the remaining two established a new maximum. No data were rejected (flagged as “R”) as a result of this validation process.

4.1 October 2011 CF4, CF5, and Northeastern Uranium Plume Sampling Event

As previously mentioned, all samples collected during this event were analyzed for ammonia, TDS, and uranium, with samples collected from select locations also analyzed for copper and selenium. Table 13 presents the CF4, CF5, and northeastern uranium plume locations (and associated concentrations) that exceeded the 0.044 milligram per liter (mg/L) uranium ground water standard. The uranium standard is based on Table 1 in Title 40 Code of Federal Regulations Part 192, Subpart A (40 CFR 192A), “Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings and Uranium In Situ Leaching Processing Facilities,” assuming uranium-234 and uranium-238 activities are in equilibrium.

Table 13. October 2011 CF4, CF5, and Northeastern Uranium Plume Locations Exceeding the 0.044 mg/L Uranium Ground Water Standard

Well Number	Date	Location	Sample Depth (ft bgs)	Uranium Concentration (mg/L)
0781	10/4/2011	CF4 - Upgradient	46	0.57
0783	10/3/2011	CF4 - Upgradient	18	1.4
0784	10/3/2011	CF4 - Downgradient	18	0.058
0785	10/3/2011	CF4 - Downgradient	18	0.046
0787	10/3/2011	CF4 - Downgradient	36	0.25
0790	10/3/2011	CF4 - Downgradient	2 - 3	0.078
0791	10/3/2011	CF4 - Downgradient	4.3 – 5.3	0.4
0792	10/3/2011	CF4 - Downgradient	9.3 – 10.3	0.06
0810	10/4/2011	CF5 Extraction Well	10.4 – 40.4	2.6
0811	10/5/2011	CF5 Extraction Well	8.6 – 38.6	2.0
0812	10/5/2011	CF5 Extraction Well	14.2 – 44.2	1.9
0813	10/5/2011	CF5 Extraction Well	14.4 – 44.4	0.91
PW02	10/5/2011	CF5 Extraction Well	20.0 – 60.0	4.5
UPD-17	10/5/2011	NE Uranium Plume	14	1.6
UPD-18	10/5/2011	NE Uranium Plume	14	1.4
UPD-19	10/4/2011	NE Uranium Plume	14	0.89
UPD-20	10/4/2011	NE Uranium Plume	25	0.97
UPD-21	10/4/2011	NE Uranium Plume	25	11

ft bgs = feet below ground surface

Figures 4 and 5 provide the time versus ammonia and uranium concentration plots (respectively) for the CF4 upgradient observation wells during the past 2 years. These plots also designate when the freshwater injection system was operating. The system (which injects freshwater near the ground water surface) was re-started for the first time in 2011 on March 1 and ran until May 9, at which time the system was shut down due to the high Colorado River stage. Previous surface water/ground water interaction investigations have determined that flows above 15,000 cubic feet per second (cfs) generate a freshwater lens that migrates into the ground water system underlying the well field. Due to the above average spring runoff flows, the river elevation exceeded the bank elevation, and the area was flooded.

The injection system was re-started on August 8, after the flood waters receded, and operated on a fairly consistent basis until December 7, at which time the system was shut down for the year and winterized.

As the time concentration plots exhibit, between the injection system and the development of the freshwater lens as result of the high river stage, the ammonia and uranium concentrations significantly decreased down to a depth of 30 feet (ft) below ground surface (bgs) in the ground water system. Below 30 ft bgs, the contaminant concentrations started to rebound after October, with the ammonia concentration in the sample collected from 46 ft bgs reaching more than twice the concentration measured before the start of the injection system. Uranium concentrations also started to rebound after late April, with no apparent trend regarding the depth from which the samples were collected. It is possible that the introduction of oxygenated water (with the freshwater lens as the source) may have resulted in the increased mobilization of uranium in the ground water.

Figure 6 displays the ammonia concentration trends for samples collected in the downgradient locations, which are approximately 30 ft from the line of injection wells. Ammonia concentrations were significantly decreased down to a depth of approximately 35 ft bgs as the sample collected from 36 ft bgs increased sharply after October. The same general trend was apparent for the uranium concentrations (Figure 7). However, the uranium concentration also increased in the sample collected from 28 ft bgs, although still well below the concentration measured before the startup of the injection system. Despite the apparent rebound of contaminant concentrations at depth, the freshwater injection system was effective in reducing the ground water contaminant concentrations discharging into the river side channel adjacent to CF4.

Figure 8 is a ground water contour map of the CF4 area (based on the data collected during the October sampling event) displaying the hydraulic mound generated by the freshwater injection. The mounding generated from the injection ranged from 4.8 to 12.1 ft along the line of the CF4 injection wells, with an average mounding of 7.8 ft.

Time versus concentration plots were generated to display the trends displayed by the CF5 extraction wells during the past 2 years. Figure 9 is the time versus ammonia concentration plot for extraction wells 0810 through 0813 and PW02, all of which are located along the CF5 southeastern boundary. Figure 10 displays time versus uranium concentration plot for the same set of wells.

As both plots exhibit, the ammonia and uranium concentrations decreased after late April. The samples collected at this time represent the concentrations just before the flooding of the well field, and the decreased concentrations may have been in response to the ponded water in this area of the site that was present from May through late August. The one exception is well PW02, which was the focal point of the ground water extraction system during 2011. Ammonia concentrations measured in samples collected from PW02 remained consistent during this time period, while the uranium concentrations significantly increased.

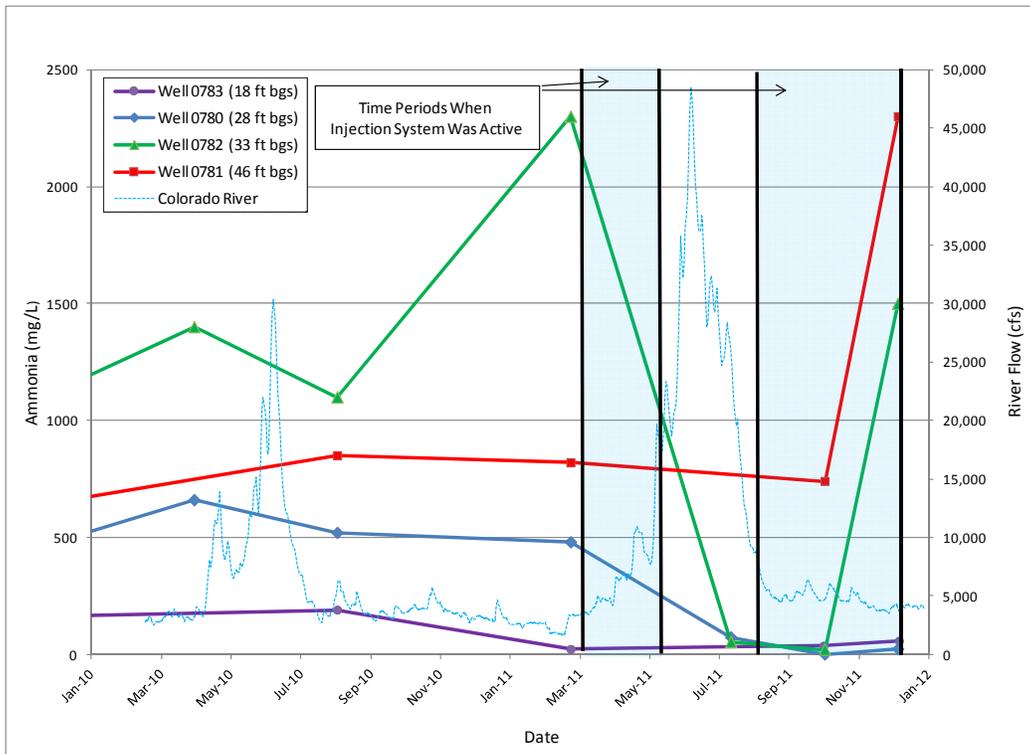


Figure 4. CF4 Upgradient Observation Wells 0780, 0781, 0782, and 0783 Time Versus Ammonia Concentration Plot

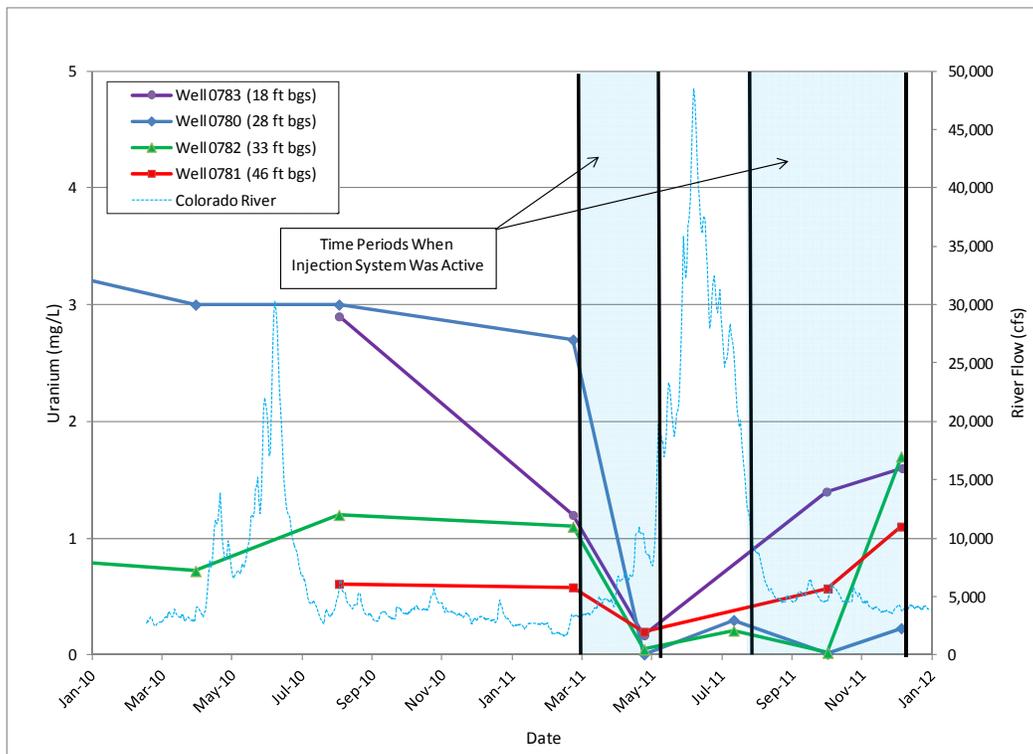


Figure 5. CF4 Upgradient Observation Wells 0780, 0781, 0782, and 0783 Time Versus Uranium Concentration Plot

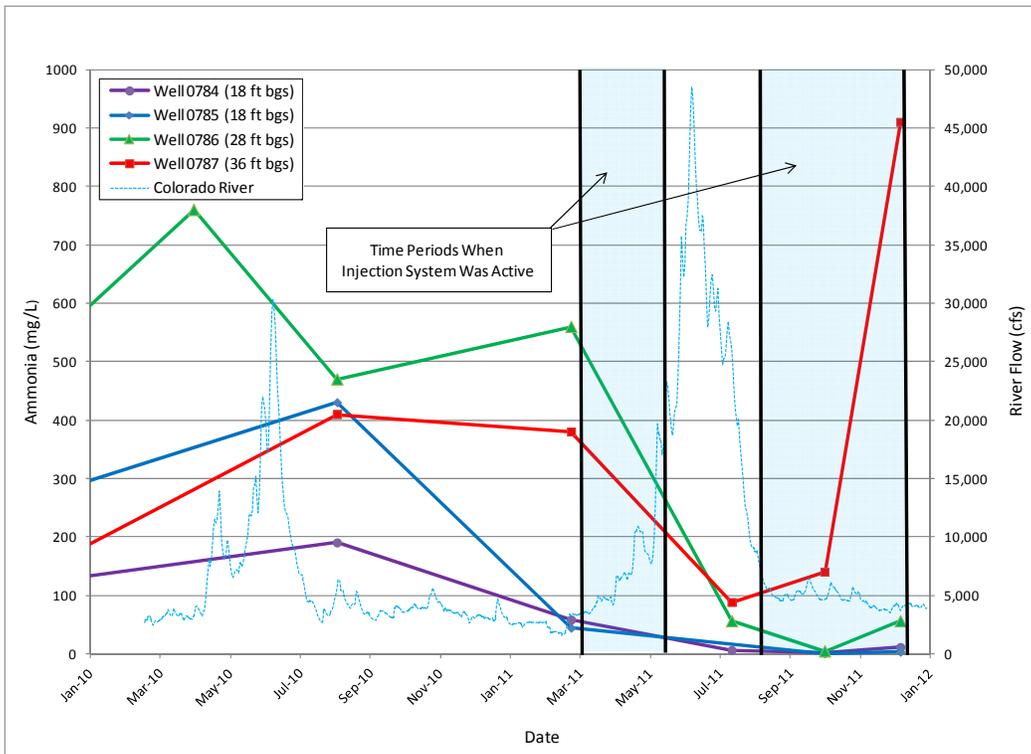


Figure 6. CF4 Downgradient Observation Wells 0784, 0785, 0786, and 0787 Time Versus Ammonia Concentration Plot

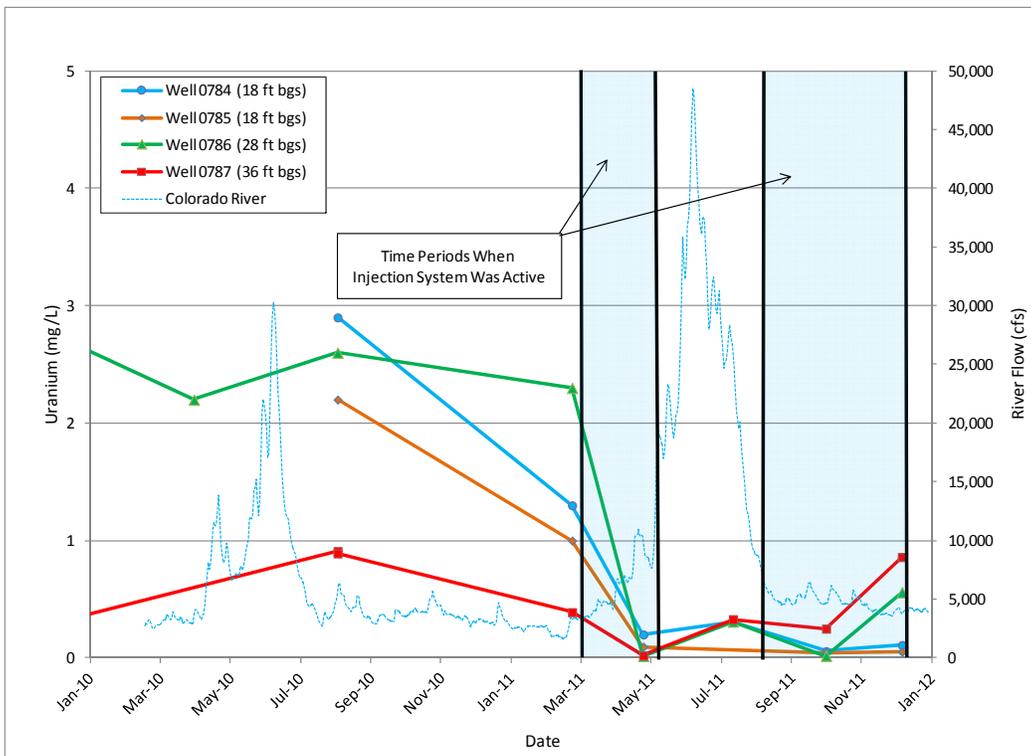


Figure 7. CF4 Downgradient Observation Wells 0784, 0785, 0786, and 0787 Time Versus Uranium Concentration Plot

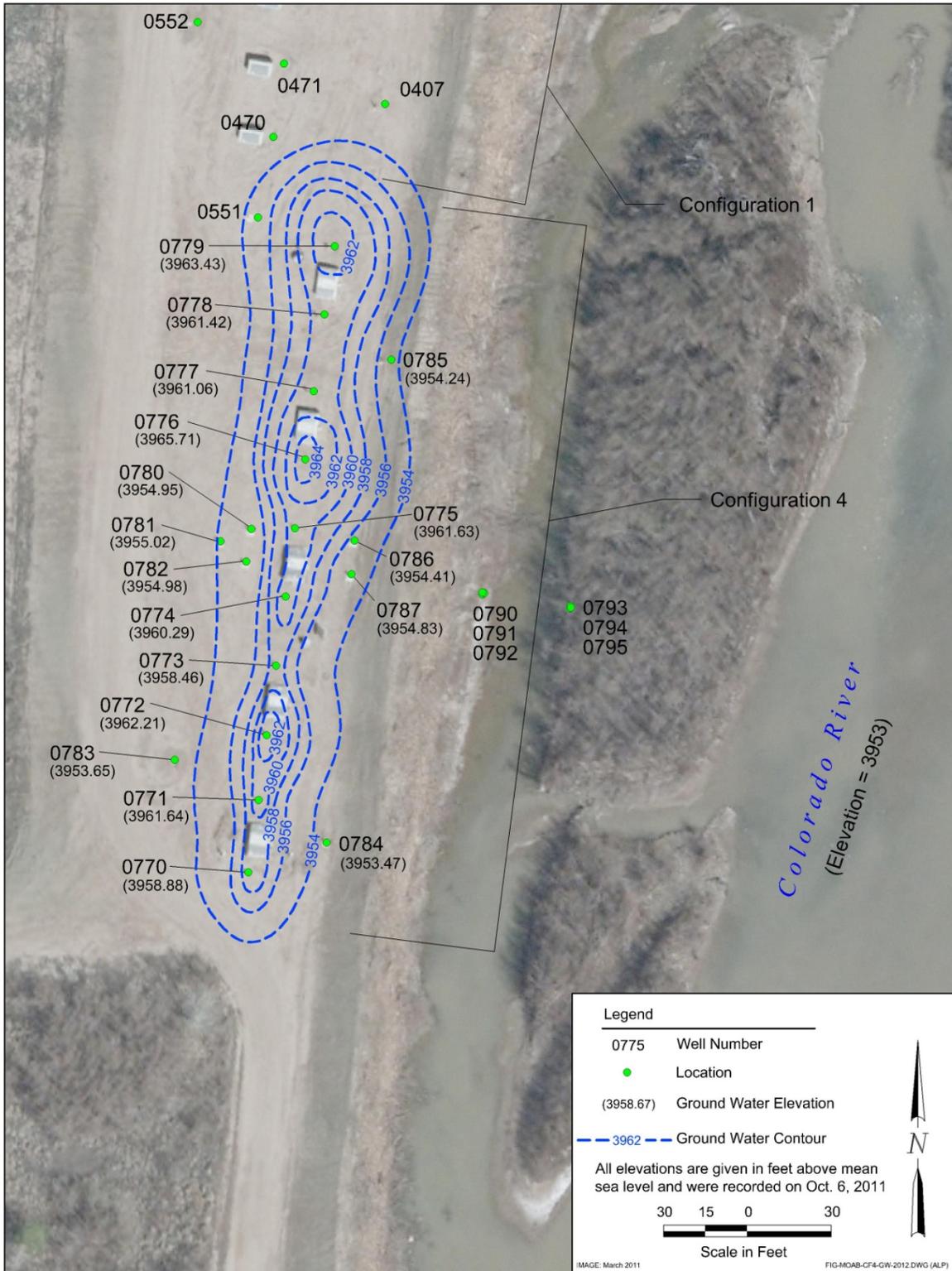


Figure 8. CF4 Ground Water Contour Map

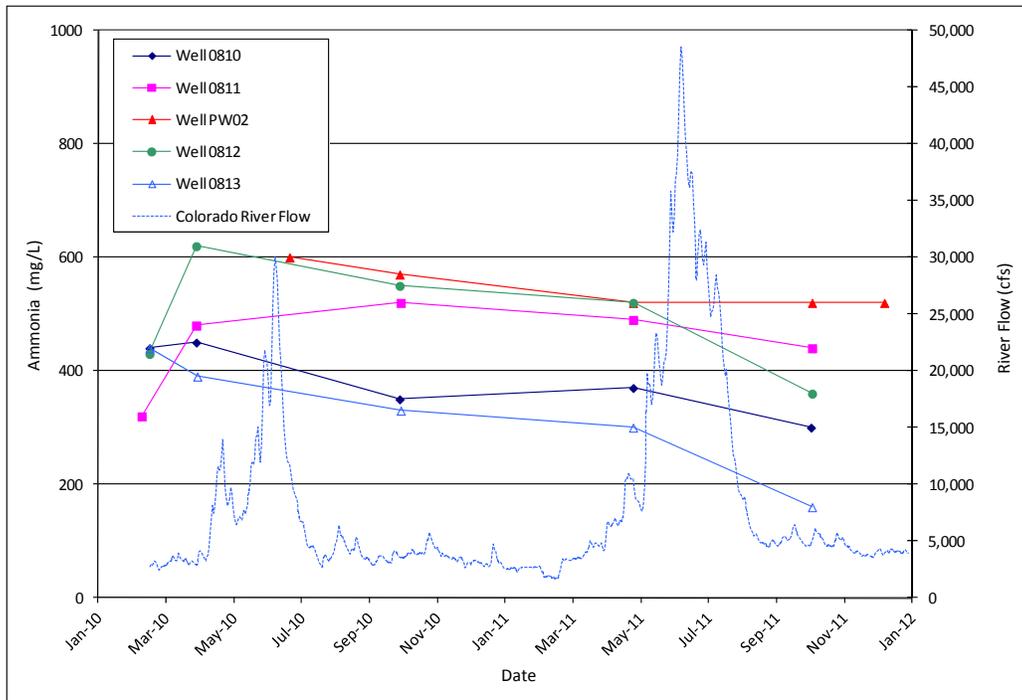


Figure 9. CF5 Extraction Wells 0810, 0811, 0812, 0813, and PW02 Time Versus Ammonia Concentration Plot

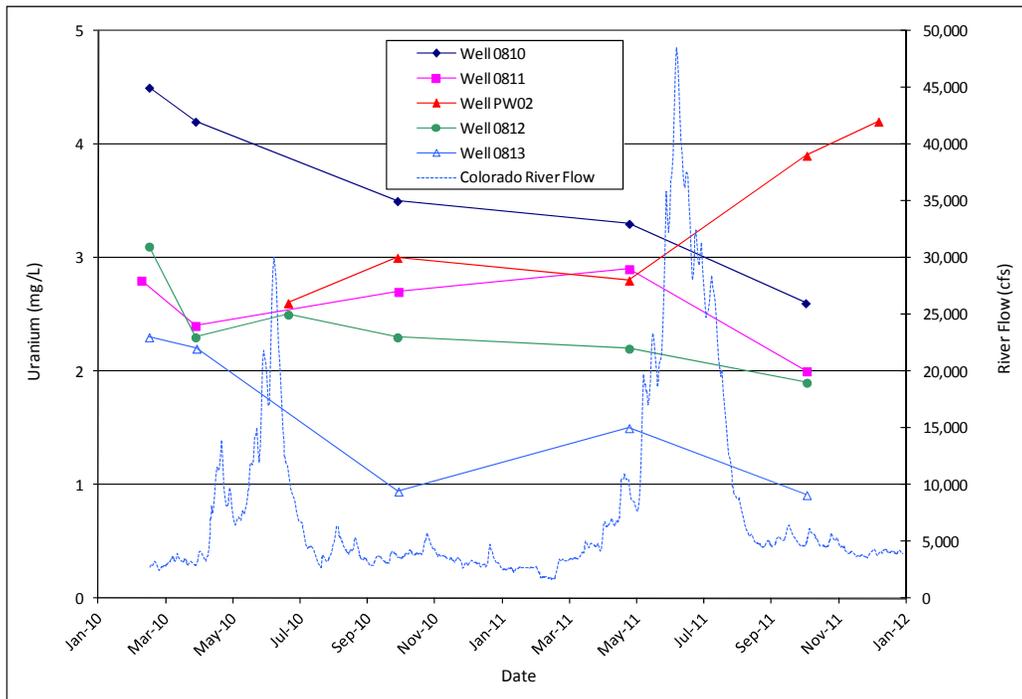


Figure 10. CF5 Extraction Wells 0810, 0811, 0812, 0813, and PW02 Time Versus Uranium Concentration Plot

Figure 11 presents the various pumping rates and associated drawdowns for wells 0810 through 0813 and PW02 measured in October.

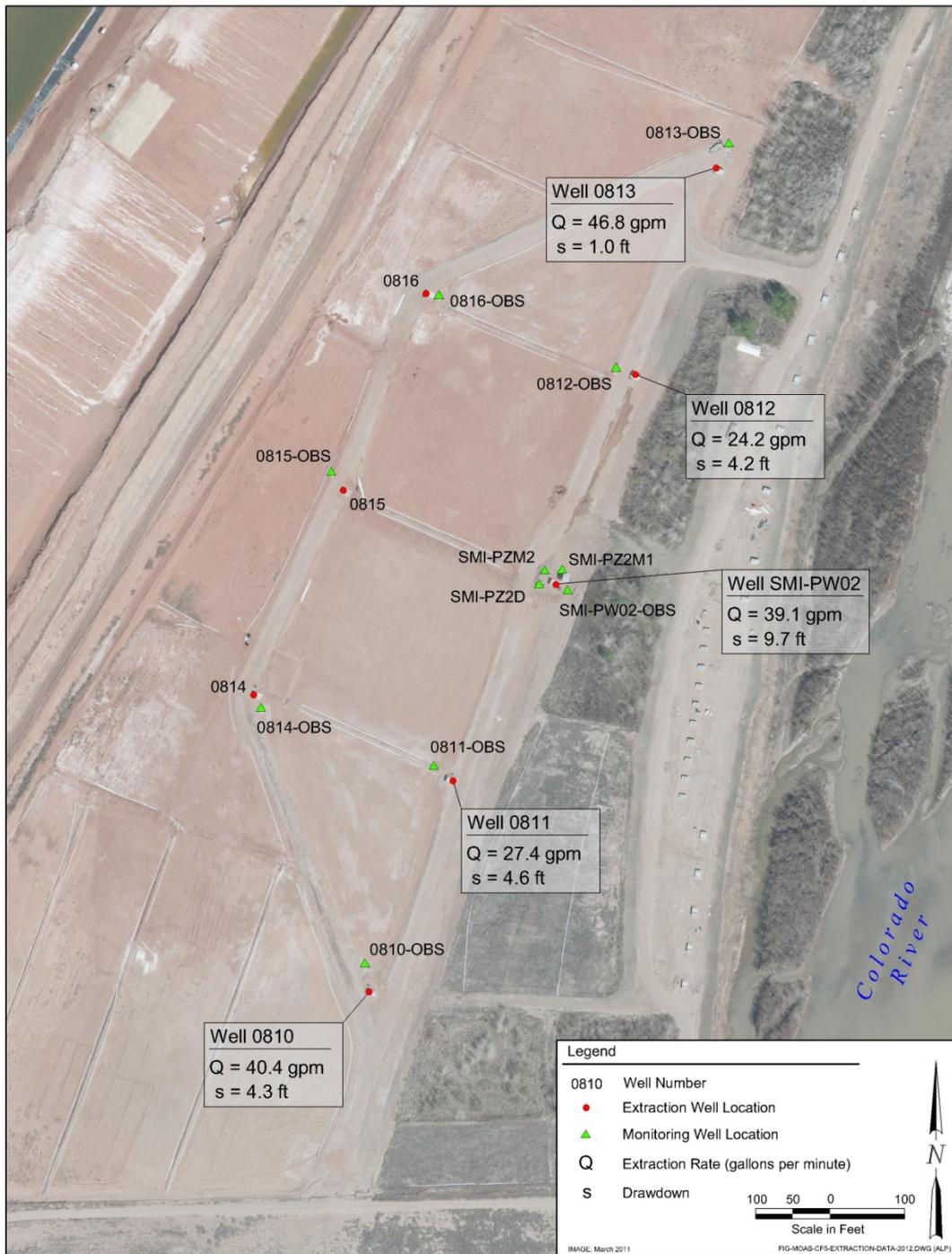


Figure 11. CF5 Pumping Rates and Drawdowns, October 2011

The northeastern uranium plume locations UPD-17 through 21 were also sampled in November, and the results associated with the October sampling event are included in the discussion presented in Section 4.2.

4.2 November 2011 Site-Wide Sampling Event

Table 14 presents the site-wide locations (and associated concentrations) that exceeded the 0.044 mg/L uranium ground water standard. All locations are shown in Figure 2. The uranium standard is based on Table 1 in 40 CFR 192A, assuming uranium-234 and uranium-238 activities are in equilibrium.

Table 14. November 2011 Site-Wide Locations Exceeding the 0.044 mg/L Uranium Ground Water Standard

Well Number	Date	Location	Sample Depth (ft bgs)	Uranium Concentration (mg/L)
0401	11/16/2011	CF2 Vicinity	18	1.8
0403	11/16/2011	CF1 Vicinity	18	0.6
0404	11/16/2011	CF3 Vicinity	18	0.78
0407	11/16/2011	CF1 Vicinity	17	1.3
0410	11/17/2011	NE Uranium Plume Area	25	1.0
0411	11/17/2011	NE Uranium Plume Area	9	8.1
0412	11/17/2011	NE Uranium Plume Area	10.5	1.7
0439	11/21/2011	NE Uranium Plume Area	118	0.85
0453	11/21/2011	Along SW Site Boundary	80	1.8
0454	11/15/2011	Along S Site Boundary	13	0.94
0492	11/16/2011	Along S Site Boundary	18	0.66
AMM-2	11/14/2011	Near Base of Tailings Pile	48	1.4
AMM-3	11/15/2011	Near Base of Tailings Pile	48	1.0
SMI-MW01	11/17/2011	NE Uranium Plume Area	16	5.1
SMI-PW01	11/16/2011	CF5 Vicinity	40	1.1
SMI-PW03	11/17/2011	Uranium Plume Area	40	1.8
SMI-PZ1S	11/16/2011	CF5 Vicinity	18	0.92
SMI-PZ2D	11/14/2011	CF5 Vicinity	75	0.73
SMI-PZ2M2	11/14/2011	CF5 Vicinity	56	2.2
SMI-PZ3D2	11/17/2011	NE Uranium Plume Area	78	1.2
SMI-PZ3M	11/17/2011	NE Uranium Plume Area	59	1.6
SMI-PZ3S	11/17/2011	NE Uranium Plume Area	25	1.4
TP-01	11/14/2011	NE Uranium Plume Area	22	0.091
TP-22	11/14/2011	NE Uranium Plume Area	17	0.39
TP-23	11/15/2011	NE Uranium Plume Area	25	3.6
UPD-17	11/21/2011	NE Uranium Plume Area	14	1.5
UPD-18	11/21/2011	NE Uranium Plume Area	14	1.3
UPD-19	11/21/2011	NE Uranium Plume Area	14	0.7
UPD-20	11/21/2011	NE Uranium Plume Area	25	0.52
UPD-21	11/21/2011	NE Uranium Plume Area	25	13
UPD-22	11/22/2011	NE Uranium Plume Area	15	2.4

S = southern; SW = southwestern; NE = northeastern

To present the trends observed in the water chemistry for the site-wide locations, the site was divided into six areas. These include the northeastern uranium plume (which includes the PW03 cluster), the base of the tailings pile, along the southwestern boundary, along the riverbank, and south of the site areas. Time versus concentration plots were not generated for the upgradient locations, as the contaminant concentrations measured from samples collected at these locations are typically below detection limits. All results are also plotted against the Colorado River flow to determine if the river stage may impact the concentrations.

Northeastern Uranium Plume Area

Figures 12 and 13 are the time versus ammonia and uranium concentration plots, respectively, for the northeastern uranium plume area. Figures 14 and 15 display comparable data for the PW03 cluster, which is located within this area.

As Figure 12 exhibits, the ammonia concentrations have, in general, decreased in the samples collected from well 0411 during the past 2 years, while the concentrations in wells 0410 and 0412 are below the detection limit of 0.1 mg/L. Uranium concentrations (Figure 13) in well 0411 have steadily increased since November 2010, while the uranium concentrations measured in the samples collected from well 0412 have gradually decreased during this same time period. Well 0410 has consistently been at or below 1 mg/L.

Figures 14 and 15 are the time versus ammonia and uranium concentration plots, respectively, for the PW03 cluster, which is located near the center of the northeastern uranium plume area. These wells provide a vertical profile of the concentrations in this area as samples are collected from 25 (PZ3S), 59 (PZ3M), and 78 (PZ3D2) ft bgs.

Elevated ammonia has been measured in the sample collected from PZ3D2 and, to a lesser degree, from PZ3M during the past 2 years. Uranium concentrations range between 1 and 2 mg/L from these same wells in addition to well PZ3S.

Wells UPD-17 through 22 were installed at various times in 2011, and samples were collected only in October and November. Table 15 provides the comparison between these two sampling events for these locations.

Table 15. Comparison of Ammonia and Uranium Concentrations for Locations UPD-17 Through 22, October and November 2011

Location	Sample Depth (ft bgs)	October 2011		November 2011	
		Ammonia (mg/L)	Uranium (mg/L)	Ammonia (mg/L)	Uranium (mg/L)
UPD-17	14	220	1.6	270	1.5
UPD-18	14	210	1.4	240	1.3
UPD-19	14	56	0.89	73	0.72
UPD-20	25	0.1	0.97	0.1	0.52
UPD-21	25	74	11	52	13
UPD-22	15	ND	ND	0.76	2.4

ND = No Data

As the table exhibits, there were no significant differences in the ammonia and uranium concentrations as expected due to the relatively short time difference between sampling events. Because these locations were only sampled twice, time concentration plots were not warranted; however, plots will be provided for these locations in subsequent reports.

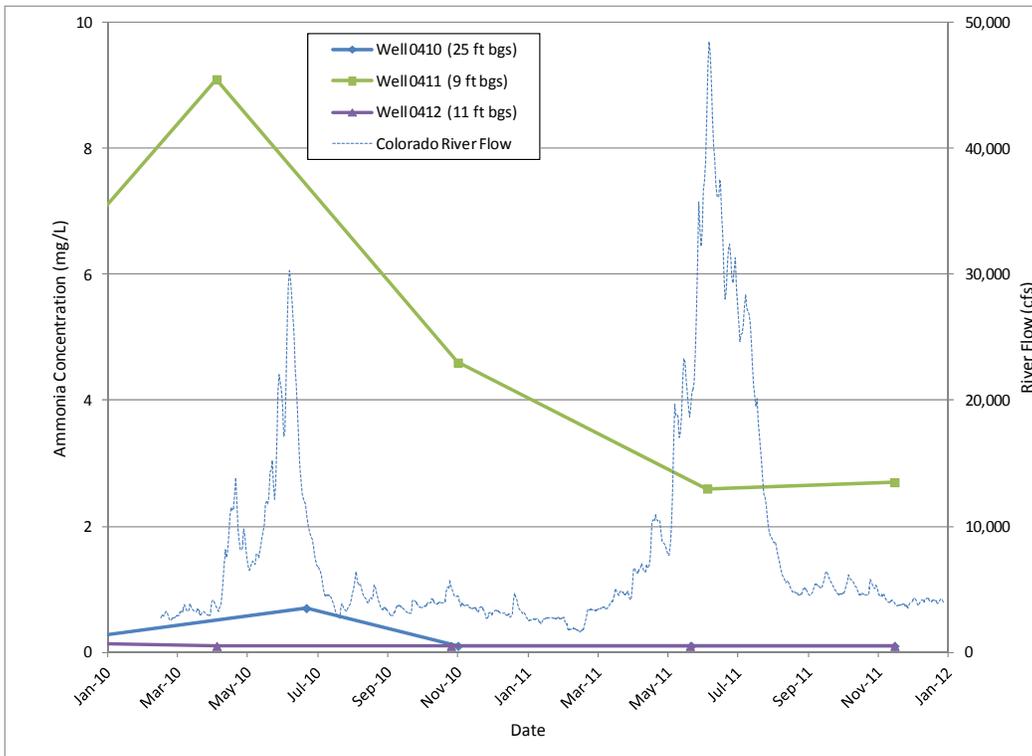


Figure 12. Northeastern Uranium Plume Observation Wells 0410, 0411, and 0412 Time Versus Ammonia Concentration Plot

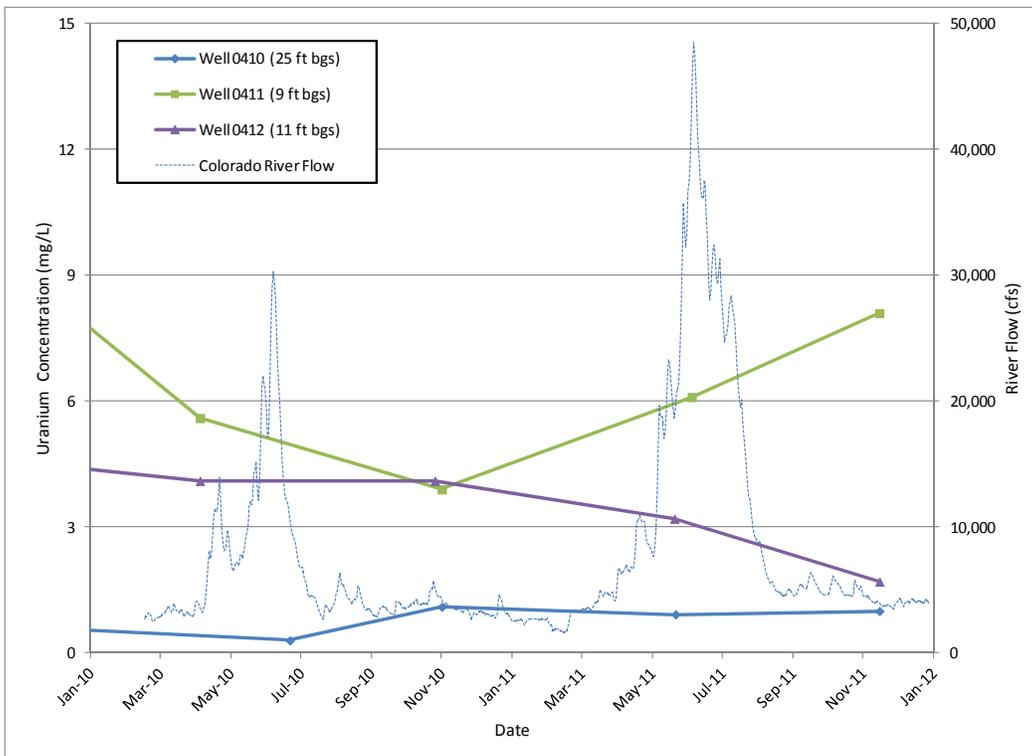


Figure 13. Northeastern Uranium Plume Observation Wells 0410, 0411, and 0412 Time Versus Uranium Concentration Plot

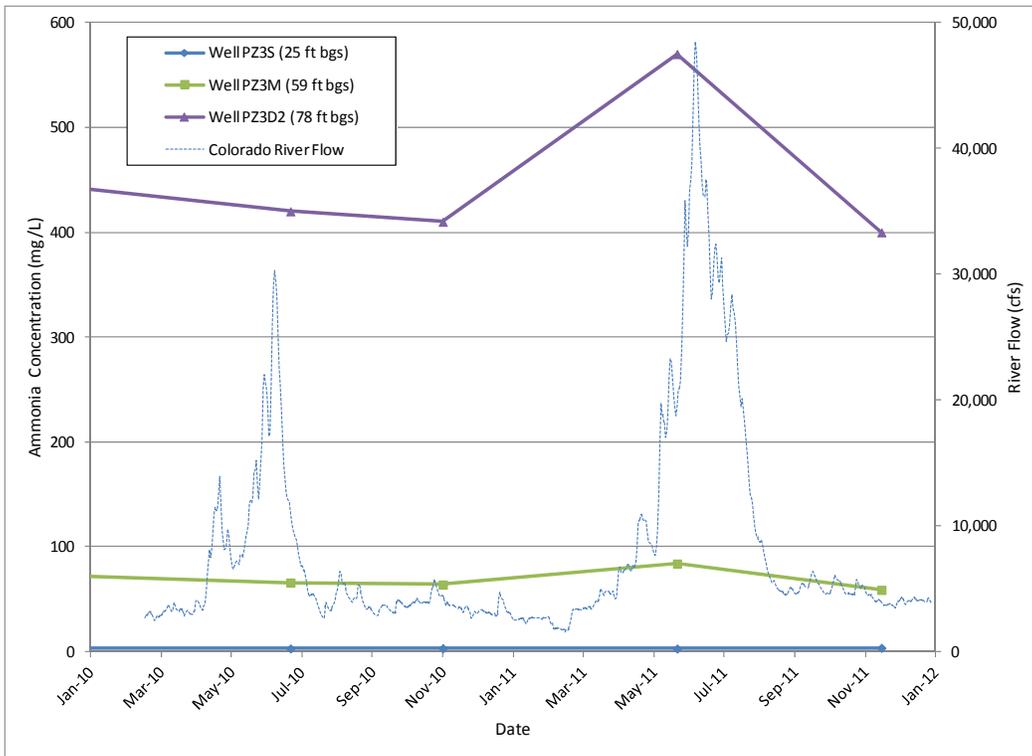


Figure 14. PW03 Cluster Observation Wells PZ3S, PZ3M, and PZ3D2 Time Versus Ammonia Concentration Plot

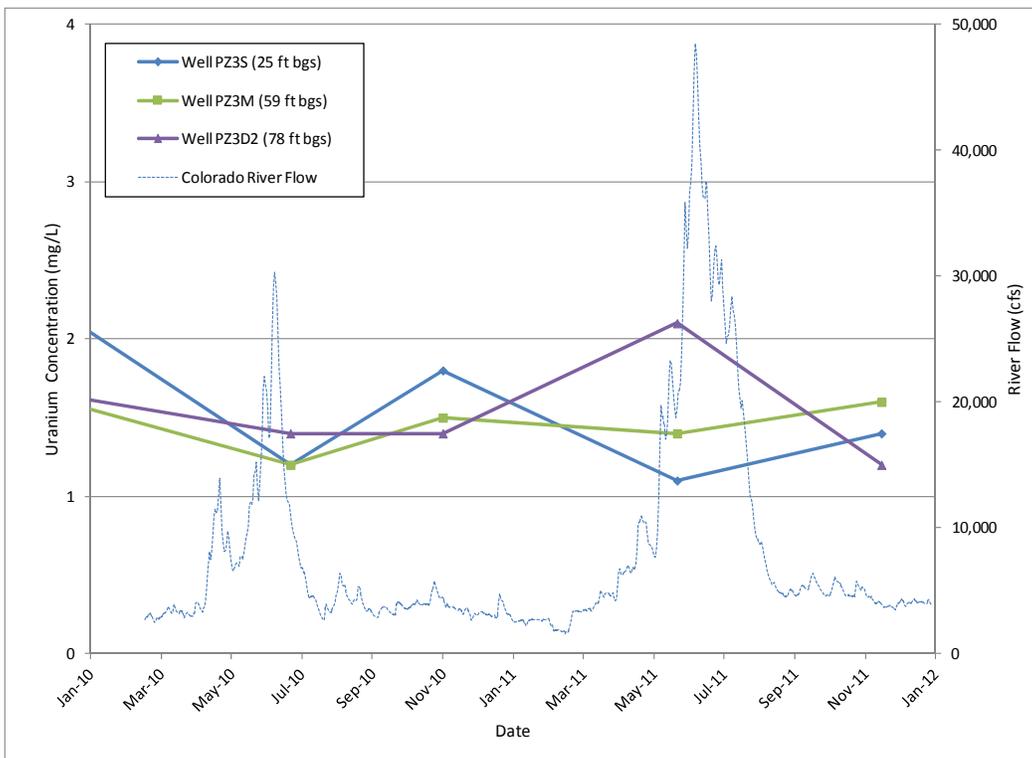


Figure 15. PW03 Cluster Plume Observation Wells PZ3S, PZ3M, and PZ3D2 Time Versus Uranium Concentration Plot

Base of the Tailings Pile

The time versus ammonia and uranium concentration plots for the area near the base of the tailings pile are presented as Figures 16 and 17. As Figure 16 exhibits, the ammonia concentrations have, in general, fluctuated independent of the river flow in the samples collected from wells AMM-3, ATP-2-S, ATP-2-D, and AMM-2 (listed from south to north). With the exception of the deepest sample collected from 88 ft bgs, the concentrations all decreased between May and November. These locations are in the area of the site that was flooded, and well AMM-2 in particular may have been impacted by the flood waters.

Uranium concentrations (Figure 17) increased in the sample from well AMM-3 between October 2010 and May 2011, and then decreased in November 2011. The concentration measured in well AMM-2 remained fairly consistent during this same time period. The uranium concentration measured in the ATP wells have consistently been below 0.1 mg/L during the past 2 years.

Southwestern Boundary

Figures 18 and 19 display the time versus concentration plots for the locations along the southwestern boundary (Figure 2), presented in the upgradient to downgradient direction. The two plots exhibit a similar trend for both ammonia and uranium concentrations, where the two most upgradient locations (0441 and 0440) have non-detectable or nearly non-detectable concentrations. Concentrations in the samples collected from well 0454 have steadily decreased since October 2010, while concentrations from well 0453 have fluctuated during the same time period.

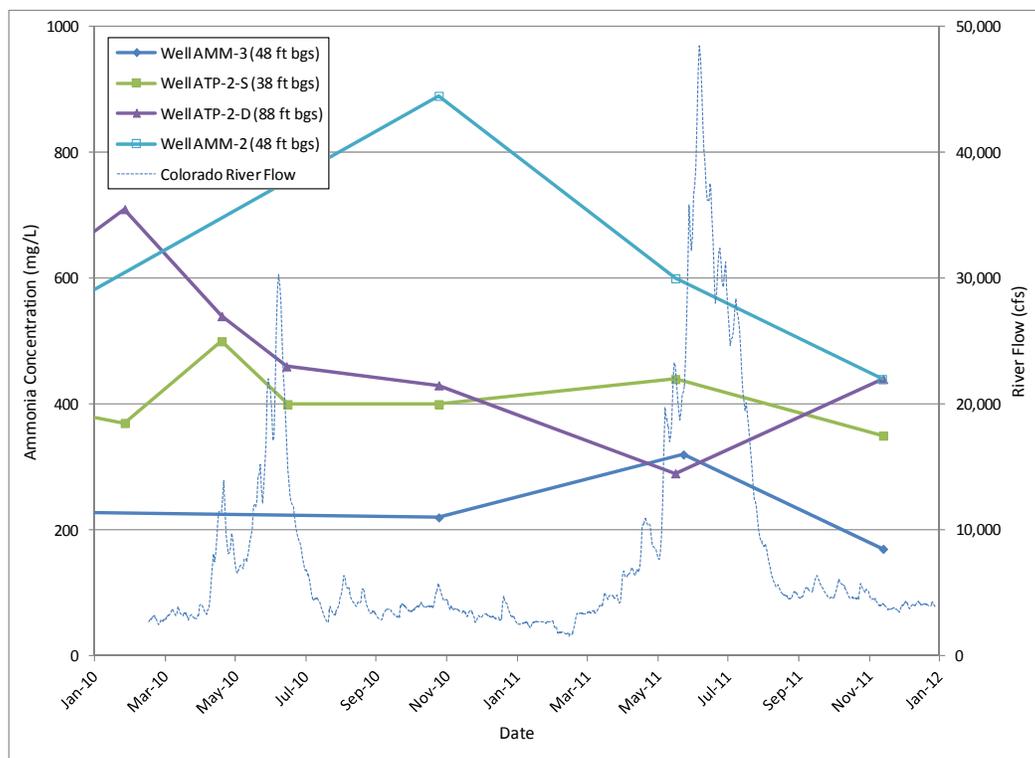


Figure 16. Base of Tailings Pile Observation Wells AMM-3, ATP-2-S, ATP-2-D, and AMM-2 Time Versus Ammonia Concentration Plot

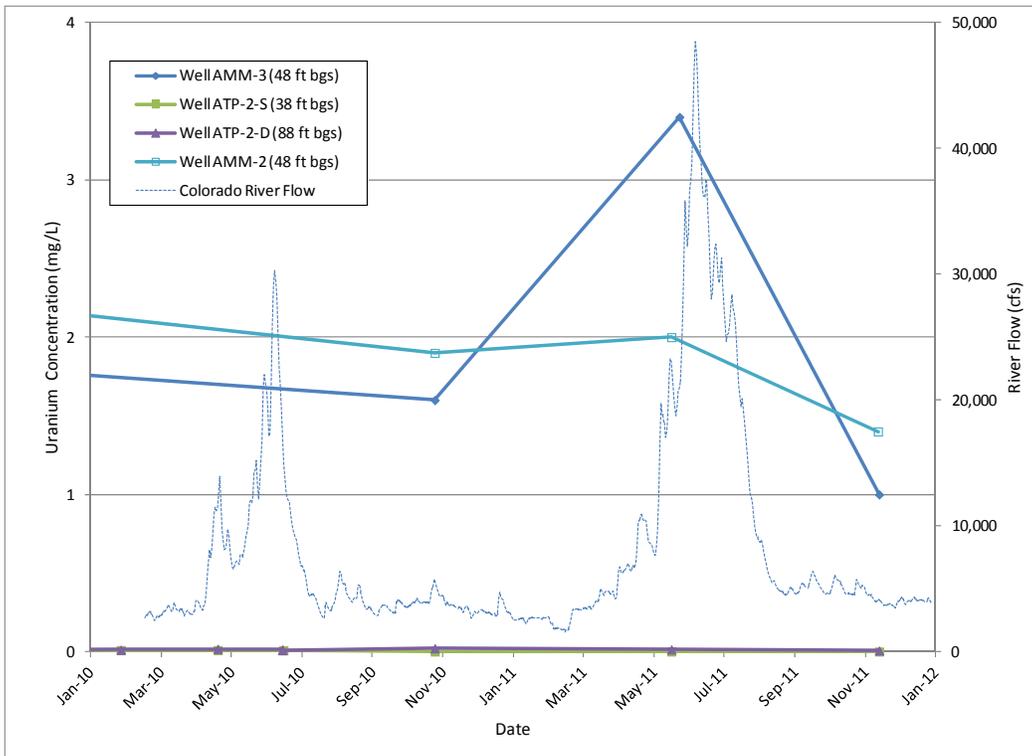


Figure 17. Base of Tailings Pile Observation Wells AMM-3, ATP-2-S, ATP-2-D, and AMM-2 Time Versus Uranium Concentration Plot

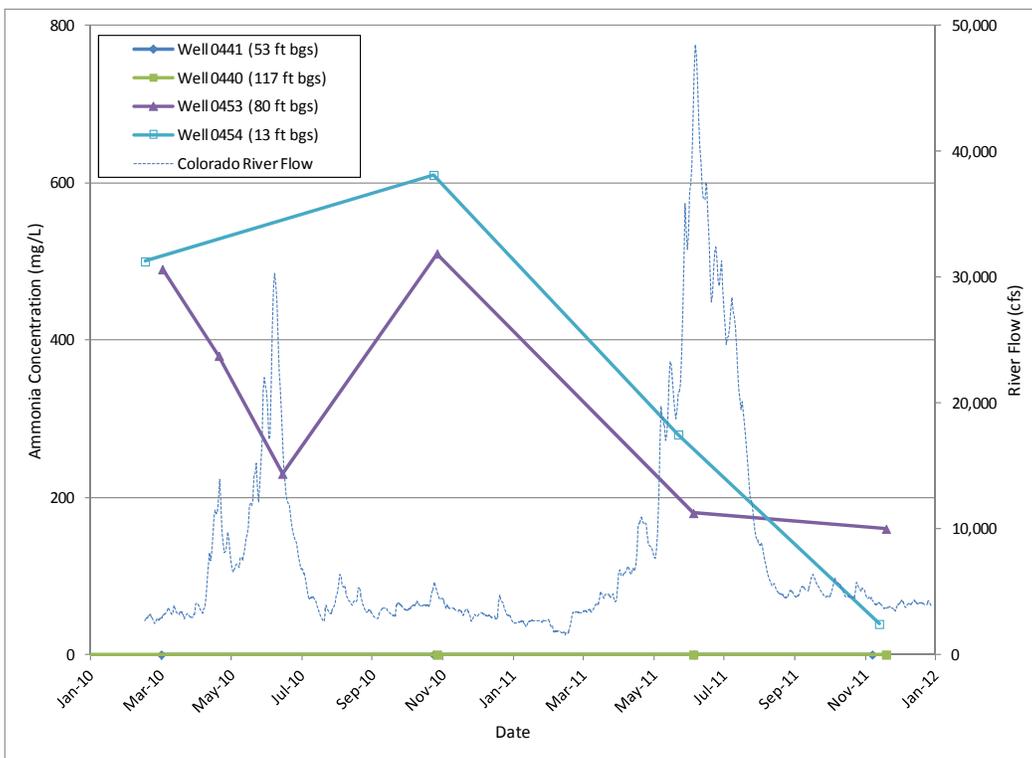


Figure 18. Southwest Boundary Observation Wells 0441, 0440, 0453, and 0454 Time Versus Ammonia Concentration Plot

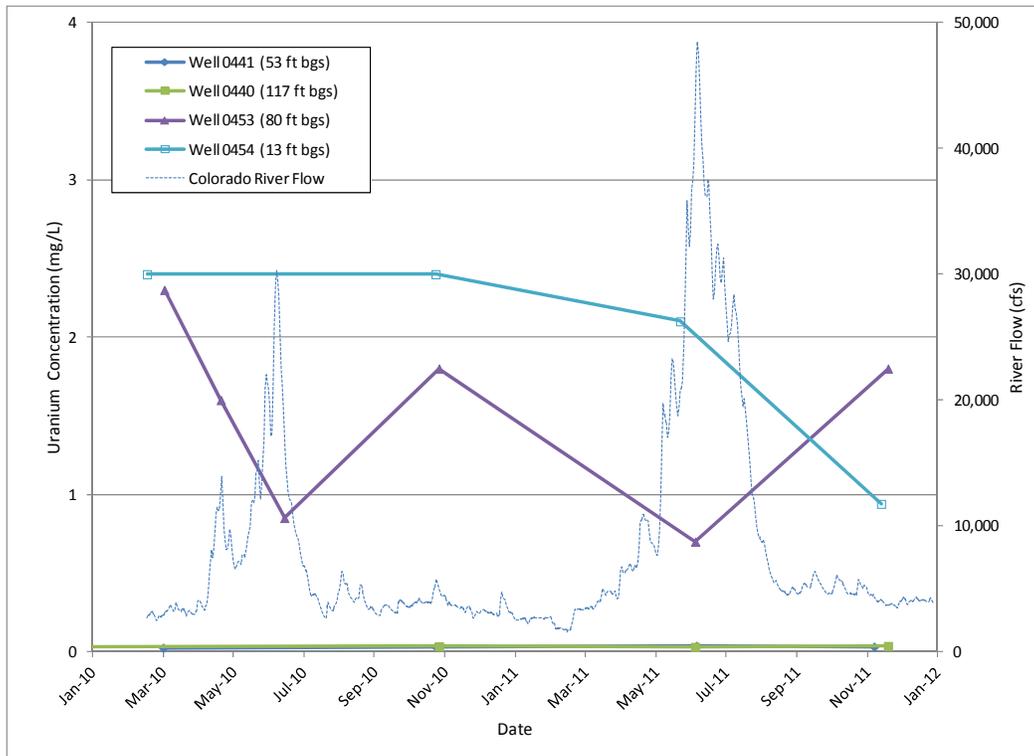


Figure 19. Southwest Boundary Observation Wells 0441, 0440, 0453, and 0454 Time Versus Uranium Concentration Plot

Riverbank Area

Figures 20 and 21 are the time versus ammonia and uranium concentration plots, respectively, for the locations sampled along the riverbank, presented from the south to the north. Ammonia concentrations are low at the southern and northern ends of the site, and increase near the middle. This plot also demonstrates how significant of an impact the higher river flows result in lower ground water concentrations, as expected. The same is true of the uranium concentration, with higher concentrations measured near the southern end of the well field.

Southern and Off-Site Areas

Figures 22 and 23 are the plots for the three locations sampled to the south of the site. Wells TP-17 and TP-19 are located along the riverbank, and TP-20 is located approximately 600 ft off the bank. Ammonia concentrations (Figure 22) have remained below 4 mg/L during the past 2 years, and the uranium concentrations (Figure 23) have consistently been below 0.044 mg/L during the same time frame.

Figure 24 is a ground water contour map generated for the site in November. All water level data were collected from the shallow aquifer zone and exhibit a ground water flow direction towards the Colorado River. Figures 25 and 26 are the shallow ground water ammonia and uranium plume maps generated using the data collected during the November site-wide event. These maps are generally comparable to previous plume maps during river base flow conditions.

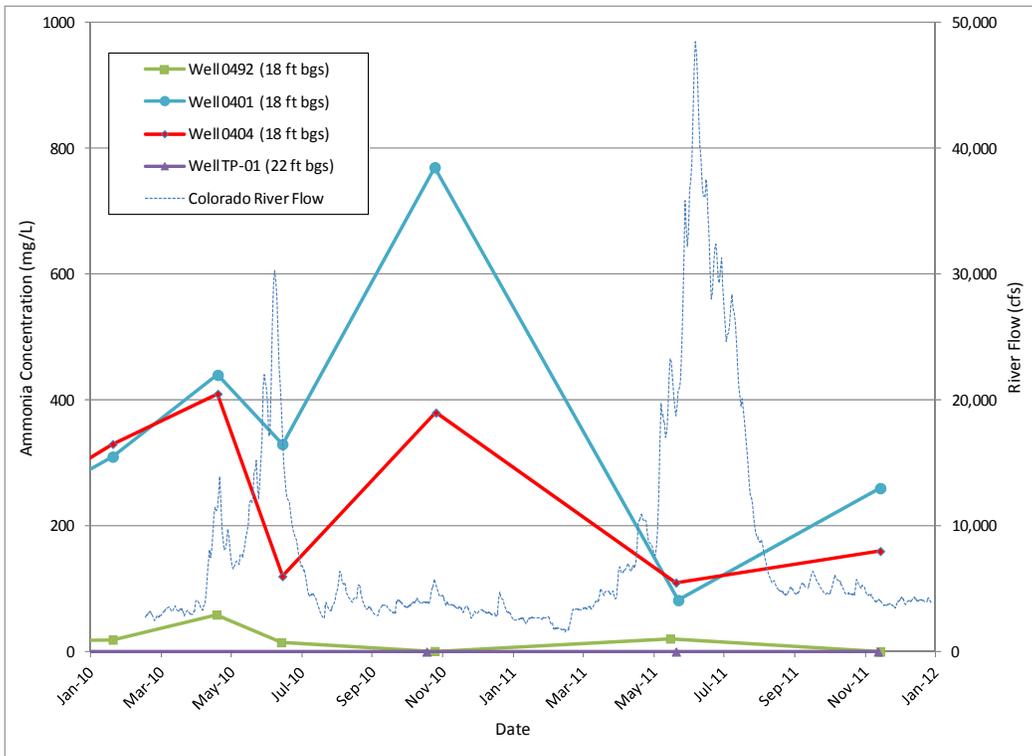


Figure 20. Riverbank Observation Wells 0492, 0401, 0404, and TP-01 Time Versus Ammonia Concentration Plot

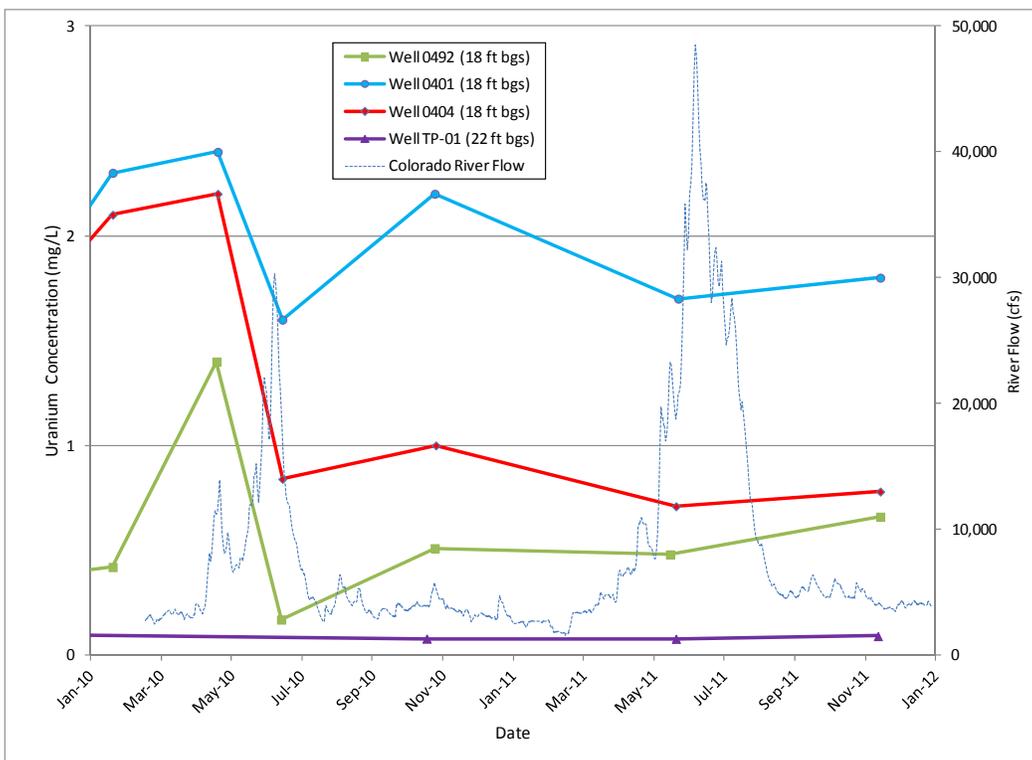


Figure 21. Riverbank Observation Wells 0492, 0401, 0404, and TP-01 Time Versus Uranium Concentration Plot

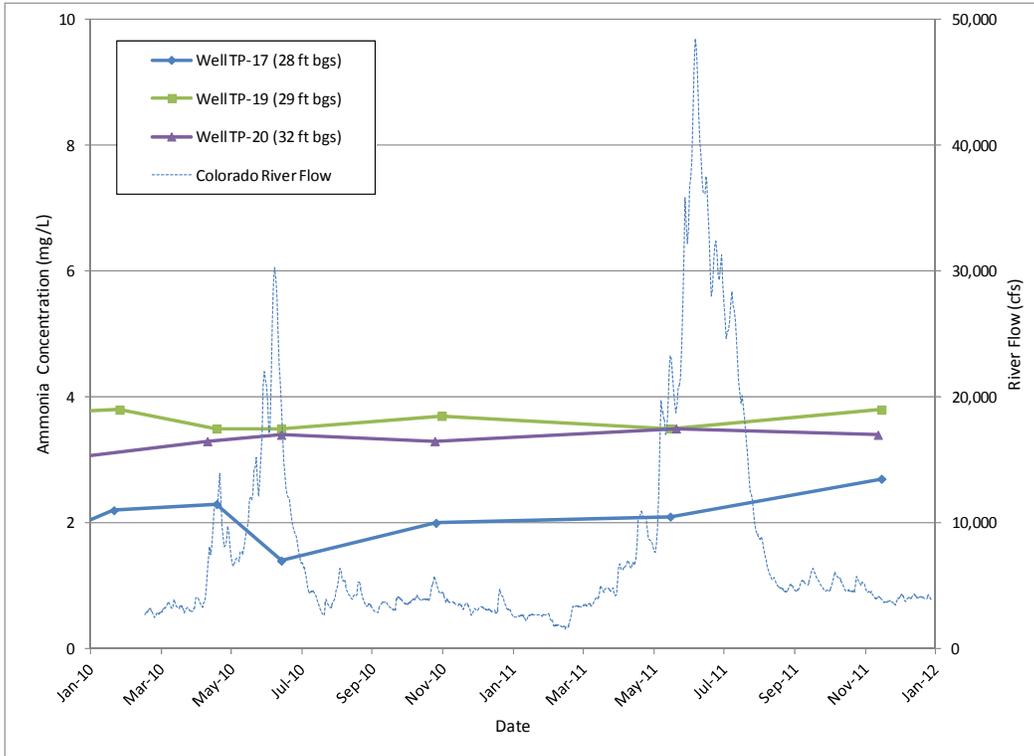


Figure 22. South of the Site Observation Wells TP-17, TP-19, and TP-20 Time Versus Ammonia Concentration Plot

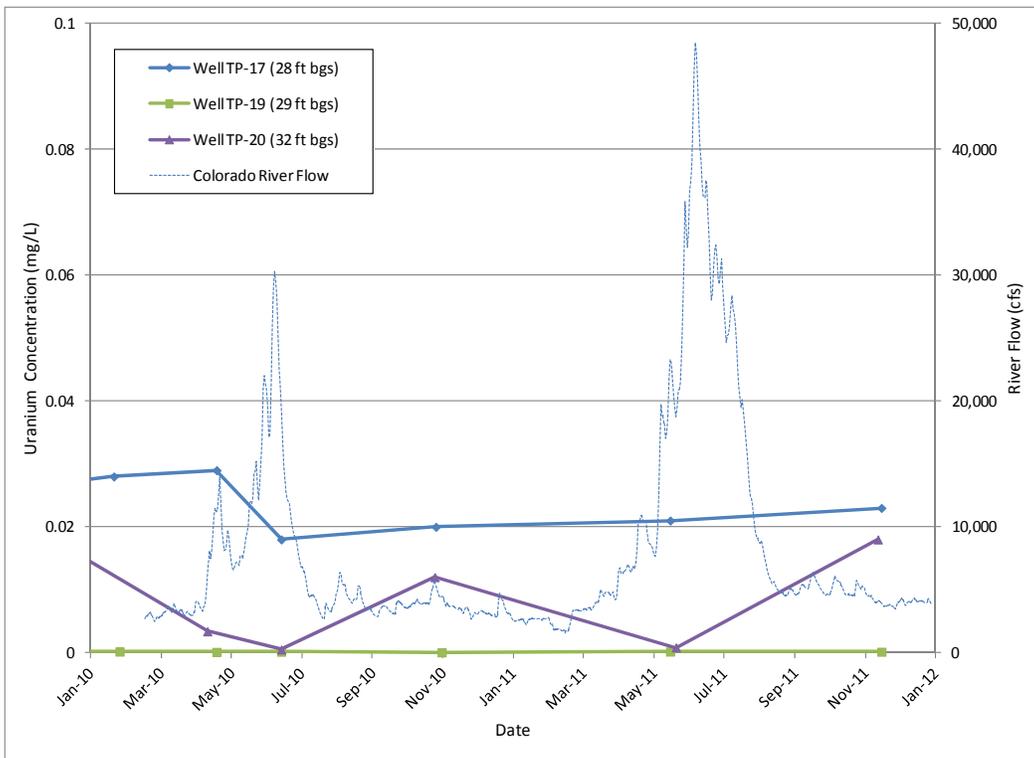


Figure 23. South of the Site Observation Wells TP-17, TP-19, and TP-20 Time Versus Uranium Concentration Plot

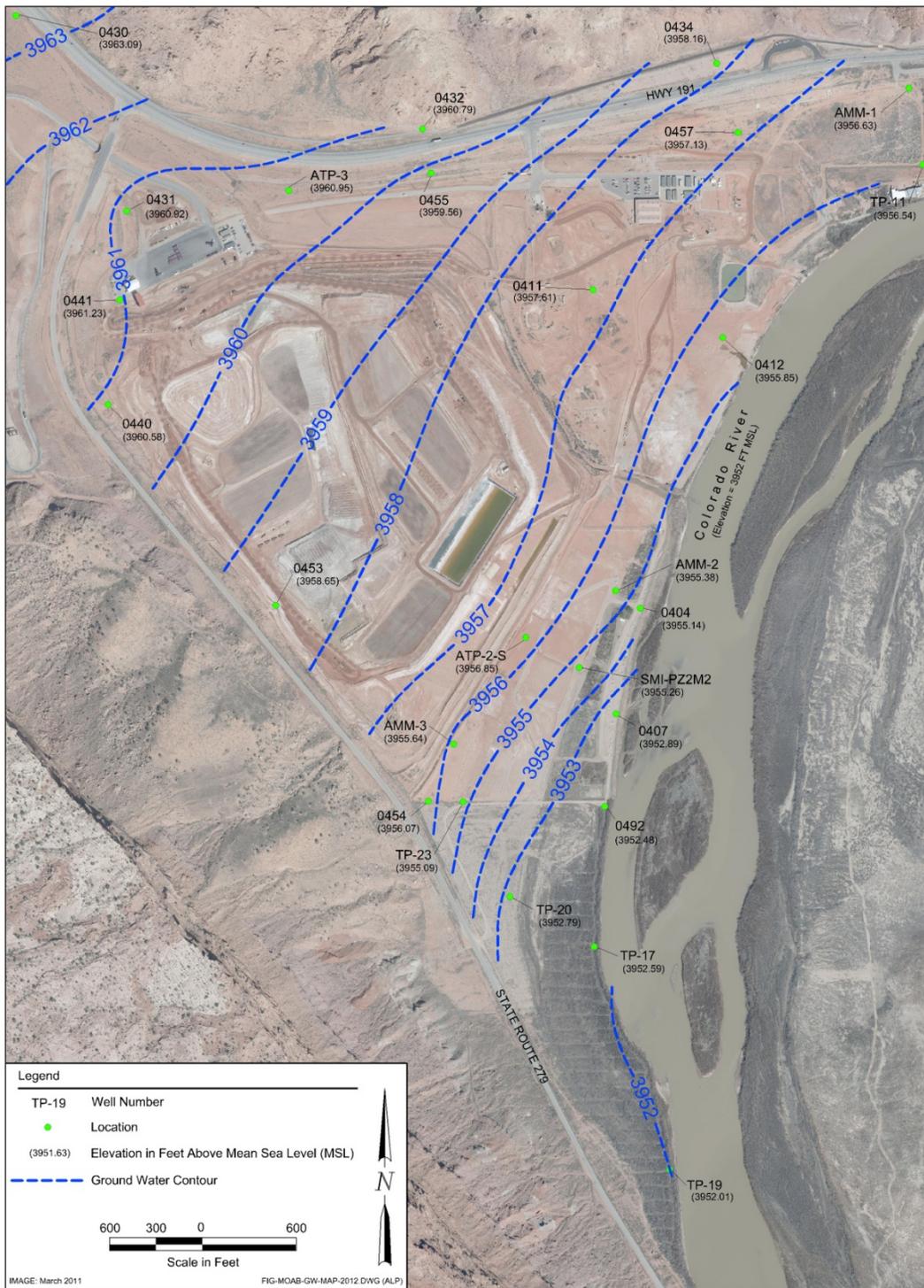


Figure 24. Site-Wide Ground Water Contour Map, November 2011

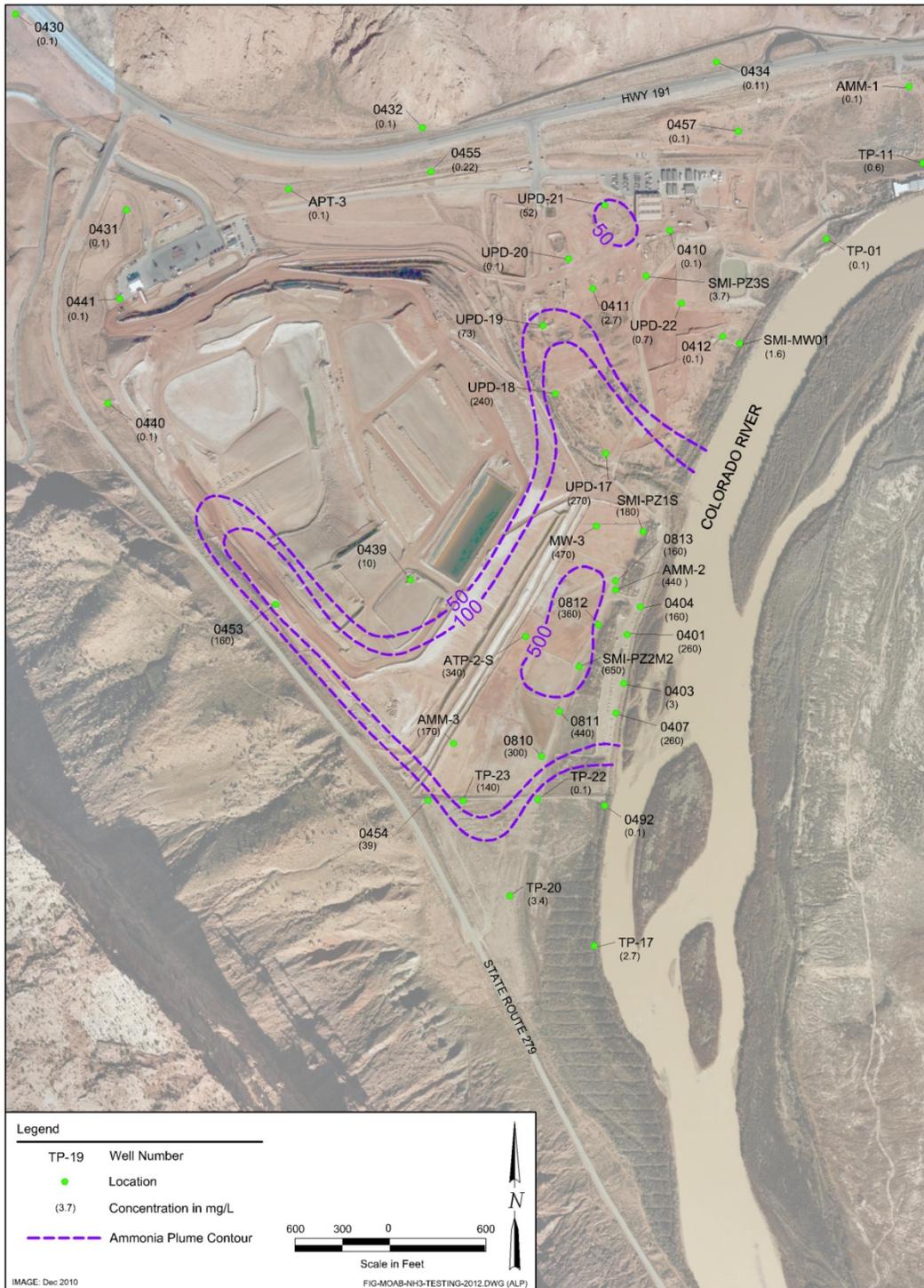


Figure 25. Location of Ammonia Plume in Shallow Ground Water, November 2011

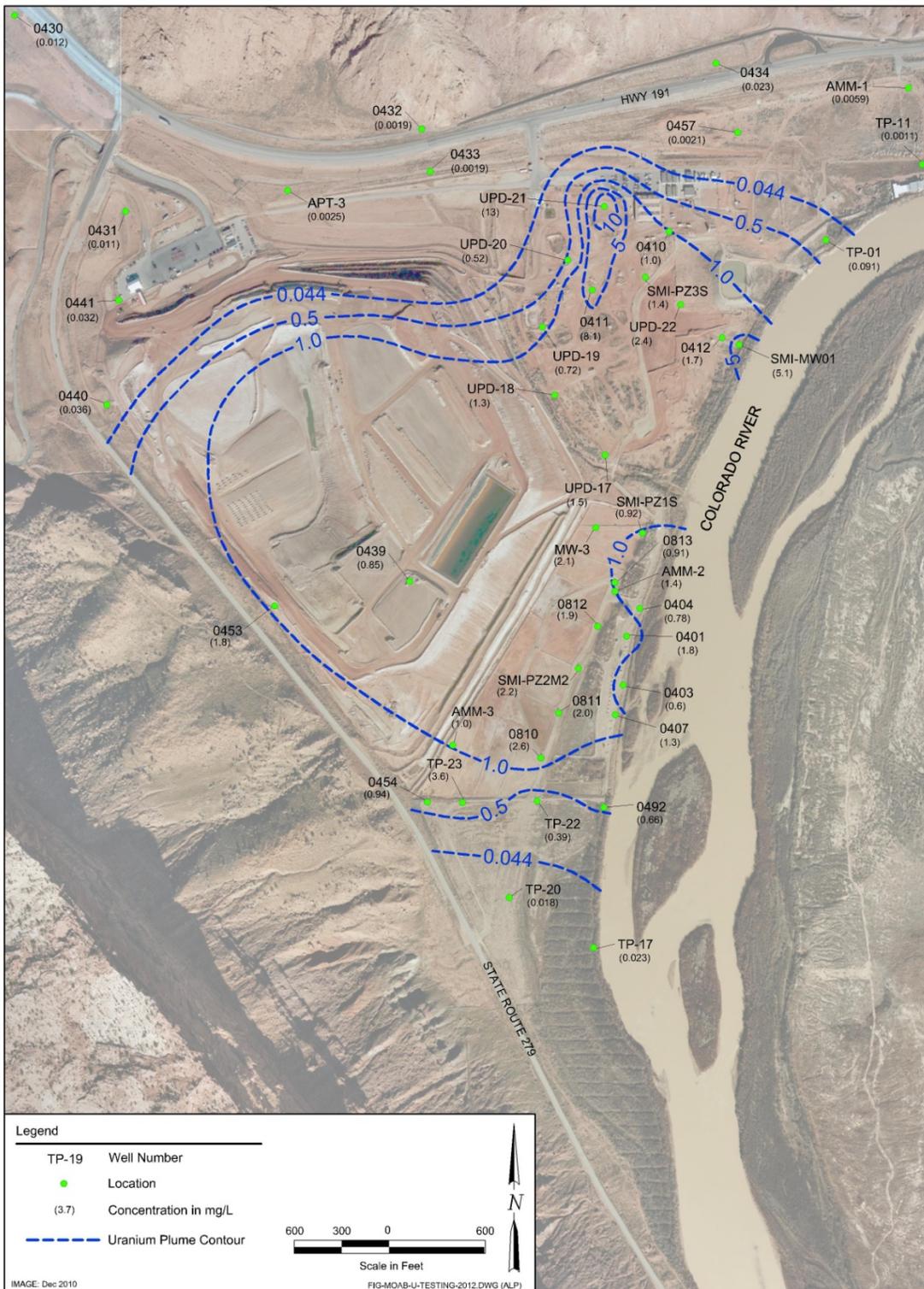


Figure 26. Location of Uranium Plume in Shallow Ground Water, November 2011

4.3 December 2011 Surface Water, CF4, and CF5 Sampling Event

The results for the CF4 and CF5 locations sampled in December are presented and discussed in Section 4.1

Table 16 presents the ammonia results from the surface water sampling conducted in December from locations 0201, 0218, 0228, CR1, CR3, and CR5 (as shown on Figure 3). The ammonia concentrations and comparisons to 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 also shown in Table 16.

Table 16. Surface Water Ammonia Concentrations and Comparisons to State of Utah and Federal Criteria

Location	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	12/7/11	1.8	7.70	0.1	9.65	3.58
0218	12/7/11	2.1	7.59	0.1	11.4	3.98
0228	12/8/11	1.7	8.02	0.17	5.62	2.43
CR1	12/7/11	1.4	8.28	0.1	3.15	1.52
CR3	12/8/11	1.5	7.95	0.1	5.62	2.43
CR5	12/7/11	1.7	7.64	0.1	11.4	3.98

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

With the exception of the sample collected from 0228, the ammonia concentrations were below the detection limit of 0.1 mg/L. The sample collected from location 0228 had a concentration of 0.17 mg/L, which is below both the acute and chronic criteria.

5.0 Conclusions

The rationale for the October sampling and water-level monitoring at the CF4 wells was to assess the effectiveness of the injection system at reducing concentrations in the Colorado River side channels. The CF5 sampling was conducted to accurately measure ammonia and uranium mass removal rates for the ground water system by the ground water extraction system. The October event also represents the first time the recently installed monitoring wells in the vicinity of the northeastern uranium plume area had been sampled.

The following conclusions can be made from the CF4 and CF5 sampling event.

- Ground water samples from five of the CF4 monitoring wells had uranium concentrations above the 0.044 mg/L ground water standard, with the samples collected from shallow downgradient wells 0784 and 0785 having a uranium concentrations (0.058 and 0.046 mg/L, respectively) just above the standard. Before the startup of the freshwater injection system, eight of these locations exceeded this standard.

- The CF4 freshwater injection system continued to be effective at reducing the contaminant concentrations in both the upgradient and downgradient directions, resulting in several historical minimum concentrations in monitoring wells. The injection system also generates a hydraulic mound that reduces the flow of contaminated ground water into the near CF4 side channel.
- With the exception of the samples collected from well PW02, ammonia and uranium concentrations in the CF5 wells slightly decreased after this area of the site was flooded starting in early June. This indicates that while the recharge of freshwater during high river stage does not reach the CF5 wells; when the area becomes flooded, the contaminant concentrations may be impacted.
- The sampling from the newly installed monitoring wells in the vicinity of the northeastern uranium plume indicated that the highest ammonia concentrations were detected along the northeastern edge of the tailings pile (wells UPD-17 and -18), while the highest uranium concentration was detected just west of the Atlas building.

The rationale for conducting the November site-wide sampling event was to collect data during river base-flow conditions and assess any changes and trends in the ground water system water chemistry. In addition, another round of samples was collected from the northeastern uranium plume wells.

The following conclusions can be made from the December site-wide sampling event.

- In general, the ammonia and uranium concentrations did not significantly change during the past year, and wells near the river exhibited the same trend of increasing concentrations during base-flow river stage.
- The ammonia and uranium concentrations measured in November were comparable to the concentrations measured in October for the UPD wells.

Surface water sampling was conducted in November to assess surface water quality adjacent to the site compared to the upstream and downstream water quality. The CF4 and CF5 samples were collected to further evaluate the freshwater injection and ground water extraction systems.

The following conclusions can be made regarding the November CF4, CF5, and surface water sampling event.

- There were significant contaminant concentration increases measured in some of the CF4 upgradient and downgradient monitoring wells below 20 ft bgs, suggesting that the ground water system started to rebound near the end of the 2011 operation for the freshwater injection system.
- The ammonia concentration of the discharge water from CF5 extraction well PW02 remained consistent, while the uranium concentration has continued to increase since April.
- With the exception of one surface water sample collected from 0228, the ammonia concentrations were below the detection limit of 0.1 mg/L. The sample collected from location 0228 had a concentration which was below the applicable state of Utah and federal criteria for both acute and chronic concentrations.

6.0 References

40 CFR 192A (Code of Federal Regulations), “Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings and Uranium In Situ Leaching Processing Facilities.”

DOE (U.S. Department of Energy), *Moab UMTRA Project Operations, Maintenance, and Performance Monitoring Plan for the Interim Action Ground Water Treatment System* (DOE-EM/GJTAC1973), June 2011.

DOE (U.S. Department of Energy), *Moab UMTRA Project Surface Water/Ground Water Sampling and Analysis Plan* (DOE-EM/GJTAC1830), November 2009.

DOE (U.S. Department of Energy), *Moab UMTRA Project Standard Practice for Validation of Laboratory Data* (DOE-EM/GJTAC1855), September 2011.

Appendix A.

**October 2011 CF4, CF5, and Northeastern Uranium Plume
Sampling Event**

**Water Sampling Field Activities Verification
Minimums and Maximums Report
Water Quality Data
Water Level Data
Trip Report**

Appendix A. Water Sampling Field Activities Verification

Sampling Event/RIN	October 2011 CF4, CF5 and NE U Plume Event / 1110061	Date(s) of Water Sampling	October 3-5, 2011
Date(s) of Verification	December 30, 2011	Name of Verifier	Rachel Cowan
	Response (Yes, No, NA)	Comments	
1. Is the Sampling Analysis Plan the primary document directing field procedures? List other documents, standard operating procedures, instructions.	Yes		
	NA		
2. Were the sampling locations specified in the planning documents sampled?	No	The following wells were not sampled (reasons given in parentheses): 0793, 0794, and 0795 (inaccessibility); 0814, 0815, and 0816 (power not yet restored after summer flooding).	
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	Field measurements for temperature, pH, turbidity, dissolved oxygen, oxidation reduction potential, and conductivity were collected.	
6. Was the category of the well documented?	No	The well category was not given for UPD-19 and UPD-20 in the field notes.	
7. Were the following conditions met when purging a Category I well: Was one pump/tubing volume purged before sampling? Did the water level stabilize before sampling? Did pH, specific conductance, and turbidity measurements stabilize before sampling? Was the flow rate less than 500 milliliters per minute? If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	Yes		
	Yes		
	Yes		
	NA		
	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 before sampling?	NA		
	NA		
9. Were duplicates taken at a frequency of one per 20 samples?	No	One duplicate was taken for 21 samples.	
10. Were EBs taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	NA	All samples were collected on dedicated equipment.	

Appendix A. Water Sampling Field Activities Verification (continued)

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?	NA
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?	NA
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?	NA

NA = not applicable

Appendix A. Minimums and Maximums Report

**October 2011 CF4, CF5, and NE U Plume Sampling Event
Data Validation Minimums and Maximums Report - No Field Parameters**

Laboratory: ALS

RIN: 1110061

Comparison: All Historical Data

Report Date: 2/7/2012

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	0780	10/04/2011	Ammonia Total as N	0.48		890	F	73		35	0
MOA01	0782	10/04/2011	Ammonia Total as N	21		2300		53		35	0
MOA01	0782	10/04/2011	Uranium	0.021		2.9	F	0.049		36	0
MOA01	0784	10/03/2011	Ammonia Total as N	1.4		410	J	3.6		13	0
MOA01	0785	10/03/2011	Ammonia Total as N	0.28		680	J	6.7		15	0
MOA01	0786	10/03/2011	Ammonia Total as N	4.3		820	J	27		33	0
MOA01	0792	10/03/2011	Uranium	0.06		1.6	QF	0.076		19	0
MOA01	0811	10/05/2011	Uranium	2		2.9		2.4		10	0
MOA01	0812	10/05/2011	Ammonia Total as N	360		620		430		9	0
MOA01	0812	10/05/2011	Uranium	1.9		3.1		2.2		9	0
MOA01	0813	10/05/2011	Ammonia Total as N	160		530		300		10	0
MOA01	0813	10/05/2011	Uranium	0.91		2.3		0.94		10	0
MOA01	SMI-PW02	10/05/2011	Uranium	4.5		4.466		1.8		33	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 A. 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 before sampling. | Q | Qualitative result due to sampling technique. | R | Unusable result. |
| U | Parameter analyzed for but was not detected. | X | Location is undefined. | | |

Appendix A. Water Quality Data

October 2011 CF4, CF5, and NE U Plume Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/7/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	0780	WL	10/04/2011	0001	28 - 28	0.48		#	0.1	
Ammonia Total as N	mg/L	0781	WL	10/04/2011	0001	46 - 46	740		#	20	
Ammonia Total as N	mg/L	0782	WL	10/04/2011	0001	33 - 33	21		#	2	
Ammonia Total as N	mg/L	0783	WL	10/03/2011	0001	18 - 18	36		#	2	
Ammonia Total as N	mg/L	0784	WL	10/03/2011	0001	18 - 18	1.4		#	0.1	
Ammonia Total as N	mg/L	0785	WL	10/03/2011	0001	18 - 18	0.28		#	0.1	
Ammonia Total as N	mg/L	0786	WL	10/03/2011	0001	28 - 28	4.3		#	0.1	
Ammonia Total as N	mg/L	0787	WL	10/03/2011	0001	36 - 36	140		#	10	
Ammonia Total as N	mg/L	0790	WL	10/03/2011	0001	2 - 3	8.5		#	0.5	
Ammonia Total as N	mg/L	0791	WL	10/03/2011	0001	4.3 - 5.3	48		#	5	
Ammonia Total as N	mg/L	0792	WL	10/03/2011	0001	9.3 - 10.3	230		#	10	
Ammonia Total as N	mg/L	0810	WL	10/04/2011	0001	10.4 - 40.4	300		#	10	
Ammonia Total as N	mg/L	0811	WL	10/05/2011	0001	8.6 - 38.6	440		#	10	
Ammonia Total as N	mg/L	0812	WL	10/05/2011	0001	14.2 - 44.2	360		#	10	
Ammonia Total as N	mg/L	0813	WL	10/05/2011	0001	14.4 - 44.4	160		#	10	
Ammonia Total as N	mg/L	SMI-PW02	WL	10/05/2011	0001	20.04 - 60.04	520		#	20	
Ammonia Total as N	mg/L	SMI-PW02	WL	10/05/2011	0002	20.04 - 60.04	520		#	20	
Ammonia Total as N	mg/L	UPD-17	WL	10/05/2011	0001	14 - 14	220		#	10	
Ammonia Total as N	mg/L	UPD-18	WL	10/05/2011	0001	14 - 14	210		#	10	
Ammonia Total as N	mg/L	UPD-19	WL	10/04/2011	0001	14 - 14	56		#	2	
Ammonia Total as N	mg/L	UPD-20	WL	10/04/2011	0001	25 - 25	0.1	U	U	#	0.1
Ammonia Total as N	mg/L	UPD-21	WL	10/04/2011	0001	25 - 25	74		J	#	2

Appendix A. Water Quality Data (continued)

October 2011 CF4, CF5, and NE U Plume Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/7/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
Copper	mg/L	0785	WL	10/03/2011	0001	18 - 18	0.00097	U		#	0.00097	
Copper	mg/L	0787	WL	10/03/2011	0001	36 - 36	0.0062	B	J	#	0.00097	
Dissolved Oxygen	mg/L	0780	WL	10/04/2011	0001	28 - 28	5			#		
Dissolved Oxygen	mg/L	0781	WL	10/04/2011	0001	46 - 46	1.03			#		
Dissolved Oxygen	mg/L	0782	WL	10/04/2011	0001	33 - 33	1.76			#		
Dissolved Oxygen	mg/L	0783	WL	10/03/2011	0001	18 - 18	13.24			#		
Dissolved Oxygen	mg/L	0784	WL	10/03/2011	0001	18 - 18	2.8			#		
Dissolved Oxygen	mg/L	0785	WL	10/03/2011	0001	18 - 18	4.14			#		
Dissolved Oxygen	mg/L	0786	WL	10/03/2011	0001	28 - 28	2.74			#		
Dissolved Oxygen	mg/L	0787	WL	10/03/2011	0001	36 - 36	11.12			#		
Dissolved Oxygen	mg/L	0790	WL	10/03/2011	0001	2 - 3	3.91			#		
Dissolved Oxygen	mg/L	0791	WL	10/03/2011	0001	4.3 - 5.3	12.67			#		
Dissolved Oxygen	mg/L	0792	WL	10/03/2011	0001	9.3 - 10.3	7.61			#		
Dissolved Oxygen	mg/L	0810	WL	10/04/2011	0001	10.4 - 40.4	3.47			#		
Dissolved Oxygen	mg/L	0811	WL	10/05/2011	0001	8.6 - 38.6	2.26			#		
Dissolved Oxygen	mg/L	0812	WL	10/05/2011	0001	14.2 - 44.2	3.14			#		
Dissolved Oxygen	mg/L	0813	WL	10/05/2011	0001	14.4 - 44.4	12.12			#		
Dissolved Oxygen	mg/L	SMI-PW02	WL	10/05/2011	0001	20.04 - 60.04	2.18			#		
Dissolved Oxygen	mg/L	UPD-17	WL	10/05/2011	0001	14 - 14	7.89			#		
Dissolved Oxygen	mg/L	UPD-18	WL	10/05/2011	0001	14 - 14	7.12			#		
Dissolved Oxygen	mg/L	UPD-19	WL	10/04/2011	0001	14 - 14	7.48			#		
Dissolved Oxygen	mg/L	UPD-20	WL	10/04/2011	0001	25 - 25	5.57			#		
Dissolved Oxygen	mg/L	UPD-21	WL	10/04/2011	0001	25 - 25	8.08			#		

Appendix A. Water Quality Data (continued)

October 2011 CF4, CF5, and NE U Plume Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/7/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Oxidation Reduction Potential	mV	0780	WL	10/04/2011	0001	28 - 28	98		#		
Oxidation Reduction Potential	mV	0781	WL	10/04/2011	0001	46 - 46	45		#		
Oxidation Reduction Potential	mV	0782	WL	10/04/2011	0001	33 - 33	44		#		
Oxidation Reduction Potential	mV	0783	WL	10/03/2011	0001	18 - 18	194		#		
Oxidation Reduction Potential	mV	0784	WL	10/03/2011	0001	18 - 18	131		#		
Oxidation Reduction Potential	mV	0785	WL	10/03/2011	0001	18 - 18	-79		#		
Oxidation Reduction Potential	mV	0786	WL	10/03/2011	0001	28 - 28	-15		#		
Oxidation Reduction Potential	mV	0787	WL	10/03/2011	0001	36 - 36	43		#		
Oxidation Reduction Potential	mV	0790	WL	10/03/2011	0001	2 - 3	-194		#		
Oxidation Reduction Potential	mV	0791	WL	10/03/2011	0001	4.3 - 5.3	-223		#		
Oxidation Reduction Potential	mV	0792	WL	10/03/2011	0001	9.3 - 10.3	-318		#		
Oxidation Reduction Potential	mV	0810	WL	10/04/2011	0001	10.4 - 40.4	60		#		
Oxidation Reduction Potential	mV	0811	WL	10/05/2011	0001	8.6 - 38.6	114		#		
Oxidation Reduction Potential	mV	0812	WL	10/05/2011	0001	14.2 - 44.2	12.12		#		
Oxidation Reduction Potential	mV	0813	WL	10/05/2011	0001	14.4 - 44.4	121		#		
Oxidation Reduction Potential	mV	SMI-PW02	WL	10/05/2011	0001	20.04 - 60.04	118		#		
Oxidation Reduction Potential	mV	UPD-17	WL	10/05/2011	0001	14 - 14	162		#		
Oxidation Reduction Potential	mV	UPD-18	WL	10/05/2011	0001	14 - 14	194		#		
Oxidation Reduction Potential	mV	UPD-19	WL	10/04/2011	0001	14 - 14	115		#		
Oxidation Reduction Potential	mV	UPD-20	WL	10/04/2011	0001	25 - 25	114		#		
Oxidation Reduction Potential	mV	UPD-21	WL	10/04/2011	0001	25 - 25	160		#		
pH	s.u.	0780	WL	10/04/2011	0001	28 - 28	7.5		#		
pH	s.u.	0781	WL	10/04/2011	0001	46 - 46	6.98		#		

Appendix A. Water Quality Data (continued)

October 2011 CF4, CF5, and NE U Plume Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/7/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
pH	s.u.	0782	WL	10/04/2011	0001	33 - 33	7.61		#		
pH	s.u.	0783	WL	10/03/2011	0001	18 - 18	6.69		#		
pH	s.u.	0784	WL	10/03/2011	0001	18 - 18	7.39		#		
pH	s.u.	0785	WL	10/03/2011	0001	18 - 18	7.55		#		
pH	s.u.	0786	WL	10/03/2011	0001	28 - 28	7.61		#		
pH	s.u.	0787	WL	10/03/2011	0001	36 - 36	7.62		#		
pH	s.u.	0790	WL	10/03/2011	0001	2 - 3	8.35		#		
pH	s.u.	0791	WL	10/03/2011	0001	4.3 - 5.3	8.34		#		
pH	s.u.	0792	WL	10/03/2011	0001	9.3 - 10.3	9.24		#		
pH	s.u.	0810	WL	10/04/2011	0001	10.4 - 40.4	7.29		#		
pH	s.u.	0811	WL	10/05/2011	0001	8.6 - 38.6	7.46		#		
pH	s.u.	0812	WL	10/05/2011	0001	14.2 - 44.2	7.13		#		
pH	s.u.	0813	WL	10/05/2011	0001	14.4 - 44.4	7.63		#		
pH	s.u.	SMI-PW02	WL	10/05/2011	0001	20.04 - 60.04	7.21		#		
pH	s.u.	UPD-17	WL	10/05/2011	0001	14 - 14	7.04		#		
pH	s.u.	UPD-18	WL	10/05/2011	0001	14 - 14	6.78		#		
pH	s.u.	UPD-19	WL	10/04/2011	0001	14 - 14	6.62		#		
pH	s.u.	UPD-20	WL	10/04/2011	0001	25 - 25	7.16		#		
pH	s.u.	UPD-21	WL	10/04/2011	0001	25 - 25	6.4		#		
Selenium	mg/L	0792	WL	10/03/2011	0001	9.3 - 10.3	0.00044	B	J	#	0.00032
Specific Conductance	umhos/cm	0780	WL	10/04/2011	0001	28 - 28	1305		#		
Specific Conductance	umhos/cm	0781	WL	10/04/2011	0001	46 - 46	38459		#		
Specific Conductance	umhos/cm	0782	WL	10/04/2011	0001	33 - 33	1698		#		
Specific Conductance	umhos/cm	0783	WL	10/03/2011	0001	18 - 18	11733		#		
Specific Conductance	umhos/cm	0784	WL	10/03/2011	0001	18 - 18	1143		#		
Specific Conductance	umhos/cm	0785	WL	10/03/2011	0001	18 - 18	1210		#		

Appendix A. Water Quality Data (continued)

October 2011 CF4, CF5, and NE U Plume Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/7/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Specific Conductance	umhos/cm	0786	WL	10/03/2011	0001	28 - 28	1183			#	
Specific Conductance	umhos/cm	0787	WL	10/03/2011	0001	36 - 36	10666			#	
Specific Conductance	umhos/cm	0790	WL	10/03/2011	0001	2 - 3	1402			#	
Specific Conductance	umhos/cm	0791	WL	10/03/2011	0001	4.3 - 5.3	5246			#	
Specific Conductance	umhos/cm	0792	WL	10/03/2011	0001	9.3 - 10.3	9036			#	
Specific Conductance	umhos/cm	0810	WL	10/04/2011	0001	10.4 - 40.4	29873			#	
Specific Conductance	umhos/cm	0811	WL	10/05/2011	0001	8.6 - 38.6	21942			#	
Specific Conductance	umhos/cm	0812	WL	10/05/2011	0001	14.2 - 44.2	18582			#	
Specific Conductance	umhos/cm	0813	WL	10/05/2011	0001	14.4 - 44.4	9284			#	
Specific Conductance	umhos/cm	SMI-PW02	WL	10/05/2011	0001	20.04 - 60.04	30856			#	
Specific Conductance	umhos/cm	UPD-17	WL	10/05/2011	0001	14 - 14	12352			#	
Specific Conductance	umhos/cm	UPD-18	WL	10/05/2011	0001	14 - 14	12431			#	
Specific Conductance	umhos/cm	UPD-19	WL	10/04/2011	0001	14 - 14	4855			#	
Specific Conductance	umhos/cm	UPD-20	WL	10/04/2011	0001	25 - 25	3708			#	
Specific Conductance	umhos/cm	UPD-21	WL	10/04/2011	0001	25 - 25	9456			#	
Temperature	C	0780	WL	10/04/2011	0001	28 - 28	19.6			#	
Temperature	C	0781	WL	10/04/2011	0001	46 - 46	17.42			#	
Temperature	C	0782	WL	10/04/2011	0001	33 - 33	19.27			#	
Temperature	C	0783	WL	10/03/2011	0001	18 - 18	17.24			#	
Temperature	C	0784	WL	10/03/2011	0001	18 - 18	21.42			#	
Temperature	C	0785	WL	10/03/2011	0001	18 - 18	21.65			#	
Temperature	C	0786	WL	10/03/2011	0001	28 - 28	21.02			#	
Temperature	C	0787	WL	10/03/2011	0001	36 - 36	19.63			#	
Temperature	C	0790	WL	10/03/2011	0001	2 - 3	21.13			#	
Temperature	C	0791	WL	10/03/2011	0001	4.3 - 5.3	21.83			#	

Appendix A. Water Quality Data (continued)

October 2011 CF4, CF5, and NE U Plume Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/7/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Temperature	C	0792	WL	10/03/2011	0001	9.3 - 10.3	21.04			#	
Temperature	C	0810	WL	10/04/2011	0001	10.4 - 40.4	17.09			#	
Temperature	C	0811	WL	10/05/2011	0001	8.6 - 38.6	16.62			#	
Temperature	C	0812	WL	10/05/2011	0001	14.2 - 44.2	17.94			#	
Temperature	C	0813	WL	10/05/2011	0001	14.4 - 44.4	18.97			#	
Temperature	C	SMI-PW02	WL	10/05/2011	0001	20.04 - 60.04	16.42			#	
Temperature	C	UPD-17	WL	10/05/2011	0001	14 - 14	19.11			#	
Temperature	C	UPD-18	WL	10/05/2011	0001	14 - 14	20.23			#	
Temperature	C	UPD-19	WL	10/04/2011	0001	14 - 14	20.55			#	
Temperature	C	UPD-20	WL	10/04/2011	0001	25 - 25	19.69			#	
Temperature	C	UPD-21	WL	10/04/2011	0001	25 - 25	19.86			#	
Turbidity	NTU	0780	WL	10/04/2011	0001	28 - 28	2.41			#	
Turbidity	NTU	0781	WL	10/04/2011	0001	46 - 46	1.86			#	
Turbidity	NTU	0782	WL	10/04/2011	0001	33 - 33	2.24			#	
Turbidity	NTU	0783	WL	10/03/2011	0001	18 - 18	4.57			#	
Turbidity	NTU	0784	WL	10/03/2011	0001	18 - 18	1.02			#	
Turbidity	NTU	0785	WL	10/03/2011	0001	18 - 18	2.23			#	
Turbidity	NTU	0786	WL	10/03/2011	0001	28 - 28	4.32			#	
Turbidity	NTU	0787	WL	10/03/2011	0001	36 - 36	2.76			#	
Turbidity	NTU	0790	WL	10/03/2011	0001	2 - 3	142.6			#	
Turbidity	NTU	0791	WL	10/03/2011	0001	4.3 - 5.3	30			#	
Turbidity	NTU	0792	WL	10/03/2011	0001	9.3 - 10.3	30.6			#	
Turbidity	NTU	0810	WL	10/04/2011	0001	10.4 - 40.4	2.67			#	
Turbidity	NTU	0811	WL	10/05/2011	0001	8.6 - 38.6	4.25			#	
Turbidity	NTU	0812	WL	10/05/2011	0001	14.2 - 44.2	1.62			#	
Turbidity	NTU	0813	WL	10/05/2011	0001	14.4 - 44.4	19.29			#	
Turbidity	NTU	SMI-PW02	WL	10/05/2011	0001	20.04 - 60.04	12.03			#	

Appendix A. Water Quality Data (continued)

October 2011 CF4, CF5, and NE U Plume Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/7/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Turbidity	NTU	UPD-17	WL	10/05/2011	0001	14 - 14	105		#		
Turbidity	NTU	UPD-18	WL	10/05/2011	0001	14 - 14	55.1		#		
Turbidity	NTU	UPD-19	WL	10/04/2011	0001	14 - 14	63.5		#		
Turbidity	NTU	UPD-20	WL	10/04/2011	0001	25 - 25	185		#		
Turbidity	NTU	UPD-21	WL	10/04/2011	0001	25 - 25	15.2		#		
Uranium	mg/L	0780	WL	10/04/2011	0001	28 - 28	0.012		#	2.9E-005	
Uranium	mg/L	0781	WL	10/04/2011	0001	46 - 46	0.57		#	0.00058	
Uranium	mg/L	0782	WL	10/04/2011	0001	33 - 33	0.021		#	2.9E-005	
Uranium	mg/L	0783	WL	10/03/2011	0001	18 - 18	1.4		#	0.00058	
Uranium	mg/L	0784	WL	10/03/2011	0001	18 - 18	0.058		#	2.9E-005	
Uranium	mg/L	0785	WL	10/03/2011	0001	18 - 18	0.046		#	2.9E-005	
Uranium	mg/L	0786	WL	10/03/2011	0001	28 - 28	0.019		#	2.9E-005	
Uranium	mg/L	0787	WL	10/03/2011	0001	36 - 36	0.25		#	2.9E-005	
Uranium	mg/L	0790	WL	10/03/2011	0001	2 - 3	0.078		#	0.00015	
Uranium	mg/L	0791	WL	10/03/2011	0001	4.3 - 5.3	0.4		#	0.00015	
Uranium	mg/L	0792	WL	10/03/2011	0001	9.3 - 10.3	0.06		#	2.9E-005	
Uranium	mg/L	0810	WL	10/04/2011	0001	10.4 - 40.4	2.6		#	0.00058	
Uranium	mg/L	0811	WL	10/05/2011	0001	8.6 - 38.6	2		#	0.00058	
Uranium	mg/L	0812	WL	10/05/2011	0001	14.2 - 44.2	1.9		#	0.00058	
Uranium	mg/L	0813	WL	10/05/2011	0001	14.4 - 44.4	0.91		#	0.00058	
Uranium	mg/L	SMI-PW02	WL	10/05/2011	0001	20.04 - 60.04	3.9		#	0.0029	
Uranium	mg/L	SMI-PW02	WL	10/05/2011	0002	20.04 - 60.04	4.5		#	0.0029	
Uranium	mg/L	UPD-17	WL	10/05/2011	0001	14 - 14	1.6		#	0.00058	
Uranium	mg/L	UPD-18	WL	10/05/2011	0001	14 - 14	1.4		#	0.00058	
Uranium	mg/L	UPD-19	WL	10/04/2011	0001	14 - 14	0.89		#	0.00058	
Uranium	mg/L	UPD-20	WL	10/04/2011	0001	25 - 25	0.97		#	0.00058	
Uranium	mg/L	UPD-21	WL	10/04/2011	0001	25 - 25	11		#	0.0029	

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

Appendix A. 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 before 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 A. Water Level Data

**October 2011 CF4, CF5, and NE U Plume Sampling Event
 STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/9/2012**

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Time	Date	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
0780		3968.45	10/04/2011		13.51	3954.94	
0781		3968.56	10/04/2011		13.63	3954.93	
0782		3968.46	10/04/2011		13.52	3954.94	
0784		3968.73	10/03/2011		15.48	3953.25	
0785		3969.24	10/03/2011		15.2	3954.04	
0786		3968.14	10/03/2011		13.76	3954.38	
0787		3968.43	10/03/2011		13.68	3954.75	
0810		3961.96	10/04/2011		8.5	3953.46	
0811		3962.88	10/05/2011		7.63	3955.25	
0812		3961.5	10/05/2011		8.16	3953.34	
0813		3963.55	10/05/2011		7.97	3955.58	
SMI-PW02	O	3966.73	10/05/2011		38.97	3927.76	

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

Appendix A. Trip Report



DATE: November 23, 2011
TO: K. Pill
FROM: J. Ritchey
SUBJECT: October 2011 CF4, CF5, and Northeastern Uranium Plume Sampling Trip Report

Site: Moab

Date of Sampling Event: October 03-05, 2011

Team Members: Elizabeth Glowiak, James Ritchey

RIN Assigned: All samples were assigned to RIN 1110061.

Sample Shipment: All samples were shipped in one cooler overnight UPS to ALS Environmental from Moab, Utah, on October 06, 2010 (Tracking No. 0194131206).

October 2011 CF4 Sampling

Number of Locations Sampled: Eight observation wells (0780, 0781, 0782, 0783, 0784, 0785, 0786, and 0787) and three well points (0790, 0791, and 0792) were sampled during the October sampling event.

Locations Not Sampled: Three well points (0793, 0794, and 0795) were not sampled due to inaccessibility.

Field Variance: None.

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

Well No.	Date	Time	Depth to Water (ft btoc)	Sample Depth (ft bgs)
0780	10/04/2011	08:49	13.51	28
0781	10/04/2011	09:25	13.63	46
0782	10/04/2011	09:08	13.52	33
0783	10/03/2011	14:15	12.60	18
0784	10/03/2011	14:30	15.48	18
0785	10/03/2011	16:05	15.20	18
0786	10/03/2011	15:10	13.76	28
0787	10/03/2011	14:50	13.68	36

ft btoc = feet below top of casing

Appendix A. Trip Report (continued)

Location-Specific Information – Well Point Sampling: The table below presents the water level, stick up height, and depth to the river surface before the initial purge.

WP No.	Date	Time	Depth to Water (ft btoc)	Stick Up Height (ft)	Depth to River Surface (ft btoc)
0790	10/03/2011	15:53	NA	3.15	Dry At Base
0791	10/03/2011	15:25	NA	2.70	Dry At Base
0792	10/03/2011	15:40	NA	3.20	Dry At Base

ft btoc = feet below top of casing; NA = not applicable; WP = well point

October 2011 CF5 Sampling

Number of Locations Sampled: Five extraction wells (0810, 0811, 0812, 0813, and SMI-PW02) were sampled. Including one duplicate, a total of six samples were collected during the October monthly sampling event.

Locations Not Sampled: Three extraction wells (0814, 0815, and 0816) were not sampled because power had not yet been restored to the pumps after flooding conditions and well development.

Field Variance: None.

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	SMI-PW02	Duplicate from 55 ft bgs	Ground Water	OCT 021

ID = identification

Location-Specific Information – Extraction Wells: Extraction wells were sampled using dedicated submersible pumps. Samples were collected into open containers and filtered using dedicated flexible tubing. Sample depths and water levels for each extraction well are listed below.

Well No.	Date	Time	Depth to Water (ft btoc)	Pump Intake Depth (ft bgs)
0810	10/04/2011	10:00	8.50	35
0811	10/05/2011	12:32	7.63	35
0812	10/05/2011	11:49	8.16	40
0813	10/05/2011	11:29	7.97	40
SMI-PW02	10/05/2011	12:13	17.50	55

ft btoc = feet below top of casing

Appendix A. Trip Report (continued)

October 2011 Northeastern Uranium Plume Sampling

Number of Locations Sampled: Five observation wells were drilled in the continuation of the uranium plume investigation. This is the first time samples were collected from these locations.

Locations Not Sampled: None.

Field Variance: None

Location-Specific Information – Observation Wells: All observation wells were sampled using micro-purge techniques with a peristaltic pump. Sample depths of observation wells are listed below.

Well No.	Date	Time	Depth to Water (ft btoc)	Sample Depth (ft bgs)
UPD-17	10/05/2011	09:30	10.80	14
UPD-18	10/05/2011	09:07	11.28	14
UPD-19	10/04/2011	15:09	8.35	14
UPD-20	10/04/2011	14:45	20.21	25
UPD-21	10/04/2011	14:17	23.26	25

ft btoc = feet below top of casing

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)
10/03/2011	4,620
10/04/2011	4,710
10/05/2011	4,930
UPD-20	10/04/2011
UPD-21	10/04/2011

Equipment Issues: None.

Corrective Action Required/Taken: None.

Appendix B.

November 2011 Site-Wide Sampling Event

Water Sampling Field Activities Verification

Minimums and Maximums Report

Water Quality Data

Water Level Data

Trip Report

Appendix B. Water Sampling Field Activities Verification

Sampling Event/RIN	November 2011 Site-Wide Sampling Event / 1110062	Date(s) of Water Sampling	November 7-22, 2011
Date(s) of Verification	January 30, 2012	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?	No	The following wells were not sampled (reasons given in parentheses): 0437 and 0438 (excavation operations); 0413 and 0414 (lost due to flooding); 0436 (pump not working); TP-02 (removed during to off-pile remediation).
3.	Was a pre-trip calibration conducted as specified in the aforementioned documents?	Yes	
4.	Was an operational check of the field equipment conducted twice daily? 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	The field measurements temperature, pH, dissolved oxygen, oxidation reduction potential, and conductivity were collected.
6.	Was the category of the well documented?	No	The well category was not given for 0453, 0454, ATP-3, and ATD-2-D in the field notes.
7.	Were the following conditions met when purging a Category I well: Was one pump/tubing volume purged before sampling?	Yes	
	Did the water level stabilize before sampling?	Yes	
	Did pH, specific conductance, and turbidity measurements stabilize before sampling?	Yes	
	Was the flow rate less than 500 milliliters per minute (mL/min)?	Yes	
	If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	Yes	

Appendix B. Water Sampling Field Activities Verification (continued)

Sampling Event / RIN	November 2011 Site-Wide Sampling Event / 1110062	Date(s) of Water Sampling	November 7-22, 2011
Date(s) of Verification	January 30, 2012	Name of Verifier	Rachel Cowan
8. Were the following conditions met when purging a Category II well:			
Was the flow rate less than 500 mL/min?		Yes	
Was one pump/tubing volume removed before sampling?		Yes	
9. Were duplicates taken at a frequency of one per 20 samples?		Yes	Three duplicates were taken for 57 samples.
10. Were EBs taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?		NA	All samples were collected on dedicated equipment.
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?		NA	
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	

NA = not applicable

Appendix B. Minimums and Maximums Report

**November 2011 Site-Wide Sampling Event
Data Validation Minimums and Maximums Report - No Field Parameters**

Laboratory: ALS

RIN: 1111062

Comparison: All Historical Data

Report Date: 2/7/2012

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	0401	11/16/2011	Selenium	0.016		0.014	F	0.0051	J	17	0
MOA01	0403	11/16/2011	Ammonia Total as N	3		930		10		70	0
MOA01	0412	11/17/2011	Total Dissolved Solids	1700		3910	F	1900		8	0
MOA01	0412	11/17/2011	Uranium	1.7		12.8	F	3.2		9	0
MOA01	0433	11/08/2011	Total Dissolved Solids	2900		2800	J	2550	F	8	0
MOA01	0453	11/21/2011	Ammonia Total as N	160		510	J	180	J	5	0
MOA01	0453	11/21/2011	Total Dissolved Solids	23000		21000		20000		5	0
MOA01	0457	11/09/2011	Total Dissolved Solids	3300		3258	FQ	2900		8	0
MOA01	0492	11/16/2011	Ammonia Total as N	0.1	U	200	F	1.1	J	25	0
MOA01	ATP-2-S	11/15/2011	Uranium	0.0015		28		0.0019		86	0
MOA01	SMI-PW01	11/16/2011	Ammonia Total as N	170		1620		280		38	0
MOA01	SMI-PW01	11/16/2011	Total Dissolved Solids	8600		46350		10000	J	37	0
MOA01	SMI-PW01	11/16/2011	Uranium	1.1		3.2	F	1.2044		38	0
MOA01	SMI-PW03	11/17/2011	Ammonia Total as N	28		150	J	30		16	0
MOA01	SMI-PW03	11/17/2011	Total Dissolved Solids	4100		12000		5500		15	0
MOA01	SMI-PZ2D	11/14/2011	Total Dissolved Solids	85000		90000	J	88000		5	0
MOA01	SMI-PZ2M2	11/14/2011	Total Dissolved Solids	51000		80000		54000		5	0
MOA01	SMI-PZ2M2	11/14/2011	Uranium	2.2		1.8144		0.68		6	0
MOA01	SMI-PZ3D2	11/17/2011	Total Dissolved Solids	15000		21000		16000		9	0

Appendix B. Minimums and Maximums Report (continued)

November 2011 Site-Wide Sampling Event
Data Validation Minimums and Maximums Report - No Field Parameters

Laboratory: ALS
 RIN: 1111062
 Comparison: All Historical Data
 Report Date: 2/7/2012

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	SMI-PZ3D2	11/17/2011	Uranium	1.2		4.68		1.4		13	0
MOA01	TP-01	11/14/2011	Total Dissolved Solids	4600		14800	F	4700		13	0
MOA01	TP-11	11/14/2011	Ammonia Total as N	0.64		1.5		0.65		6	0
MOA01	TP-11	11/14/2011	Total Dissolved Solids	13000		18000		14000		5	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.

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

Appendix B. Water Quality Data

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	0401	WL	11/16/2011	0001	18 - 18	260		#	10	
Ammonia Total as N	mg/L	0403	WL	11/16/2011	0001	18 - 18	3		#	0.1	
Ammonia Total as N	mg/L	0404	WL	11/16/2011	0001	18 - 18	160		#	10	
Ammonia Total as N	mg/L	0407	WL	11/16/2011	0001	17 - 17	260		#	10	
Ammonia Total as N	mg/L	0410	WL	11/17/2011	0001	25 - 25	0.1	U	#	0.1	
Ammonia Total as N	mg/L	0411	WL	11/17/2011	0001	9 - 9	2.7		#	0.1	
Ammonia Total as N	mg/L	0412	WL	11/17/2011	0001	10.5 - 10.5	0.1	U	#	0.1	
Ammonia Total as N	mg/L	0430	WL	11/07/2011	0001	101 - 101	0.1	U	#	0.1	
Ammonia Total as N	mg/L	0431	WL	11/08/2011	0001	91 - 91	0.1	U	#	0.1	
Ammonia Total as N	mg/L	0432	WL	11/07/2011	0001	55 - 55	0.1	U	#	0.1	
Ammonia Total as N	mg/L	0433	WL	11/08/2011	0001	99 - 99	0.1	U	#	0.1	
Ammonia Total as N	mg/L	0434	WL	11/07/2011	0001	35 - 35	0.1	U	#	0.1	
Ammonia Total as N	mg/L	0435	WL	11/09/2011	0001	173 - 173	1.9		#	0.1	
Ammonia Total as N	mg/L	0439	WL	11/21/2011	0001	118 - 118	10		#	0.5	
Ammonia Total as N	mg/L	0440	WL	11/21/2011	0001	117 - 117	0.1	U	#	0.1	
Ammonia Total as N	mg/L	0441	WL	11/09/2011	0001	53 - 53	0.1	U	#	0.1	
Ammonia Total as N	mg/L	0443	WL	11/08/2011	0001	73 - 73	0.1	U	#	0.1	
Ammonia Total as N	mg/L	0444	WL	11/09/2011	0001	116 - 116	1.8		#	0.1	
Ammonia Total as N	mg/L	0453	WL	11/21/2011	0001	80 - 80	160		#	10	
Ammonia Total as N	mg/L	0454	WL	11/15/2011	0001	13 - 13	39		#	2	
Ammonia Total as N	mg/L	0455	WL	11/08/2011	0001	46 - 46	0.1	U	#	0.1	
Ammonia Total as N	mg/L	0456	WL	11/07/2011	0001	53 - 53	0.1	U	#	0.1	
Ammonia Total as N	mg/L	0457	WL	11/09/2011	0001	29 - 29	0.1	U	#	0.1	
Ammonia Total as N	mg/L	0457	WL	11/09/2011	0002	29 - 29	0.1	U	#	0.1	

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	0492	WL	11/16/2011	0001	18 - 18	0.1	U	#	0.1	
Ammonia Total as N	mg/L	0548	TS	11/21/2011	0001	0 - 0	980		#	20	
Ammonia Total as N	mg/L	AMM-1-19	WL	11/14/2011	0001	19 - 19	0.1	U	#	0.1	
Ammonia Total as N	mg/L	AMM-1-53	WL	11/14/2011	0001	53 - 53	0.1	U	#	0.1	
Ammonia Total as N	mg/L	AMM-2	WL	11/14/2011	0001	48 - 48	440		#	10	
Ammonia Total as N	mg/L	AMM-3	WL	11/15/2011	0001	48 - 48	170		#	10	
Ammonia Total as N	mg/L	ATP-2-D	WL	11/15/2011	0001	88 - 88	440		#	10	
Ammonia Total as N	mg/L	ATP-2-S	WL	11/15/2011	0001	25 - 25	340		#	10	
Ammonia Total as N	mg/L	ATP-3	WL	11/08/2011	0001	51 - 51	0.1	U	#	0.1	
Ammonia Total as N	mg/L	SMI-MW01	WL	11/17/2011	0001	16 - 16	1.6		#	0.1	
Ammonia Total as N	mg/L	SMI-PW01	WL	11/16/2011	0001	40 - 40	170		#	10	
Ammonia Total as N	mg/L	SMI-PW03	WL	11/17/2011	0001	40 - 40	28	J	#	1	
Ammonia Total as N	mg/L	SMI-PZ1S	WL	11/16/2011	0001	18 - 18	180	J	#	10	
Ammonia Total as N	mg/L	SMI-PZ2D	WL	11/14/2011	0001	75 - 75	1100		#	50	
Ammonia Total as N	mg/L	SMI-PZ2M2	WL	11/14/2011	0001	56 - 56	650		#	20	
Ammonia Total as N	mg/L	SMI-PZ3D2	WL	11/17/2011	0001	78 - 79	400	J	#	10	
Ammonia Total as N	mg/L	SMI-PZ3M	WL	11/17/2011	0001	59 - 59	59	J	#	2	
Ammonia Total as N	mg/L	SMI-PZ3S	WL	11/17/2011	0001	25 - 25	3.7	J	#	0.1	
Ammonia Total as N	mg/L	TP-01	WL	11/14/2011	0001	22 - 22	0.1	U	#	0.1	
Ammonia Total as N	mg/L	TP-11	WL	11/14/2011	0001	30 - 30	0.64		#	0.1	
Ammonia Total as N	mg/L	TP-17	WL	11/17/2011	0001	28 - 28	2.7	J	#	0.1	
Ammonia Total as N	mg/L	TP-19	WL	11/17/2011	0001	29 - 29	3.8	J	#	0.1	
Ammonia Total as N	mg/L	TP-20	WL	11/14/2011	0001	32 - 32	3.4		#	0.1	
Ammonia Total as N	mg/L	TP-22	WL	11/14/2011	0001	17 - 17	0.1	U	#	0.1	
Ammonia Total as N	mg/L	TP-23	WL	11/15/2011	0001	25 - 25	140		#	10	
Ammonia Total as N	mg/L	UPD-17	WL	11/21/2011	0001	14 - 14	270		#	10	

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	UPD-18	WL	11/21/2011	0001	14 - 14	240		#	10	
Ammonia Total as N	mg/L	UPD-19	WL	11/21/2011	0001	14 - 14	71		#	5	
Ammonia Total as N	mg/L	UPD-19	WL	11/21/2011	0002	14 - 14	73		#	10	
Ammonia Total as N	mg/L	UPD-20	WL	11/21/2011	0001	25 - 25	0.1	U	#	0.1	
Ammonia Total as N	mg/L	UPD-21	WL	11/21/2011	0001	25 - 25	52		#	5	
Ammonia Total as N	mg/L	UPD-21	WL	11/21/2011	0002	25 - 25	49		#	5	
Ammonia Total as N	mg/L	UPD-22	WL	11/22/2011	0001	15 - 15	0.76		#	0.1	
Dissolved Oxygen	mg/L	0401	WL	11/16/2011	0001	18 - 18	2.27		#		
Dissolved Oxygen	mg/L	0403	WL	11/16/2011	0001	18 - 18	3.09		#		
Dissolved Oxygen	mg/L	0404	WL	11/16/2011	0001	18 - 18	3.97		#		
Dissolved Oxygen	mg/L	0407	WL	11/16/2011	0001	17 - 17	2.34		#		
Dissolved Oxygen	mg/L	0410	WL	11/17/2011	0001	25 - 25	3.6		#		
Dissolved Oxygen	mg/L	0411	WL	11/17/2011	0001	9 - 9	2.72		#		
Dissolved Oxygen	mg/L	0412	WL	11/17/2011	0001	10.5 - 10.5	6.48		#		
Dissolved Oxygen	mg/L	0430	WL	11/07/2011	0001	101 - 101	1.47		#		
Dissolved Oxygen	mg/L	0431	WL	11/08/2011	0001	91 - 91	3.2		#		
Dissolved Oxygen	mg/L	0432	WL	11/07/2011	0001	55 - 55	4.16		#		
Dissolved Oxygen	mg/L	0433	WL	11/08/2011	0001	99 - 99	2.9		#		
Dissolved Oxygen	mg/L	0434	WL	11/07/2011	0001	35 - 35	2.28		#		
Dissolved Oxygen	mg/L	0435	WL	11/09/2011	0001	173 - 173	0.34		#		
Dissolved Oxygen	mg/L	0439	WL	11/21/2011	0001	118 - 118	1.32		#		
Dissolved Oxygen	mg/L	0440	WL	11/21/2011	0001	117 - 117	3.63		#		
Dissolved Oxygen	mg/L	0441	WL	11/09/2011	0001	53 - 53	1.59		#		
Dissolved Oxygen	mg/L	0443	WL	11/08/2011	0001	73 - 73	2.62		#		
Dissolved Oxygen	mg/L	0444	WL	11/09/2011	0001	116 - 116	2.5		#		
Dissolved Oxygen	mg/L	0453	WL	11/21/2011	0001	80 - 80	3.81		#		
Dissolved Oxygen	mg/L	0454	WL	11/15/2011	0001	13 - 13	1.46		#		
Dissolved Oxygen	mg/L	0455	WL	11/08/2011	0001	46 - 46	12.12		#		

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Dissolved Oxygen	mg/L	0456	WL	11/07/2011	0001	53 - 53	2.22		#		
Dissolved Oxygen	mg/L	0457	WL	11/09/2011	0001	29 - 29	1.35		#		
Dissolved Oxygen	mg/L	0492	WL	11/16/2011	0001	18 - 18	2.6		#		
Dissolved Oxygen	mg/L	0548	TS	11/21/2011	0001	0 - 0	6.47		#		
Dissolved Oxygen	mg/L	AMM-1-19	WL	11/14/2011	0001	19 - 19	3.26		#		
Dissolved Oxygen	mg/L	AMM-1-53	WL	11/14/2011	0001	53 - 53	1.88		#		
Dissolved Oxygen	mg/L	AMM-2	WL	11/14/2011	0001	48 - 48	0.99		#		
Dissolved Oxygen	mg/L	AMM-3	WL	11/15/2011	0001	48 - 48	0.81		#		
Dissolved Oxygen	mg/L	ATP-2-D	WL	11/15/2011	0001	88 - 88	0.63		#		
Dissolved Oxygen	mg/L	ATP-2-S	WL	11/15/2011	0001	25 - 25	2.47		#		
Dissolved Oxygen	mg/L	ATP-3	WL	11/08/2011	0001	51 - 51	1.4		#		
Dissolved Oxygen	mg/L	SMI-MW01	WL	11/17/2011	0001	16 - 16	2.83		#		
Dissolved Oxygen	mg/L	SMI-PW01	WL	11/16/2011	0001	40 - 40	2.04		#		
Dissolved Oxygen	mg/L	SMI-PW03	WL	11/17/2011	0001	40 - 40	5.51		#		
Dissolved Oxygen	mg/L	SMI-PZ1S	WL	11/16/2011	0001	18 - 18	2.51		#		
Dissolved Oxygen	mg/L	SMI-PZ2D	WL	11/14/2011	0001	75 - 75	0.63		#		
Dissolved Oxygen	mg/L	SMI-PZ2M2	WL	11/14/2011	0001	56 - 56	1.31		#		
Dissolved Oxygen	mg/L	SMI-PZ3D2	WL	11/17/2011	0001	78 - 79	4		#		
Dissolved Oxygen	mg/L	SMI-PZ3M	WL	11/17/2011	0001	59 - 59	3.88		#		
Dissolved Oxygen	mg/L	SMI-PZ3S	WL	11/17/2011	0001	25 - 25	3.58		#		
Dissolved Oxygen	mg/L	TP-01	WL	11/14/2011	0001	22 - 22	7.36		#		
Dissolved Oxygen	mg/L	TP-11	WL	11/14/2011	0001	30 - 30	2.59		#		
Dissolved Oxygen	mg/L	TP-17	WL	11/17/2011	0001	28 - 28	0.26		#		
Dissolved Oxygen	mg/L	TP-19	WL	11/17/2011	0001	29 - 29	0.38		#		
Dissolved Oxygen	mg/L	TP-20	WL	11/14/2011	0001	32 - 32	1.3		#		
Dissolved Oxygen	mg/L	TP-22	WL	11/14/2011	0001	17 - 17	3.06		#		

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)		Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Dissolved Oxygen	mg/L	TP-23	WL	11/15/2011	0001	25	- 25	6.11		#		
Dissolved Oxygen	mg/L	UPD-17	WL	11/21/2011	0001	14	- 14	4.43		#		
Dissolved Oxygen	mg/L	UPD-18	WL	11/21/2011	0001	14	- 14	3.97		#		
Dissolved Oxygen	mg/L	UPD-19	WL	11/21/2011	0001	14	- 14	2.47		#		
Dissolved Oxygen	mg/L	UPD-20	WL	11/21/2011	0001	25	- 25	2.1		#		
Dissolved Oxygen	mg/L	UPD-21	WL	11/21/2011	0001	25	- 25	5.12		#		
Dissolved Oxygen	mg/L	UPD-22	WL	11/22/2011	0001	15	- 15	1.62		#		
Oxidation Reduction Potential	mV	0401	WL	11/16/2011	0001	18	- 18	95		#		
Oxidation Reduction Potential	mV	0403	WL	11/16/2011	0001	18	- 18	83		#		
Oxidation Reduction Potential	mV	0404	WL	11/16/2011	0001	18	- 18	91		#		
Oxidation Reduction Potential	mV	0407	WL	11/16/2011	0001	17	- 17	161		#		
Oxidation Reduction Potential	mV	0410	WL	11/17/2011	0001	25	- 25	57		#		
Oxidation Reduction Potential	mV	0411	WL	11/17/2011	0001	9	- 9	46		#		
Oxidation Reduction Potential	mV	0412	WL	11/17/2011	0001	10.5	- 10.5	176		#		
Oxidation Reduction Potential	mV	0430	WL	11/07/2011	0001	101	- 101	30		#		
Oxidation Reduction Potential	mV	0431	WL	11/08/2011	0001	91	- 91	89		#		
Oxidation Reduction Potential	mV	0432	WL	11/07/2011	0001	55	- 55	45		#		
Oxidation Reduction Potential	mV	0433	WL	11/08/2011	0001	99	- 99	105		#		
Oxidation Reduction Potential	mV	0434	WL	11/07/2011	0001	35	- 35	-15		#		
Oxidation Reduction Potential	mV	0435	WL	11/09/2011	0001	173	- 173	-179		#		
Oxidation Reduction Potential	mV	0439	WL	11/21/2011	0001	118	- 118	171		#		
Oxidation Reduction Potential	mV	0440	WL	11/21/2011	0001	117	- 117	142		#		
Oxidation Reduction Potential	mV	0441	WL	11/09/2011	0001	53	- 53	200		#		
Oxidation Reduction Potential	mV	0443	WL	11/08/2011	0001	73	- 73	75		#		

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Oxidation Reduction Potential	mV	0444	WL	11/09/2011	0001	116 - 116	-116		#		
Oxidation Reduction Potential	mV	0453	WL	11/21/2011	0001	80 - 80	175		#		
Oxidation Reduction Potential	mV	0454	WL	11/15/2011	0001	13 - 13	85		#		
Oxidation Reduction Potential	mV	0455	WL	11/08/2011	0001	46 - 46	95		#		
Oxidation Reduction Potential	mV	0456	WL	11/07/2011	0001	53 - 53	29		#		
Oxidation Reduction Potential	mV	0457	WL	11/09/2011	0001	29 - 29	-163		#		
Oxidation Reduction Potential	mV	0492	WL	11/16/2011	0001	18 - 18	192		#		
Oxidation Reduction Potential	mV	0548	TS	11/21/2011	0001	0 - 0	256		#		
Oxidation Reduction Potential	mV	AMM-1-19	WL	11/14/2011	0001	19 - 19	137		#		
Oxidation Reduction Potential	mV	AMM-1-53	WL	11/14/2011	0001	53 - 53	149		#		
Oxidation Reduction Potential	mV	AMM-2	WL	11/14/2011	0001	48 - 48	-144		#		
Oxidation Reduction Potential	mV	AMM-3	WL	11/15/2011	0001	48 - 48	-116		#		
Oxidation Reduction Potential	mV	ATP-2-D	WL	11/15/2011	0001	88 - 88	-243		#		
Oxidation Reduction Potential	mV	ATP-2-S	WL	11/15/2011	0001	25 - 25	-20		#		
Oxidation Reduction Potential	mV	ATP-3	WL	11/08/2011	0001	51 - 51	88		#		
Oxidation Reduction Potential	mV	SMI-MW01	WL	11/17/2011	0001	16 - 16	164		#		
Oxidation Reduction Potential	mV	SMI-PW01	WL	11/16/2011	0001	40 - 40	106		#		
Oxidation Reduction Potential	mV	SMI-PW03	WL	11/17/2011	0001	40 - 40	4		#		
Oxidation Reduction Potential	mV	SMI-PZ1S	WL	11/16/2011	0001	18 - 18	88		#		
Oxidation Reduction Potential	mV	SMI-PZ2D	WL	11/14/2011	0001	75 - 75	-26		#		
Oxidation Reduction Potential	mV	SMI-PZ2M2	WL	11/14/2011	0001	56 - 56	-72		#		
Oxidation Reduction Potential	mV	SMI-PZ3D2	WL	11/17/2011	0001	78 - 79	30		#		
Oxidation Reduction Potential	mV	SMI-PZ3M	WL	11/17/2011	0001	59 - 59	-19		#		

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Oxidation Reduction Potential	mV	SMI-PZ3S	WL	11/17/2011	0001	25 - 25	45		#		
Oxidation Reduction Potential	mV	TP-01	WL	11/14/2011	0001	22 - 22	-96		#		
Oxidation Reduction Potential	mV	TP-11	WL	11/14/2011	0001	30 - 30	-85		#		
Oxidation Reduction Potential	mV	TP-17	WL	11/17/2011	0001	28 - 28	-225		#		
Oxidation Reduction Potential	mV	TP-19	WL	11/17/2011	0001	29 - 29	-316		#		
Oxidation Reduction Potential	mV	TP-20	WL	11/14/2011	0001	32 - 32	-204		#		
Oxidation Reduction Potential	mV	TP-22	WL	11/14/2011	0001	17 - 17	-27		#		
Oxidation Reduction Potential	mV	TP-23	WL	11/15/2011	0001	25 - 25	129		#		
Oxidation Reduction Potential	mV	UPD-17	WL	11/21/2011	0001	14 - 14	133		#		
Oxidation Reduction Potential	mV	UPD-18	WL	11/21/2011	0001	14 - 14	135		#		
Oxidation Reduction Potential	mV	UPD-19	WL	11/21/2011	0001	14 - 14	134		#		
Oxidation Reduction Potential	mV	UPD-20	WL	11/21/2011	0001	25 - 25	18		#		
Oxidation Reduction Potential	mV	UPD-21	WL	11/21/2011	0001	25 - 25	141		#		
Oxidation Reduction Potential	mV	UPD-22	WL	11/22/2011	0001	15 - 15	89		#		
pH	s.u.	0401	WL	11/16/2011	0001	18 - 18	6.88		#		
pH	s.u.	0403	WL	11/16/2011	0001	18 - 18	7.21		#		
pH	s.u.	0404	WL	11/16/2011	0001	18 - 18	7.11		#		
pH	s.u.	0407	WL	11/16/2011	0001	17 - 17	7.13		#		
pH	s.u.	0410	WL	11/17/2011	0001	25 - 25	7.37		#		
pH	s.u.	0411	WL	11/17/2011	0001	9 - 9	7.35		#		
pH	s.u.	0412	WL	11/17/2011	0001	10.5 - 10.5	7.56		#		
pH	s.u.	0430	WL	11/07/2011	0001	101 - 101	7.38		#		
pH	s.u.	0431	WL	11/08/2011	0001	91 - 91	6.98		#		
pH	s.u.	0432	WL	11/07/2011	0001	55 - 55	7.62		#		
pH	s.u.	0433	WL	11/08/2011	0001	99 - 99	7.16		#		

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
pH	s.u.	0434	WL	11/07/2011	0001	35 - 35	6.62		#		
pH	s.u.	0435	WL	11/09/2011	0001	173 - 173	6.93		#		
pH	s.u.	0439	WL	11/21/2011	0001	118 - 118	6.57		#		
pH	s.u.	0440	WL	11/21/2011	0001	117 - 117	7.08		#		
pH	s.u.	0441	WL	11/09/2011	0001	53 - 53	6.98		#		
pH	s.u.	0443	WL	11/08/2011	0001	73 - 73	7.24		#		
pH	s.u.	0444	WL	11/09/2011	0001	116 - 116	6.75		#		
pH	s.u.	0453	WL	11/21/2011	0001	80 - 80	6.81		#		
pH	s.u.	0454	WL	11/15/2011	0001	13 - 13	7.42		#		
pH	s.u.	0455	WL	11/08/2011	0001	46 - 46	7.43		#		
pH	s.u.	0456	WL	11/07/2011	0001	53 - 53	7.46		#		
pH	s.u.	0457	WL	11/09/2011	0001	29 - 29	7.93		#		
pH	s.u.	0492	WL	11/16/2011	0001	18 - 18	6.86		#		
pH	s.u.	0548	TS	11/21/2011	0001	0 - 0	6.94		#		
pH	s.u.	AMM-1-19	WL	11/14/2011	0001	19 - 19	7.08		#		
pH	s.u.	AMM-1-53	WL	11/14/2011	0001	53 - 53	6.84		#		
pH	s.u.	AMM-2	WL	11/14/2011	0001	48 - 48	6.7		#		
pH	s.u.	AMM-3	WL	11/15/2011	0001	48 - 48	6.97		#		
pH	s.u.	ATP-2-D	WL	11/15/2011	0001	88 - 88	7.82		#		
pH	s.u.	ATP-2-S	WL	11/15/2011	0001	25 - 25	8.64		#		
pH	s.u.	ATP-3	WL	11/08/2011	0001	51 - 51	7.27		#		
pH	s.u.	SMI-MW01	WL	11/17/2011	0001	16 - 16	7.87		#		
pH	s.u.	SMI-PW01	WL	11/16/2011	0001	40 - 40	7.08		#		
pH	s.u.	SMI-PW03	WL	11/17/2011	0001	40 - 40	7.83		#		
pH	s.u.	SMI-PZ1S	WL	11/16/2011	0001	18 - 18	6.95		#		
pH	s.u.	SMI-PZ2D	WL	11/14/2011	0001	75 - 75	6.39		#		
pH	s.u.	SMI-	WL	11/14/2011	0001	56 - 56	6.5		#		

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
		PZ2M2									
pH	s.u.	SMI-PZ3D2	WL	11/17/2011	0001	78 - 79	7.13		#		
pH	s.u.	SMI-PZ3M	WL	11/17/2011	0001	59 - 59	7.58		#		
pH	s.u.	SMI-PZ3S	WL	11/17/2011	0001	25 - 25	7.98		#		
pH	s.u.	TP-01	WL	11/14/2011	0001	22 - 22	7.53		#		
pH	s.u.	TP-11	WL	11/14/2011	0001	30 - 30	6.91		#		
pH	s.u.	TP-17	WL	11/17/2011	0001	28 - 28	7.2		#		
pH	s.u.	TP-19	WL	11/17/2011	0001	29 - 29	6.71		#		
pH	s.u.	TP-20	WL	11/14/2011	0001	32 - 32	6.33		#		
pH	s.u.	TP-22	WL	11/14/2011	0001	17 - 17	6.74		#		
pH	s.u.	TP-23	WL	11/15/2011	0001	25 - 25	6.71		#		
pH	s.u.	UPD-17	WL	11/21/2011	0001	14 - 14	6.71		#		
pH	s.u.	UPD-18	WL	11/21/2011	0001	14 - 14	6.68		#		
pH	s.u.	UPD-19	WL	11/21/2011	0001	14 - 14	7.02		#		
pH	s.u.	UPD-20	WL	11/21/2011	0001	25 - 25	7.46		#		
pH	s.u.	UPD-21	WL	11/21/2011	0001	25 - 25	7.29		#		
pH	s.u.	UPD-22	WL	11/22/2011	0001	15 - 15	7.77		#		
Selenium	mg/L	0401	WL	11/16/2011	0001	18 - 18	0.016		#	0.0016	
Selenium	mg/L	0404	WL	11/16/2011	0001	18 - 18	0.02		#	0.0016	
Selenium	mg/L	0412	WL	11/17/2011	0001	10.5 - 10.5	0.04		#	0.0016	
Selenium	mg/L	0439	WL	11/21/2011	0001	118 - 118	0.0034	B	#	0.0016	
Selenium	mg/L	0440	WL	11/21/2011	0001	117 - 117	0.054		#	0.00032	
Selenium	mg/L	SMI-PZ3S	WL	11/17/2011	0001	25 - 25	0.025		#	0.0016	
Selenium	mg/L	TP-17	WL	11/17/2011	0001	28 - 28	0.0013		#	0.00032	
Selenium	mg/L	TP-19	WL	11/17/2011	0001	29 - 29	0.018		#	0.0016	
Specific Conductance	umhos/cm	0401	WL	11/16/2011	0001	18 - 18	11323		#		
Specific Conductance	umhos/cm	0403	WL	11/16/2011	0001	18 - 18	5419		#		

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Specific Conductance	umhos /cm	0404	WL	11/16/2011	0001	18 - 18	8224		#		
Specific Conductance	umhos /cm	0407	WL	11/16/2011	0001	17 - 17	11791		#		
Specific Conductance	umhos /cm	0410	WL	11/17/2011	0001	25 - 25	3436		#		
Specific Conductance	umhos /cm	0411	WL	11/17/2011	0001	9 - 9	9247		#		
Specific Conductance	umhos /cm	0412	WL	11/17/2011	0001	10.5 - 10.5	2697		#		
Specific Conductance	umhos /cm	0430	WL	11/07/2011	0001	101 - 101	6289		#		
Specific Conductance	umhos /cm	0431	WL	11/08/2011	0001	91 - 91	32679		#		
Specific Conductance	umhos /cm	0432	WL	11/07/2011	0001	55 - 55	3142		#		
Specific Conductance	umhos /cm	0433	WL	11/08/2011	0001	99 - 99	5035		#		
Specific Conductance	umhos /cm	0434	WL	11/07/2011	0001	35 - 35	44681		#		
Specific Conductance	umhos /cm	0435	WL	11/09/2011	0001	173 - 173	120178		#		
Specific Conductance	umhos /cm	0439	WL	11/21/2011	0001	118 - 118	9504		#		
Specific Conductance	umhos /cm	0440	WL	11/21/2011	0001	117 - 117	8279		#		
Specific Conductance	umhos /cm	0441	WL	11/09/2011	0001	53 - 53	6449		#		
Specific Conductance	umhos /cm	0443	WL	11/08/2011	0001	73 - 73	5872		#		
Specific Conductance	umhos /cm	0444	WL	11/09/2011	0001	116 - 116	116749		#		
Specific Conductance	umhos /cm	0453	WL	11/21/2011	0001	80 - 80	29674		#		
Specific Conductance	umhos /cm	0454	WL	11/15/2011	0001	13 - 13	6308		#		
Specific Conductance	umhos /cm	0455	WL	11/08/2011	0001	46 - 46	2915		#		
Specific Conductance	umhos /cm	0456	WL	11/07/2011	0001	53 - 53	8628		#		
Specific Conductance	umhos /cm	0457	WL	11/09/2011	0001	29 - 29	5690		#		
Specific Conductance	umhos /cm	0492	WL	11/16/2011	0001	18 - 18	9325		#		
Specific Conductance	umhos /cm	0548	TS	11/21/2011	0001	0 - 0	52028		#		

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Specific Conductance	umhos /cm	AMM-1-19	WL	11/14/2011	0001	19 - 19	11551		#		
Specific Conductance	umhos /cm	AMM-1-53	WL	11/14/2011	0001	53 - 53	11926		#		
Specific Conductance	umhos /cm	AMM-2	WL	11/14/2011	0001	48 - 48	15307		#		
Specific Conductance	umhos /cm	AMM-3	WL	11/15/2011	0001	48 - 48	17015		#		
Specific Conductance	umhos /cm	ATP-2-D	WL	11/15/2011	0001	88 - 88	111121		#		
Specific Conductance	umhos /cm	ATP-2-S	WL	11/15/2011	0001	25 - 25	16328		#		
Specific Conductance	umhos /cm	ATP-3	WL	11/08/2011	0001	51 - 51	2459		#		
Specific Conductance	umhos /cm	SMI-MW01	WL	11/17/2011	0001	16 - 16	5071		#		
Specific Conductance	umhos /cm	SMI-PW01	WL	11/16/2011	0001	40 - 40	10928		#		
Specific Conductance	umhos /cm	SMI-PW03	WL	11/17/2011	0001	40 - 40	6255		#		
Specific Conductance	umhos /cm	SMI-PZ1S	WL	11/16/2011	0001	18 - 18	10167		#		
Specific Conductance	umhos /cm	SMI-PZ2D	WL	11/14/2011	0001	75 - 75	113068		#		
Specific Conductance	umhos /cm	SMI-PZ2M2	WL	11/14/2011	0001	56 - 56	68812		#		
Specific Conductance	umhos /cm	SMI-PZ3D2	WL	11/17/2011	0001	78 - 79	21154		#		
Specific Conductance	umhos /cm	SMI-PZ3M	WL	11/17/2011	0001	59 - 59	8943		#		
Specific Conductance	umhos /cm	SMI-PZ3S	WL	11/17/2011	0001	25 - 25	4735		#		
Specific Conductance	umhos /cm	TP-01	WL	11/14/2011	0001	22 - 22	7131		#		
Specific Conductance	umhos /cm	TP-11	WL	11/14/2011	0001	30 - 30	19437		#		
Specific Conductance	umhos /cm	TP-17	WL	11/17/2011	0001	28 - 28	106004		#		
Specific Conductance	umhos /cm	TP-19	WL	11/17/2011	0001	29 - 29	131655		#		
Specific Conductance	umhos /cm	TP-20	WL	11/14/2011	0001	32 - 32	128		#		
Specific Conductance	umhos /cm	TP-22	WL	11/14/2011	0001	17 - 17	30274		#		
Specific Conductance	umhos /cm	TP-23	WL	11/15/2011	0001	25 - 25	46802		#		

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Specific Conductance	umhos /cm	UPD-17	WL	11/21/2011	0001	14 - 14	11636		#		
Specific Conductance	umhos /cm	UPD-18	WL	11/21/2011	0001	14 - 14	10444		#		
Specific Conductance	umhos /cm	UPD-19	WL	11/21/2011	0001	14 - 14	4273		#		
Specific Conductance	umhos /cm	UPD-20	WL	11/21/2011	0001	25 - 25	3093		#		
Specific Conductance	umhos /cm	UPD-21	WL	11/21/2011	0001	25 - 25	7110		#		
Specific Conductance	umhos /cm	UPD-22	WL	11/22/2011	0001	15 - 15	1796		#		
Temperature	C	0401	WL	11/16/2011	0001	18 - 18	17.42		#		
Temperature	C	0403	WL	11/16/2011	0001	18 - 18	17.27		#		
Temperature	C	0404	WL	11/16/2011	0001	18 - 18	17.55		#		
Temperature	C	0407	WL	11/16/2011	0001	17 - 17	16.34		#		
Temperature	C	0410	WL	11/17/2011	0001	25 - 25	18.01		#		
Temperature	C	0411	WL	11/17/2011	0001	9 - 9	18.51		#		
Temperature	C	0412	WL	11/17/2011	0001	10.5 - 10.5	16.85		#		
Temperature	C	0430	WL	11/07/2011	0001	101 - 101	17.93		#		
Temperature	C	0431	WL	11/08/2011	0001	91 - 91	17.69		#		
Temperature	C	0432	WL	11/07/2011	0001	55 - 55	18.83		#		
Temperature	C	0433	WL	11/08/2011	0001	99 - 99	18.56		#		
Temperature	C	0434	WL	11/07/2011	0001	35 - 35	18.11		#		
Temperature	C	0435	WL	11/09/2011	0001	173 - 173	17.41		#		
Temperature	C	0439	WL	11/21/2011	0001	118 - 118	16.71		#		
Temperature	C	0440	WL	11/21/2011	0001	117 - 117	18.29		#		
Temperature	C	0441	WL	11/09/2011	0001	53 - 53	16.28		#		
Temperature	C	0443	WL	11/08/2011	0001	73 - 73	17.91		#		
Temperature	C	0444	WL	11/09/2011	0001	116 - 116	17.11		#		
Temperature	C	0453	WL	11/21/2011	0001	80 - 80	17.28		#		
Temperature	C	0454	WL	11/15/2011	0001	13 - 13	18.75		#		
Temperature	C	0455	WL	11/08/2011	0001	46 - 46	16.57		#		

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Temperature	C	0456	WL	11/07/2011	0001	53 - 53	18.61		#		
Temperature	C	0457	WL	11/09/2011	0001	29 - 29	16.81		#		
Temperature	C	0492	WL	11/16/2011	0001	18 - 18	15.32		#		
Temperature	C	0548	TS	11/21/2011	0001	0 - 0	6.83		#		
Temperature	C	AMM-1-19	WL	11/14/2011	0001	19 - 19	16.51		#		
Temperature	C	AMM-1-53	WL	11/14/2011	0001	53 - 53	17.69		#		
Temperature	C	AMM-2	WL	11/14/2011	0001	48 - 48	16.97		#		
Temperature	C	AMM-3	WL	11/15/2011	0001	48 - 48	18.48		#		
Temperature	C	ATP-2-D	WL	11/15/2011	0001	88 - 88	16.75		#		
Temperature	C	ATP-2-S	WL	11/15/2011	0001	25 - 25	16.71		#		
Temperature	C	ATP-3	WL	11/08/2011	0001	51 - 51	18.29		#		
Temperature	C	SMI-MW01	WL	11/17/2011	0001	16 - 16	15.99		#		
Temperature	C	SMI-PW01	WL	11/16/2011	0001	40 - 40	17.58		#		
Temperature	C	SMI-PW03	WL	11/17/2011	0001	40 - 40	17.02		#		
Temperature	C	SMI-PZ1S	WL	11/16/2011	0001	18 - 18	17.37		#		
Temperature	C	SMI-PZ2D	WL	11/14/2011	0001	75 - 75	16.16		#		
Temperature	C	SMI-PZ2M2	WL	11/14/2011	0001	56 - 56	16.29		#		
Temperature	C	SMI-PZ3D2	WL	11/17/2011	0001	78 - 79	18.19		#		
Temperature	C	SMI-PZ3M	WL	11/17/2011	0001	59 - 59	17.96		#		
Temperature	C	SMI-PZ3S	WL	11/17/2011	0001	25 - 25	18.86		#		
Temperature	C	TP-01	WL	11/14/2011	0001	22 - 22	17.32		#		
Temperature	C	TP-11	WL	11/14/2011	0001	30 - 30	16.41		#		
Temperature	C	TP-17	WL	11/17/2011	0001	28 - 28	13.55		#		
Temperature	C	TP-19	WL	11/17/2011	0001	29 - 29	14.56		#		
Temperature	C	TP-20	WL	11/14/2011	0001	32 - 32	17.92		#		
Temperature	C	TP-22	WL	11/14/2011	0001	17 - 17	17.98		#		

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Temperature	C	TP-23	WL	11/15/2011	0001	25 - 25	18.1		#		
Temperature	C	UPD-17	WL	11/21/2011	0001	14 - 14	17.78		#		
Temperature	C	UPD-18	WL	11/21/2011	0001	14 - 14	18.59		#		
Temperature	C	UPD-19	WL	11/21/2011	0001	14 - 14	18.78		#		
Temperature	C	UPD-20	WL	11/21/2011	0001	25 - 25	18.3		#		
Temperature	C	UPD-21	WL	11/21/2011	0001	25 - 25	18.35		#		
Temperature	C	UPD-22	WL	11/22/2011	0001	15 - 15	18.8		#		
Total Dissolved Solids	mg/L	0401	WL	11/16/2011	0001	18 - 18	12000		#	200	
Total Dissolved Solids	mg/L	0403	WL	11/16/2011	0001	18 - 18	4600		#	80	
Total Dissolved Solids	mg/L	0404	WL	11/16/2011	0001	18 - 18	6200		#	200	
Total Dissolved Solids	mg/L	0407	WL	11/16/2011	0001	17 - 17	8300		#	200	
Total Dissolved Solids	mg/L	0410	WL	11/17/2011	0001	25 - 25	2200		#	80	
Total Dissolved Solids	mg/L	0411	WL	11/17/2011	0001	9 - 9	4200		#	80	
Total Dissolved Solids	mg/L	0412	WL	11/17/2011	0001	10.5 - 10.5	1700		#	80	
Total Dissolved Solids	mg/L	0430	WL	11/07/2011	0001	101 - 101	3800		#	80	
Total Dissolved Solids	mg/L	0431	WL	11/08/2011	0001	91 - 91	22000		#	1000	
Total Dissolved Solids	mg/L	0432	WL	11/07/2011	0001	55 - 55	1800		#	80	
Total Dissolved Solids	mg/L	0433	WL	11/08/2011	0001	99 - 99	2900		#	80	
Total Dissolved Solids	mg/L	0434	WL	11/07/2011	0001	35 - 35	30000		#	1000	
Total Dissolved Solids	mg/L	0435	WL	11/09/2011	0001	173 - 173	96000		#	2000	
Total Dissolved Solids	mg/L	0439	WL	11/21/2011	0001	118 - 118	8100		#	200	
Total Dissolved Solids	mg/L	0440	WL	11/21/2011	0001	117 - 117	6400		#	200	
Total Dissolved Solids	mg/L	0441	WL	11/09/2011	0001	53 - 53	4200		#	80	
Total Dissolved Solids	mg/L	0443	WL	11/08/2011	0001	73 - 73	3600		#	80	
Total Dissolved Solids	mg/L	0444	WL	11/09/2011	0001	116 - 116	91000		#	1000	
Total Dissolved Solids	mg/L	0453	WL	11/21/2011	0001	80 - 80	23000		#	400	
Total Dissolved Solids	mg/L	0454	WL	11/15/2011	0001	13 - 13	4800		#	200	
Total Dissolved Solids	mg/L	0455	WL	11/08/2011	0001	46 - 46	1700		#	80	

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Total Dissolved Solids	mg/L	0456	WL	11/07/2011	0001	53 - 53	5400		#	200	
Total Dissolved Solids	mg/L	0457	WL	11/09/2011	0001	29 - 29	3300		#	80	
Total Dissolved Solids	mg/L	0457	WL	11/09/2011	0002	29 - 29	3300		#	80	
Total Dissolved Solids	mg/L	0492	WL	11/16/2011	0001	18 - 18	7700		#	200	
Total Dissolved Solids	mg/L	0548	TS	11/21/2011	0001	0 - 0	43000		#	1000	
Total Dissolved Solids	mg/L	AMM-1-19	WL	11/14/2011	0001	19 - 19	7200		#	200	
Total Dissolved Solids	mg/L	AMM-1-53	WL	11/14/2011	0001	53 - 53	7400		#	200	
Total Dissolved Solids	mg/L	AMM-2	WL	11/14/2011	0001	48 - 48	12000		#	400	
Total Dissolved Solids	mg/L	AMM-3	WL	11/15/2011	0001	48 - 48	17000		#	400	
Total Dissolved Solids	mg/L	ATP-2-D	WL	11/15/2011	0001	88 - 88	84000		#	2000	
Total Dissolved Solids	mg/L	ATP-2-S	WL	11/15/2011	0001	25 - 25	13000		#	400	
Total Dissolved Solids	mg/L	ATP-3	WL	11/08/2011	0001	51 - 51	1400		#	40	
Total Dissolved Solids	mg/L	SMI-MW01	WL	11/17/2011	0001	16 - 16	3500		#	80	
Total Dissolved Solids	mg/L	SMI-PW01	WL	11/16/2011	0001	40 - 40	8600		#	200	
Total Dissolved Solids	mg/L	SMI-PW03	WL	11/17/2011	0001	40 - 40	4100		#	80	
Total Dissolved Solids	mg/L	SMI-PZ1S	WL	11/16/2011	0001	18 - 18	8200		#	200	
Total Dissolved Solids	mg/L	SMI-PZ2D	WL	11/14/2011	0001	75 - 75	85000		#	2000	
Total Dissolved Solids	mg/L	SMI-PZ2M2	WL	11/14/2011	0001	56 - 56	51000		#	2000	
Total Dissolved Solids	mg/L	SMI-PZ3D2	WL	11/17/2011	0001	78 - 79	15000		#	400	
Total Dissolved Solids	mg/L	SMI-PZ3M	WL	11/17/2011	0001	59 - 59	5800		#	200	
Total Dissolved Solids	mg/L	SMI-PZ3S	WL	11/17/2011	0001	25 - 25	2900		#	80	
Total Dissolved Solids	mg/L	TP-01	WL	11/14/2011	0001	22 - 22	4600		#	200	
Total Dissolved Solids	mg/L	TP-11	WL	11/14/2011	0001	30 - 30	13000		#	400	
Total Dissolved Solids	mg/L	TP-17	WL	11/17/2011	0001	28 - 28	83000		#	2000	
Total Dissolved Solids	mg/L	TP-19	WL	11/17/2011	0001	29 - 29	110000		#	4000	
Total Dissolved Solids	mg/L	TP-20	WL	11/14/2011	0001	32 - 32	100000		#	2000	

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Total Dissolved Solids	mg/L	TP-22	WL	11/14/2011	0001	17 - 17	26000		#	400	
Total Dissolved Solids	mg/L	TP-23	WL	11/15/2011	0001	25 - 25	41000		#	1000	
Total Dissolved Solids	mg/L	UPD-17	WL	11/21/2011	0001	14 - 14	8700		#	200	
Total Dissolved Solids	mg/L	UPD-18	WL	11/21/2011	0001	14 - 14	7600		#	200	
Total Dissolved Solids	mg/L	UPD-19	WL	11/21/2011	0001	14 - 14	2400		#	200	
Total Dissolved Solids	mg/L	UPD-19	WL	11/21/2011	0002	14 - 14	2400		#	200	
Total Dissolved Solids	mg/L	UPD-20	WL	11/21/2011	0001	25 - 25	1700		#	200	
Total Dissolved Solids	mg/L	UPD-21	WL	11/21/2011	0001	25 - 25	5400		#	200	
Total Dissolved Solids	mg/L	UPD-21	WL	11/21/2011	0002	25 - 25	5100		#	200	
Total Dissolved Solids	mg/L	UPD-22	WL	11/22/2011	0001	15 - 15	1700		#	200	
Turbidity	NTU	0401	WL	11/16/2011	0001	18 - 18	1.27		#		
Turbidity	NTU	0403	WL	11/16/2011	0001	18 - 18	1.41		#		
Turbidity	NTU	0404	WL	11/16/2011	0001	18 - 18	2.89		#		
Turbidity	NTU	0407	WL	11/16/2011	0001	17 - 17	1.71		#		
Turbidity	NTU	0410	WL	11/17/2011	0001	25 - 25	70.7		#		
Turbidity	NTU	0411	WL	11/17/2011	0001	9 - 9	232		#		
Turbidity	NTU	0412	WL	11/17/2011	0001	10.5 - 10.5	477		#		
Turbidity	NTU	0430	WL	11/07/2011	0001	101 - 101	9.45		#		
Turbidity	NTU	0431	WL	11/08/2011	0001	91 - 91	2.44		#		
Turbidity	NTU	0432	WL	11/07/2011	0001	55 - 55	7.68		#		
Turbidity	NTU	0433	WL	11/08/2011	0001	99 - 99	5.03		#		
Turbidity	NTU	0434	WL	11/07/2011	0001	35 - 35	3.07		#		
Turbidity	NTU	0435	WL	11/09/2011	0001	173 - 173	9.97		#		
Turbidity	NTU	0439	WL	11/21/2011	0001	118 - 118	9.59		#		
Turbidity	NTU	0440	WL	11/21/2011	0001	117 - 117	5.03		#		
Turbidity	NTU	0441	WL	11/09/2011	0001	53 - 53	7.03		#		
Turbidity	NTU	0443	WL	11/08/2011	0001	73 - 73	4.76		#		
Turbidity	NTU	0444	WL	11/09/2011	0001	116 - 116	3.83		#		

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Turbidity	NTU	0453	WL	11/21/2011	0001	80 - 80	7.86		#		
Turbidity	NTU	0454	WL	11/15/2011	0001	13 - 13	9.75		#		
Turbidity	NTU	0457	WL	11/09/2011	0001	29 - 29	2.87		#		
Turbidity	NTU	0492	WL	11/16/2011	0001	18 - 18	1.07		#		
Turbidity	NTU	0548	TS	11/21/2011	0001	0 - 0	5.76		#		
Turbidity	NTU	AMM-1-19	WL	11/14/2011	0001	19 - 19	0.98		#		
Turbidity	NTU	AMM-1-53	WL	11/14/2011	0001	53 - 53	0.96		#		
Turbidity	NTU	AMM-2	WL	11/14/2011	0001	48 - 48	39.1		#		
Turbidity	NTU	AMM-3	WL	11/15/2011	0001	48 - 48	5.66		#		
Turbidity	NTU	ATP-2-D	WL	11/15/2011	0001	88 - 88	366		#		
Turbidity	NTU	ATP-2-S	WL	11/15/2011	0001	25 - 25	83		#		
Turbidity	NTU	ATP-3	WL	11/08/2011	0001	51 - 51	4.04		#		
Turbidity	NTU	SMI-MW01	WL	11/17/2011	0001	16 - 16	71.6		#		
Turbidity	NTU	SMI-PW01	WL	11/16/2011	0001	40 - 40	20.8		#		
Turbidity	NTU	SMI-PW03	WL	11/17/2011	0001	40 - 40	0.94		#		
Turbidity	NTU	SMI-PZ1S	WL	11/16/2011	0001	18 - 18	48.8		#		
Turbidity	NTU	SMI-PZ2D	WL	11/14/2011	0001	75 - 75	2.39		#		
Turbidity	NTU	SMI-PZ2M2	WL	11/14/2011	0001	56 - 56	7.43		#		
Turbidity	NTU	SMI-PZ3D2	WL	11/17/2011	0001	78 - 79	2.03		#		
Turbidity	NTU	SMI-PZ3M	WL	11/17/2011	0001	59 - 59	0.84		#		
Turbidity	NTU	SMI-PZ3S	WL	11/17/2011	0001	25 - 25	3.02		#		
Turbidity	NTU	TP-11	WL	11/14/2011	0001	30 - 30	9.52		#		
Turbidity	NTU	TP-17	WL	11/17/2011	0001	28 - 28	52.1		#		
Turbidity	NTU	TP-19	WL	11/17/2011	0001	29 - 29	7.12		#		
Turbidity	NTU	TP-20	WL	11/14/2011	0001	32 - 32	4.94		#		
Turbidity	NTU	TP-22	WL	11/14/2011	0001	17 - 17	112		#		

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Turbidity	NTU	TP-23	WL	11/15/2011	0001	25 - 25	83.4		#		
Turbidity	NTU	UPD-17	WL	11/21/2011	0001	14 - 14	7.24		#		
Turbidity	NTU	UPD-18	WL	11/21/2011	0001	14 - 14	22.6		#		
Turbidity	NTU	UPD-19	WL	11/21/2011	0001	14 - 14	7.94		#		
Turbidity	NTU	UPD-20	WL	11/21/2011	0001	25 - 25	17		#		
Turbidity	NTU	UPD-21	WL	11/21/2011	0001	25 - 25	9.32		#		
Turbidity	NTU	UPD-22	WL	11/22/2011	0001	15 - 15	563		#		
Uranium	mg/L	0401	WL	11/16/2011	0001	18 - 18	1.8		#	0.00015	
Uranium	mg/L	0403	WL	11/16/2011	0001	18 - 18	0.6		#	0.00015	
Uranium	mg/L	0404	WL	11/16/2011	0001	18 - 18	0.78		#	0.00015	
Uranium	mg/L	0407	WL	11/16/2011	0001	17 - 17	1.3		#	0.00015	
Uranium	mg/L	0410	WL	11/17/2011	0001	25 - 25	1		#	0.00058	
Uranium	mg/L	0411	WL	11/17/2011	0001	9 - 9	8.1		#	0.00058	
Uranium	mg/L	0412	WL	11/17/2011	0001	10.5 - 10.5	1.7		#	0.00015	
Uranium	mg/L	0430	WL	11/07/2011	0001	101 - 101	0.012		#	2.9E-005	
Uranium	mg/L	0431	WL	11/08/2011	0001	91 - 91	0.011		#	2.9E-005	
Uranium	mg/L	0432	WL	11/07/2011	0001	55 - 55	0.0019		#	2.9E-005	
Uranium	mg/L	0433	WL	11/08/2011	0001	99 - 99	0.0019		#	2.9E-005	
Uranium	mg/L	0434	WL	11/07/2011	0001	35 - 35	0.023		#	0.00015	
Uranium	mg/L	0435	WL	11/09/2011	0001	173 - 173	0.025		#	2.9E-005	
Uranium	mg/L	0439	WL	11/21/2011	0001	118 - 118	0.85		#	0.00015	
Uranium	mg/L	0440	WL	11/21/2011	0001	117 - 117	0.036		#	2.9E-005	
Uranium	mg/L	0441	WL	11/09/2011	0001	53 - 53	0.032		#	2.9E-005	
Uranium	mg/L	0443	WL	11/08/2011	0001	73 - 73	0.011		#	2.9E-005	
Uranium	mg/L	0444	WL	11/09/2011	0001	116 - 116	0.02		#	2.9E-005	
Uranium	mg/L	0453	WL	11/21/2011	0001	80 - 80	1.8		#	0.00058	
Uranium	mg/L	0454	WL	11/15/2011	0001	13 - 13	0.94		#	0.00029	
Uranium	mg/L	0455	WL	11/08/2011	0001	46 - 46	0.0024		#	2.9E-005	

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Uranium	mg/L	0456	WL	11/07/2011	0001	53 - 53	0.026		#	2.9E-005	
Uranium	mg/L	0457	WL	11/09/2011	0001	29 - 29	0.0021		#	2.9E-005	
Uranium	mg/L	0457	WL	11/09/2011	0002	29 - 29	0.002		#	2.9E-005	
Uranium	mg/L	0492	WL	11/16/2011	0001	18 - 18	0.66		#	0.00015	
Uranium	mg/L	0548	TS	11/21/2011	0001	0 - 0	4.3		#	0.00058	
Uranium	mg/L	AMM-1-19	WL	11/14/2011	0001	19 - 19	0.0059		#	2.9E-005	
Uranium	mg/L	AMM-1-53	WL	11/14/2011	0001	53 - 53	0.0052		#	2.9E-005	
Uranium	mg/L	AMM-2	WL	11/14/2011	0001	48 - 48	1.4		#	0.00058	
Uranium	mg/L	AMM-3	WL	11/15/2011	0001	48 - 48	1		#	0.00029	
Uranium	mg/L	ATP-2-D	WL	11/15/2011	0001	88 - 88	0.0074		#	2.9E-005	
Uranium	mg/L	ATP-2-S	WL	11/15/2011	0001	25 - 25	0.0015		#	2.9E-005	
Uranium	mg/L	ATP-3	WL	11/08/2011	0001	51 - 51	0.0025		#	2.9E-005	
Uranium	mg/L	SMI-MW01	WL	11/17/2011	0001	16 - 16	5.1		#	0.00058	
Uranium	mg/L	SMI-PW01	WL	11/16/2011	0001	40 - 40	1.1		#	0.00015	
Uranium	mg/L	SMI-PW03	WL	11/17/2011	0001	40 - 40	1.8		#	0.00015	
Uranium	mg/L	SMI-PZ1S	WL	11/16/2011	0001	18 - 18	0.92		#	0.00015	
Uranium	mg/L	SMI-PZ2D	WL	11/14/2011	0001	75 - 75	0.73		#	0.00015	
Uranium	mg/L	SMI-PZ2M2	WL	11/14/2011	0001	56 - 56	2.2		#	0.00058	
Uranium	mg/L	SMI-PZ3D2	WL	11/17/2011	0001	78 - 79	1.2		#	0.00015	
Uranium	mg/L	SMI-PZ3M	WL	11/17/2011	0001	59 - 59	1.6		#	0.00015	
Uranium	mg/L	SMI-PZ3S	WL	11/17/2011	0001	25 - 25	1.4		#	0.00015	
Uranium	mg/L	TP-01	WL	11/14/2011	0001	22 - 22	0.091		#	2.9E-005	
Uranium	mg/L	TP-11	WL	11/14/2011	0001	30 - 30	0.0011		#	2.9E-005	
Uranium	mg/L	TP-17	WL	11/17/2011	0001	28 - 28	0.023		#	2.9E-005	
Uranium	mg/L	TP-19	WL	11/17/2011	0001	29 - 29	0.00015	U	#	0.00015	
Uranium	mg/L	TP-20	WL	11/14/2011	0001	32 - 32	0.018		#	2.9E-005	

Appendix B. Water Quality Data (continued)

November 2011 Site-Wide Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Uranium	mg/L	TP-22	WL	11/14/2011	0001	17 - 17	0.39		#	0.00029	
Uranium	mg/L	TP-23	WL	11/15/2011	0001	25 - 25	3.6		#	0.00058	
Uranium	mg/L	UPD-17	WL	11/21/2011	0001	14 - 14	1.5		#	0.00058	
Uranium	mg/L	UPD-18	WL	11/21/2011	0001	14 - 14	1.3		#	0.00058	
Uranium	mg/L	UPD-19	WL	11/21/2011	0001	14 - 14	0.7		#	0.00058	
Uranium	mg/L	UPD-19	WL	11/21/2011	0002	14 - 14	0.72		#	0.00058	
Uranium	mg/L	UPD-20	WL	11/21/2011	0001	25 - 25	0.52		#	0.00058	
Uranium	mg/L	UPD-21	WL	11/21/2011	0001	25 - 25	12		#	0.015	
Uranium	mg/L	UPD-21	WL	11/21/2011	0002	25 - 25	13		#	0.015	
Uranium	mg/L	UPD-22	WL	11/22/2011	0001	15 - 15	2.4		#	0.0029	

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

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

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- > Result above upper detection limit.
- A 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 before sampling.
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9.
- J Estimated value.
- Q Qualitative result due to sampling technique.
- R Unusable result.
- X Location is undefined.

QA QUALIFIER:

- # Validated according to quality assurance guidelines.

Appendix B. Water Level Data

**November 2011 Site-Wide Sampling Event
 STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012**

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Time	Date	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
0403	O	3968.95	11/16/2011		15.18	3953.77	
0404	O	3968.3	11/16/2011		13.16	3955.14	
0407	O	3969.09	11/16/2011		16.2	3952.89	
0410	O	3981.05	11/17/2011		23.92	3955.19	
0411	O	3964.88	11/17/2011		7.27	3957.61	
0430	U	4022.1	11/07/2011		59.01	3963.09	
0431	O	4007.04	11/08/2011		46.12	3960.92	
0432	U	4001.57	11/07/2011		40.5	3960.97	
0433	O	3989.99	11/08/2011		30.15	3959.84	
0434	U	3990.21	11/07/2011		32.05	3958.16	
0435	O	3971.67	11/09/2011		13.6	3958.07	
0439	O	4055.27	11/21/2011		97.31	3957.96	
0440	O	4070.63	11/21/2011		110.13	3960.58	
0441		4008.64	11/09/2011		47.54	3961.23	
0443	O	4006.72	11/08/2011		45.32	3961.4	
0444	O	3970.99	11/09/2011		13.73	3957.26	
0453		4031.29	11/21/2011		72.64	3958.65	
0454		3966.53	11/15/2011		10.4	3956.07	
0455	O	3990.2	11/08/2011		30.64	3959.56	
0456	U	3990.46	11/07/2011		33	3957.46	
0457	O	3971.3	11/09/2011		14.17	3957.13	
0492		3967.56	11/16/2011		15.16	3952.48	
AMM-1	U	3971.9	11/14/2011		15.39	3956.51	
AMM-2	O	3964.09	11/14/2011		8.71	3959.03	
AMM-3	O	3962.9	11/15/2011		7.26	3960.43	
ATP-2-D	O	3967.05	11/15/2011		5.85	3961.2	

Appendix B. Water Level Data (continued)

**November 2011 Site-Wide Sampling Event
 STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012**

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Time	Date	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
ATP-2-S	O	3967.04	11/15/2011		5.32	3961.72	
ATP-3	O	3998.29	11/08/2011		37.34	3960.95	
SMI-PW01	O	3963.96	11/16/2011		8.58	3959.87	
SMI-PW03	O	3975.09	11/17/2011		17.88	3957.16	
SMI-PZ1S	O	3964.13	11/16/2011		8.8	3960.33	
SMI-PZ2D	O	3967.38	11/14/2011		14.57	3952.81	
SMI-PZ2M2	O	3967.18	11/14/2011		11.92	3955.26	
SMI-PZ3M	O	3975.23	11/17/2011		18.08	3957.15	
SMI-PZ3S	O	3975.03	11/17/2011		17.87	3957.16	
TP-11	O	3967.51	11/14/2011		10.97	3956.54	
TP-17	D	3963.69	11/17/2011		11.1	3952.59	
TP-19	D	3962.17	11/17/2011		10.16	3952.01	
TP-20	D	3967.55	11/14/2011		14.76	3952.79	
TP-22		3966.51	11/14/2011		12.25	3954.23	
TP-23		3962.6	11/15/2011		7.45	3955.09	

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

Appendix B. Trip Report



DATE: December 12, 2011
TO: Ken Pill
FROM: James Ritchey
Subject: November 2011 Site-Wide Sampling Event

Site: Moab

Date of Sampling Event: November 7 - 22, 2011

Team Members: E. Glowiak and J. Ritchey

RIN Assigned: All samples were assigned to RIN 1111062.

Sample Shipment: The coolers were shipped overnight UPS to ALS Environmental from Moab, Utah, on November 09, 15, 18, and 22 (tracking numbers 0191372863, 0190012879, 4498249154, and 0197380763).

Number of Locations Sampled: A total of 54 locations were sampled during this event. Including three duplicates, a total of 57 samples were collected during the November ground water sampling event.

Locations Not Sampled/Reason: Wells 0437 and 0438 were not sampled due to the excavation operations. Wells 0413 and 0414 were destroyed while this area of the site was flooded. Well 0436 was not sampled due to difficulties with the bladder pump. Well TP-02 was not sampled since it was removed during the off-pile remediation in May.

Field Variance: None.

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

False ID	True ID	Sample Type	Associated Matrix
2000	0457	Duplicate from 29 ft bgs	Ground Water
2001	UPD-21	Duplicate from 25 ft bgs	Ground Water
2002	UPD-19	Duplicate from 14 ft bgs	Ground Water

ID = identification

Appendix B. Trip Report (continued)

Location-Specific Information: All of the observation wells were sampled using a peristaltic pump and dedicated tubing unless otherwise noted. The table below provides additional information:

Location	Date	Sample Depth (ft bgs)	Comments
0401	11/16/2011	18	
0403	11/16/2011	18	
0404	11/16/2011	18	
0407	11/16/2011	17	
0410	11/17/2011	25	Dewatered at 0.25L.
0411	11/17/2011	9	Dewatered at 0.5L.
0412	11/17/2011	10.5	
0430	11/07/2011	101	Sampled with dedicated bladder pump
0431	11/08/2011	91	Sampled with dedicated bladder pump
0432	11/07/2011	55	Sampled with dedicated bladder pump
0433	11/08/2011	99	Duplicate collected, Sampled with dedicated bladder pump
0434	11/07/2011	35	Sampled with dedicated bladder pump
0435	11/09/2011	173	
0439	11/21/2011	118	Sampled with dedicated bladder pump
0440	11/21/2011	117	Sampled with dedicated bladder pump
0441	11/09/2011	53	Sampled with dedicated bladder pump
0443	11/08/2011	73	Sampled with dedicated bladder pump
0444	11/09/2011	116	Sulfur odor.
0453	11/21/2011	80	Sampled with dedicated bladder pump.
0454	11/15/2011	13	Water is gray.
0455	11/08/2011	46	Sampled with inertia pump. Turbid water.
0456	11/07/2011	53	Sampled with inertia pump.
0457	11/09/2011	29	Duplicate collected.
0492	11/16/2011	18	Could not monitor water level due to well casing diameter.
0548	11/21/2011	NA	Temperature is off. Pond level was at 5.6.
AMM-1-19	11/14/2011	19	
AMM-1-53	11/14/2011	53	
AMM-2	11/14/2011	48	
AMM-3	11/15/2011	48	
ATP-2-D	11/15/2011	88	Water is gray.
ATP-2-S	11/15/2011	~25	
ATP-3	11/08/2011	51	Sampled with dedicated bladder pump, sulfur odor
SMI-MW01	11/17/2011	16	
SMI-PW01	11/16/2011	40	
SMI-PW03	11/17/2011	40	
SMI-PZ1S	11/16/2011	18	
SMI-PZ2D	11/14/2011	75	
SMI-PZ2M2	11/14/2011	56	
SMI-PZ3D2	11/17/2011	78	
SMI-PZ3M	11/17/2011	59	
SMI-PZ3S	11/17/2011	25	
TP-01	11/14/2011	22	Sulfur odor. Dissolved oxygen is high due to air in line. Cannot obtain water level due to broken casing.
TP-11	11/14/2011	30	Sulfur odor. Stickup 0.25 ft.
TP-17	11/17/2011	28	Can't obtain WLs with tubing in casing.
TP-19	11/17/2011	29	Can't obtain WLs with tubing in casing. Water is gray.
TP-20	11/14/2011	32	Sulfur odor.
TP-22	11/14/2011	17	
TP-23	11/15/2011	25	

Appendix B. Water Level Data (continued)

Location	Date	Sample Depth (ft bgs)	Comments
UPD-17	11/21/2011	18	
UPD-18	11/21/2011	18	
UPD-19	11/21/2011	18	Duplicate collected
UPD-20	11/21/2011	17	
UPD-21	11/21/2011	25	Duplicate collected
UPD-22	11/22/2011	9	First time location sampled

NA = not applicable

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

Well No.	Date	Time	Depth to Water (ft btoc)
0401	11/16/2011	12:05	12.65
0404	11/16/2011	12:35	13.16
0403	11/16/2011	10:23	15.18
0407	11/16/2011	10:02	16.20
0410	11/17/2011	13:30	23.92
0411	11/17/2011	13:08	7.27
0412	11/17/2011	09:09	6.57
0430	11/07/2011	16:04	59.01
0431	11/08/2011	15:28	46.12
0432	11/07/2011	15:19	40.50
0433	11/08/2011	09:45	30.15
0434	11/07/2011	14:03	32.65
0435	11/09/2011	10:55	13.60
0439	11/21/2011	12:20	97.31
0440	11/21/2011	12:57	110.13
0441	11/09/2011	08:25	47.54
0443	11/08/2011	15:44	45.32
0444	11/09/2011	10:30	13.73
0453	11/21/2011	09:29	72.64
0454	11/15/2011	09:05	10.04
0455	11/08/2011	10:10	30.64
0456	11/07/2011	14:31	33.00
0457	11/09/2011	11:14	14.17
0492	11/16/2011	09:06	15.16
0548	11/21/2011	15:30	NA
AMM-1-19	11/14/2011	09:36	15.39
AMM-1-53	11/14/2011	09:20	15.34
AMM-2	11/14/2011	14:38	8.71
AMM-3	11/15/2011	10:50	7.26
ATP-2-D	11/15/2011	10:03	5.85
ATP-2-S	11/15/2011	09:46	5.32
ATP-3	11/08/2011	14:03	37.34
SMI-MW01	11/17/2011	09:26	4.85
SMI-PW01	11/16/2011	11:27	8.58
SMI-PW03	11/17/2011	15:09	17.88
SMI-PZ1S	11/16/2011	11:44	8.80
SMI-PZ2D	11/14/2011	16:08	14.57
SMI-PZ2M2	11/14/2011	15:51	11.92
SMI-PZ3D2	11/17/2011	14:46	18.19
SMI-PZ3M	11/17/2011	14:31	18.08
SMI-PZ3S	11/17/2011	13:53	17.87

Appendix B. Water Level Data (continued)

Well No.	Date	Time	Depth to Water (ft btoc)
TP-01	11/14/2011	10:57	NA
TP-11	11/14/2011	10:10	10.97
TP-17	11/17/2011	11:06	11.10
TP-19	11/17/2011	10:40	10.16
TP-20	11/14/2011	14:10	14.76
TP-22	11/14/2011	15:07	12.25
TP-23	11/15/2011	08:36	7.45
UPD-17	11/21/2011	14:45	11.22
UPD-18	11/21/2011	14:18	11.83
UPD-19	11/21/2011	13:59	8.95
UPD-20	11/21/2011	13:36	20.92
UPD-21	11/21/2011	10:22	23.97
UPD-22	11/22/2011	11:03	9.52

NA = not applicable

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)
11/07/2011	4,510
11/08/2011	4,690
11/09/2011	4,390
11/10/2011	4,280
11/11/2011	4,140
11/12/2011	4,100
11/13/2011	4,100
11/14/2011	4,190
11/15/2011	4,270
11/16/2011	4,180
11/17/2011	4,070
11/18/2011	3,950
11/19/2011	3,840
11/20/2011	3,890
11/21/2011	3,900
11/22/2011	3,870

Corrective Action Required/Taken: None.

Appendix C.

December 2011 Surface Water, CF4, and CF5 Sampling Event

**Water Sampling Field Activities Verification
Minimums and Maximums Report
Water Quality Data
Water Level Data
Trip Report**

Appendix C. Water Sampling Field Activities Verification

Sampling Event / RIN	December 2011 Surface Water, CF4, and CF5 Sampling Event / 1112063	Date(s) of Water Sampling	December 7-9, 2011
Date(s) of Verification	February 12, 2012	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?	No		The following locations were not sampled due to inaccessibility: surface water location 0228 and well points 0793, 0794, 0795
3. Was a pre-trip calibration conducted as specified in the aforementioned documents?	Yes		
4. Was an operational check of the field equipment conducted twice daily? 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		The field measurements temperature, pH, dissolved oxygen, oxidation reduction potential, and conductivity were collected.
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 before sampling?	Yes		
Did the water level stabilize before sampling?	Yes		
Did pH, specific conductance, and turbidity measurements stabilize before sampling?	Yes		
Was the flow rate less than 500 milliliters per minute (mL/min)?	Yes		
If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	Yes		

Appendix C. Water Sampling Field Activities Verification (continued)

Sampling Event / RIN	December 2011 Surface Water, CF4, and CF5 Sampling Event / 1112063	Date(s) of Water Sampling	December 7-9, 2011
Date(s) of Verification	February 12, 2012	Name of Verifier	Rachel Cowan
8. Were the following conditions met when purging a Category II well:			
Was the flow rate less than 500 mL/min?		Yes	
Was one pump/tubing volume removed before sampling?		Yes	
9. Were duplicates taken at a frequency of one per 20 samples?		Yes	One duplicate was taken for 19 samples.
10. Were EBs taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?		NA	All samples were collected on dedicated equipment.
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?		NA	
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	

NA = not applicable

Appendix C. Minimums and Maximums Report

**December 2011 Surface Water, CF4, and CF5 Sampling Event
Data Validation Minimums and Maximums Report - No Field Parameters**

Laboratory: ALS

RIN: 1112063

Comparison: All Historical Data

Report Date: 2/27/2012

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	0218	12/07/2011	Uranium	0.014		0.013	J	0.0012			8	0	
MOA01	0781	12/07/2011	Ammonia Total as N	2300		850		25			27	0	
MOA01	0787	12/08/2011	Ammonia Total as N	910		410		32	F		36	0	
MOA01	0792	12/08/2011	Total Dissolved Solids	7100		22000	QF	7600			19	0	
MOA01	MW-3	12/08/2011	Ammonia Total as N	470		1190		815.217 4	JF		7	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.

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

Appendix C. Water Quality Data

**December 2011 Surface Water, CF4, and CF5 Sampling Event
General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
REPORT DATE: 2/27/2012**

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	0201	SL	12/07/2011	0001	0 - 0	0.1	U	#	0.1	
Ammonia Total as N	mg/L	0218	SL	12/07/2011	0001	0 - 0	0.1	U	#	0.1	
Ammonia Total as N	mg/L	0228	SL	12/08/2011	0001	0 - 0	0.17		#	0.1	
Ammonia Total as N	mg/L	0780	WL	12/07/2011	0001	28 - 28	23		#	1	
Ammonia Total as N	mg/L	0781	WL	12/07/2011	0001	48 - 48	2300		#	50	
Ammonia Total as N	mg/L	0782	WL	12/07/2011	0001	33 - 33	1500		#	50	
Ammonia Total as N	mg/L	0783	WL	12/08/2011	0001	18 - 18	57		#	2	
Ammonia Total as N	mg/L	0784	WL	12/08/2011	0001	18 - 18	11		#	0.5	
Ammonia Total as N	mg/L	0785	WL	12/08/2011	0001	18 - 18	2.9		#	0.1	
Ammonia Total as N	mg/L	0785	WL	12/08/2011	0002	18 - 18	3		#	0.1	
Ammonia Total as N	mg/L	0786	WL	12/08/2011	0001	28 - 28	56		#	2	
Ammonia Total as N	mg/L	0787	WL	12/08/2011	0001	36 - 36	910		#	20	
Ammonia Total as N	mg/L	0790	WL	12/08/2011	0001	2 - 3	1.1		#	0.1	
Ammonia Total as N	mg/L	0791	WL	12/08/2011	0001	4.3 - 5.3	29		#	1	
Ammonia Total as N	mg/L	0792	WL	12/08/2011	0001	9.3 - 10.3	200		#	5	
Ammonia Total as N	mg/L	CR1	SL	12/07/2011	0001	0 - 0	0.1	U	#	0.1	
Ammonia Total as N	mg/L	CR3	SL	12/08/2011	0001	0 - 0	0.76		#	0.1	
Ammonia Total as N	mg/L	CR5	SL	12/07/2011	0001	0 - 0	0.1	U	#	0.1	
Ammonia Total as N	mg/L	MW-3	WL	12/08/2011	0001	44 - 44	470		#	10	
Ammonia Total as N	mg/L	SMI-PW02	WL	12/09/2011	0001	20.04 - 60.04	520		#	20	

Appendix C. Water Quality Data (continued)

December 2011 Surface Water, CF4, and CF5 Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Copper	mg/L	0785	WL	12/08/2011	0001	18 - 18	0.00097	U	#	0.00097	
Copper	mg/L	0785	WL	12/08/2011	0002	18 - 18	0.0094	B	#	0.00097	
Copper	mg/L	0787	WL	12/08/2011	0001	36 - 36	0.0086	B	#	0.00097	
Dissolved Oxygen	mg/L	0201	SL	12/07/2011	0001	0 - 0	20.51		#		
Dissolved Oxygen	mg/L	0218	SL	12/07/2011	0001	0 - 0	18.45		#		
Dissolved Oxygen	mg/L	0228	SL	12/08/2011	0001	0 - 0	15.53		#		
Dissolved Oxygen	mg/L	0780	WL	12/07/2011	0001	28 - 28	0.51		#		
Dissolved Oxygen	mg/L	0781	WL	12/07/2011	0001	48 - 48	0.17		#		
Dissolved Oxygen	mg/L	0782	WL	12/07/2011	0001	33 - 33	0.22		#		
Dissolved Oxygen	mg/L	0783	WL	12/08/2011	0001	18 - 18	3.51		#		
Dissolved Oxygen	mg/L	0784	WL	12/08/2011	0001	18 - 18	0.74		#		
Dissolved Oxygen	mg/L	0785	WL	12/08/2011	0001	18 - 18	1.01		#		
Dissolved Oxygen	mg/L	0786	WL	12/08/2011	0001	28 - 28	1.2		#		
Dissolved Oxygen	mg/L	0787	WL	12/08/2011	0001	36 - 36	0.18		#		
Dissolved Oxygen	mg/L	0790	WL	12/08/2011	0001	2 - 3	0.81		#		
Dissolved Oxygen	mg/L	0791	WL	12/08/2011	0001	4.3 - 5.3	9.11		#		
Dissolved Oxygen	mg/L	0792	WL	12/08/2011	0001	9.3 - 10.3	3.42		#		
Dissolved Oxygen	mg/L	CR1	SL	12/07/2011	0001	0 - 0	20.19		#		
Dissolved Oxygen	mg/L	CR3	SL	12/08/2011	0001	0 - 0	17.76		#		
Dissolved Oxygen	mg/L	CR5	SL	12/07/2011	0001	0 - 0	20.56		#		
Dissolved Oxygen	mg/L	MW-3	WL	12/08/2011	0001	44 - 44	0.35		#		
Dissolved Oxygen	mg/L	SMI-PW02	WL	12/09/2011	0001	20.04 - 60.04	3.68		#		
Oxidation Reduction Potential	mV	0201	SL	12/07/2011	0001	0 - 0	180.5		#		
Oxidation Reduction Potential	mV	0218	SL	12/07/2011	0001	0 - 0	211		#		
Oxidation Reduction Potential	mV	0228	SL	12/08/2011	0001	0 - 0	205		#		
Oxidation Reduction Potential	mV	0780	WL	12/07/2011	0001	28 - 28	120		#		

Appendix C. Water Quality Data (continued)

December 2011 Surface Water, CF4, and CF5 Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Oxidation Reduction Potential	mV	0781	WL	12/07/2011	0001	48 - 48	189		#		
Oxidation Reduction Potential	mV	0782	WL	12/07/2011	0001	33 - 33	163		#		
Oxidation Reduction Potential	mV	0783	WL	12/08/2011	0001	18 - 18	124		#		
Oxidation Reduction Potential	mV	0784	WL	12/08/2011	0001	18 - 18	158		#		
Oxidation Reduction Potential	mV	0785	WL	12/08/2011	0001	18 - 18	75		#		
Oxidation Reduction Potential	mV	0786	WL	12/08/2011	0001	28 - 28	-52.4		#		
Oxidation Reduction Potential	mV	0787	WL	12/08/2011	0001	36 - 36	-23		#		
Oxidation Reduction Potential	mV	0790	WL	12/08/2011	0001	2 - 3	-199		#		
Oxidation Reduction Potential	mV	0791	WL	12/08/2011	0001	4.3 - 5.3	-124		#		
Oxidation Reduction Potential	mV	0792	WL	12/08/2011	0001	9.3 - 10.3	-322		#		
Oxidation Reduction Potential	mV	CR1	SL	12/07/2011	0001	0 - 0	193.2		#		
Oxidation Reduction Potential	mV	CR3	SL	12/08/2011	0001	0 - 0	169		#		
Oxidation Reduction Potential	mV	CR5	SL	12/07/2011	0001	0 - 0	180.9		#		
Oxidation Reduction Potential	mV	MW-3	WL	12/08/2011	0001	44 - 44	157		#		
Oxidation Reduction Potential	mV	SMI-PW02	WL	12/09/2011	0001	20.04 - 60.04	194		#		
pH	s.u.	0201	SL	12/07/2011	0001	0 - 0	7.7		#		
pH	s.u.	0218	SL	12/07/2011	0001	0 - 0	7.59		#		
pH	s.u.	0228	SL	12/08/2011	0001	0 - 0	8.02		#		
pH	s.u.	0780	WL	12/07/2011	0001	28 - 28	7.46		#		
pH	s.u.	0781	WL	12/07/2011	0001	48 - 48	6.57		#		
pH	s.u.	0782	WL	12/07/2011	0001	33 - 33	6.84		#		
pH	s.u.	0783	WL	12/08/2011	0001	18 - 18	6.89		#		
pH	s.u.	0784	WL	12/08/2011	0001	18 - 18	7.61		#		
pH	s.u.	0785	WL	12/08/2011	0001	18 - 18	7.48		#		

Appendix C. Water Quality Data (continued)

December 2011 Surface Water, CF4, and CF5 Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
pH	s.u.	0786	WL	12/08/2011	0001	28 - 28	7.66			#		
pH	s.u.	0787	WL	12/08/2011	0001	36 - 36	6.92			#		
pH	s.u.	0790	WL	12/08/2011	0001	2 - 3	8.63			#		
pH	s.u.	0791	WL	12/08/2011	0001	4.3 - 5.3	8.23			#		
pH	s.u.	0792	WL	12/08/2011	0001	9.3 - 10.3	9.3			#		
pH	s.u.	CR1	SL	12/07/2011	0001	0 - 0	8.28			#		
pH	s.u.	CR3	SL	12/08/2011	0001	0 - 0	7.95			#		
pH	s.u.	CR5	SL	12/07/2011	0001	0 - 0	7.64			#		
pH	s.u.	MW-3	WL	12/08/2011	0001	44 - 44	6.78			#		
pH	s.u.	SMI-PW02	WL	12/09/2011	0001	20.04 - 60.04	6.87			#		
Selenium	mg/L	0792	WL	12/08/2011	0001	9.3 - 10.3	0.00032	U	J	#	0.00032	
Specific Conductance	umhos/cm	0201	SL	12/07/2011	0001	0 - 0	1222			#		
Specific Conductance	umhos/cm	0218	SL	12/07/2011	0001	0 - 0	1236			#		
Specific Conductance	umhos/cm	0228	SL	12/08/2011	0001	0 - 0	1923			#		
Specific Conductance	umhos/cm	0780	WL	12/07/2011	0001	28 - 28	4215			#		
Specific Conductance	umhos/cm	0781	WL	12/07/2011	0001	48 - 48	98351			#		
Specific Conductance	umhos/cm	0782	WL	12/07/2011	0001	33 - 33	62439			#		
Specific Conductance	umhos/cm	0783	WL	12/08/2011	0001	18 - 18	13590			#		
Specific Conductance	umhos/cm	0784	WL	12/08/2011	0001	18 - 18	1757			#		
Specific Conductance	umhos/cm	0785	WL	12/08/2011	0001	18 - 18	1467			#		
Specific Conductance	umhos/cm	0786	WL	12/08/2011	0001	28 - 28	6660			#		
Specific Conductance	umhos/cm	0787	WL	12/08/2011	0001	36 - 36	89002			#		
Specific Conductance	umhos/cm	0790	WL	12/08/2011	0001	2 - 3	1433			#		
Specific Conductance	umhos/cm	0791	WL	12/08/2011	0001	4.3 - 5.3	2315			#		

Appendix C. Water Quality Data (continued)

December 2011 Surface Water, CF4, and CF5 Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Specific Conductance	umhos /cm	0792	WL	12/08/2011	0001	9.3 - 10.3	11391				#
Specific Conductance	umhos /cm	CR1	SL	12/07/2011	0001	0 - 0	1215				#
Specific Conductance	umhos /cm	CR3	SL	12/08/2011	0001	0 - 0	1323				#
Specific Conductance	umhos /cm	CR5	SL	12/07/2011	0001	0 - 0	1244				#
Specific Conductance	umhos /cm	MW-3	WL	12/08/2011	0001	44 - 44	21574				#
Specific Conductance	umhos /cm	SMI-PW02	WL	12/09/2011	0001	20.04 - 60.04	33217				#
Temperature	C	0201	SL	12/07/2011	0001	0 - 0	1.75				#
Temperature	C	0218	SL	12/07/2011	0001	0 - 0	2.05				#
Temperature	C	0228	SL	12/08/2011	0001	0 - 0	1.7				#
Temperature	C	0780	WL	12/07/2011	0001	28 - 28	9.64				#
Temperature	C	0781	WL	12/07/2011	0001	48 - 48	13.54				#
Temperature	C	0782	WL	12/07/2011	0001	33 - 33	12.34				#
Temperature	C	0783	WL	12/08/2011	0001	18 - 18	15.26				#
Temperature	C	0784	WL	12/08/2011	0001	18 - 18	10.62				#
Temperature	C	0785	WL	12/08/2011	0001	18 - 18	11.45				#
Temperature	C	0786	WL	12/08/2011	0001	28 - 28	7.42				#
Temperature	C	0787	WL	12/08/2011	0001	36 - 36	12.26				#
Temperature	C	0790	WL	12/08/2011	0001	2 - 3	10.01				#
Temperature	C	0791	WL	12/08/2011	0001	4.3 - 5.3	9.96				#
Temperature	C	0792	WL	12/08/2011	0001	9.3 - 10.3	10.15				#
Temperature	C	CR1	SL	12/07/2011	0001	0 - 0	1.37				#
Temperature	C	CR3	SL	12/08/2011	0001	0 - 0	1.48				#
Temperature	C	CR5	SL	12/07/2011	0001	0 - 0	1.74				#
Temperature	C	MW-3	WL	12/08/2011	0001	44 - 44	15.91				#
Temperature	C	SMI-PW02	WL	12/09/2011	0001	20.04 - 60.04	14.75				#

Appendix C. Water Quality Data (continued)

December 2011 Surface Water, CF4, and CF5 Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Total Dissolved Solids	mg/L	0201	SL	12/07/2011	0001	0 - 0	650		#	20	
Total Dissolved Solids	mg/L	0218	SL	12/07/2011	0001	0 - 0	650		#	20	
Total Dissolved Solids	mg/L	0228	SL	12/08/2011	0001	0 - 0	700		#	20	
Total Dissolved Solids	mg/L	0780	WL	12/07/2011	0001	28 - 28	2700		#	80	
Total Dissolved Solids	mg/L	0781	WL	12/07/2011	0001	48 - 48	60000		#	2000	
Total Dissolved Solids	mg/L	0782	WL	12/07/2011	0001	33 - 33	38000		#	2000	
Total Dissolved Solids	mg/L	0783	WL	12/08/2011	0001	18 - 18	11000		#	200	
Total Dissolved Solids	mg/L	0784	WL	12/08/2011	0001	18 - 18	1100		#	40	
Total Dissolved Solids	mg/L	0785	WL	12/08/2011	0001	18 - 18	840		#	40	
Total Dissolved Solids	mg/L	0785	WL	12/08/2011	0002	18 - 18	840		#	40	
Total Dissolved Solids	mg/L	0786	WL	12/08/2011	0001	28 - 28	4900		#	80	
Total Dissolved Solids	mg/L	0787	WL	12/08/2011	0001	36 - 36	60000		#	2000	
Total Dissolved Solids	mg/L	0790	WL	12/08/2011	0001	2 - 3	760		#	40	
Total Dissolved Solids	mg/L	0791	WL	12/08/2011	0001	4.3 - 5.3	1200		#	40	
Total Dissolved Solids	mg/L	0792	WL	12/08/2011	0001	9.3 - 10.3	7100		#	200	
Total Dissolved Solids	mg/L	CR1	SL	12/07/2011	0001	0 - 0	650		#	20	
Total Dissolved Solids	mg/L	CR3	SL	12/08/2011	0001	0 - 0	720		#	20	
Total Dissolved Solids	mg/L	CR5	SL	12/07/2011	0001	0 - 0	670		#	20	
Total Dissolved Solids	mg/L	MW-3	WL	12/08/2011	0001	44 - 44	18000		#	400	
Total Dissolved Solids	mg/L	SMI-PW02	WL	12/09/2011	0001	20.04 - 60.04	25000		#	1000	
Turbidity	NTU	0201	SL	12/07/2011	0001	0 - 0	9.54		#		
Turbidity	NTU	0218	SL	12/07/2011	0001	0 - 0	9.78		#		
Turbidity	NTU	0228	SL	12/08/2011	0001	0 - 0	22.6		#		
Turbidity	NTU	0780	WL	12/07/2011	0001	28 - 28	1.95		#		
Turbidity	NTU	0781	WL	12/07/2011	0001	48 - 48	2.26		#		
Turbidity	NTU	0782	WL	12/07/2011	0001	33 - 33	2.8		#		

Appendix C. Water Quality Data (continued)

December 2011 Surface Water, CF4, and CF5 Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Turbidity	NTU	0783	WL	12/08/2011	0001	18 - 18	1.04		#		
Turbidity	NTU	0784	WL	12/08/2011	0001	18 - 18	3.68		#		
Turbidity	NTU	0785	WL	12/08/2011	0001	18 - 18	2.68		#		
Turbidity	NTU	0786	WL	12/08/2011	0001	28 - 28	1.96		#		
Turbidity	NTU	0787	WL	12/08/2011	0001	36 - 36	1.65		#		
Turbidity	NTU	0790	WL	12/08/2011	0001	2 - 3	3.19		#		
Turbidity	NTU	0791	WL	12/08/2011	0001	4.3 - 5.3	3.52		#		
Turbidity	NTU	0792	WL	12/08/2011	0001	9.3 - 10.3	204		#		
Turbidity	NTU	CR1	SL	12/07/2011	0001	0 - 0	6.73		#		
Turbidity	NTU	CR3	SL	12/08/2011	0001	0 - 0	11.8		#		
Turbidity	NTU	CR5	SL	12/07/2011	0001	0 - 0	4.88		#		
Turbidity	NTU	MW-3	WL	12/08/2011	0001	44 - 44	9.87		#		
Turbidity	NTU	SMI-PW02	WL	12/09/2011	0001	20.04 - 60.04	1.89		#		
Uranium	mg/L	0201	SL	12/07/2011	0001	0 - 0	0.005		#	2.9E-005	
Uranium	mg/L	0218	SL	12/07/2011	0001	0 - 0	0.014		#	2.9E-005	
Uranium	mg/L	0228	SL	12/08/2011	0001	0 - 0	0.0066		#	2.9E-005	
Uranium	mg/L	0780	WL	12/07/2011	0001	28 - 28	0.23		#	2.9E-005	
Uranium	mg/L	0781	WL	12/07/2011	0001	48 - 48	1.1		#	0.00029	
Uranium	mg/L	0782	WL	12/07/2011	0001	33 - 33	1.7		#	0.00029	
Uranium	mg/L	0783	WL	12/08/2011	0001	18 - 18	1.6		#	0.00029	
Uranium	mg/L	0784	WL	12/08/2011	0001	18 - 18	0.11		#	2.9E-005	
Uranium	mg/L	0785	WL	12/08/2011	0001	18 - 18	0.053		#	2.9E-005	
Uranium	mg/L	0785	WL	12/08/2011	0002	18 - 18	0.055		#	2.9E-005	
Uranium	mg/L	0786	WL	12/08/2011	0001	28 - 28	0.56		#	2.9E-005	
Uranium	mg/L	0787	WL	12/08/2011	0001	36 - 36	0.86		#	2.9E-005	
Uranium	mg/L	0790	WL	12/08/2011	0001	2 - 3	0.046		#	2.9E-005	
Uranium	mg/L	0791	WL	12/08/2011	0001	4.3 - 5.3	0.21		#	2.9E-005	

Appendix C. Water Quality Data (continued)

December 2011 Surface Water, CF4, and CF5 Sampling Event
 General Water Quality Data by Parameter (USEE205) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012

Parameter	Units	Location ID	Location Type	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Uranium	mg/L	0792	WL	12/08/2011	0001	9.3	-	10.3	0.19		#	2.9E-005	
Uranium	mg/L	CR1	SL	12/07/2011	0001	0	-	0	0.0043		#	2.9E-005	
Uranium	mg/L	CR3	SL	12/08/2011	0001	0	-	0	0.016		#	2.9E-005	
Uranium	mg/L	CR5	SL	12/07/2011	0001	0	-	0	0.006		#	2.9E-005	
Uranium	mg/L	MW-3	WL	12/08/2011	0001	44	-	44	2.1		#	0.00029	
Uranium	mg/L	SMI-PW02	WL	12/09/2011	0001	20.04	-	60.04	4.2		#	0.00058	

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

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

LAB QUALIFIERS:

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

DATA QUALIFIERS:

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

QA QUALIFIER:

- # Validated according to quality-assurance guidelines.

NEED TO ADD FLAGS

Appendix C. Water Sampling Field Activities Verification

**December 2011 Surface Water, CF4, and CF5 Sampling Event
 STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site
 REPORT DATE: 2/27/2012**

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Time	Date	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
0780		3968.45	12/07/2011		14.95	3953.5	
0781		3968.56	12/07/2011		14.31	3954.25	
0782		3968.46	12/07/2011		14.92	3953.54	
0783		3966.16	12/08/2011		13.64	3952.52	
0784		3968.73	12/08/2011		16.45	3952.28	
0785		3969.24	12/08/2011		16.17	3953.07	
0786		3968.14	12/08/2011		15.15	3952.99	
0787		3968.43	12/08/2011		14.95	3953.48	
MW-3	O	3965.98	12/08/2011		10.37	3955.61	
SMI-PW02	O	3966.73	12/09/2011		23.53	3943.2	

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

Appendix C. Trip Report



DATE: January 31, 2011
TO: K. Pill
FROM: J. Ritchey
SUBJECT: December 2011 Surface water Sampling Trip Report

Site: Moab

Date of Sampling Event: December 07-09, 2011

Team Members: Ernie Colunga, James Ritchey

RIN Assigned: All samples were assigned to RIN 1112063.

Sample Shipment: All samples were shipped in one cooler overnight UPS to ALS Environmental from Moab, Utah, on December 9 (Tracking No. 4498386774).

December 2011 Surface water Sampling

Number of Locations Sampled: Six surface water samples (CR1, CR3, CR5, 0201, 0218, and 0228) were collected during the July sampling event.

Locations Not Sampled: Location 0226 was undercut by high river flow and was inaccessible.

Field Variance: None.

Location-Specific Information: Each surface water sample was collected using a peristaltic pump and dedicated tubing. The table below provides additional information:

Sample ID	Location	Date	Comments
DEC 001	CR1	12/07/2011	~ 2-in. deep and 1 ft from the river edge, low flow
DEC 015	CR3	12/08/2011	~ 6-in. deep, 18-in. from bank, little to no flow
DEC 003	CR5	12/07/2011	Approximately 4-in. deep, stagnant, much woody debris, very turbid.
DEC 002	0201	12/07/2011	~4-in. below surface, 1 ft from edge
DEC 004	0218	12/07/2011	1 ft deep, 1.5 ft from bank, river flowing slightly upstream
DEC 014	0228	12/08/2011	Low turbidity, ~3-in. deep, 6-in. from bank

ID = identification

Appendix C. Trip Report (continued)



Surface Water Location CR1



Surface Water Location CR3

Appendix C. Trip Report (continued)



Surface Water Location CR5



Surface Water Location 0201

Appendix C. Trip Report (continued)



Surface Water Location 0218



Surface Water Location 0228

Appendix C. Trip Report (continued)

December 2011 CF4 Sampling

Number of Locations Sampled: Eight observation wells (0780, 0781, 0782, 0783, 0784, 0785, 0786, and 0787) and three well points (0790, 0791, and 0792) were sampled.

Locations Not Sampled: Three well points (0793, 0794, and 0795) were not sampled because they could not be safely accessed.

Field Variance: Water levels could not be acquired due to the water level indicator with the smaller probe was not operating.

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	0785	Duplicate from 18 ft bgs.	Ground Water	DEC 018

ID = identification

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

Well No.	Date	Time	Depth to Water (ft btoc)	Sample Depth (ft bgs)
0780	12/07/2011	16:11	14.95	28
0781	12/07/2011	15:38	14.31	48
0782	12/07/2011	15:55	14.92	33
0783	12/08/2011	16:06	13.64	18
0784	12/08/2011	15:30	16.45	18
0785	12/08/2011	15:45	16.17	18
0786	12/08/2011	10:58	15.15	28
0787	12/08/2011	11:15	14.95	36

Location-Specific Information – Well Point Sampling: The table below presents the water level, stick up height, and depth to the river surface before the initial purge.

WP No.	Date	Time	Depth to Water (ft btoc)	Stick Up Height (ft)	Depth to River Surface (ft btoc)
0790	12/08/2011	10:31	Could Not Collect	3.10	Dry
0791	12/08/2011	10:03	Could Not Collect	3.10	Dry
0792	12/08/2011	10:23	Could Not Collect	3.20	Dry

Appendix C. Trip Report (continued)

December 2011 CF5 Sampling

Number of Locations Sampled: One observation well (MW-3) and one extraction well (SMI-PW02) were sampled during the December 2011 sampling event.

Locations Not Sampled: None.

Field Variance: None.

Location-Specific Information – Extraction Wells: Extraction wells were sampled using dedicated submersible pumps. Samples were collected into open containers and filtered using dedicated flexible tubing. Sample depths and water levels for each extraction well are listed below.

Well No.	Date	Time	Depth to Water (ft btoc)	Pump Intake Depth (ft bgs)
SMI-PW02	12/09/2011	11:00	23.53	55

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

Well No.	Date	Time	Depth to Water (ft btoc)	Sample Depth (ft bgs)
MW-3	12/08/2011	09:24	10.37	44

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

Date	Daily Mean Flow (cfs)
12/07/2011	3,870
12/08/2011	3,700
12/09/2011	3,900

Equipment Issues: None.

Corrective Action Required/Taken: None.