

Office of Environmental Management – Grand Junction



Moab UMTRA Project
Ground Water and Surface Water
Monitoring Report July through
December 2014

Revision 0

April 2015



U.S. Department
of Energy

Office of Environmental Management

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Acronyms and Abbreviations

ALS	ALS Global
CCB	continuing calibration blank
CCV	continuing calibration verification
CF	Configuration
CFR	Code of Federal Regulations
cfs	cubic feet per second
CJ	Crescent Junction
COC	chain-of-custody
CRI	reporting limit verification
DOE	U.S. Department of Energy
EB	equipment blank
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
ft	feet or foot
ft bgs	feet below ground surface
ICB	initial calibration blank
ICP	inductively coupled plasma
ICV	initial calibration verification
IDL	instrument detection limit
LCS	laboratory control sample
MB	method blanks
MDL	method detection limit
mg/L	milligrams per liter
MS	matrix spike or mass spectroscopy
MSD	matrix spike duplicate
r^2	correlation coefficient
RIN	report identification number
RL	reporting limit
RPD	relative percent difference
SAP	Sampling and Analysis Plan
SD	serial dilution
SDG	sample data group
TDS	total dissolved solids
UMTRA	Uranium Mill Tailings Remedial Action
USGS	U.S. Geological Survey

1.0 Introduction

1.1 Purpose

The purpose of this semi-annual report is to summarize the results associated with ground water and surface water samples collected from the U.S. Department of Energy (DOE) Moab Uranium Mill Tailings Remedial Action (UMTRA) Project sites during the second half of 2014. The results of the data validation process are also presented.

Four sampling events were completed during this time frame: 1) the sampling event in July included the collection of one surface water sample from the freshwater pond at the Crescent Junction (CJ) disposal cell; 2) in July/August ground water samples were collected from Configuration (CF) 4 monitoring wells and well points and CF5 extraction wells; 3) the Colorado River side channel off CF 4 and the collection of ground water samples from the tree plot area in September; and 4) in November/December, samples were collected from a variety of site-wide ground water and surface water locations.

The location of the CJ freshwater pond is shown on Figure 1. This sample was collected to determine the water quality of the water stored in this pond and if this water can be used for applications outside of the CJ site.

The July/August event was conducted to determine the effectiveness of the freshwater injection and ground water extraction systems. In addition, the concentrations measured at each of the CF5 extraction wells were used to update the ammonia and uranium concentrations for mass removal calculations and contaminant concentration trends. The CF4 and CF5 ground water sampling locations are shown on Figure 2. Ground water samples from five site-wide locations were also collected at this time because site flooding in May/June 2014 did not allow the collection of these samples at that time.

In September, samples were collected to assess the surface water quality along the side channel adjacent to and downgradient of CF4. All surface water sample locations are shown on Figure 3.

The November/December site-wide event ground water sampling locations are shown on Figure 4. The surface water samples associated with this event were collected 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 these events. Sampling and analyses were conducted in accordance with the *Moab UMTRA Project Operations and Maintenance Manual* (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).

Appendix A includes Water Sampling Field Activities Verification, Water Quality Data, and the trip report associated with the July CJ sampling event. Appendices B, C, and D contain Water Sampling Field Activities Verification, Minimums and Maximums Report, Water Quality Data, Blanks Report, Water Level Data, and the trip reports associated with the July/August, September, and November/December sampling events, respectively. 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.

The 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. The new data set was compared to the historical data to determine if these data fall outside the historical data range. 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. CJ Freshwater Pond Sampling Location



Figure 2. CF4, CF5, and Tree Plot Area Ground Water Sampling Locations

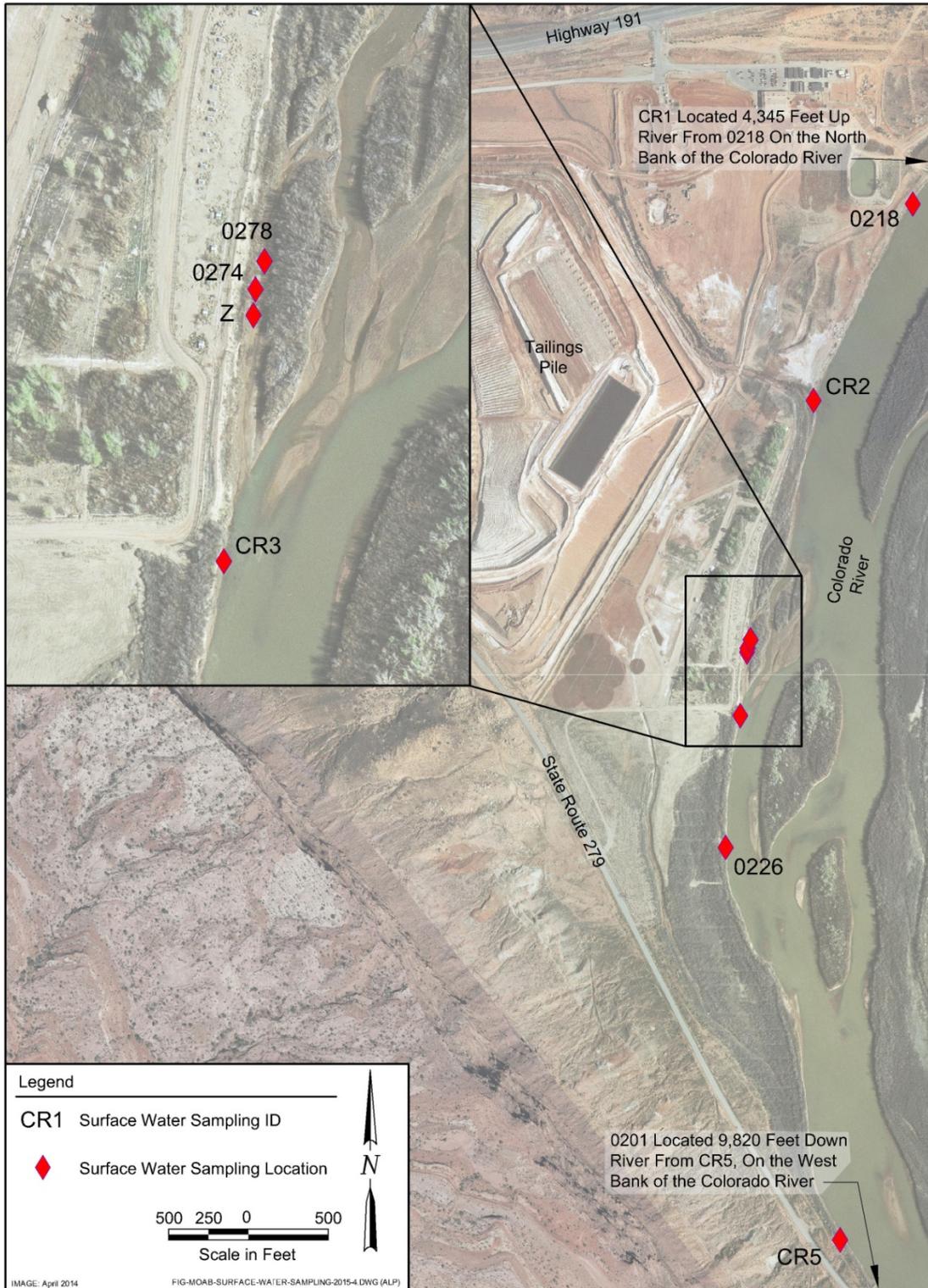


Figure 3. September and December 2014 Surface Water Sampling Locations

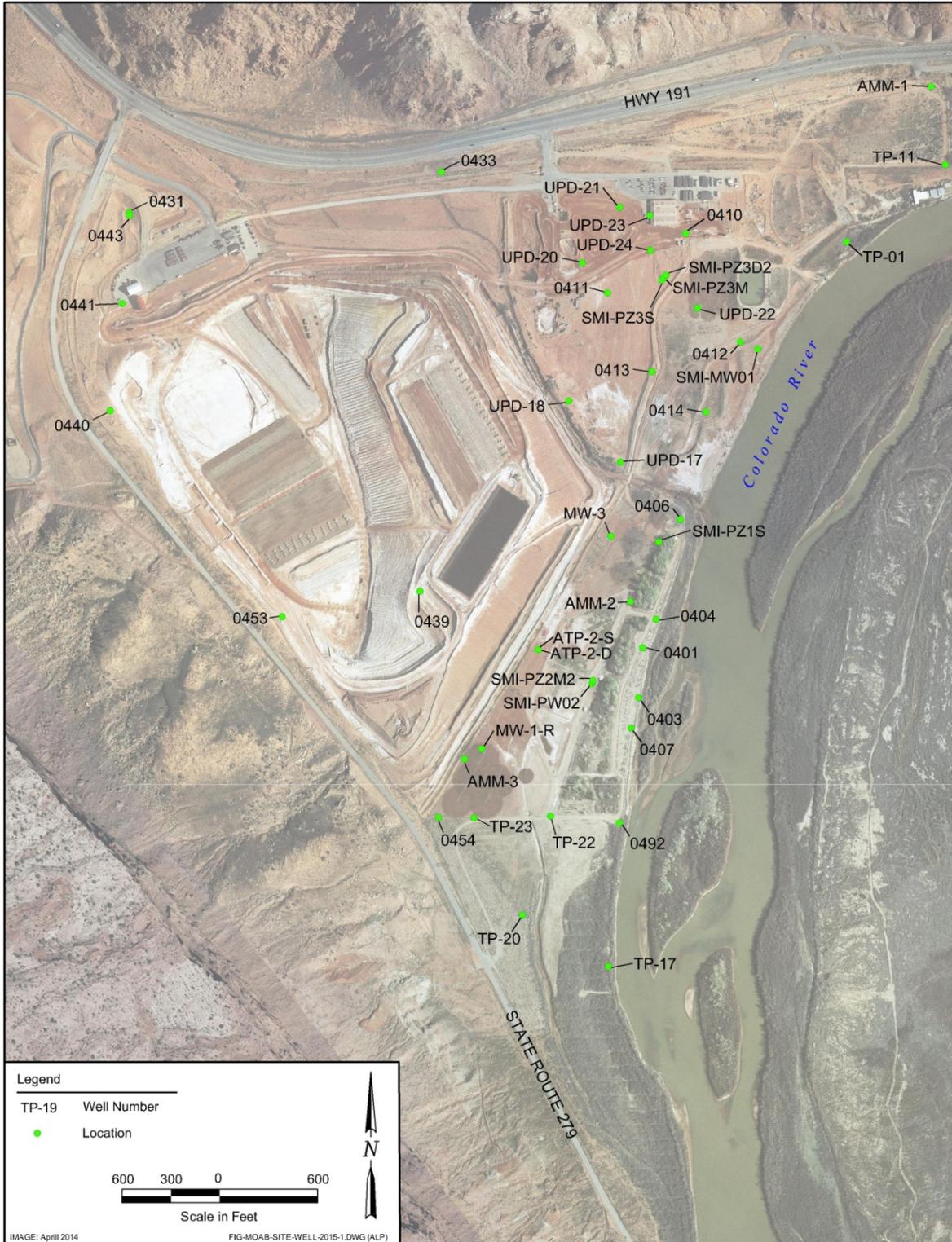


Figure 4. November/December 2014 Site-wide Ground Water Sampling Locations

2.0 Summary of Sampling Events

2.1 July 2014 CJ Freshwater Pond Sampling Event

At the request of the RAC, one sample was collected from the CJ freshwater pond and submitted for a full suite of analytes to determine if this water would be suitable for off-site applications.

2.2 July/August 2014 CF4 and CF5 Ground Water Sampling Event

Ground water samples were collected from eight CF4 monitoring wells to determine how effectively the freshwater injection system was diluting the ammonia concentrations, particularly downgradient of the CF4 injection wells. The analytical results associated with the samples of extracted ground water from the eight CF5 extraction wells were used to update the mass removal calculations.

2.3 September 2014 CF4 Surface Water and Tree Plot Area Ground Water Sampling Event

Four surface water samples were collected in the vicinity of the Colorado River side channel off CF4 on September 11. Following the U.S. Fish and Wildlife Service definition, this side channel was not a suitable habitat when the samples were collected. The samples were collected when the river flows unusual for this time of year increased to above 7,000 cfs in response to a significant precipitation event.

Eight ground water samples in the vicinity of the tree plot area (near CF3) were sampled to determine if phytoremediation had impacted ammonia concentrations in the downgradient direction. Because of ground water extraction shifting from this area to CF5 and injection restricted to CF4 (due to the side channel habitat potential development), these wells had not been sampled since 2008/2009.

2.4 November/December 2014 Site-wide Sampling Event

Fifty-one ground water and surface water samples were collected between November 13 and December 11 as part of the site-wide event. This event corresponds to the time frame when the Colorado River is generally experiencing base flow conditions.

The 44 ground water samples were collected from a variety of downgradient and cross-gradient locations at various depths. The locations in the vicinity of the northeastern uranium plume were also included. All samples were analyzed for ammonia using a HACH sension 2 portable pH/ISE probe and meter. All samples were also submitted to ALS Global (ALS), laboratory for ammonia analysis. All samples were analyzed by ALS for uranium.

The seven surface water samples were collected upstream, downstream, and adjacent to the site during this event.

3.0 Data Assessment

3.1 July 2014 CJ Freshwater Pond Sampling Event

3.1.1 Laboratory Performance Assessment

This validation was performed according to *Standard Practice for Validation of Laboratory Data*. The procedure was applied at Level 2, Data Deliverables Examination. All analyses were successfully completed.

General Information and Validation Results

Report Identification Number (RIN) 1407072
 Laboratory: ALS, Fort Collins, Colorado
 Sample Date Group (SDG) Number: 1408015
 Analysis: Metals and Inorganics
 Validator: Elizabeth Moran
 Review Date: January 22, 2015

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

Table 1. July 2014 CJ Freshwater Pond Sampling Event Analytes and Methods

Analyte	Preparation Method	Analytical Method
Ammonia as N	EPA 350.1	EPA 350.1
Nitrate/Nitrite as N	EPA 353.2	EPA 353.2
Total Phosphorus	EPA 365.2	EPA 365.2
TDS	MCAWW 160.1	MCAWW 160.1
Bromide	EPA 300.0 Rev 2.1	300.0 Rev 2.1
Chloride	EPA 300.0 Rev 2.1	300.0 Rev 2.1
Fluoride	EPA 300.0 Rev 2.1	300.0 Rev 2.1
Sulfate	EPA 300.0 Rev 2.1	300.0 Rev 2.1
Mercury	SW-7470A	SW-7470A
Arsenic, Barium, Cadmium, Calcium, Chromium, Iron, Lead, Magnesium, Potassium, Selenium, Silver, Sodium	SW-6010B	EPA 6010B

TDS = total dissolved solids

Data Qualifier Summary

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

Table 2. 2014 CJ Freshwater Pond Sampling Event Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1408015-1	CJ Freshwater Pond	All except for Total Phosphorus	J	MS-1

"J" indicates results are estimated; it becomes "UJ" for analytical results below the detection limit.

Table 3. July 2014 CJ Freshwater Pond Sampling Event Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-detects)	Explanation
MS-1	J	U	Results for the affected analyte(s) are regarded as estimated (J) because the matrix spike sample not analyzed at the proper frequency as stated in the appropriate analytical method. A sample from this order number was not the selected QC sample.

"J" indicates results are estimated; it becomes "UJ" for analytical results below the detection limit.

Sample Shipping/Receiving

ALS in Fort Collins, Colorado, received a total of one sample for RIN 1407072 in a shipment of one cooler. SDG 1408015 consisted of one sample that arrived on August 1, 2014 (UPS tracking number 1Z5W1Y510191869569). 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 1408015 was received intact with a temperature of 1.2°C, which complies with requirements. The sample was received in the correct container types and had been preserved correctly for the requested analyses. The sample was analyzed within the applicable holding time.

Case Narratives

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

Matrix Spike and Replicate Analysis

Matrix spike (MS) sample analysis, performed at a frequency of one per 20 samples unless otherwise noted, is a measure of the ability to recover analytes in a particular matrix. Replicate sample analysis consists of matrix spike duplicate (MSD) samples and field duplicates at a frequency of one per 20 samples per method or procedural requirements. Only one sample was collected under this RIN and for most of the analytes, the sample that was chosen for MSD/RS analysis was from another customer; therefore, all of the inductively coupled plasma (ICP) metals, mercury, ammonia, nitrate/nitrite as N, total dissolved solids (TDS), and ion chromatography results are flagged MS-1.

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. This sample was collected using dedicated sampling equipment; therefore, it was not necessary to collect an EB for RIN 1407072.

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 not collected for RIN 1407072.

Completeness

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

Electronic Data Deliverable File

The Electronic Data Deliverable (EDD) files arrived on August 8, 2014. The contents of the EDD 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

Because this event represents the first time a sample has been collected from this location, there were no anomalous data points associated with this event.

3.2 July/August 2014 CF4 and CF5 Ground Water Sampling Event

3.2.1 Laboratory Performance Assessment

This validation was performed according to *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

RIN: 1407071
Laboratory: ALS, Fort Collins, Colorado
SDG Numbers: 1408014, 1408375
Analysis: Inorganics and Metals
Validator: Elizabeth Moran
Review Date: December 29, 2014

The samples were prepared and analyzed using accepted procedures as shown in Table 4.

Table 4. July/August 2014 CF4 and CF5 Ground Water Sampling Event Analytes and Methods

Analyte	Preparation Method	Analytical Method
Ammonia as N	EPA 350.1	EPA 350.1
Uranium	SW-846 3005A	SW-846 6020A

Analytical results were qualified as listed in Table 5. Refer to Table 6 for an explanation of the data qualifiers applied.

Table 5. July/August 2014 CF4 and CF5 Ground Water Sampling Event Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1408375-1 through -8	All in SDG 1408375	Uranium	J	MS-1
1408375-1 through -8	All in SDG 1408375	Ammonia	J	MS-1
1408375-1 through -8	All in SDG 1408375	Uranium	J	SD-1

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

Table 6. July/August 2014 CF4 and CF5 Ground Water Sampling Event Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-detects)	Explanation
MS-1	J	U	Results for the affected analyte(s) are regarded as estimated (J) because the matrix spike sample not analyzed at the proper frequency as stated in the appropriate analytical method. A sample from this order number was not the selected QC sample.
SD-1	J	N/A	Frequency requirements for serial dilution were not met.

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

Sample Shipping/Receiving

ALS in Fort Collins, Colorado, received a total of 26 samples for RIN 1407071 in two shipments of one cooler each, as shown in Table 7. All of the SDGs were accompanied by a COC form.

Table 7. July/August 2014 CF4 and CF5 Ground Water Sampling Shipment and Receipt Summary

SDG	Date Arrived	Number of Uranium Samples	Number of Ammonia Samples	Tracking Number
1408014	8/1/2014	18	18	1Z5W1Y510191869569
1408375	8/15/2014	8	8	1Z5W1Y510193397575

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. It was noted that the laboratory mis-labeled sample location 0787 as location 1787. This error has been corrected in SEEPro. The sample submittal documents, including the COC forms and the sample tickets, had no errors or omissions.

Preservation and Holding Times

SDG 1408014 was received intact with a temperature of 0.4°C, SDG 1406294 was received intact with a temperature of 1.2°C, and SDG 1408375 was received with a temperature of 3.5°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.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that 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 that 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 ICP analytes (uranium), reporting limit verifications (CRIs) verify the linearity of the calibration curve near the reporting limit (RL). For ICP-mass spectrometry (ICP-MS) analytes (uranium), instrument tuning and performance criteria are checked for mass calibration and resolution verifications. For ICP-MS analyte uranium, internal standards are also analyzed to indicate stability of the instruments.

Method SW-846 6020A, Uranium

The calibration for the uranium analyses were performed on August 4 and August 25, 2014. The initial calibrations were both performed using five calibration standards and one blank, resulting in calibration curves with correlation coefficient (r^2) values greater than 0.995. The values of the calibration curve intercepts for uranium were positive and less than 3 times the IDL.

Initial calibration verification (ICV) and continuing calibration verification (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 EPA 350.1, Ammonia as N

Initial calibrations for ammonia as N (for both SDG 1408014 and 1408375) were performed using four calibration standards and a blank on August 7 and August 21, 2014. The calibration curve had an r^2 value greater than 0.995 and an intercept less than three times the MDL.

ICV and CCV checks were made at the required frequency. All calibration check results for all SDGs were within the acceptance criteria.

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 prior to and during sample analysis. Detected sample results associated with blanks results greater than the method detection limit (MDL) or instrument detection limit (IDL) (depending on method requirements) were “U” qualified when the detections were less than five times the blank concentration. Non-detects were not qualified.

All of the uranium and ammonia CCBs were less than the IDL on both of the SDGs. No results had to be qualified.

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. These samples were collected using dedicated sampling equipment; therefore, it was not necessary to collect an EB for RIN 1407071.

MS Analysis

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 uranium and ammonia for SDG 1408014. However, on SDG 1408375, a matrix spike analysis was not conducted with a sample from this work package. Therefore, the uranium and ammonia data in SDG 1408375 was flagged 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 MSD results for all other analytes should be less than 20 percent for results greater than five times the RL.

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. Duplicate samples were collected from locations 0814 (1408014-16) and 0403 (1408375-1). 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 5 times the RL.

Laboratory Control Sample

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 ammonia analyses.

LCSs were not reported for uranium. Per national environmental laboratory accreditation requirements provided by the NELAC Institute, an MS may be used in place of an LCS provided the acceptance criteria are as stringent.

Metals SD

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. The SD for 1408014 met all of the acceptance criteria, however, a SD was not run on SDG 1408375. Therefore, all of the uranium data in SDG 1408375 was flagged 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.

EDD Files

The EDD files arrived on August 8 and August 28 2014. 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.

3.2.2 Minimums and Maximums Report and Anomalous Data Review

The Minimums and Maximums Report for this sampling event is located in Appendix B. Based on the results, there were four anomalous data points associated with four different locations. Three of the data points were associated with ammonia concentrations below the historic minimum, and the remaining data point had a uranium concentration above the historic maximum. Table 8 presents a summary of the results of the Minimums and Maximums Report for this event.

Table 8. Anomalous Data Associated With the July/August 2014
CF4 and CF5 Ground Water Sampling Event

Location	Sample Date	Analyte	Concentration (mg/L)	Historical Minimum (mg/L)	Historical Maximum (mg/L)	Disposition
0780	07/28/2014	Ammonia Total as N	0.12	0.48	890	Location last sampled in 2009, new minimum for the data range established
0781	07/28/2014	Uranium	2.2	0.032	1.3	Location last sampled in 2009, oxygenated water from irrigation may have increased uranium concentration
0782	07/29/2014	Ammonia Total as N	4	9.5	2300	Location last sampled in 2009, new minimum for the data range established
0783	07/29/2014	Ammonia Total as N	0.16	0.4	380	Location last sampled in 2009, new minimum for the data range established

mg/L = milligrams per liter

3.3 September 2014 CF4 Surface Water and Tree Plot Area Ground Water Sampling Event

3.3.1 Laboratory Performance Assessment

This validation was performed according to *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

RIN 1409073
 Laboratory: ALS, Fort Collins, Colorado
 SDG Numbers: 1409416
 Analysis: Inorganics and Metals
 Validator: Elizabeth Moran
 Review Date: December 29, 2014

The samples were prepared and analyzed using accepted procedures as shown in Table 9.

Table 9. September 2014 CF4 Surface Water and Tree Plot Area Ground Water Sampling Event Analytes and Methods

Analyte	Preparation Method	Analytical Method
Ammonia as N	EPA 350.1	EPA 350.1
Uranium	SW-846 3005A	SW-846 6020A

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

Table 10. September 2014 CF4 Surface Water and Tree Plot Area Ground Water Sampling Event Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1409416-1 through -13	All in SDG 1409416	Uranium	J	MS-1

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

Table 11. September 2014 CF4 Surface Water and Tree Plot Area Ground Water Sampling Event Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-detects)	Explanation
MS-1	J	U	Results for the affected analyte(s) are regarded as estimated (J) because the matrix spike sample not analyzed at the proper frequency as stated in the appropriate analytical method. A sample from this order number was not the selected QC sample.

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

Sample Shipping/Receiving

ALS Analytics in Fort Collins, Colorado, received a total of 13 samples for RIN 1409073 in one shipment of one cooler. SDG 1409416 consisted of 13 uranium and ammonia samples and arrived on September 23, 2014 (UPS tracking number 1Z5W1Y510198485569). 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 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 1409416 was received intact with a temperature of 2.2°C which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that 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 that 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 ICP analytes (uranium), CRIs verify the linearity of the calibration curve near the RL. For ICP-MS analytes (uranium), instrument tuning and performance criteria are checked for mass calibration and resolution verifications. And also for ICP-MS analyte uranium, internal standards are analyzed to indicate stability of the instruments.

Method SW-846 6020A, Uranium

The calibration for the uranium analyses were performed on September 24, 2014. The initial calibrations were both performed using five 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 uranium were positive and less than 3 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 EPA 350.1, Ammonia as N

Initial calibrations for ammonia as N were performed using four calibration standards and a blank on September 24, 2014. The calibration curve had an r^2 value greater than 0.995 and an intercept less than three times the MDL.

ICV and CCV checks were made at the required frequency. All calibration check results for all SDGs were within the acceptance criteria.

Method and Calibration Blanks

MBs are analyzed to assess any contamination that may have occurred during sample preparation. Both ICBs and CCBs are analyzed to assess instrument contamination prior to and during sample analysis. Detected sample results associated with blanks results greater than the MDL or IDL (depending on method requirements) were “U” qualified when the detections were less than five times the blank concentration. Non-detects were not qualified. All of the uranium and ammonia CCBs were less than the IDL on both of the SDGs. No results had to be qualified.

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. These samples were collected using dedicated sampling equipment; therefore, it was not necessary to collect a EB for RIN 1409073.

MS Analysis

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 ammonia on SDG 1408016. However, a matrix spike analysis was not conducted with a uranium sample from this work package. Therefore, the uranium data in SDG 1408016 was flagged J for reason MS-1.

Laboratory Replicate Analysis

The laboratory replicate results demonstrate acceptable laboratory precision. The RPD values for the reported MSD results for all other analytes should be less than 20 percent for results greater than five times the RL.

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 0732 (1409416-6). The duplicate results met the EPA recommended laboratory duplicate criteria of less than 20 RPD for results that are greater than five times the RL.

LCSs

LCSs provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. LCS results were acceptable for ammonia analyses.

LCSs were not reported for uranium. Per national environmental laboratory accreditation requirements provided by the NELAC Institute, an MS may be used in place of an LCS provided the acceptance criteria are as stringent.

Metals SD

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. The SD for 1408016 met all of the acceptance criteria; however, a SD was not run on SDG 1408016. Therefore, all of the uranium data in SDG 1408016 was flagged 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.

EDD Files

The EDD files arrived on September 26, 2014. 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.

3.3.2 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 no anomalous data associated with this event. Table 12 presents a summary of the results of the Minimums and Maximums Report for this event.

3.4 November/December 2014 Site-wide Sampling Event

3.4.1 Laboratory Performance Assessment

This validation was performed according to *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

RIN 1411074
Laboratory: ALS, Fort Collins, Colorado
SDG Numbers: 1411485, 1412238
Analysis: Inorganics and Metals
Validator: Elizabeth Moran
Review Date: December 31, 2014

The samples were prepared and analyzed using accepted procedures as shown in Table 12.

Table 12. November/December 2014 Site-wide Sampling Event Analytes and Methods

Analyte	Preparation Method	Analytical Method
Ammonia as N	EPA 350.1	EPA 350.1
Uranium	SW-846 3005A	SW-846 6020A

Analytical results were qualified as listed in Table 13. Refer to Table 14 for an explanation of the data qualifiers applied.

Table 13. November/December 2014 Site-wide Sampling Event Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1411485-1 through -35	All in SDG 1411485	Uranium	J	MS-1
1412238-1 through -28	All in SDG 1412238	Uranium	J	MS-2
1411485-1 through -35	All in SDG 1411485	Ammonia	J	MS-2
1412238-1 through -28	All in SDG 1412238	Ammonia	J	MS-2

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

Table 14. November/December 2014 Site-wide Sampling Event Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-detects)	Explanation
MS-1	J	U	Results for the affected analytes are regarded as estimated because the concentration of the native sample was much greater than the spike added, so the spike recovery may not be accurate.
MS-2	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.

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

Sample Shipping/Receiving

ALS Analytics in Fort Collins, Colorado, received a total of 63 samples for RIN 1411074 in two shipments of one cooler each. SDG 1411485 consisted of 35 samples arrived on November 26, 2014 (UPS tracking number 1Z5W1Y510196949624). Sample data group 1412238 consisted of 28 samples and arrived on December 12, 2014 (UPS tracking number 1Z5W1Y510197416840). Both of the SDGs were 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 1411485, packed in one cooler, was received intact with a temperature of 0.5°C, which complies with all requirements. SDG 1412238 was also packed in one cooler and was received intact with the temperature in the cooler being 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.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that 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 that 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 ICP analytes (uranium), CRIs verify the linearity of the calibration curve near the RL. For ICP-MS analytes (uranium), instrument tuning and performance criteria are checked for mass calibration and resolution verifications. And also for ICP-MS analyte uranium, internal standards are analyzed to indicate stability of the instruments.

Method SW-846 6020A, Uranium

The calibration for the uranium analyses for SDG 1411485 was performed on December 1, 2014 and the calibration for SDG 1412238 was performed on December 19, 2014. The initial calibrations were both performed using five 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 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 EPA 350.1, Ammonia as N

Initial calibrations for ammonia as N (for both SDG 1411485 and 1411074) were performed using seven calibration standards and a blank on December 2, 2014 and December 19, 2014, respectively. The calibration curve had an r^2 value greater than 0.995 and an intercept less than three times the MDL.

ICV and CCV checks were made at the required frequency. All calibration check results for all SDGs were within the acceptance criteria.

Method and Calibration Blanks

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

All of the method and ammonia and uranium calibration and method blanks met the criteria, so no results needed to be qualified.

EBs

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.

One equipment blank was collected (NOV062) from the decontamination rinsate from the tubing used to collect the surface water samples. The uranium result was below the instrument detection limit and the ammonia was at the detection limit. No results had to be qualified.

MS Analysis

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.

For SDG 1411485, two MS were run, however one failed because the native concentration was too high. Therefore all of the uranium data in this SDG is flagged MS-1. In addition, in SDG 1412238, only one MS was run for a total of 28 samples. This does not meet the criteria for one MS per 20 samples analyzed, therefore, all of the uranium data in SDG 1412238 was flagged MS-2.

For ammonia as N analysis, only two MSs were analyzed for the 35 total ammonia samples in SDG 1411485. There were 28 ammonia samples with SDG 1412238 and only two MSs. Method 350.1 requires MSs to be analyzed for at least 10 percent of the samples, therefore all of the ammonia samples have been flagged J for reason MS-2.

Laboratory Replicate Analysis

The laboratory replicate results demonstrate acceptable laboratory precision. The RPD values for the reported MSD results for all other analytes should be less than 20 percent for results greater than five times the RL.

The RPD for the three uranium MSs was less than 20 percent, so no data was flagged.

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 locations UPD-22 (1411485-34), 0733 (1411485-13), and UPD-24 (1412238-28). The duplicate results met the EPA recommended laboratory duplicate criteria of less than 20 RPD for results that are greater than five times the RL.

LCSs

LCSs provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. LCS results were acceptable for ammonia analyses.

LCSs were not reported for uranium. Per national environmental laboratory accreditation requirements provided by the NELAC Institute, an MS may be used in place of an LCS provided the acceptance criteria are as stringent.

Metals SD

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 serial dilution data were acceptable.

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.

EDD Files

The EDD files arrived on December 3 and 18. 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.

3.4.2 Minimums and Maximums Report and Anomalous Data Review

The Minimums and Maximums Report for this sampling event is located in Appendix D. Based on the results, there were two anomalous data points from two different locations. Both data points were associated with ammonia concentrations above the historic maximum. Table 15 presents a summary of the results of the Minimums and Maximums Report for this event.

Table 15. Anomalous Data Associated With the November/December 2014 Site-wide Sampling Event

Location	Sample Date	Analyte	Concentration (mg/L)	Historical Minimum (mg/L)	Historical Maximum (mg/L)	Disposition
0732	11/25/2014	Ammonia Total as N	87	0.1	50	Location last sampled in 2009, new minimum for the data range established
TP-22	11/14/2014	Ammonia Total as N	0.2	0.1	0.1	Location last sampled in 2009, new minimum for the data range established

mg/L = milligrams per liter

4.0 Results

4.1 July 2014 CJ Freshwater Pond Sampling Event Results

A list of the analytes, measured concentrations, the analytical lab detection limits, and applicable standards for the sample collected from the CJ freshwater pond is provided in Table 16. As shown in the table, all analyte concentrations were below the standards.

4.2 July/August 2014 CF4 and CF5 Ground Water Sampling Event Results

4.2.1 CF4 Ground Water Sampling Results

The observation wells surrounding the CF4 injection wells (Figure 2) and river bed well points were sampled between July 28 and 30, 2014, to evaluate the effectiveness of the freshwater injection system. The ammonia concentrations are displayed on Figure 5. In general, the injection wells are screened and, therefore, deliver freshwater into the subsurface, from 15 to 35 feet (ft) below ground surface (bgs).

The results show a significant reduction in concentrations in the downgradient (east) direction, particularly in the zone above 35 foot bags (ft bgs). In the upgradient direction, concentrations are also impacted by freshwater injection above 35 ft bgs. The highest ammonia concentration was associated with the sample collected from well 0781 from a depth of 48 ft bgs upgradient of the CF4 injection wells.

Table 16. Results of the July 2014 CJ Freshwater Pond Sampling

Analyte	Concentration (mg/L)	Detection Limit (mg/L)	USEPA Drinking Water Primary Standard ² (mg/L)
Nitrate/Nitrite as Nitrogen	0.02	0.01	10
Ammonia as Nitrogen	0.1 ¹	0.1	NA
Mercury	0.0000079	0.0000029	0.002
Bromide	0.2 ¹	0.2	NA
Sulfate	120	5	250 ³
Chloride	18	0.2	250 ³
Fluoride	0.26	0.1	4
Iron	0.190	0.0049	0.3 ³
Lead	0.0013 ¹	0.0013	0
Barium	0.048	0.00019	2
Silver	0.0011 ¹	0.0011	0.1 ³
Sodium	45	0.0066	NA
Arsenic	0.0039 ¹	0.0039	0
Cadmium	0.00033 ¹	0.00033	0.005
Calcium	30	0.012	NA
Chromium	0.00051 ¹	0.00051	0.1
Selenium	0.0027 ¹	0.0027	0.05
Magnesium	20	0.013	NA
Potassium	3	0.110	NA
TDS	330	20	500
Total Phosphorus	0.05 ¹	0.05	NA

¹Analyte concentration below the analytical laboratory detection limit

²USEPA 2012 Edition of the Drinking Water Standards and Health Advisories

³No Primary Standard exists for analyte, Secondary Standard listed

NA = Not Applicable, no USEPA Standard exists for analyte

Figure 6 presents the ground water mound developed as a result of the freshwater injection system, as measured on July 28, the same time the samples were collected. The ground water elevation data indicate there was a difference of more than 10 ft between the elevation inside the injection wells and upgradient observation wells.

4.2.2 CF5 Ground Water Sampling Results

CF5 extraction wells 0810, 0811, 0812, 0813, 0814, and 0816 were sampled between July 28 and 30, and wells 0815 and SMI-PW02 were sampled August 5, 2014, to monitor contaminant concentration trends and update the contaminant concentrations used for the mass removal calculations. Figure 7 presents the extraction rates and associated drawdowns measured when the samples were collected. The ammonia and uranium concentrations are displayed on Figure 8.

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 SMI-PW02, all of which are located along the CF5 southeastern boundary. Figure 10 displays a time versus uranium concentration plot for the same set of wells.

Figures 11 and 12 are the time versus ammonia and uranium concentration plots, respectively, for CF5 wells 0814 through 0816, which are located closer to the base of the tailings pile (Figure 2).

As the plots exhibit, the ammonia and uranium concentrations along the CF5 southeastern boundary have not significantly changed over the past 2 years. Ammonia concentrations in the wells located closer to the base of the tailings pile all showed a similar increase between April and July 2014, while the uranium concentrations did not change significantly. As of July/August 2014, all ammonia concentrations ranged from 320 to 490 milligrams per liter (mg/L) along the southeastern CF5 boundary and from 210 to 350 mg/L along the base of the tailings pile. The uranium concentrations for all eight extraction wells ranged from 1.4 to 3.2 mg/L.

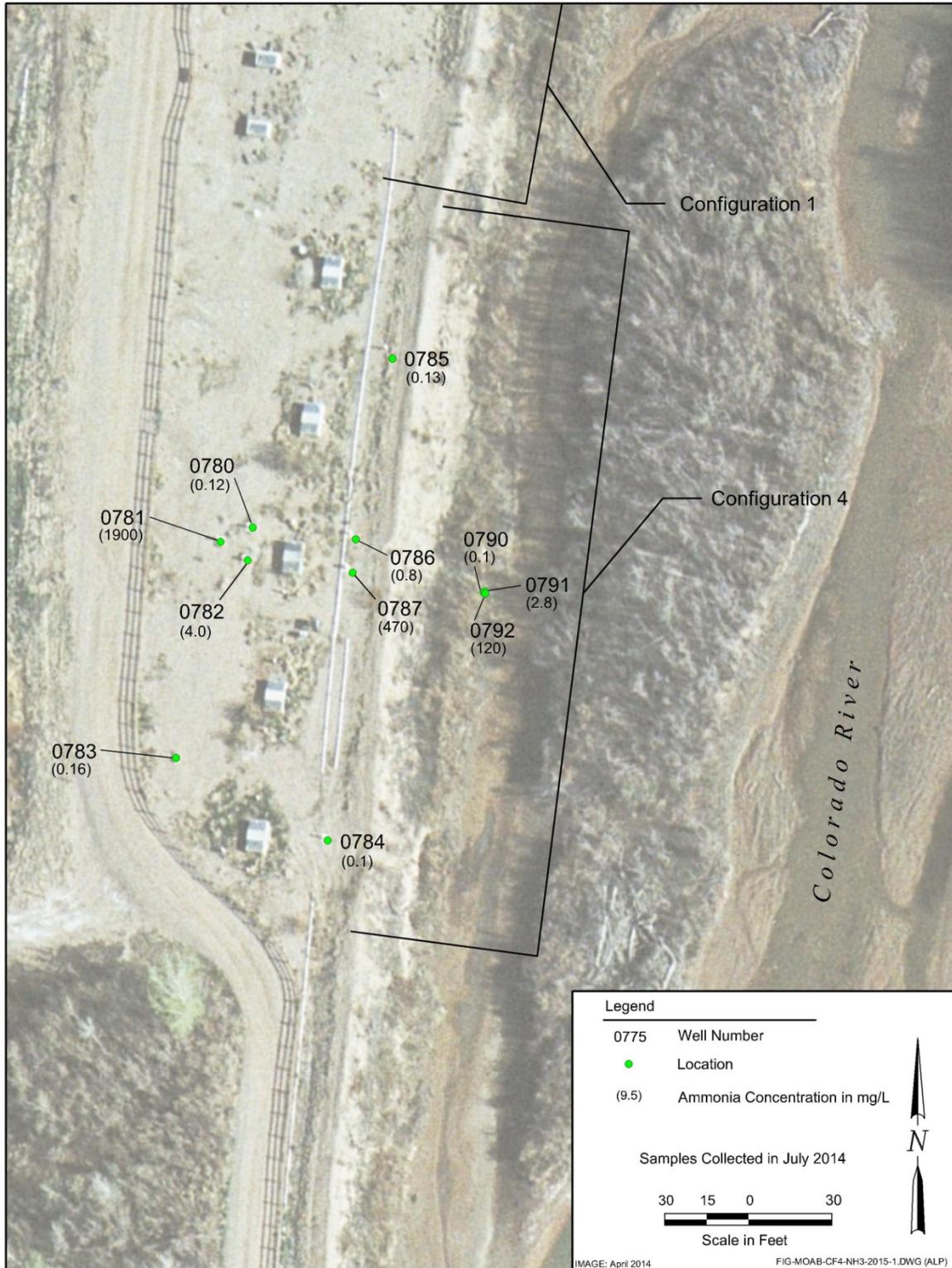


Figure 5. July 2014 CF4 Ground Water Ammonia Concentrations

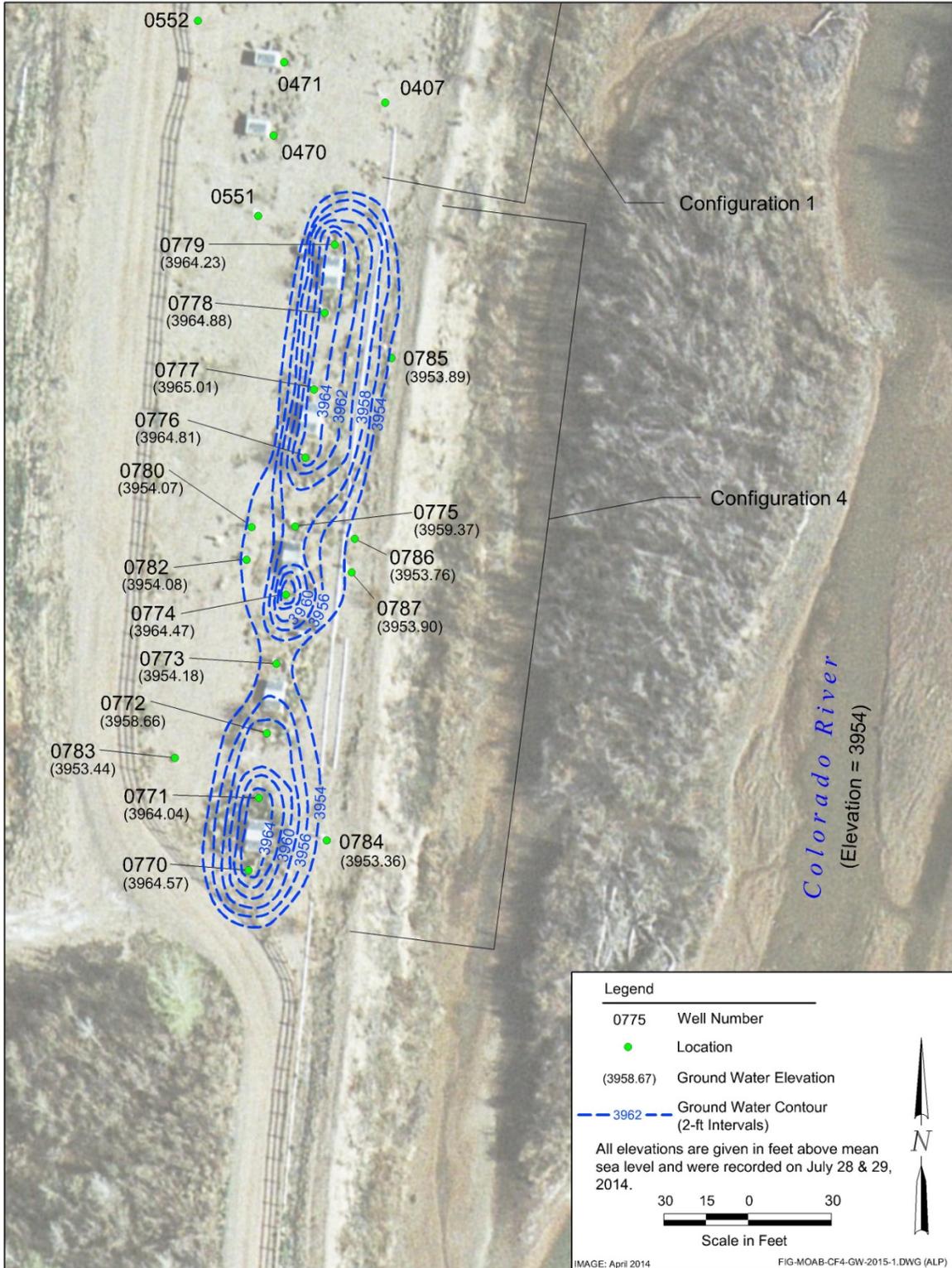


Figure 6. July 2014 CF4 Ground Water Elevation Contour Map, During Injection

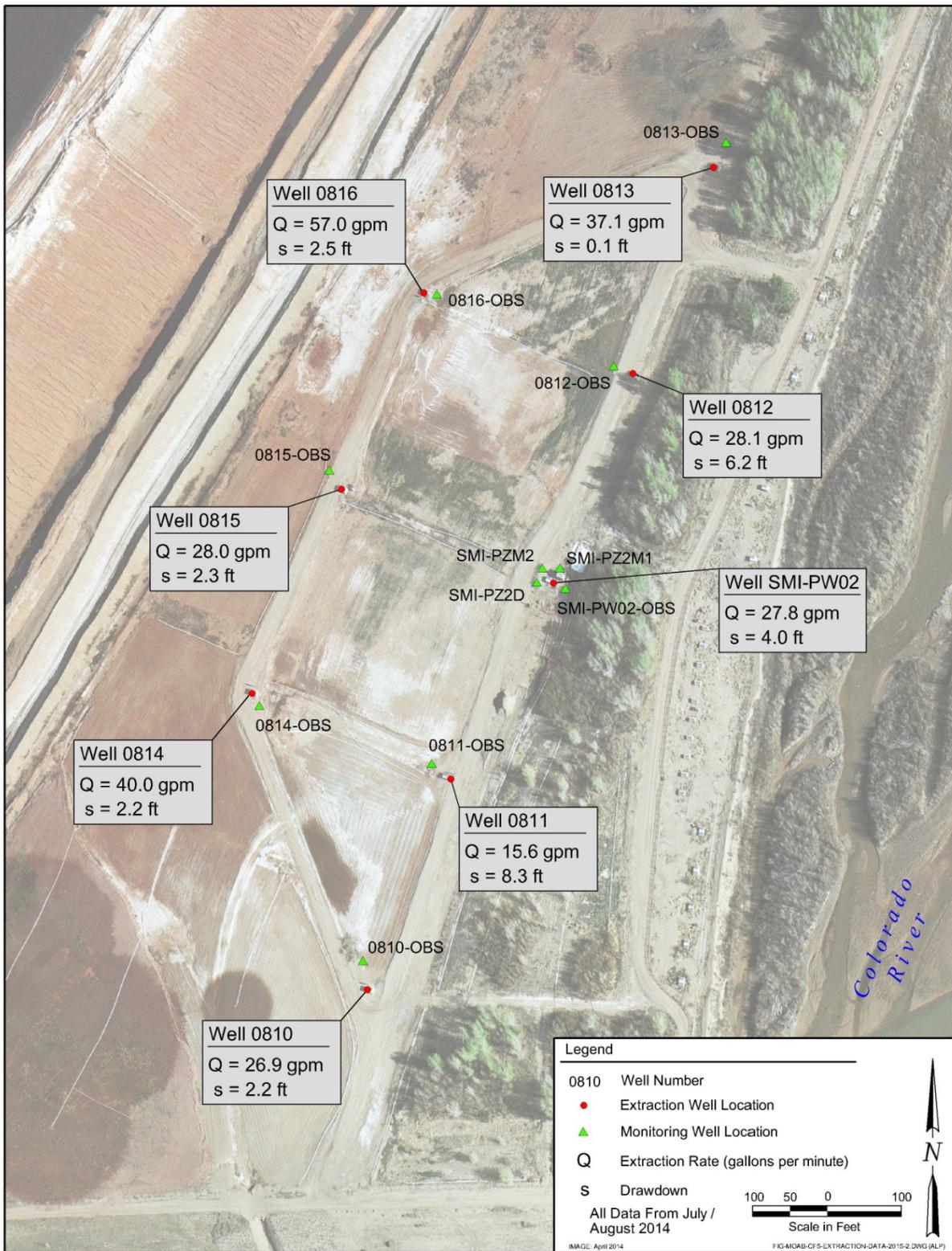


Figure 7. July/August 2014 CF5 Pumping Rates and Drawdowns

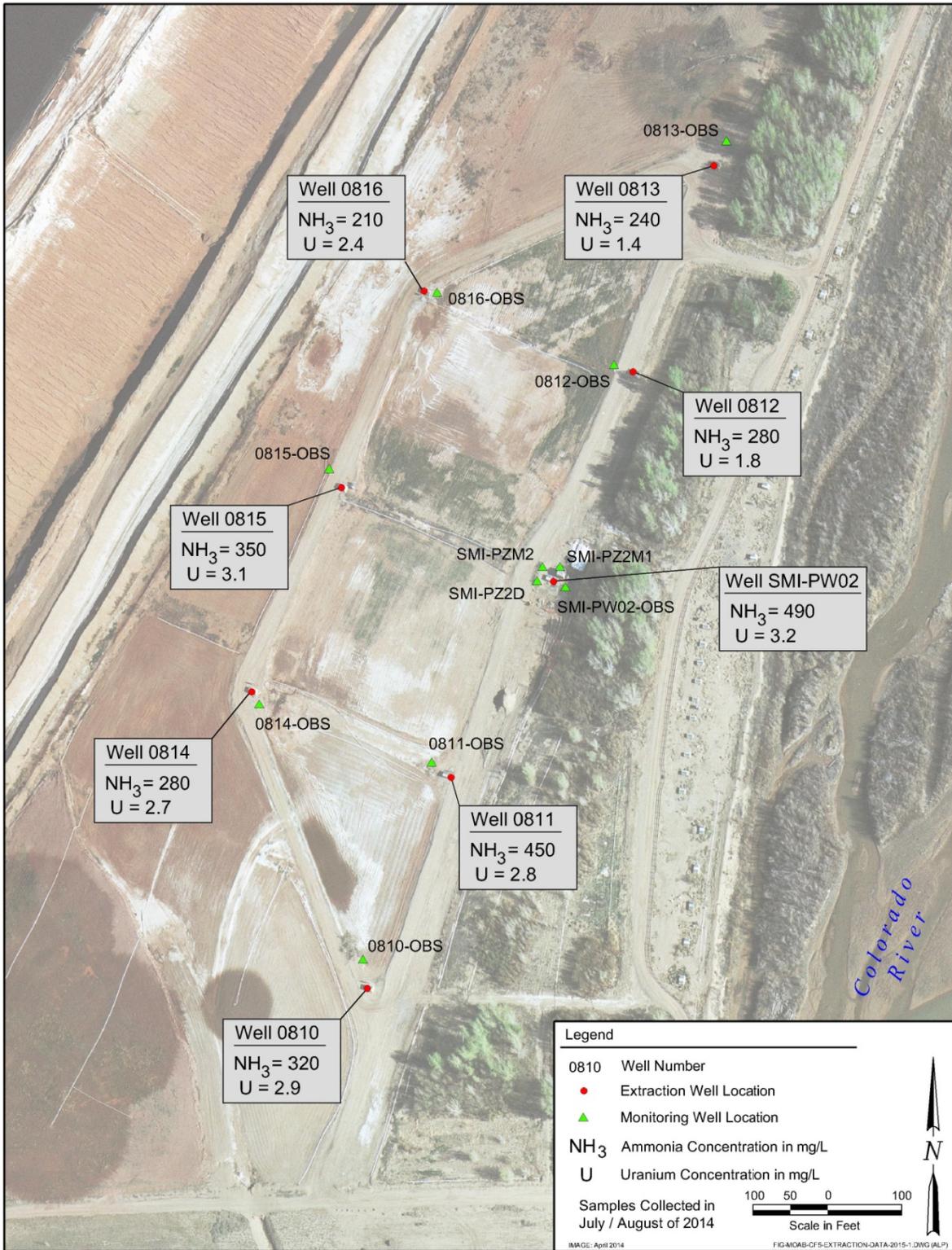


Figure 8. July/August 2014 CF5 Ammonia and Uranium Concentrations

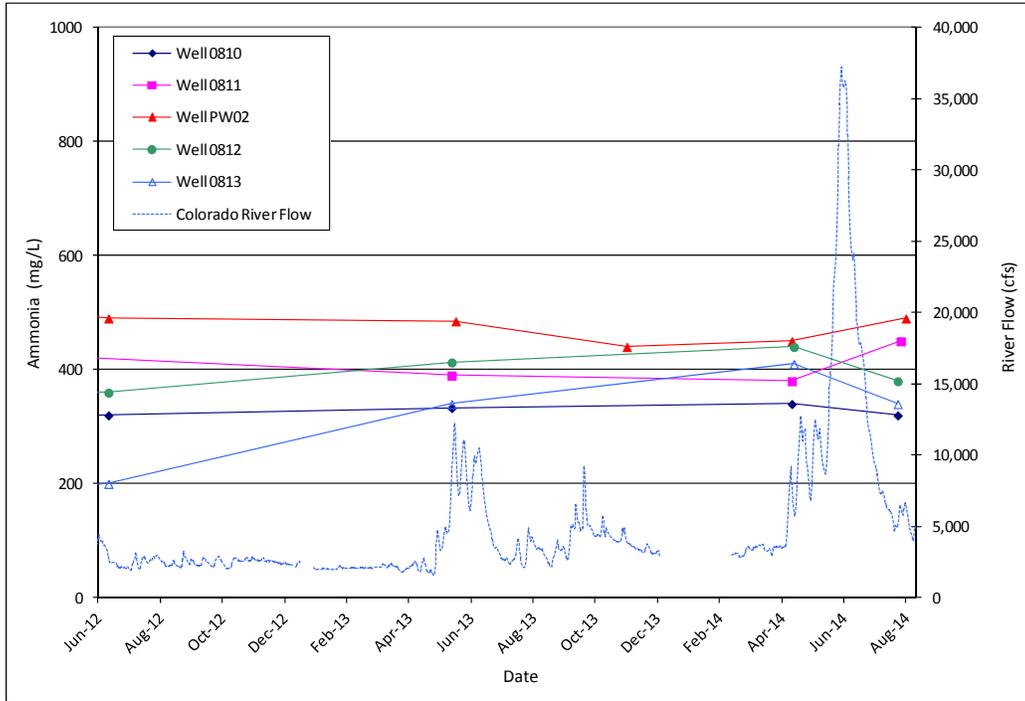


Figure 9. CF5 Extraction Wells 0810, 0811, 0812, 0813, and PW02 Time versus Ammonia Concentration Plot

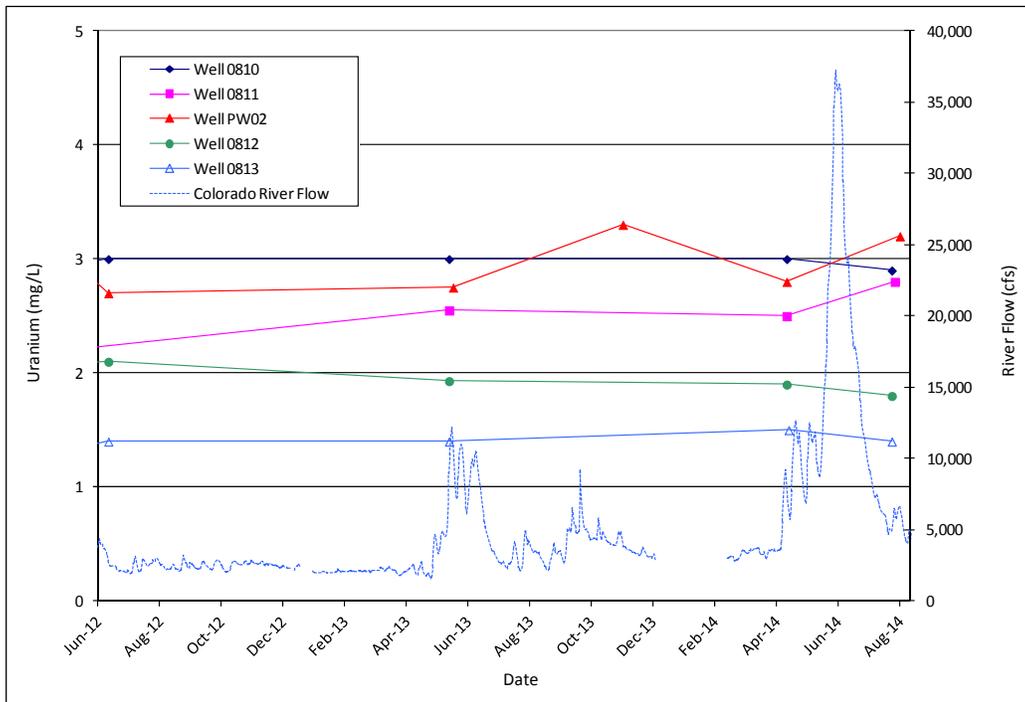


Figure 10. CF5 Extraction Wells 0810, 0811, 0812, 0813, and PW02 Time versus Uranium Concentration Plot

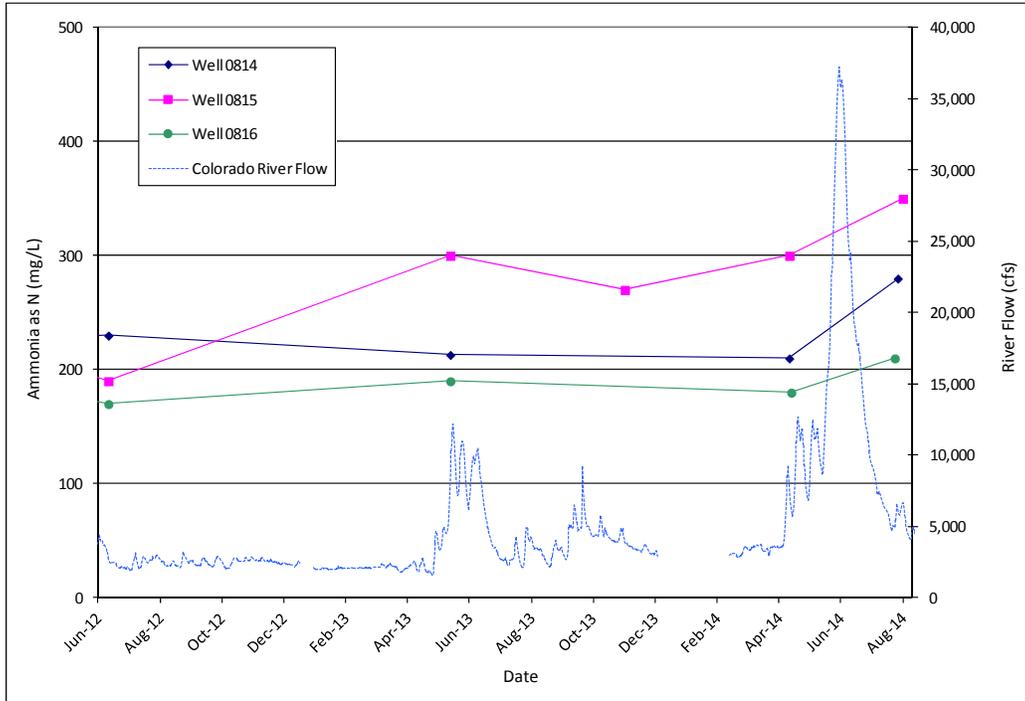


Figure 11. CF5 Extraction Wells 0814, 0815, and 0816
Time versus Ammonia Concentration Plot

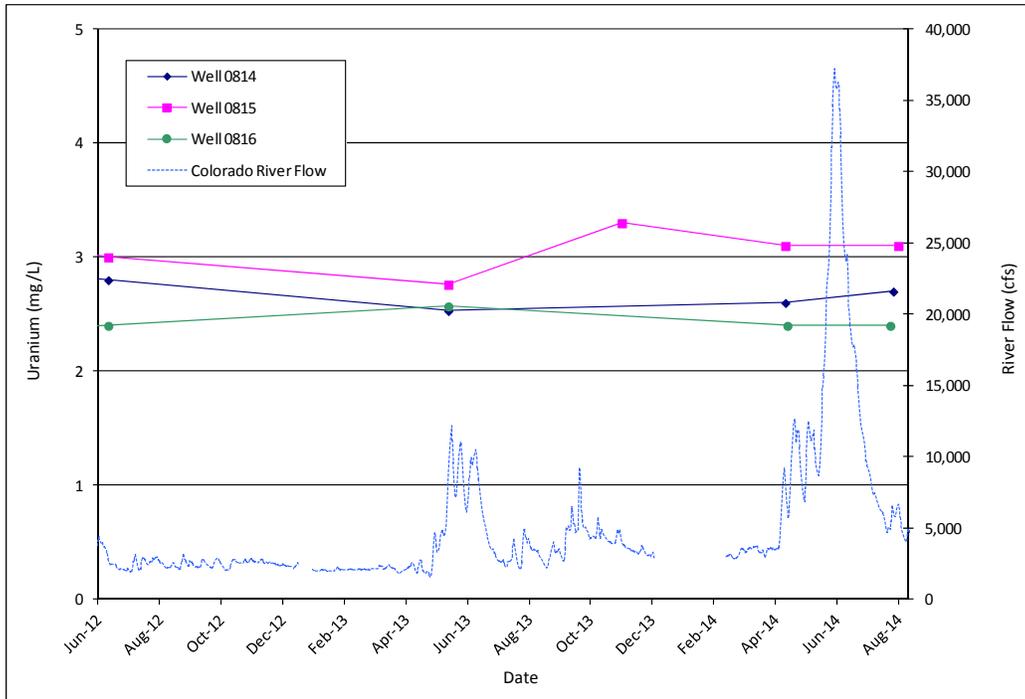


Figure 12. CF5 Extraction Wells 0814, 0815, and 0816
Time versus Uranium Concentration Plot

4.2.3 Miscellaneous Site-wide Results

Locations 0403, 0412, 0414, MW-1-R, and SMI-MW01 could not be safely accessed to collect a sample in the May/June 2014 site-wide sampling event. Once the flood waters receded, samples were collected from these locations. Laboratory analysis exhibited that the ammonia and uranium concentrations were within historical ranges in the samples collected from these locations. Where applicable, the data were applied to the time versus concentration plots in Section 4.4.

4.3 September 2014 CF4 Surface Water and Tree Plot Area Ground Water Sampling Event Results

4.3.1 Surface Water Sampling Results

The surface water sampling event conducted in September 2014 included the collection of four samples from locations listed below in Table 17. All locations are shown on Figure 3. At the time these samples were collected the side channel was not considered to be a suitable habitat for young-of-year endangered fish species because at the time it was connected to the main channel in both the upriver and downriver directions. The results and comparisons to the applicable EPA criteria for both acute and chronic concentrations (along with the temperature and pH data used to calculate these concentrations) are also included in Table 17.

Table 17. September 2014 Surface Water Ammonia Concentrations and Comparisons to EPA Acute and Chronic Criteria

Location	Date	Temp (°C)	pH	Ammonia as N (mg/L)	EPA - Acute Total as N (mg/L) ¹	EPA - Chronic Total as N (mg/L) ²
0274	09/11/2014	20.7	9.00	0.14	1.4	0.15
0278	09/11/2014	20.91	8.89	0.18	1.6	0.17
CR3	09/11/2014	21.08	9.05	0.14	1.4	0.15
Z	09/11/2014	21.44	8.99	0.26	1.4	0.15

- (1) EPA Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater State (Effective April 2013), Table N.4, Temperature and pH-Dependent Values, Acute Concentration of Total Ammonia as N (mg/L)
(2) EPA Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater State (Effective April 2013), Table 9, Temperature and pH-Dependent Values, Chronic Concentration of Total Ammonia as N (mg/L)

Based on the information provided in Table 17, the ammonia concentrations from locations 0274, 0278, CR3, and Z were all below the acute criteria. However, the concentrations measured at locations 0278 and Z were just above the chronic criteria (0.01 and 0.11 mg/L above, respectively). There were no fish observed when the samples were collected, and by definition this area was not considered to be a suitable habitat for young-of-year fish. According to the EPA, the chronic criteria is a 30-day average that is not to be exceeded 2.5 times as a 4-day average. In addition, this average must not be exceeded more than once in three years. The data presented in the table is from one sample at each location that was collected on one day and does not represent a 4-day average. Figure 13 presents the ammonia concentrations along the side channel off CF4.

4.3.2 Tree Plot Area Ground Water Sampling Results

The locations sampled during this event in the vicinity of the tree plot, located upgradient of CF3 (Figure 2), were subsequently sampled during the November/December 2014 site-wide event, and both results are discussed in Section 4.6.

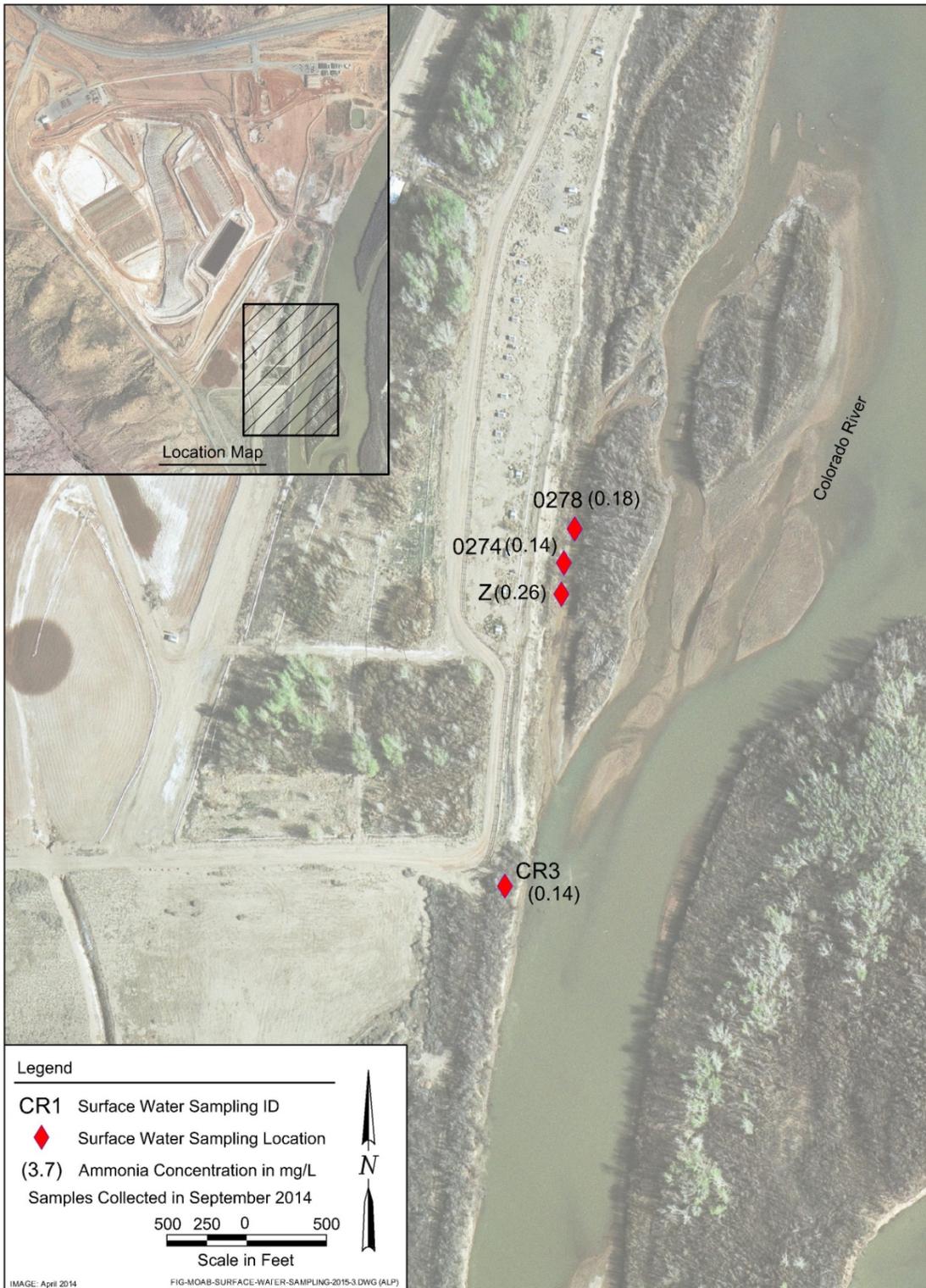


Figure 13. September 2014 Surface Water Ammonia Concentrations

4.4 November/December 2014 Site-wide Sampling Event

All samples collected during this event were analyzed for both ammonia and uranium. Table 18 presents the site-wide locations and associated concentrations that exceeded the 0.044 mg/L uranium ground water standard, which is based on Table 1 in Title 40 Code of Federal Regulations Part 192, Subpart A (40 CFR 192A), “Standard for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites,” assuming uranium-234 and uranium-238 activities are in equilibrium.

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 base of the tailings pile, northeastern uranium plume (which includes the PW03 cluster), the southeastern base of the tailings pile, along the southwestern boundary, along the Colorado River bank, and south of the site. All results are also plotted against the Colorado River flow to determine if the river stage may impact the concentrations. Any results based on analysis using the ammonia probe are also displayed.

4.4.1 Northeastern Base of Tailings Pile

Figures 14 and 15 are time versus ammonia and uranium concentration plots, respectively, for these locations. The ammonia concentrations in the samples collected from UPD-17 and UPD-18 have rebounded since June 2014, and as of December 2014 they are similar (280 and 290 mg/L, respectively) and comparable to the concentrations measured in December 2012. The uranium concentrations have exhibited less fluctuation compared to the ammonia concentrations, and ranged from 0.8 to 1.3 mg/L over the past two years (Figure 15).

4.4.2 Northeastern Uranium Plume Area

Due to the number of wells associated with the northeastern uranium plume, this area of the site was further subdivided into the center of the plume, the vicinity of the Atlas building, and the northeastern edge of the plume area.

4.4.3 Center of Northeastern Uranium Plume Area

Figures 16 and 17 are the time versus ammonia and uranium concentration plots, respectively, for the center of the northeastern uranium plume area, which includes locations 0411, 0413, 0414, and UPD-20. As displayed in Figure 16, the ammonia concentrations have remained consistently below 5 mg/L in the samples collected from wells UPD-20 and 0411. Concentrations have ranged from 46 to 53 mg/L in samples collected from 0413, and after steadily increasing from 12 to 50 mg/L between June 2013 and August 2014, and concentration decreased to 40 mg/L in November 2014.

The uranium concentrations have not significantly changed in the samples collected from wells 0413, 0414, and UPD-20 since December 2012 (Figure 17). The sample collected from well 0411 increased from 1.7 to 4.9 mg/L from June 2013 to June 2014, and then decreased to 2.3 mg/L in December 2014.

Table 18. November/December 2014 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	11/20/2014	CF2 Vicinity	18	1.7
0403	11/24/2014	CF1 Vicinity	18	0.34
0404	11/20/2014	CF3 Vicinity	18	1.3
0407	11/24/2014	CF1 Vicinity	17	0.86
0410	12/2/2014	NE Uranium Plume Area	23.5	0.53
0411	12/3/2014	NE Uranium Plume Area	9	2.3
0412	11/14/2014	NE Uranium Plume Area	9.5	1.6
0413	11/17/2014	NE Uranium Plume Area	10.5	3.1
0414	11/19/2014	NE Uranium Plume Area	7.5	3.2
0439	12/2/2014	On Tailings Pile	120	1.2
0453	12/2/2014	Along SW Site Boundary	80	2.0
0454	11/17/2014	Along SW Site Boundary	13	2.0
0492	11/17/2014	Along S Site Boundary	18	0.20
0683	11/24/2014	CF3 Vicinity / Tree Plot	27	1.2
0684	11/25/2014	CF3 Vicinity / Tree Plot	18	1.3
0732	11/25/2014	Infiltration Trench / Tree Plot	18	1.1
0733	11/25/2014	Infiltration Trench / Tree Plot	18	1.1
AMM-2	11/17/2014	Near Base of Tailings Pile	48	2.0
AMM-3	11/24/2014	Near Base of Tailings Pile	48	1.3
MW-3	11/17/2014	CF5 Vicinity	44	2.7
SMI-MW01	11/24/2014	NE Uranium Plume Area	16	4.8
SMI-PW02	12/11/2014	CF5 Vicinity	55	3.3
SMI-PZ1S	11/17/2014	CF5 Vicinity	19	1.2
SMI-PZ2M2	11/17/2014	CF5 Vicinity	56	2.9
SMI-PZ3D2	12/3/2014	NE Uranium Plume Area	78	0.83
SMI-PZ3M	12/3/2014	NE Uranium Plume Area	59	1.1
SMI-PZ3S	12/3/2014	NE Uranium Plume Area	25	1.6
TP-01	11/14/2014	NE Uranium Plume Area	22	0.075
TP-22	11/14/2014	NE Uranium Plume Area	17	0.35
TP-23	11/17/2014	NE Uranium Plume Area	25	3.5
UPD-17	12/2/2014	NE Uranium Plume Area	14	1.3
UPD-18	12/2/2014	NE Uranium Plume Area	13	0.81
UPD-20	12/3/2014	NE Uranium Plume Area	17	0.064
UPD-21	12/3/2014	NE Uranium Plume Area	25	18.0
UPD-22	11/19/2014	NE Uranium Plume Area	9	2.9
UPD-23	11/14/2014	NE Uranium Plume Area	26	0.74
UPD-24	12/3/2014	NE Uranium Plume Area	27	10.0

NE = northeastern; SW = southwestern

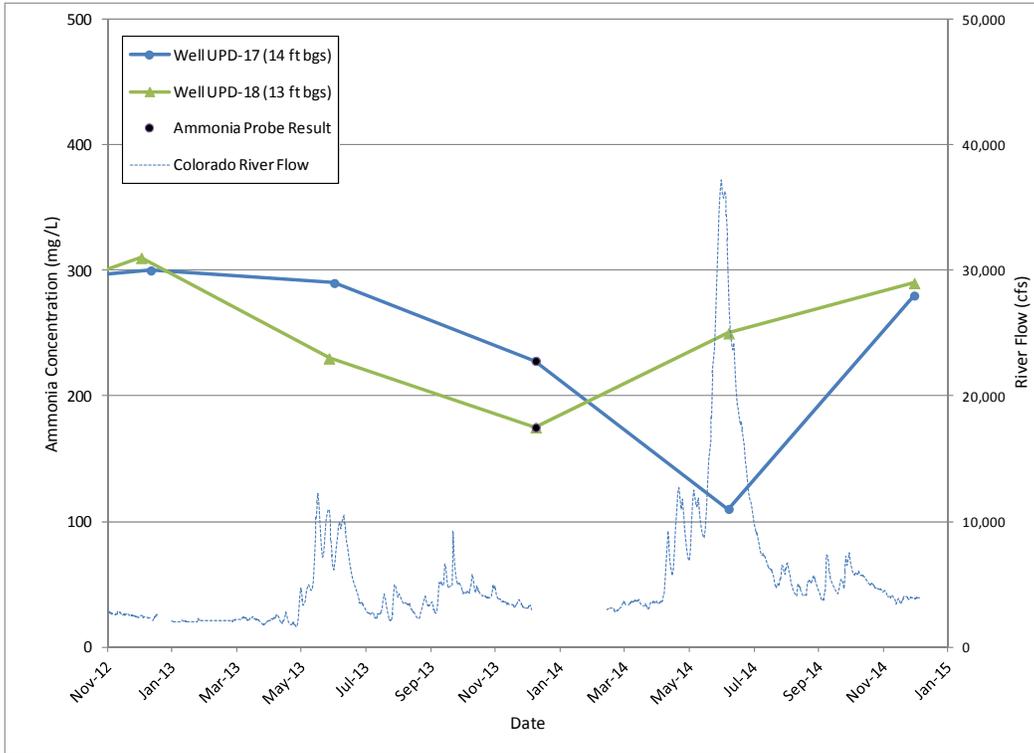


Figure 14. Wells UPD-17 and UPD-18
Time versus Ammonia Concentration Plot

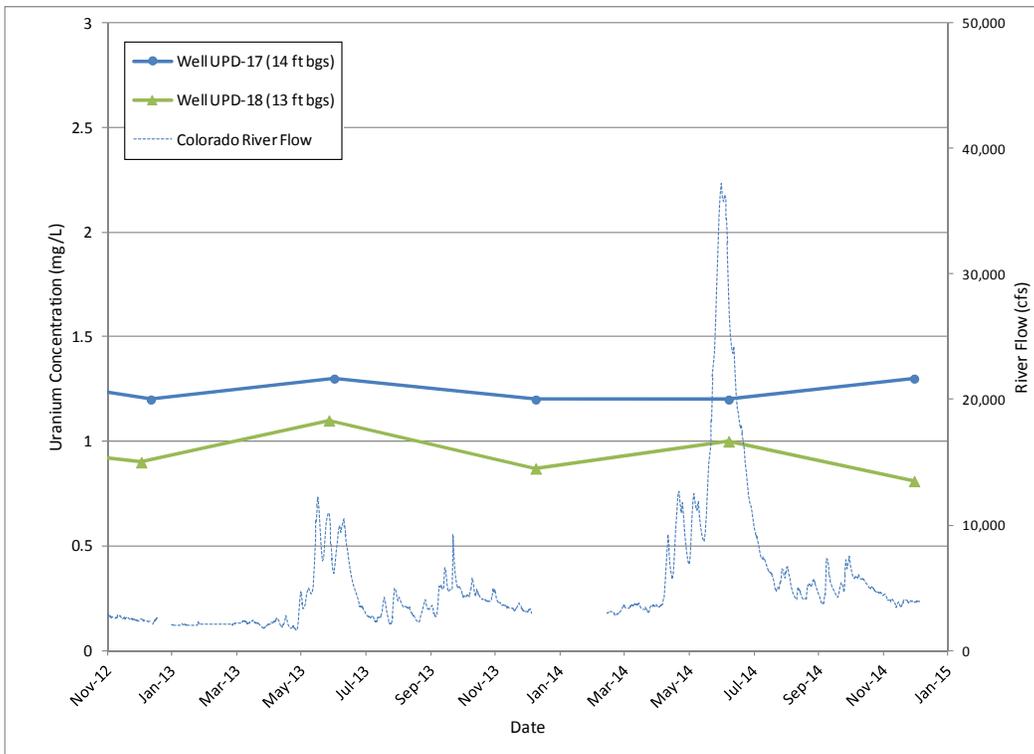


Figure 15. Wells UPD-17 and UPD-18
Time versus Uranium Concentration Plot

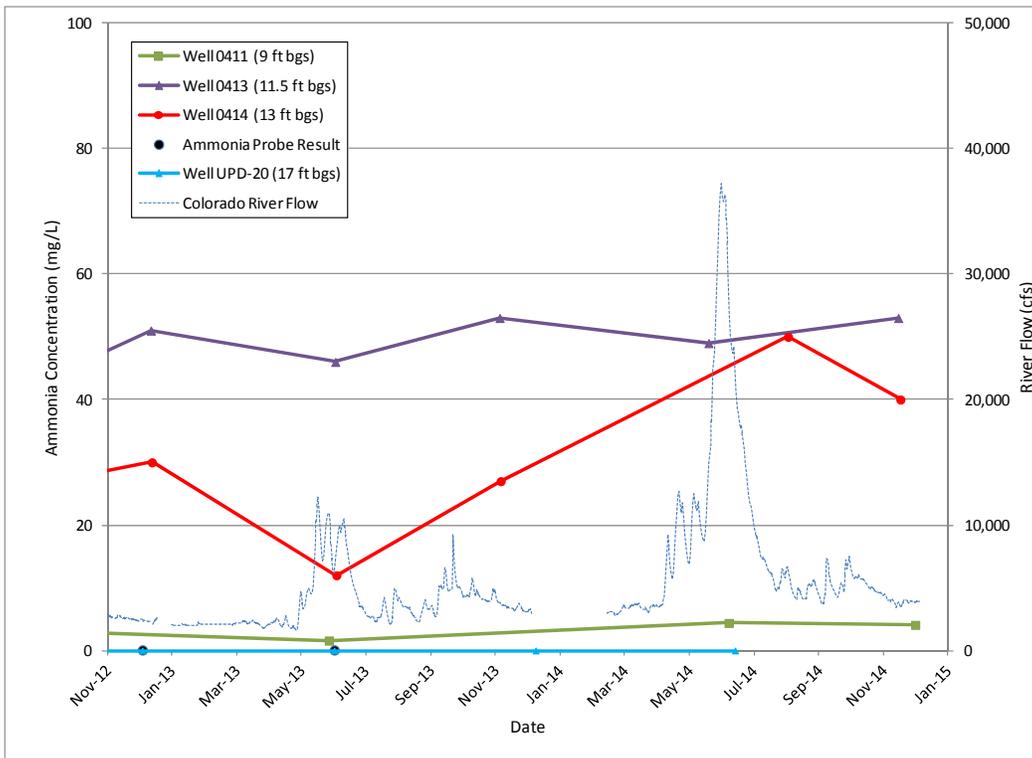


Figure 16. Center of Northeastern Uranium Plume Area Observation Wells 0411, 0413, 0414, and UPD-20 Time versus Ammonia Concentration Plot

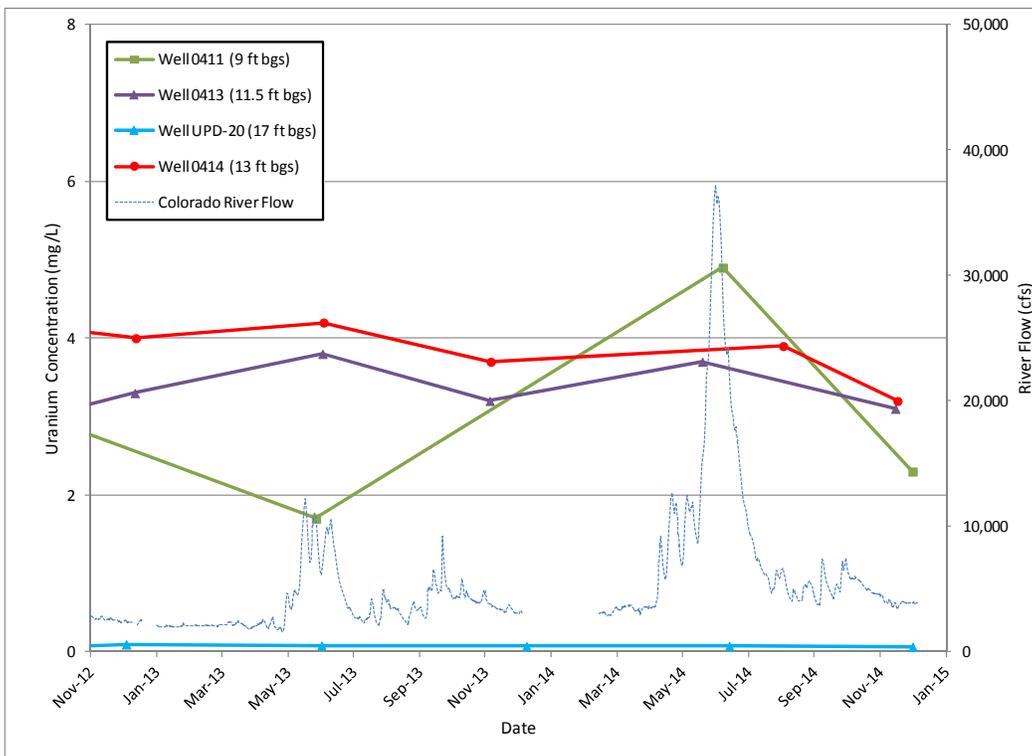


Figure 17. Center of Northeastern Uranium Plume Area Observation Wells 0411, 0413, 0414, and UPD-20 Time versus Uranium Concentration Plot

4.4.4 Atlas Building Vicinity

The ammonia and uranium concentrations associated with samples collected from locations in the vicinity of the Atlas building are displayed in Figures 18 and 19, respectively. These wells include 0410, UPD-21, UPD-23, and UPD-24. Wells UPD-23 and UPD-24 were installed in the winter of 2012 to better define the extent of the elevated uranium concentrations detected in the samples collected from well UPD-21. This sampling event represents the fourth time these new wells were sampled.

As shown in Figure 18, the ammonia concentrations in the samples collected from wells 0410, UPD-23, and UPD-24 have not changed significantly and all remain less than 5 mg/L. After steadily decreasing from 13.1 to 3.3 mg/L between December 2013 and June 2014, the concentration in the sample collected from well UPD-21 increased to 10 mg/L.

A similar trend was observed in the uranium concentration in the sample from UPD-21, where the concentration significantly increased from 5.8 to 18 mg/L. This concentration exceeds the historic high of 13 mg/L measured in the sample collected in November 2011. The concentration in the sample from UPD-24 also increased since June 2014, but it was below the historical maximum. Figure 19 also displays that the uranium concentrations in samples collected from wells 0410 and UPD-23 remain below 1 mg/L. It is not clear as to why the concentration increased to 18 mg/L in UPD-21, as there were no site activities that may have contributed to such a change.

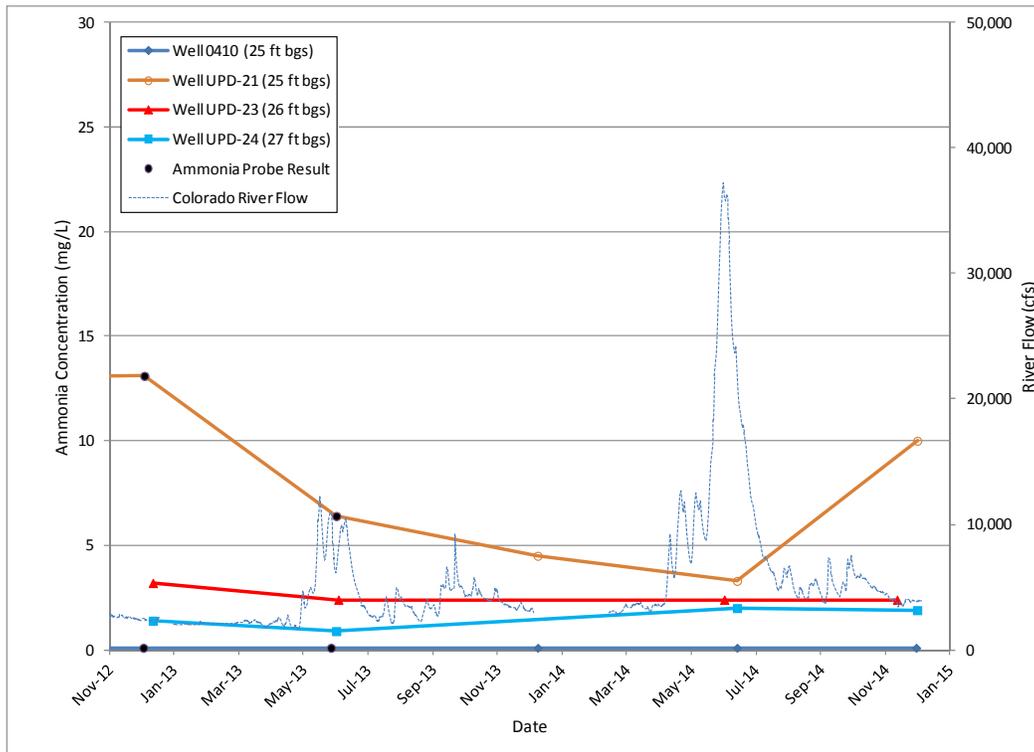


Figure 18. Vicinity of Atlas Building Observation Wells 0410, UPD-21, UPD-23, and UPD-24 Time versus Ammonia Concentration Plot

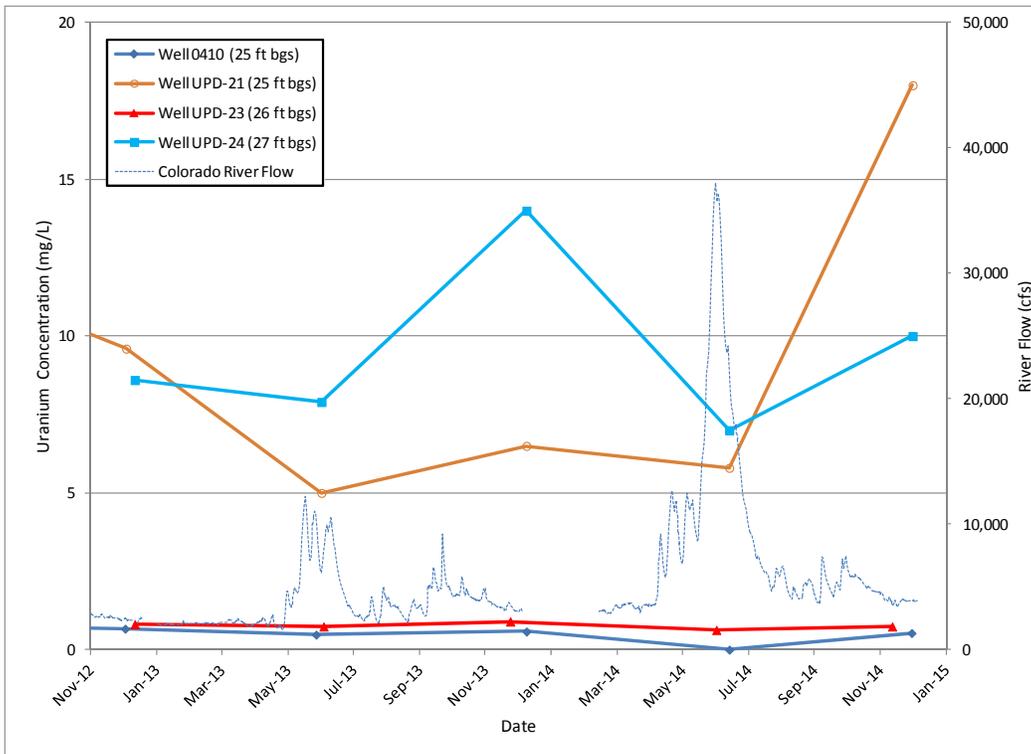


Figure 19. Vicinity of Atlas Building Observation Wells 0410, UPD-21, UPD-23, and UPD-24 Time versus Uranium Concentration Plot

4.4.5 Northeastern Edge of Uranium Plume Area

Figures 20 and 21 display ammonia and uranium concentration data for the wells located in the vicinity of the northeastern edge of the plume area (wells 0412, UPD-22, SMI-MW01, and SMI-PZ3S). As Figure 20 exhibits, with the exception of the ammonia concentration in the sample collected from UPD-21, the concentrations have remained consistent since May 2013. During this time the ammonia concentration from UPD-21 decreased from 4.4 to 1.7 mg/L.

There is no general trend associated with the uranium concentrations (Figure 21). In the past two years uranium concentrations associated with well 0412 decreased from 3.4 to 1.6 mg/L, while the concentrations in wells SMI-PZ3S and UPD-22 concentrations have ranged from 1 to 2 mg/L and 2.6 to 3.9 mg/L, respectively. Of this group of wells, only SMI-MW01 exhibited a gradually increase, from 3.8 to 4.8 mg/L.

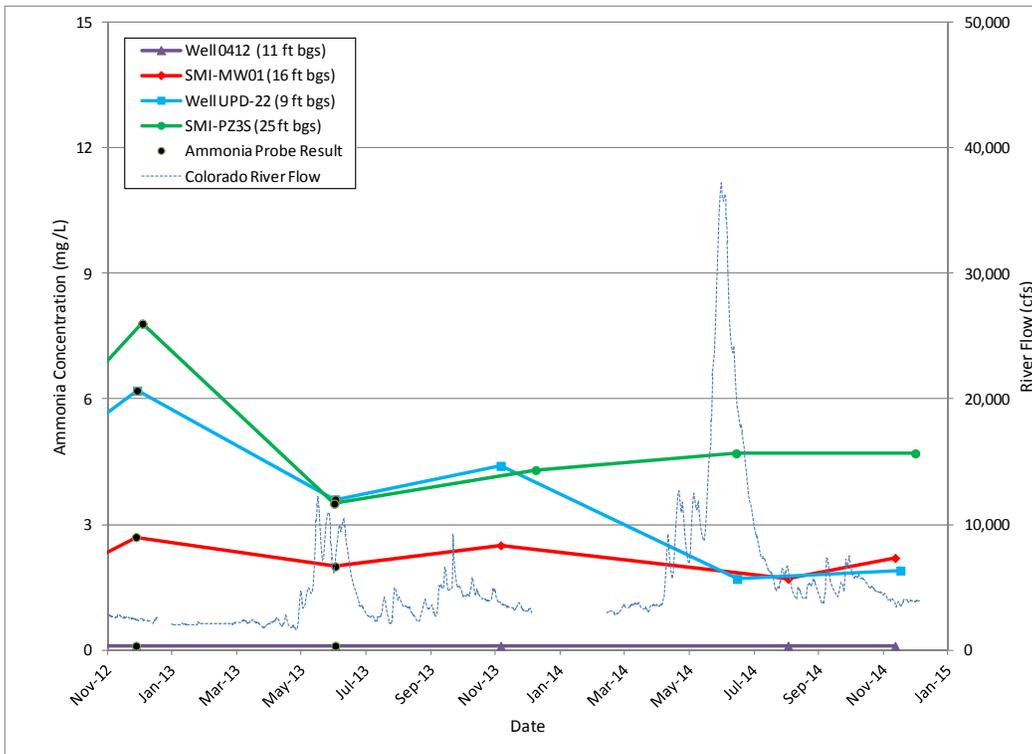


Figure 20. Northeastern Edge of Uranium Area Observation Wells 0412, SMI-MW01, SMI-PZ3S, and UPD-22 Time versus Ammonia Concentration Plot

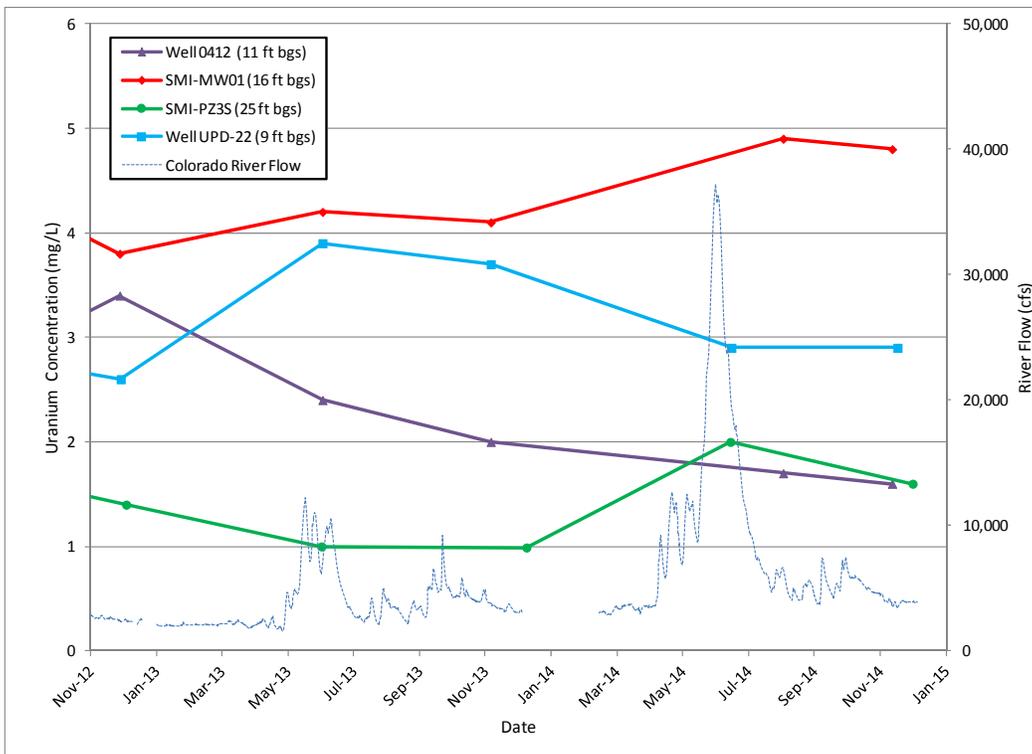


Figure 21. Northeastern Edge of Uranium Area Observation Wells 0412, SMI-MW01, SMI-PZ3S, and UPD-22 Time versus Uranium Concentration Plot

4.4.6 Base of Tailings Pile

The time versus ammonia and uranium concentration plots for the area near the base of the tailings pile are presented in Figures 22 and 23 for wells AMM-3, ATP-2-S, ATP-2-D, and AMM-2 (listed from south to north). As Figure 22 exhibits, while there has been some fluctuation over the past two years, since November 2012 the ammonia concentrations measured in November/December 2014 are all within 20 percent of each other.

Uranium concentrations in wells ATP-2-S (sample depth 25 ft bgs) and ATP-2-D (sample depth 88 ft bgs) have consistently been below 0.01 mg/L since 2010. Figure 23 suggests the uranium concentrations associated with the sample collected from AMM-3 exhibits a strong seasonal fluctuation, which may be a function of the flooding of this area or irrigation activities over the past 2 years.

4.4.7 Southwestern Boundary

Figures 24 and 25 display the time versus concentration plots for the locations along the southwestern boundary presented in the upgradient to downgradient ground water flow direction (towards the south east). Ammonia concentrations in the sample collected from well 0440, the furthest upgradient location, have been below 0.1 mg/L since 2009. Figure 24 displays the gradual increase measured in the sample associated with well 0454 since May 2013, from 220 to 400 mg/L, while over the same time period the concentrations from 0453 have ranged from 240 to 420 mg/L. The sample collected from well 0440 continues to have a uranium concentration below the 0.044 mg/L UMTRA standard, since 2009. While the uranium concentrations have fluctuated in samples collected from wells 0453 and 0454 (Figure 25).

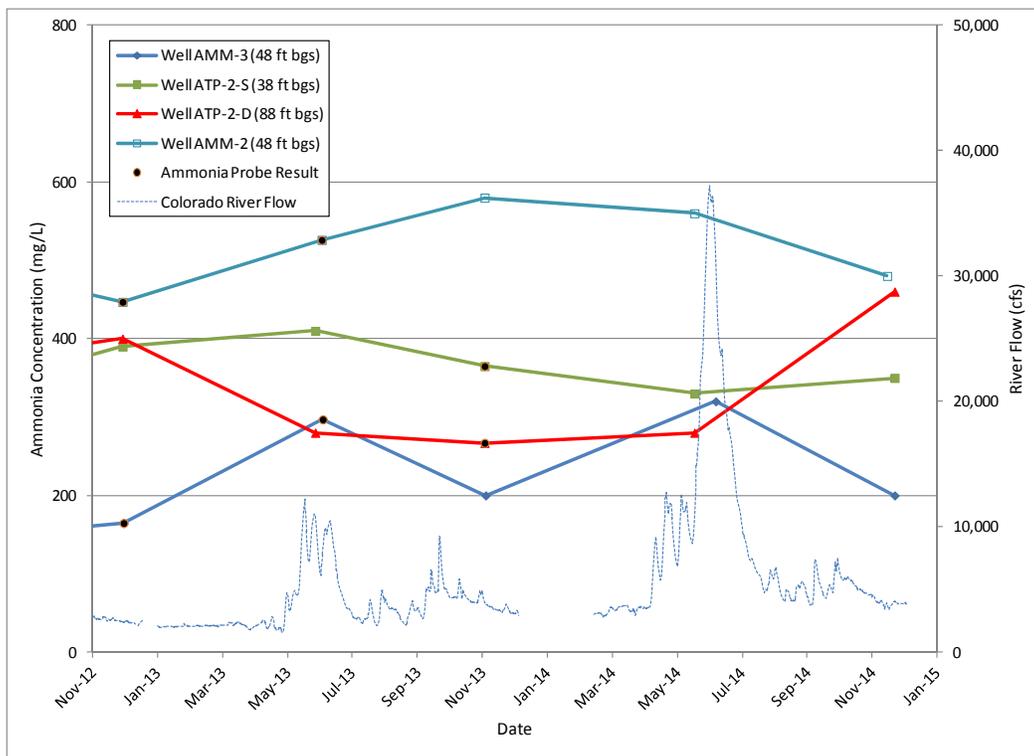


Figure 22. Base of Tailings Pile Observation Wells AMM-3, ATP-2-S, ATP-2-D, and AMM-2 Time versus Ammonia Concentration Plot

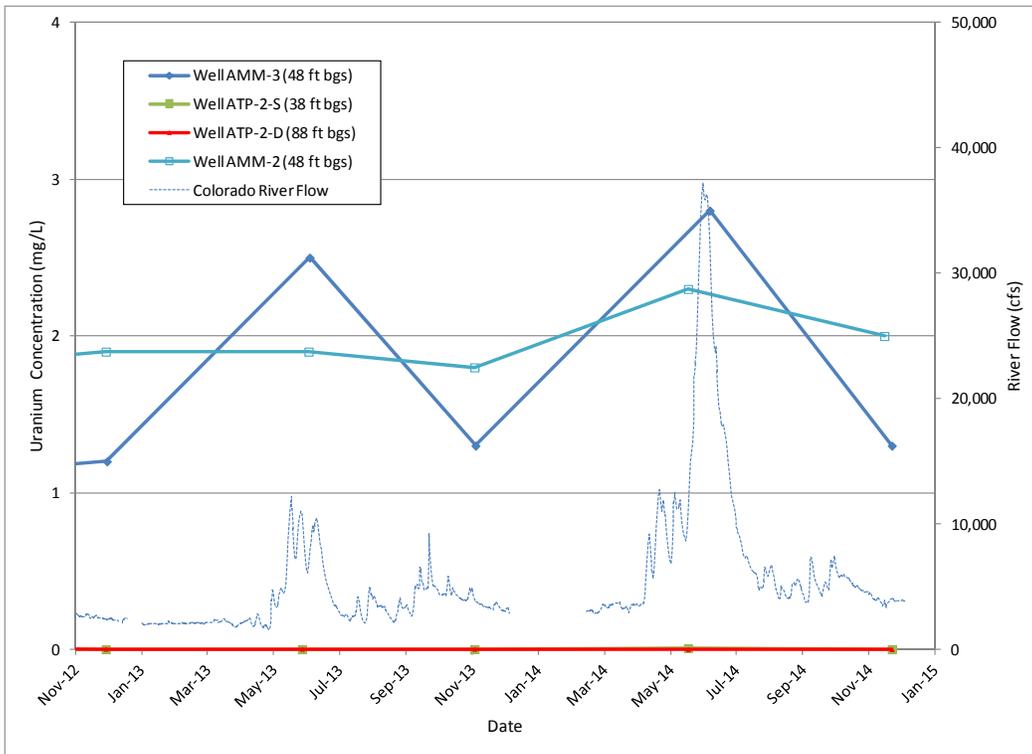


Figure 23. Base of Tailings Pile Observation Wells AMM-3, ATP-2-S, ATP-2-D, and AMM-2 Time versus Uranium Concentration Plot

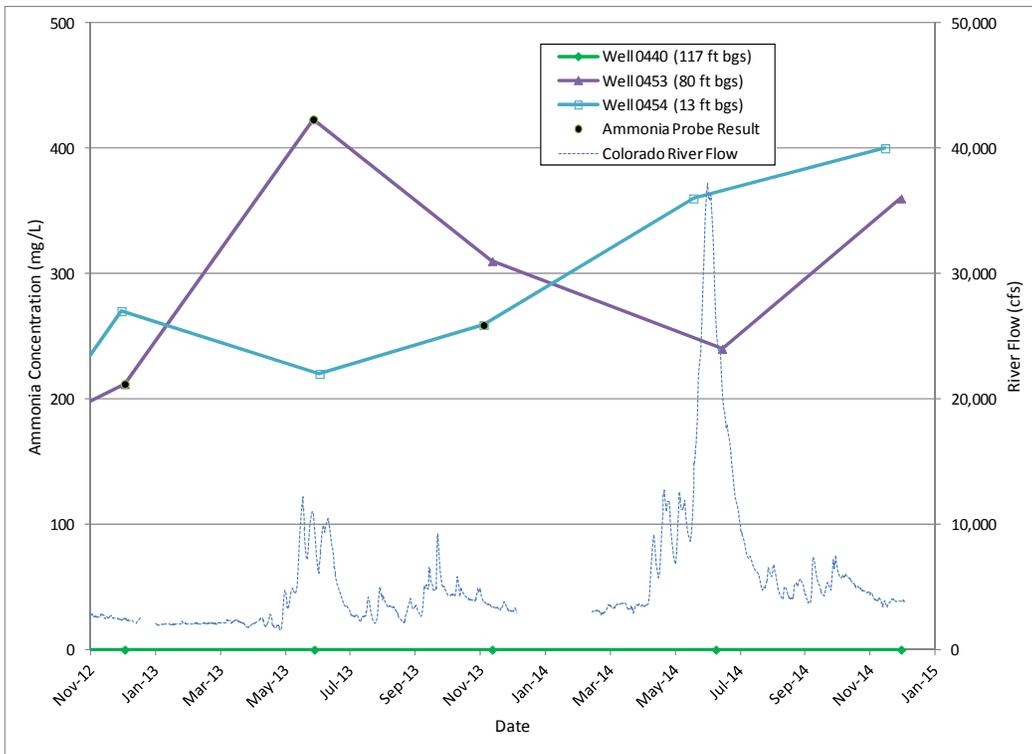


Figure 24. Southwestern Boundary Observation Wells 0453, 0454, and 0440 Time versus Ammonia Concentration Plot

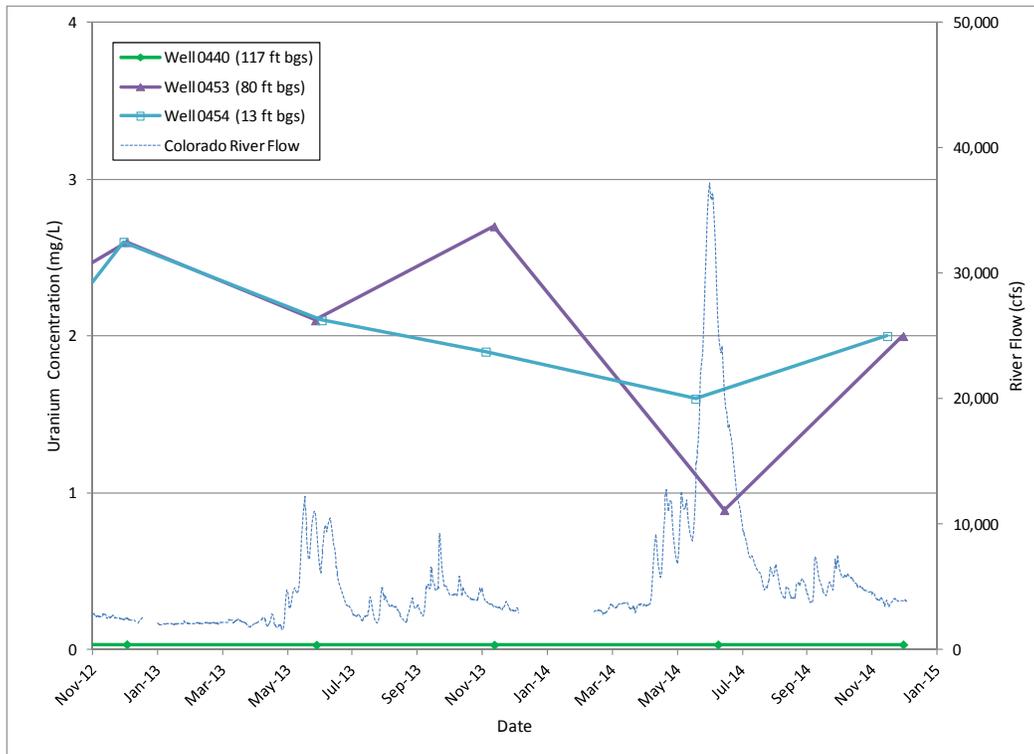


Figure 25. Southwestern Boundary Observation Wells 0453, 0454, and 0440 Time versus Uranium Concentration Plot

4.4.8 Riverbank Area

Figures 26 and 27 are the time versus ammonia and uranium concentration plots, respectively, for the locations sampled along the riverbank, presented from south to north (wells 0492, 0407, 0401, 0404, and TP-01). Because all these wells are located along the river bank, their water chemistry is heavily influenced by the seasonal changes of the Colorado River stage. As expected, near the middle of the river bank, the ammonia concentrations have rebounded since May 2014. Ammonia concentrations historically have been low at the southern and northern ends of the site and increase near the middle.

A similar trend is evident for the uranium concentrations measured at these locations (Figure 27). Samples collected from wells 0492, 0407, 0401, 0404 all had uranium concentrations that started to rebound after the 2014 spring runoff river flows.

4.4.9 Southern and Off-site Areas

Figures 28 and 29 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. It was not possible to safely access well TP-19 due to site conditions, and a sample was not collected. Typically ammonia and uranium concentrations are low at these locations because they are screened within the brine. Ammonia concentrations (Figure 28) in samples collected from TP-17 and TP-20 remain below 4 mg/L, with no significant changes since May 2013. The uranium concentrations (Figure 29) have consistently been below the 0.044 mg/L UMTRA standard over the past 2 years.

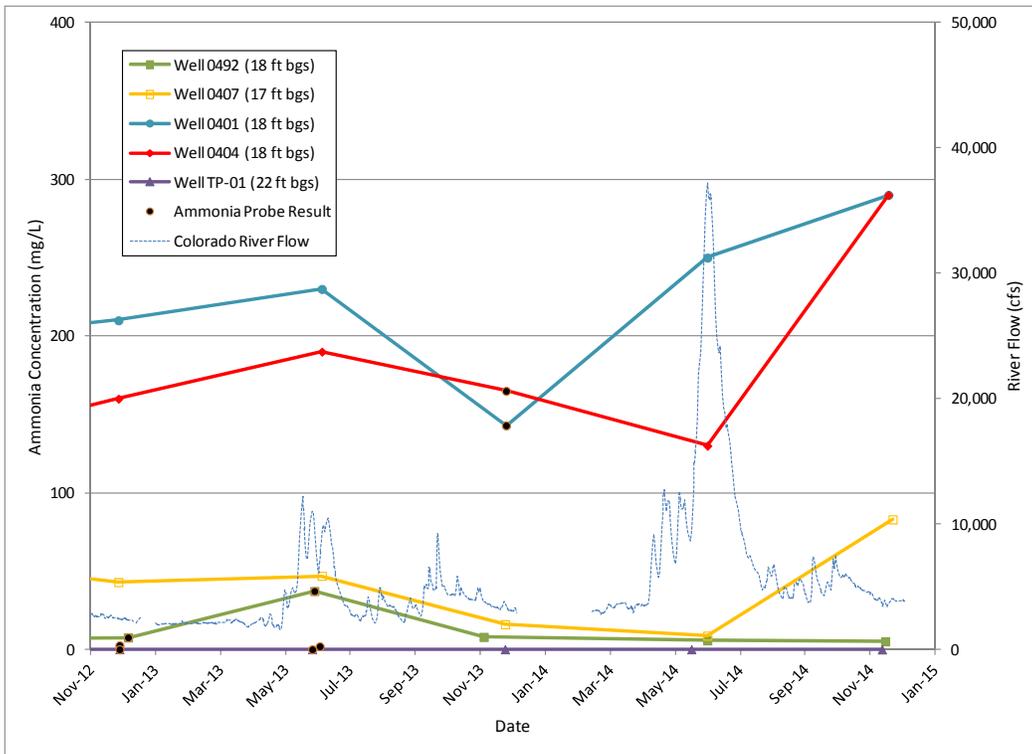


Figure 26. Riverbank Observation Wells 0492, 0401, 0404, and TP-01 Time versus Ammonia Concentration Plot

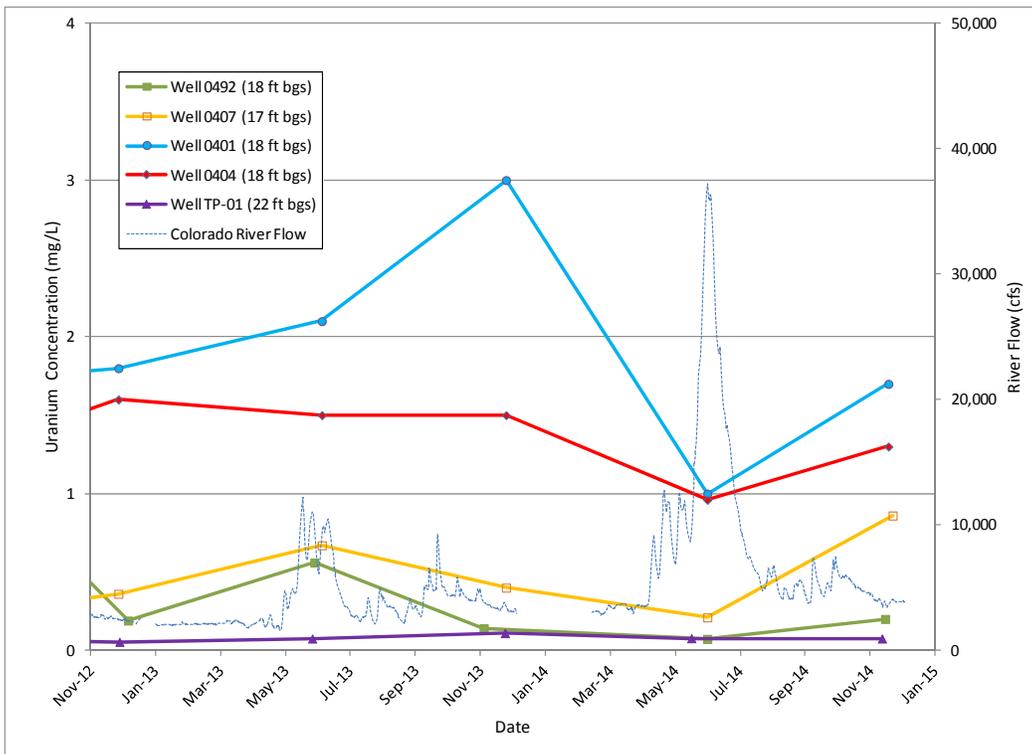


Figure 27. Riverbank Observation Wells 0492, 0401, 0404, and TP-01 Time versus Uranium Concentration Plot

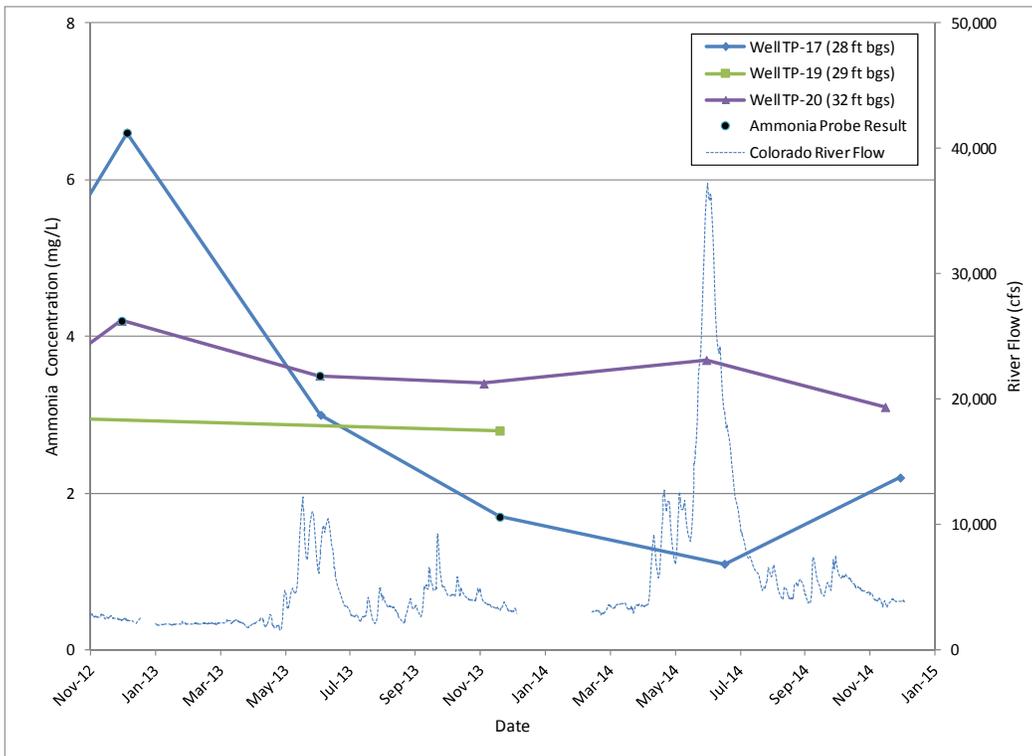


Figure 28. South of Site Observation Wells TP-17, TP-19, and TP-20 Time versus Ammonia Concentration Plot

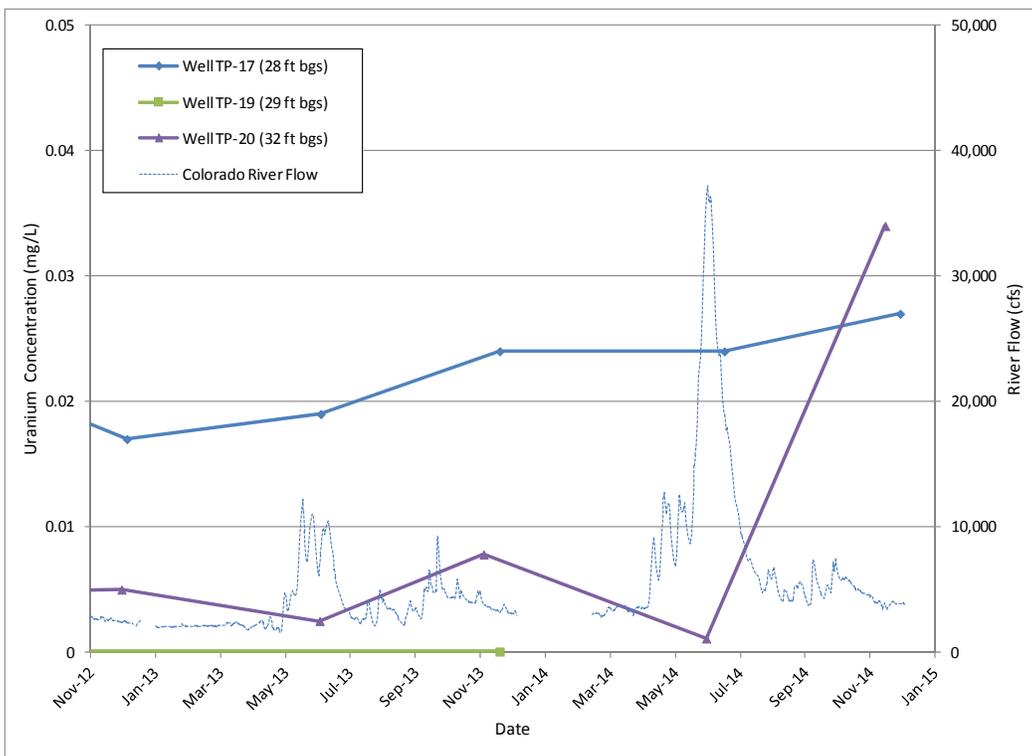


Figure 29. South of Site Observation Wells TP-17, TP-19, and TP-20 Time versus Uranium Concentration Plot

4.4.10 Surface Water Sampling Results

Table 19 presents the ammonia results from the surface water sampling conducted in November/December 2014 from locations 0201, 0218, 0226, CR1, CR2, CR3, and CR5 (as shown on Figure 3). The ammonia concentrations and comparisons to the applicable EPA criteria for both acute and chronic concentrations (along with the temperature and pH data used to calculate these concentrations) are shown in Table 19. The ammonia concentrations measured during this event, all of which were below 1 mg/L, were below both the acute and chronic criteria.

Table 19. November/December 2014 Surface Water Ammonia Concentrations and Comparisons to EPA Acute and Chronic Criteria

Location	Date	Temp (°C)	pH	Ammonia as N (mg/L)	EPA - Acute Total as N (mg/L)*	EPA - Chronic Total as N (mg/L)**
0201	12/01/14	6.70	8.32	<0.1	4.9	1.1
0218	12/01/14	6.45	8.07	<0.1	7.3	1.5
0226	12/11/14	5.29	8.00	<0.1	8.8	1.8
CR1	12/01/14	6.38	8.21	<0.1	6.0	1.3
CR2	12/01/14	6.78	8.11	0.52	7.3	1.5
CR3	12/01/14	7.76	8.05	0.89	7.3	1.5
CR5	12/01/14	7.42	8.28	<0.1	4.9	1.1

*U.S. EPA Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater State (Effective April 2013), Table N.4, Temperature and pH-Dependent Values, Acute Concentration of Total Ammonia as N (mg/L)

**U.S. EPA Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater State (Effective April 2013), Table 9, Temperature and pH-Dependent Values, Chronic Concentration of Total Ammonia as N (mg/L)

4.5 Tree Plot Area Ground Water Sampling Results

In an attempt to determine if the revegetation tree plots through phytoremediation reduces the ammonia concentrations in ground water, samples were collected from wells 0682, 0683 (both have a sample depth of 28 ft bgs), 0684, 0732, 0733 (sample depth of 18 ft bgs). These locations are just downgradient of the tree plot in the vicinity of CF3 (Figure 2). Water chemistry data from well AMM-2 (sample depth of 48 ft bgs) was also useful because it's located just upgradient of the tree plot area.

The influence of phytoremediation on the ground water system is difficult to determine because of the other hydrogeologic impacts to this area. Flood irrigation has taken place inside the tree plot since 2005/2006, and upgradient to the tree plot since 2010 (when the CF5 well field was installed). Ground water extraction from CF5 (in particular well 0813 which is located approximately 50 ft upgradient of the tree plot) also plays a role. In addition, this area is in close proximity to the river bank and Moab Wash. Previous investigations have shown that ground water underlying this area is impacted by a freshwater lens that develops when the spring runoff river stage is above average, further reducing the ammonia concentrations.

Figure 30 presents the ammonia concentrations measured since 2005 from wells located upgradient and downgradient of the tree plot. The concentration data are plotted with the river stage over this same time period. Typically this area is subjected to flood irrigation between April and September. With the limited data from these wells since 2009 (no sampling occurred due to site extraction and injection operations taking place in other areas of the well field), it is difficult to quantify the impacts of phytoremediation at this time. Subsequent and more frequent sampling of these locations has been scheduled.

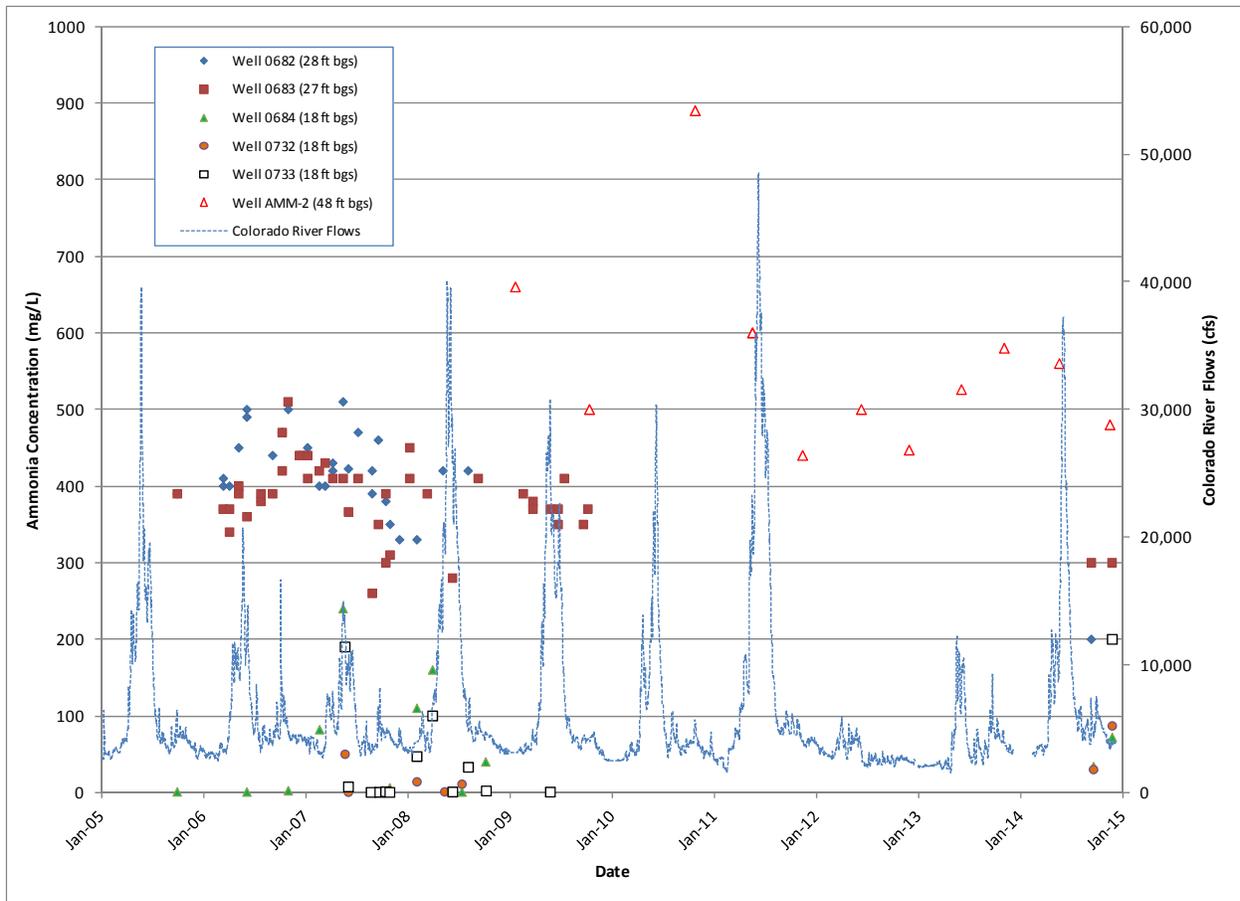


Figure 30. Ground Water Ammonia Concentrations in the Vicinity of the Tree Plot Area

4.6 Ammonia Probe Analysis Results

Previous field results indicated that samples with a high specific conductance impact the instrument accuracy of the Sension2 portable meter with an ammonia gas-sensing, combination probe (model 51927-00). Site-wide samples that had a specific conductance below 20,000 $\mu\text{mhos/cm}$ and analyzed for ammonia using this equipment are presented in Table 20. Sample splits were collected and submitted to ALS for ammonia analysis to determine how the measured concentrations compared to each other, with the results also provided in Table 20.

Figure 31 is a graphical representation displaying the comparison between the ammonia results generated from the analytical laboratory and the ammonia probe. The analytical laboratory and the ammonia probe comparison result with the trendline having an r^2 value of 0.976. This suggests the ammonia field probe provides comparable results for samples with a specific conductance below 20,000 $\mu\text{mhos/cm}$. The fact that the trendline lies below the dashed line representing a perfect match between the two data sets in Figure 31 suggests the field probe tends to measure lower concentrations compared to the method used by the analytical laboratory.

Table 20. Site-wide Ammonia Field Analysis Results Compared to Analytical Laboratory Results

Well Number	Date	Ammonia Concentration (mg/L)	
		Analytical Laboratory Results	Field Results
0401	11/20/2014	290	290
0403	11/24/2014	24	24.2
0404	11/20/2014	290	255
0407	11/24/2014	83	70.8
0411	12/03/2014	4.1	4.03
0439	12/02/2014	9.2	6.90
0492	11/17/2014	5.2	1.80
0683	11/24/2014	300	305
0684	11/25/2014	72	76.7
0732	11/25/2014	87	74.0
0733	11/25/2014	200	196
AMM-3	11/24/2014	200	200
ATP-2-S	11/24/2014	350	264
SMI-PZ3D2	12/03/2014	410	317
SMI-PZ3S	12/03/2014	4.7	4.70
TP-11	11/13/2014	0.84	<1
UPD-17	12/02/2014	280	247
UPD-18	12/02/2014	290	258
UPD-20	12/03/2014	0.1	<1
UPD-21	12/03/2014	10	8.53
UPD-22	11/19/2014	1.9	<1
UPD-24	12/03/2014	1.9	1.72

4.7 Ground Water Surface

Water level data were collected between November 13 and December 11, 2014, when the Colorado River mean daily flows ranged from 3,370 to 4,030 cubic feet per second (cfs), and the river stage at the site ranged from 3,953.6 to 3,954.0 cfs. Because ground water elevations during river base flow conditions do not generally fluctuate significantly during this time of the year, despite the fact that ground water elevations were collected over a month's time, all data collected were used to generate the ground water surface contour map displayed as Figure 32. Ground water flow direction and gradient displayed in this contour map is comparable to historical contour maps previously generated using data during this time of year.

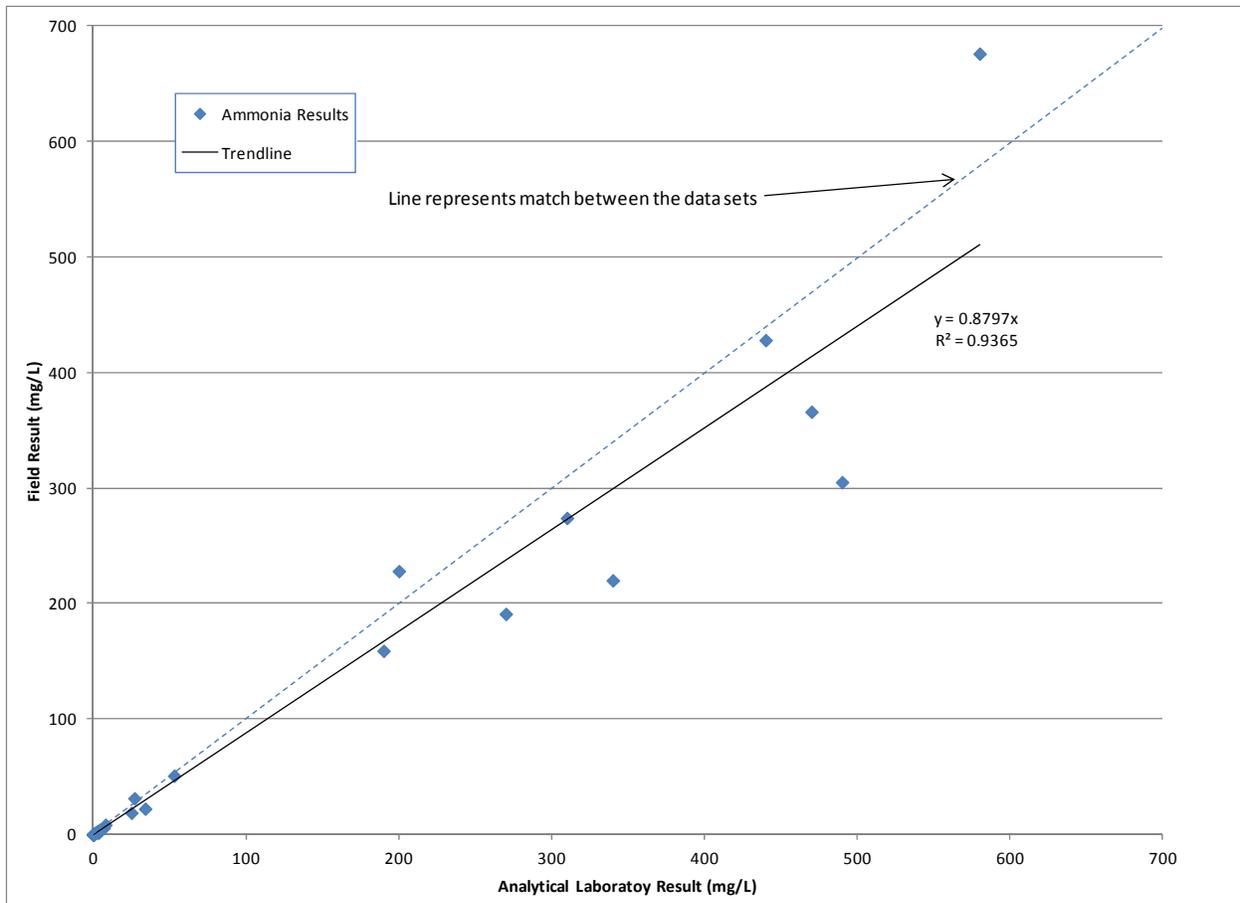


Figure 31. Graphical Comparison of Ammonia Results Generated from the Analytical Laboratory and Field Analyses

4.8 Contaminant Distribution

Figures 33 and 34 are maps showing shallow ground water ammonia and uranium plumes, respectively, using data collected during the November/December 2014 site-wide event. Contaminant distribution is generally comparable to previous plume maps generated using data collected during the past 2 years.

While Figure 34 displays the result associated with well ATP-2-S, this concentration was not taken into consideration for the contour line location. This well is screened over a deeper interval in this shallow zone and is not representative of the uranium concentration in the shallowest ground water.

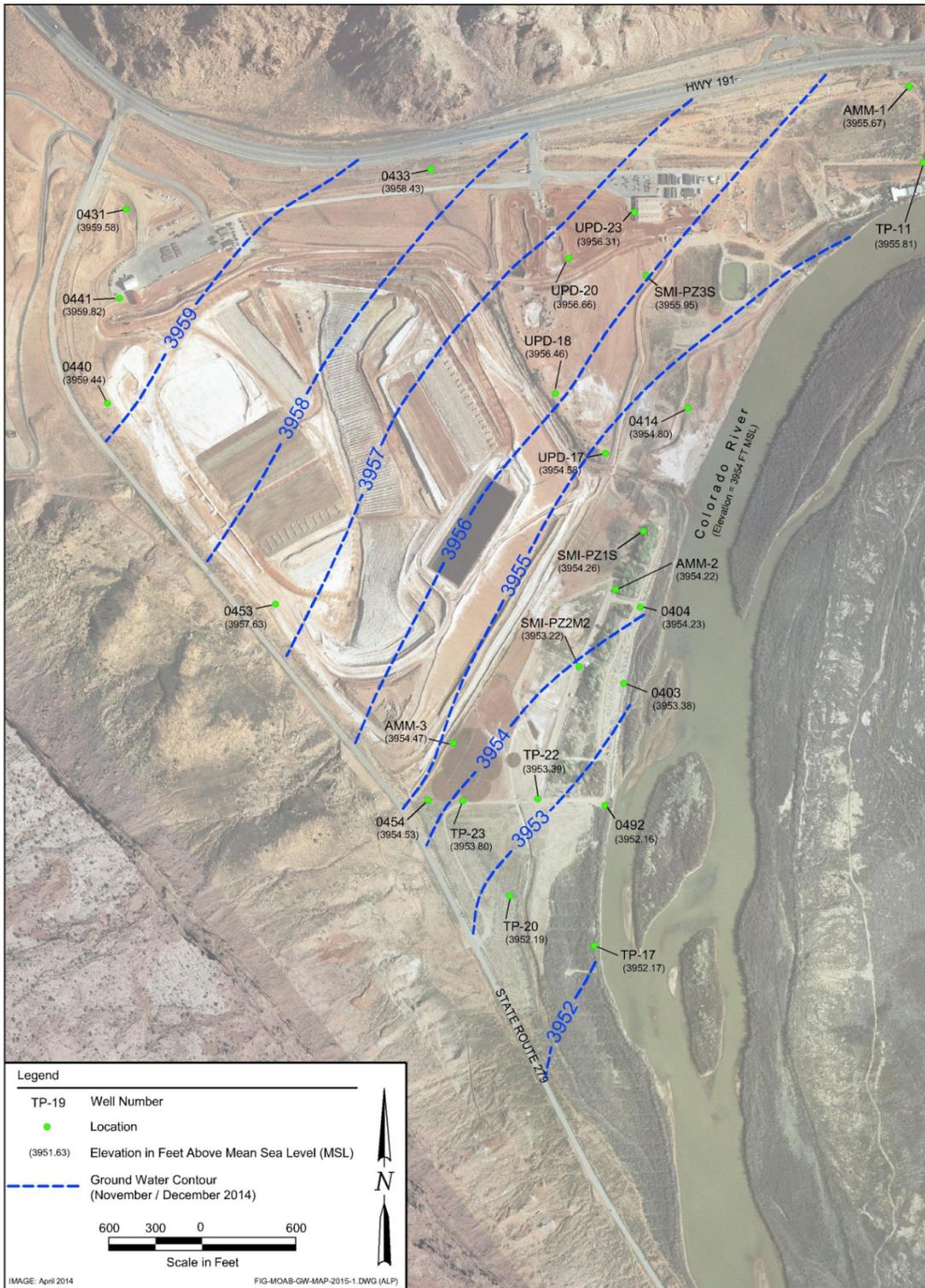


Figure 32. Site-wide Ground Water Elevations, November 13 through December 11, 2014

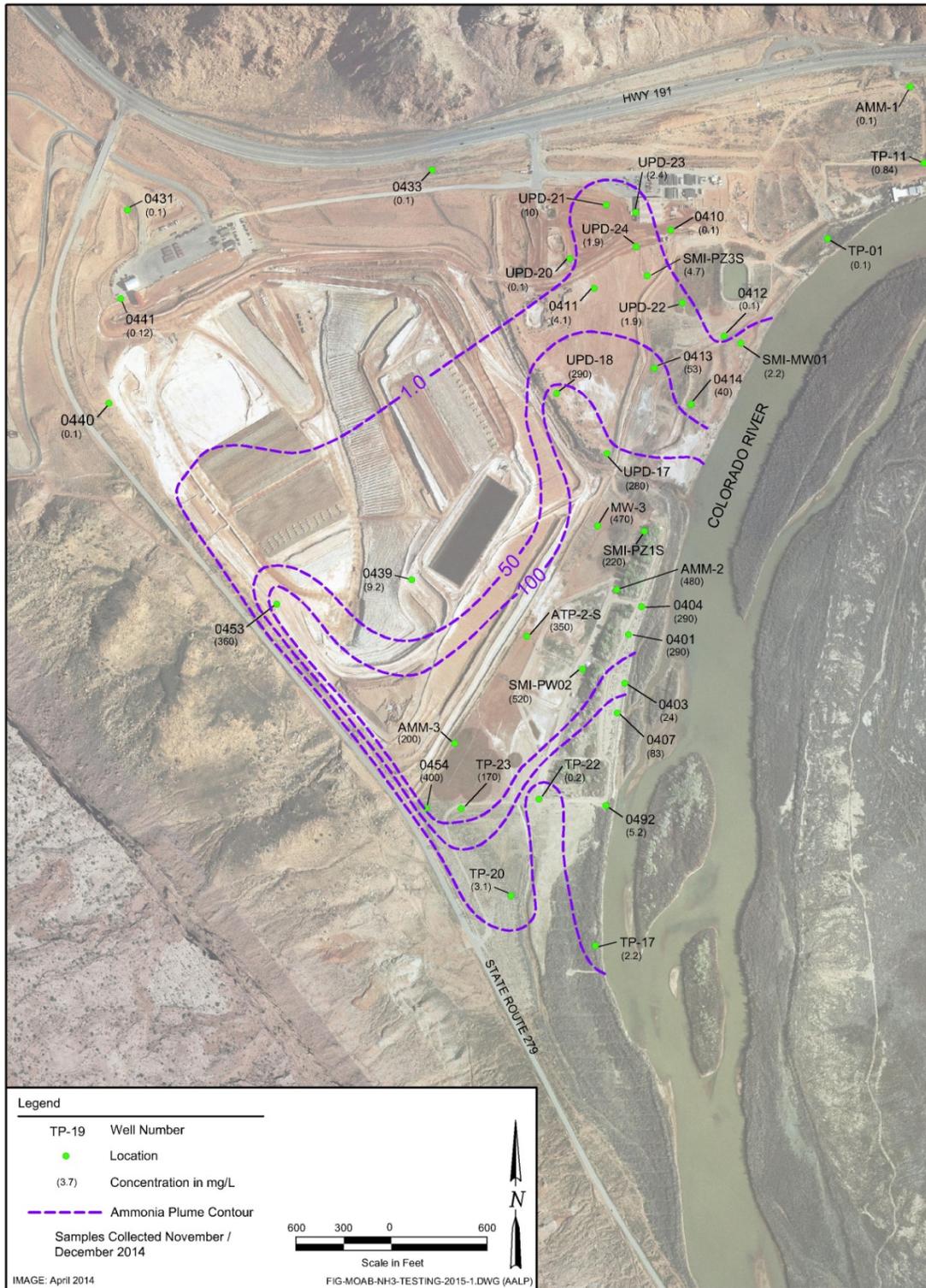


Figure 33. Ammonia Plume in Shallow Ground Water, November/December 2014

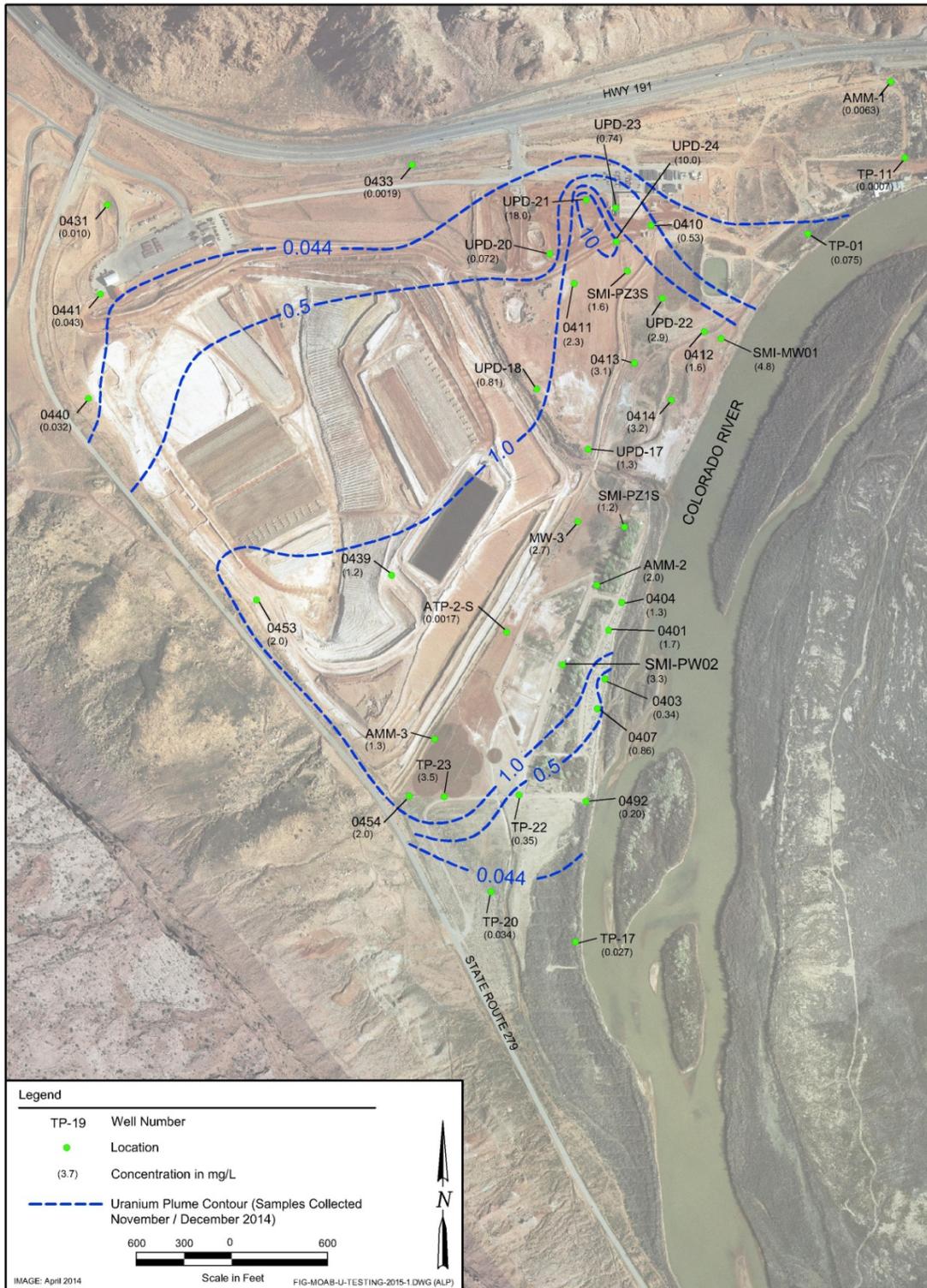


Figure 34. Uranium Plume in Shallow Ground Water, November/December 2014

5.0 Conclusions

5.1 July 2014 CJ Freshwater Pond Sampling Event

In July 2014 the RAC requested the TAC to collect a sample of the fresh water pond at the CJ site and submit the sample for general water quality analytes to determine if this water would be suitable for off-site applications. Analytical results indicated the concentrations were below applicable standards.

5.2 July/August 2014 CF4 and CF5 Ground Water Sampling Event

The rationale for collecting ground water samples from observation wells surrounding the CF4 injection wells and river bed well points in late July 2014 was to evaluate the effectiveness of the freshwater injection system. The results indicate the injection system reduced the ammonia concentrations within the subsurface shallow zone (15 to 35 ft bgs). Water elevation data confirmed up to 10 ft of mounding was generated from this system.

CF5 wells were sampled to monitor contaminant concentration trends and update the contaminant concentrations used for the mass removal calculations. Ammonia and uranium concentrations in general have not significantly changed over the past 2 years.

As a follow up to the May/June 2014 site-wide sampling event, five locations that were inaccessible due to site flooding were sampled in August 2014.

With the exception of three samples analyzed for ammonia (which were more than 50 percent below the historical minimum) and one for uranium (which was more than 50 percent above the historical maximum), all ammonia and uranium concentrations associated with this event were within 50 percent of historical ranges during this sampling event.

5.3 September 2014 CF4 Surface Water and Tree Plot Area Ground Water Sampling Event

According to the U.S. Fish and Wildlife Service definition, this side channel was not a suitable habitat when these samples were collected in September 2014. The samples were collected when the river flows increased to above 7,000 cfs in response to a significant precipitation event, and the CF4 side channel was open in both the upstream and downstream directions. Even with the higher flows flowing through the channel, results indicated the ammonia concentrations were below the EPA acute criteria, yet two of the four samples had concentrations just above the chronic criteria.

Eight ground water samples in the vicinity of the tree plot area (near CF3) were sampled to determine if phytoremediation had impacted ammonia concentrations in the down gradient direction. Because of ground water extraction shifting from this area to CF5 and injection restricted to CF4 (due to the side channel habitat potential development), these wells had not been sampled since 2008/2009. These results were included with subsequent November 2014 sampling results.

All ammonia and uranium concentrations associated with this event were within 50 percent of historical ranges during this sampling event.

5.4 November/December 2014 Site-wide Sampling Event

The rationale for conducting the November/December 2014 site-wide sampling event was to collect data from the site when the Colorado River typically experiences base flows and to assess any changes and trends in the ground water system water chemistry. Surface water sampling was also conducted to assess surface water quality adjacent to the site compared to the upstream and downstream water quality.

In general, the ammonia and uranium concentrations did not significantly change since the previous site-wide sampling event in May/June 2014. Concentrations associated with locations impacted by the river stage tend to increase during seasonal river base flows.

With the exception of two samples analyzed for ammonia (which were more than 50 percent above the historical maximum), all ammonia and uranium concentrations in the site-wide wells were within 50 percent of historical ranges during this sampling event. All surface water samples collected during this sampling event had ammonia concentrations below the applicable state of EPA criteria (for a suitable habitat) for both acute and chronic concentrations.

The influence of phytoremediation on the ground water system is difficult to determine because of the other hydrogeologic impacts to the tree plot area, in the vicinity of CF3. Flood irrigation between the months of April and September has taken place inside the tree plot since 2005/2006, and upgradient to the tree plot since 2010 (when the CF5 well field was installed). CF5 ground water extraction the area's close proximity to the river bank further impact the ammonia concentrations.

With the limited data from wells 0682, 0683, 0684, 0732, and 0733 since 2009 (no sampling occurred due to site extraction and injection operations taking place in other areas of the well field), no noticeable impacts of phytoremediation are evident based on the available data. Subsequent and more frequent sampling of these locations has been scheduled.

6.0 References

40 CFR 192A (Code of Federal Regulations), "Standards for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites."

DOE (U.S. Department of Energy), *Moab UMTRA Project Operations and Maintenance Manual* (DOE-EM/GJTAC1973).

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

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

Appendix A.
July 2014 CJ Fresh Water Pond Sampling Event
Water Sampling Field Activities Verification
Water Quality Data
Trip Report

Appendix A. Water Sampling Field Activities Verification

Sampling Event/RIN	July 2014 CJ Freshwater Pond Sampling Event/1407072	Date(s) of Water Sampling	July 31, 2014
Date(s) of Verification	December 22, 2014	Name of Verifier	Ken Pill
		Response (Yes, No, NA)	Comments
1.	Is the Sampling Analysis Plan (SAP) the primary document directing field procedures? List other documents, standard operating procedures, instructions.	Yes	
		NA	
2.	Were the sampling locations specified in the planning documents sampled?	Yes	
3.	Was a pre-trip calibration conducted as specified in the aforementioned documents?	Yes	
4.	Was an operational check of the field equipment conducted in accordance with the SAP? 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?	NA	
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?	NA	
		NA	
		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	This sample was submitted along with RIN 1407072, which included a duplicate.
10.	Were EBs taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	NA	Sample was collected using dedicated equipment
11.	Were trip blanks prepared and included with each shipment of volatile organic compound samples?	NA	

Appendix A. Water Sampling Field Activities Verification (*continued*)

Sampling Event/RIN	July 2014 CJ Freshwater Pond Sampling Event/1407072	Date(s) of Water Sampling	July 31, 2014
Date(s) of Verification	December 22, 2014	Name of Verifier	Ken Pill
		Response (Yes, No, NA)	Comments
12. Were quality-control samples assigned a fictitious site identification number?	NA		
13. Was the true identity of the samples recorded on the quality assurance sample log?	NA		
14. Were samples collected in the containers specified?	Yes		
15. Were samples filtered and preserved as specified?	Yes		
16. Were the number and types of samples collected as specified?	NA		
17. Were COC records completed, and was sample custody maintained?	Yes		
18. Are field data sheets signed and dated by both team members?	Yes		
19. Was all other pertinent information documented on the field data sheets?	NA		
20. Was the presence or absence of ice in the cooler documented at every sample location?	Yes		
21. Were water levels measured at the locations specified in the planning documents?	NA		

Appendix A. Water Quality Data

General Water Quality Data by Location (USEE105) FOR SITE CRJ01, Crescent Junction Site

REPORT DATE: 4/2/2015

Location: CJ Freshwater Pond SURFACE LOCATION

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/31/2014	0001	0 - 0	0.1	U	J #	0.1	
Arsenic	mg/L	07/31/2014	0001	0 - 0	0.0039	U	J #	0.0039	
Barium	mg/L	07/31/2014	0001	0 - 0	0.048	B	J #	0.00019	
Bromide	mg/L	07/31/2014	0001	0 - 0	0.2	U	J #	0.2	
Cadmium	mg/L	07/31/2014	0001	0 - 0	0.00033	U	J #	0.00033	
Calcium	mg/L	07/31/2014	0001	0 - 0	30		J #	0.012	
Chloride	mg/L	07/31/2014	0001	0 - 0	18		J #	0.2	
Chromium	mg/L	07/31/2014	0001	0 - 0	0.00051	U	J #	0.00051	
Fluoride	mg/L	07/31/2014	0001	0 - 0	0.26		J #	0.1	
Iron	mg/L	07/31/2014	0001	0 - 0	0.19		J #	0.0049	
Lead	mg/L	07/31/2014	0001	0 - 0	0.0013	U	J #	0.0013	
Magnesium	mg/L	07/31/2014	0001	0 - 0	20		J #	0.013	
Mercury	mg/L	07/31/2014	0001	0 - 0	7.9E-6	B	J #	2.9E-6	
Nitrate + Nitrite as Nitrogen	mg/L	07/31/2014	0001	0 - 0	0.02		J #	0.01	
Oxidation Reduction Potential	mV	07/31/2014	N001	0 - 0	-221		J #		
pH	s.u.	07/31/2014	N001	0 - 0	7.92		J #		
Phosphorus	mg/L	07/31/2014	0001	0 - 0	0.05	U	J #	0.05	
Potassium	mg/L	07/31/2014	0001	0 - 0	3		J #	0.11	
Selenium	mg/L	07/31/2014	0001	0 - 0	0.0027	U	J #	0.0027	
Silver	mg/L	07/31/2014	0001	0 - 0	0.0011	U	J #	0.0011	

Appendix A. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE CRJ01, Crescent Junction Site

REPORT DATE: 4/2/2015

Location: CJ Freshwater Pond SURFACE LOCATION

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Sodium	mg/L	07/31/2014	0001	0 - 0	45	J	#	0.0066	
Specific Conductance	umhos/cm	07/31/2014	N001	0 - 0	816	J	#		
Sulfate	mg/L	07/31/2014	0001	0 - 0	120	J	#	5	
Temperature	C	07/31/2014	N001	0 - 0	24.2	J	#		
Total Dissolved Solids	mg/L	07/31/2014	0001	0 - 0	330	J	#	20	
Turbidity	NTU	07/31/2014	N001	0 - 0	7.18	J	#		

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

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

LAB QUALIFIERS:

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

DATA QUALIFIERS:

- F Low flow sampling method used.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9. 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 A. July 2014 CJ Fresh Water Pond Sampling Event Trip Report



DATE: December 18, 2014
TO: K. Pill
FROM: James Ritchey
SUBJECT: July 2014 Crescent Junction Freshwater Pond Trip Report

Date of Sampling Event: July 31, 2014

Team Members: Elizabeth Glowiak, James Ritchey

RIN Number Assigned: All samples were assigned to RIN 1407072.

Sample Shipment: All samples were shipped in one cooler overnight UPS to ALS Laboratory from Moab, Utah, on July 31, 2014 (Tracking No. 1Z5W1Y510191869569).

July 2014 Crescent Junction Freshwater Pond Sampling

Number of Locations Sampled: One surface water location was sampled during July 2014 Crescent Junction Freshwater Pond Sampling Event.

Locations Not Sampled: None.

Field Variance: None.

Quality Control Sample Cross Reference: No quality control samples were collected under this RIN as the sample was collected and sent to the laboratory with the July 2014 Site-Wide Sampling Event (RIN 1407071).

Location Specific Information – Surface Water: The surface water sample was collected with dedicated surface water tubing that was decontaminated with Alconox® and de-ionized water between locations. Sample depths and water levels for each extraction well are listed below.

Location	Date	Time	Comments
CJ Freshwater Pond	07/31/2014	10:10	Collected off the left side of the catwalk ~2 inches from surface.

Site Issues: None

Equipment Issues: None.

Corrective Action Required/Taken: None.

Appendix B.
July/August 2014 CF4 and CF5 Ground Water 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	July/August 2014 CF4 and CF5 Ground Water Sampling Event/1407071	Date(s) of Water Sampling	July 28 through August 7, 2014
Date(s) of Verification	December 22, 2014	Name of Verifier	Ken Pill
		Response (Yes, No, NA)	Comments
1. Is the Sampling Analysis Plan (SAP) the primary document directing field procedures?		Yes	
List other documents, standard operating procedures, instructions.		NA	
2. Were the sampling locations specified in the planning documents sampled?		Yes	
3. Was a pre-trip calibration conducted as specified in the aforementioned documents?		Yes	
4. Was an operational check of the field equipment conducted in accordance with the SAP?		Yes	
Did the operational checks meet criteria?		Yes	
5. Were the number and types (alkalinity, temperature, electrical conductivity, pH, turbidity, dissolved oxygen, oxidation reduction potential) of field measurements taken as specified?		Yes	Field measurements for temperature, pH, turbidity, 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?		Yes	
If a portable pump was used, was there a 4-hour delay between pump installation and sampling?		NA	
8. Were the following conditions met when purging a Category II well: Was the flow rate less than 500 milliliters per minute?		NA	
Was one pump/tubing volume removed before sampling?		NA	
9. Were duplicates taken at a frequency of one per 20 samples?		Yes	Two duplicates were collected for 24 samples.

Appendix B. Water Sampling Field Activities Verification (*continued*)

Sampling Event/RIN	July/August 2014 CF4 and CF5 Ground Water Sampling Event/1407071	Date(s) of Water Sampling	July 28 through August 7, 2014
Date(s) of Verification	December 22, 2014	Name of Verifier	Ken Pill
		Response (Yes, No, NA)	Comments
10. Were EBs taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?		NA	All samples were collected using dedicated 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?		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	

Appendix B. Minimums and Maximums Report

Data Validation Minimums and Maximums Report - No Field Parameters

Laboratory: ALS

RIN: 1407071

Comparison: All Historical Data

Report Date: 4/2/2015

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	07/28/2014	Ammonia Total as N	0.12		890	F	0.48		38	0
MOA01	0780	07/28/2014	Uranium	0.0049		3.9	J	0.007		39	0
MOA01	0781	07/28/2014	Uranium	2.2		1.3	F	0.032	J	30	0
MOA01	0782	07/29/2014	Ammonia Total as N	4		2300		9.5		38	0
MOA01	0783	07/29/2014	Ammonia Total as N	0.16		380	F	0.4		14	0
MOA01	0786	07/29/2014	Uranium	0.0076		3.2	F	0.0097		37	0
MOA01	0792	07/30/2014	Ammonia Total as N	120		760	QF	195	FQ	21	0
MOA01	0812	07/28/2014	Uranium	1.8		3.1		1.9		16	0

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

LAB QUALIFIERS:

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

DATA QUALIFIERS:

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

Appendix B. Water Quality Data

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0403 WELL Configuration 1

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	08/07/2014	0001	13.26 - 18.18	37	J	#	2	
Ammonia Total as N	mg/L	08/07/2014	0002	13.26 - 18.18	37	J	#	2.5	
Oxidation Reduction Potential	mV	08/07/2014	N001	13.26 - 18.18	-242		#		
pH	s.u.	08/07/2014	N001	13.26 - 18.18	7.27		#		
Specific Conductance	umhos/cm	08/07/2014	N001	13.26 - 18.18	6413		#		
Temperature	C	08/07/2014	N001	13.26 - 18.18	18.27		#		
Turbidity	NTU	08/07/2014	N001	13.26 - 18.18	1.07		#		
Uranium	mg/L	08/07/2014	0001	13.26 - 18.18	0.36	J	#	0.000029	
Uranium	mg/L	08/07/2014	0002	13.26 - 18.18	0.36	J	#	0.000029	

Appendix B. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0412 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	08/05/2014	0001	9.5 -	0.1	U	J #	0.1	
Oxidation Reduction Potential	mV	08/05/2014	N001	9.5 -	-251		#		
pH	s.u.	08/05/2014	N001	9.5 -	7.68		#		
Specific Conductance	umhos/cm	08/05/2014	N001	9.5 -	1600		#		
Temperature	C	08/05/2014	N001	9.5 -	21.29		#		
Turbidity	NTU	08/05/2014	N001	9.5 -	23.3		#		
Uranium	mg/L	08/05/2014	0001	9.5 -	1.7		J #	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0414 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	08/05/2014	0001	7.5 -	50		J #	2	
Oxidation Reduction Potential	mV	08/05/2014	N001	7.5 -	-240		#		
pH	s.u.	08/05/2014	N001	7.5 -	7.2		#		
Specific Conductance	umhos/cm	08/05/2014	N001	7.5 -	6071		#		
Temperature	C	08/05/2014	N001	7.5 -	17.27		#		
Turbidity	NTU	08/05/2014	N001	7.5 -	2.31		#		
Uranium	mg/L	08/05/2014	0001	7.5 -	3.9		J #	0.00058	

Appendix B. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0780 WELL Configuration 4

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/28/2014	0001	28 -	0.12		#	0.1	
Oxidation Reduction Potential	mV	07/28/2014	N001	28 -	-228		#		
pH	s.u.	07/28/2014	N001	28 -	7.59		#		
Specific Conductance	umhos/cm	07/28/2014	N001	28 -	1739		#		
Temperature	C	07/28/2014	N001	28 -	21.19		#		
Turbidity	NTU	07/28/2014	N001	28 -	2.57		#		
Uranium	mg/L	07/28/2014	0001	28 -	0.0049		#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0781 WELL Configuration 4

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/28/2014	0001	48 -	1900		#	50	
Oxidation Reduction Potential	mV	07/28/2014	N001	48 -	-232		#		
pH	s.u.	07/28/2014	N001	48 -	6.66		#		
Specific Conductance	umhos/cm	07/28/2014	N001	48 -	114158		#		
Temperature	C	07/28/2014	N001	48 -	17.52		#		
Turbidity	NTU	07/28/2014	N001	48 -	1.35		#		
Uranium	mg/L	07/28/2014	0001	48 -	2.2		#	0.000029	

Appendix B. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0782 WELL Configuration 4

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/29/2014	0001	33 -	4		#	1	
Oxidation Reduction Potential	mV	07/29/2014	N001	33 -	-262		#		
pH	s.u.	07/29/2014	N001	33 -	7.54		#		
Specific Conductance	umhos/cm	07/29/2014	N001	33 -	1126		#		
Temperature	C	07/29/2014	N001	33 -	21.43		#		
Turbidity	NTU	07/29/2014	N001	33 -	0.67		#		
Uranium	mg/L	07/29/2014	0001	33 -	0.014		#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0783 WELL Configuration 4

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/29/2014	0001	18 -	0.16		#	0.1	
Oxidation Reduction Potential	mV	07/29/2014	N001	18 -	-214		#		
pH	s.u.	07/29/2014	N001	18 -	7.35		#		
Specific Conductance	umhos/cm	07/29/2014	N001	18 -	4144		#		
Temperature	C	07/29/2014	N001	18 -	16.02		#		
Turbidity	NTU	07/29/2014	N001	18 -	1.83		#		
Uranium	mg/L	07/29/2014	0001	18 -	0.15		#	0.000029	

Appendix B. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0784 WELL Configuration 4

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/29/2014	0001	18 -	0.1	U	#	0.1	
Oxidation Reduction Potential	mV	07/29/2014	N001	18 -	-250		#		
pH	s.u.	07/29/2014	N001	18 -	7.43		#		
Specific Conductance	umhos/cm	07/29/2014	N001	18 -	1906		#		
Temperature	C	07/29/2014	N001	18 -	23.7		#		
Turbidity	NTU	07/29/2014	N001	18 -	1.85		#		
Uranium	mg/L	07/29/2014	0001	18 -	0.023		#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0785 WELL Configuration 4

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/29/2014	0001	18 -	0.13		#	0.1	
Oxidation Reduction Potential	mV	07/29/2014	N001	18 -	-254		#		
pH	s.u.	07/29/2014	N001	18 -	7.37		#		
Specific Conductance	umhos/cm	07/29/2014	N001	18 -	1613		#		
Temperature	C	07/29/2014	N001	18 -	21.75		#		
Turbidity	NTU	07/29/2014	N001	18 -	3.64		#		
Uranium	mg/L	07/29/2014	0001	18 -	0.021		#	0.000029	

Appendix B. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0786 WELL Configuration 4

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/29/2014	0001	28 -	0.8		#	0.1	
Oxidation Reduction Potential	mV	07/29/2014	N001	28 -	-262		#		
pH	s.u.	07/29/2014	N001	28 -	7.53		#		
Specific Conductance	umhos/cm	07/29/2014	N001	28 -	1854		#		
Temperature	C	07/29/2014	N001	28 -	23.04		#		
Turbidity	NTU	07/29/2014	N001	28 -	1.48		#		
Uranium	mg/L	07/29/2014	0001	28 -	0.0076		#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0787 WELL Configuration 4

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/29/2014	0001	36 -	470		#	50	
Oxidation Reduction Potential	mV	07/29/2014	N001	36 -	-245		#		
pH	s.u.	07/29/2014	N001	36 -	7.26		#		
Specific Conductance	umhos/cm	07/29/2014	N001	36 -	34790		#		
Temperature	C	07/29/2014	N001	36 -	19.77		#		
Turbidity	NTU	07/29/2014	N001	36 -	1.3		#		
Uranium	mg/L	07/29/2014	0001	36 -	0.46		#	0.000029	

Appendix B. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0790 WELL Configuration 4

Parameter	Units	Sample ID	Date	Depth Range (BLS)	(Ft)	Result	Qualifiers Data QA	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/30/2014	0001	3 - 3		0.1	U	#	0.1	
Oxidation Reduction Potential	mV	07/30/2014	N001	3 - 3		-321		#		
pH	s.u.	07/30/2014	N001	3 - 3		9.51		#		
Specific Conductance	umhos/cm	07/30/2014	N001	3 - 3		5233		#		
Temperature	C	07/30/2014	N001	3 - 3		17.31		#		
Uranium	mg/L	07/30/2014	0001	3 - 3		0.097		#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0791 WELL Configuration 4

Parameter	Units	Sample ID	Date	Depth Range (BLS)	(Ft)	Result	Qualifiers Data QA	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/30/2014	0001	5.3 - 5.3		2.8		#	1	
Oxidation Reduction Potential	mV	07/30/2014	N001	5.3 - 5.3		-303		#		
pH	s.u.	07/30/2014	N001	5.3 - 5.3		9.09		#		
Specific Conductance	umhos/cm	07/30/2014	N001	5.3 - 5.3		2425		#		
Temperature	C	07/30/2014	N001	5.3 - 5.3		17.86		#		
Uranium	mg/L	07/30/2014	0001	5.3 - 5.3		0.3		#	0.000029	

Appendix B. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0792 WELL Configuration 4

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/30/2014	0001	10.3 - 10.3	120		#	5	
Oxidation Reduction Potential	mV	07/30/2014	N001	10.3 - 10.3	-288		#		
pH	s.u.	07/30/2014	N001	10.3 - 10.3	7.85		#		
Specific Conductance	umhos/cm	07/30/2014	N001	10.3 - 10.3	2838		#		
Temperature	C	07/30/2014	N001	10.3 - 10.3	15.32		#		
Turbidity	NTU	07/30/2014	N001	10.3 - 10.3	25.7		#		
Uranium	mg/L	07/30/2014	0001	10.3 - 10.3	0.1		#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0810 WELL Configuration 5

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/28/2014	0001	10.4 - 40.4	320		#	50	
Oxidation Reduction Potential	mV	07/28/2014	N001	10.4 - 40.4	-178		#		
pH	s.u.	07/28/2014	N001	10.4 - 40.4	7.01		#		
Specific Conductance	umhos/cm	07/28/2014	N001	10.4 - 40.4	29742		#		
Temperature	C	07/28/2014	N001	10.4 - 40.4	17.45		#		
Turbidity	NTU	07/28/2014	N001	10.4 - 40.4	2.17		#		
Uranium	mg/L	07/28/2014	0001	10.4 - 40.4	2.9		#	0.000029	

Appendix B. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0811 WELL Configuration 5

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/31/2014	0001	8.6 - 38.6	450		#	50	
Oxidation Reduction Potential	mV	07/31/2014	N001	8.6 - 38.6	243		#		
pH	s.u.	07/31/2014	N001	8.6 - 38.6	6.98		#		
Specific Conductance	umhos/cm	07/31/2014	N001	8.6 - 38.6	26044		#		
Temperature	C	07/31/2014	N001	8.6 - 38.6	17.76		#		
Turbidity	NTU	07/31/2014	N001	8.6 - 38.6	3.93		#		
Uranium	mg/L	07/31/2014	0001	8.6 - 38.6	2.8		#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0812 WELL Configuration 5

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/28/2014	0001	14.2 - 44.2	380		#	50	
Oxidation Reduction Potential	mV	07/28/2014	N001	14.2 - 44.2	-183		#		
pH	s.u.	07/28/2014	N001	14.2 - 44.2	6.94		#		
Specific Conductance	umhos/cm	07/28/2014	N001	14.2 - 44.2	20940		#		
Temperature	C	07/28/2014	N001	14.2 - 44.2	16.33		#		
Turbidity	NTU	07/28/2014	N001	14.2 - 44.2	3.42		#		
Uranium	mg/L	07/28/2014	0001	14.2 - 44.2	1.8		#	0.000029	

Appendix B. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0813 WELL Configuration 5

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/28/2014	0001	14.4 - 44.4	340		#	50	
Dissolved Oxygen	mg/L	07/28/2014	N001	14.4 - 44.4	1.93		#		
Oxidation Reduction Potential	mV	07/28/2014	N001	14.4 - 44.4	-175		#		
pH	s.u.	07/28/2014	N001	14.4 - 44.4	6.74		#		
Specific Conductance	umhos /cm	07/28/2014	N001	14.4 - 44.4	12354		#		
Temperature	C	07/28/2014	N001	14.4 - 44.4	17.31		#		
Turbidity	NTU	07/28/2014	N001	14.4 - 44.4	3.36		#		
Uranium	mg/L	07/28/2014	0001	14.4 - 44.4	1.4		#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0814 WELL Configuration 5

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/31/2014	0001	12.4 - 42.4	280		#	20	
Ammonia Total as N	mg/L	07/31/2014	0002	12.4 - 42.4	290		#	50	
Oxidation Reduction Potential	mV	07/31/2014	N001	12.4 - 42.4	-265		#		
pH	s.u.	07/31/2014	N001	12.4 - 42.4	6.83		#		
Specific Conductance	umhos /cm	07/31/2014	N001	12.4 - 42.4	27535		#		
Temperature	C	07/31/2014	N001	12.4 - 42.4	17.57		#		
Turbidity	NTU	07/31/2014	N001	12.4 - 42.4	4.68		#		
Uranium	mg/L	07/31/2014	0001	12.4 - 42.4	2.7		#	0.000029	
Uranium	mg/L	07/31/2014	0002	12.4 - 42.4	2.7		#	0.000029	

Appendix B. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0815 WELL Configuration 5

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	08/05/2014	0001	21.7 - 51.7	350	J	#	10	
Dissolved Oxygen	mg/L	08/05/2014	N001	21.7 - 51.7	0.97		#		
Oxidation Reduction Potential	mV	08/05/2014	N001	21.7 - 51.7	-262		#		
pH	s.u.	08/05/2014	N001	21.7 - 51.7	6.75		#		
Specific Conductance	umhos /cm	08/05/2014	N001	21.7 - 51.7	25074		#		
Temperature	C	08/05/2014	N001	21.7 - 51.7	17.31		#		
Turbidity	NTU	08/05/2014	N001	21.7 - 51.7	7.07		#		
Uranium	mg/L	08/05/2014	0001	21.7 - 51.7	3.1	J	#	0.00058	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: 0816 WELL Configuration 5

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	07/28/2014	0001	20.9 - 50.9	210		#	50	
Oxidation Reduction Potential	mV	07/28/2014	N001	20.9 - 50.9	-181		#		
pH	s.u.	07/28/2014	N001	20.9 - 50.9	7.02		#		
Specific Conductance	umhos /cm	07/28/2014	N001	20.9 - 50.9	24387		#		
Temperature	C	07/28/2014	N001	20.9 - 50.9	17.88		#		
Turbidity	NTU	07/28/2014	N001	20.9 - 50.9	2.13		#		
Uranium	mg/L	07/28/2014	0001	20.9 - 50.9	2.4		#	0.000029	

Appendix B. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: MW-1-R WELL

Parameter	Units	Sample ID	Date	Depth Range (BLS)	(Ft)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	08/07/2014	0001	3 - 13		19	J	#	2.5	
Oxidation Reduction Potential	mV	08/07/2014	N001	3 - 13		-231		#		
pH	s.u.	08/07/2014	N001	3 - 13		7.08		#		
Specific Conductance	umhos/cm	08/07/2014	N001	3 - 13		18612		#		
Temperature	C	08/07/2014	N001	3 - 13		21.03		#		
Turbidity	NTU	08/07/2014	N001	3 - 13		7.58		#		
Uranium	mg/L	08/07/2014	0001	3 - 13		0.64	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: SMI-MW01 WELL

Parameter	Units	Sample ID	Date	Depth Range (BLS)	(Ft)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	08/05/2014	0001	16 -		1.7	J	#	0.1	
Oxidation Reduction Potential	mV	08/05/2014	N001	16 -		-238		#		
pH	s.u.	08/05/2014	N001	16 -		7.3		#		
Specific Conductance	umhos/cm	08/05/2014	N001	16 -		5386		#		
Temperature	C	08/05/2014	N001	16 -		17.34		#		
Turbidity	NTU	08/05/2014	N001	16 -		7.58		#		
Uranium	mg/L	08/05/2014	0001	16 -		4.9	J	#	0.00058	

Appendix B. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/6/2015

Location: SMI-PW02 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	08/05/2014	0001	20.04 - 60.04	490	J	#	20	
Dissolved Oxygen	mg/L	08/05/2014	N001	20.04 - 60.04	0.58		#		
Oxidation Reduction Potential	mV	08/05/2014	N001	20.04 - 60.04	-245		#		
pH	s.u.	08/05/2014	N001	20.04 - 60.04	6.71		#		
Specific Conductance	umhos/cm	08/05/2014	N001	20.04 - 60.04	21987		#		
Temperature	C	08/05/2014	N001	20.04 - 60.04	16.04		#		
Turbidity	NTU	08/05/2014	N001	20.04 - 60.04	0.25		#		
Uranium	mg/L	08/05/2014	0001	20.04 - 60.04	3.2	J	#	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 TIC is a suspected aldol-condensation product.
- B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
- C Pesticide result confirmed by GC-MS.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- I Increased detection limit due to required dilution.
- J Estimated
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
- P > 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X,Y,Z Laboratory defined qualifier, see case narrative.

DATA QUALIFIERS:

- F Low flow sampling method used.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9. 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

STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site						
REPORT DATE: 3/15/2015						
Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date Time	Depth From Top of Casing (Ft)	Water Elevation (MSL)	Water Level Flag
0780	O	3968.45	7/28/14	13.93	3954.52	
0781	O	3968.56	7/28/14	14.26	3954.3	
0782	O	3968.46	7/29/14	14.03	3954.43	
0783	O	3966.16	7/29/14	12.58	3953.58	
0784	O	3968.73	7/29/14	14.85	3953.88	
0785	O	3969.24	7/29/14	14.95	3954.29	
0786	O	3968.14	7/29/14	13.83	3954.31	
0787	O	3968.43	7/29/14	13.98	3954.45	
0790	O	3958.23	7/29/14	13.98	3954.45	
0791	O	3957.73	7/29/14	13.98	3954.45	
0792	O	3957.88	7/29/14	13.98	3954.45	
0810	O	3961.88	7/28/14	11.44	3950.44	
0811	O	3962.82	7/31/14	15.2	3947.62	
0812	O	3963.12	7/28/14	17.2	3945.92	
0813	O	3964.45	7/28/14	10.06	3954.39	
0814	O	3960.98	7/31/14	11.81	3949.17	
0815	O	3963.14	8/5/14	11.52	3951.62	
0816	O	3961.87	7/28/14	9.28	3952.59	
SMI-PW02	O	3966.73	8/5/14	16.81	3949.92	
0403	O	3968.95	8/7/14	14.85	3953.38	
0412	O	3962.48	8/5/14	6.09	3956.72	
0414	O	3959.20	8/5/14	3.37	3954.8	
MW-1-R	O	3962.60	8/7/14	5.01	3957.59	
SMI-MW01	O	3966.22	8/5/14	4.50	3954.67	

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

Appendix B. July/August 2014 CF4 and CF5 Ground Water Sampling Event Trip Report



DATE: December 18, 2014
TO: K. Pill
FROM: J. Ritchey
SUBJECT: July/August 2014 CF4 and CF5 Ground Water Sampling Trip Report

Date of Sampling Event: July 28 – August 07, 2014

Team Members: Elizabeth Glowiak, James Ritchey

RIN Number Assigned: All samples were assigned to RIN 1407071.

Sample Shipment: All samples were shipped in two coolers overnight UPS to ALS Laboratory from Moab, Utah, on July 31 and August 14, 2014 (Tracking No. 1Z5W1Y510191869569 and 1Z5W1Y510193397575).

July 2014 Configuration 4 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 July 2014 Sampling Event.

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 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	07/28/2014	14:45	14.38	28
0781	07/28/2014	14:31	14.38	48
0782	07/29/2014	13:30	14.38	33
0783	07/29/2014	15:00	12.72	18
0784	07/29/2014	14:40	15.37	18
0785	07/29/2014	13:49	15.35	18
0786	07/29/2014	14:06	14.38	28
0787	07/29/2014	14:21	14.53	36

ft btoc = feet below top of casing

Appendix B. July/August 2014 CF4 and CF5 Ground Water Sampling Event 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 prior to the initial purge.

WP No.	Date	Time	Depth to Water (ft btoc)	Stick Up Height (ft)	Depth to River Surface (ft btoc)
0790	07/30/2014	13:15	4.20	3.18	Dry
0791	07/30/2014	13:10	5.53	3.07	Dry
0792	07/30/2014	13:29	4.85	3.12	Dry

ft btoc = feet below top of casing

July 2014 Configuration 5 Sampling

Number of Locations Sampled: Eight extraction wells (0810, 0811, 0812, 0813, 0814, 0815, 0816, and SMI-PW02) were sampled. Including one duplicate, a total of nine samples were collected during the July 2014 Monthly Sampling Event.

Locations Not Sampled: None.

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	0814	Duplicate from 21.7 – 51.7 ft bgs	Ground Water	JUL 018

Location Specific Information – Extraction Wells: Extraction wells were sampled using dedicated submersible pumps. Samples were filtered and collected into open containers 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	07/28/2014	11:10	9.37	10.4 – 40.4
0811	07/31/2014	11:55	16.19	8.6 – 38.6
0812	07/28/2014	11:20	14.64	14.2 – 44.2
0813	07/28/2014	10:36	9.68	14.4 – 44.4
0814	07/31/2014	11:45	8.25	12.4 – 42.4
0815	08/05/2014	13:18	10.33	21.7 – 51.7
0816	07/28/2014	11:00	9.61	20.9 – 50.9
SMI-PW02	08/05/2014	13:42	15.70	20.0 – 60.0

ft btoc = feet below top of casing

Appendix B. July/August 2014 CF4 and CF5 Ground Water Sampling Event Trip Report *(continued)*

July 2014 Site-wide Sampling

Number of Locations Sampled: Five observation wells (0403, 0412, 0414, MW-1-R, and SMI-MW01) and one duplicate were sampled during the July 2014 Sampling Event to. These locations were sampled to complete the previous site-wide event (RIN 1405070) impacted by flooding.

Locations Not Sampled: None.

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
2001	0403	Duplicate from 18 ft bgs	Ground Water	JUL 027

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.

Name	Date	Time	Depth to Water (ft btoc)	Sample Depth (bgs)
0403	08/07/2014	15:05	14.85	18
0412	08/05/2014	11:25	6.09	9.5
0414	08/05/2014	10:52	3.37	7.5
MW-1-R	08/07/2014	14:17	5.01	12
SMI-MW01	08/05/2014	10:12	4.50	16

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)
07/28/2014	4,940
07/29/2014	5,450
07/30/2014	6,530
07/31/2014	6,370
08/01/2014	5,910
08/02/2014	5,820
08/03/2014	6,190
08/04/2014	6,570
08/05/2014	6,700
08/06/2014	6,180
08/07/2014	5,790

Equipment Issues: None.

Corrective Action Required/Taken: None.

Appendix C.
September 2014 CF4 Surface Water and Tree Plot Area Ground Water
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	September 2014 CF4 Surface Water and Tree Plot Area Ground Water Sampling Event/1409073	Date(s) of Water Sampling	September 11 through 19, 2014
Date(s) of Verification	December 23 , 2014	Name of Verifier	Ken Pill
	Response (Yes, No, NA)	Comments	
1. Is the Sampling Analysis Plan (SAP) the primary document directing field procedures?	Yes		
2. List other documents, standard operating procedures, instructions.	NA		
3. Were the sampling locations specified in the planning documents sampled?	Yes		
4. Was a pre-trip calibration conducted as specified in the aforementioned documents?	Yes		
5. Was an operational check of the field equipment conducted in accordance with the SAP?	Yes		
6. Did the operational checks meet criteria?	Yes		
7. 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.	
8. Was the category of the well documented?	Yes		
9. 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?	Yes		
If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	NA		
10. Were the following conditions met when purging a Category II well: Was the flow rate less than 500 milliliters per minute?	Yes		
Was one pump/tubing volume removed before sampling?	Yes		
11. Were duplicates taken at a frequency of one per 20 samples?	Yes	One duplicate was collected for 13 samples.	

Appendix C. Water Sampling Field Activities Verification (*continued*)

Sampling Event/RIN	Date(s) of Water Sampling	Date(s) of Verification	Name of Verifier	Response (Yes, No, NA)	Comments
September 2014 CF4 Surface Water and Tree Plot Area Ground Water Sampling Event/1409073	September 11 through 19, 2014	December 23, 2014	Ken Pill		
12. Were EBs taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	NA			Yes	All samples were collected using dedicated equipment.
13. Were trip blanks prepared and included with each shipment of volatile organic compound samples?	NA			Yes	
14. Were quality-control samples assigned a fictitious site identification number?	Yes			Yes	
Was the true identity of the samples recorded on the quality assurance sample log?	Yes			Yes	
15. Were samples collected in the containers specified?	Yes			Yes	
16. Were samples filtered and preserved as specified?	Yes			Yes	
17. Were the number and types of samples collected as specified?	NA			Yes	
18. Were COC records completed, and was sample custody maintained?	Yes			Yes	
19. Are field data sheets signed and dated by both team members?	Yes			Yes	
20. Was all other pertinent information documented on the field data sheets?	NA			Yes	
21. Was the presence or absence of ice in the cooler documented at every sample location?	Yes			Yes	
22. Were water levels measured at the locations specified in the planning documents?	Yes			Yes	

Appendix C. Minimums and Maximums Report

Data Validation Minimums and Maximums Report - No Field Parameters
 Laboratory: ALS
 RIN: 1407073
 Comparison: All Historical Data
 Report Date: 4/2/2015

Site Code	Location Code	Sample Date	Analyte	Current Qualifiers		Historical Maximum Qualifiers			Historical Minimum Qualifiers			Count	
				Result	Lab Data	Result	Lab Data	Data	Result	Lab Data	Data	N	N Below Detect
MOA01	0682	09/11/2014	Ammonia Total as N	200		510			330			29	0
MOA01	0682	09/11/2014	Uranium	1.9		3.1			2.0			29	0

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

LAB QUALIFIERS:

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

DATA QUALIFIERS:

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

Appendix C. Water Quality Data

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site										
REPORT DATE: 4/2/2015										
Location: 0274 SURFACE LOCATION										
Parameter	Units	Sample ID	Date	Depth Range (BLS)	(Ft)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	09/11/2014	0001	0 - 0	0	0.14		#	0.1	
Oxidation Reduction Potential	mV	09/11/2014	N001	0 - 0	0	-127		#		
pH	s.u.	09/11/2014	N001	0 - 0	0	9.00		#		
Specific Conductance	umhos/cm	09/11/2014	N001	0 - 0	0	1625		#		
Temperature	C	09/11/2014	N001	0 - 0	0	20.7		#		
Turbidity	NTU	09/11/2014	N001	0 - 0	0	OR		#		
Uranium	mg/L	09/11/2014	0001	0 - 0	0	0.004	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site										
REPORT DATE: 4/2/2015										
Location: 0278 SURFACE LOCATION										
Parameter	Units	Sample ID	Date	Depth Range (BLS)	(Ft)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	09/11/2014	0001	0 - 0	0	0.18		#	0.1	
Oxidation Reduction Potential	mV	09/11/2014	N001	0 - 0	0	-116		#		
pH	s.u.	09/11/2014	N001	0 - 0	0	8.89		#		
Specific Conductance	umhos/cm	09/11/2014	N001	0 - 0	0	1624		#		
Temperature	C	09/11/2014	N001	0 - 0	0	20.91		#		
Turbidity	NTU	09/11/2014	N001	0 - 0	0	OR		#		
Uranium	mg/L	09/11/2014	0001	0 - 0	0	0.0041	J	#	0.000029	

Appendix C. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0682 WELL Configuration 3

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	09/11/2014	0001	28 - 28	200		#	50	
Oxidation Reduction Potential	mV	09/11/2014	N001	28 - 28	-156		#		
pH	s.u.	09/11/2014	N001	28 - 28	7.70		#		
Specific Conductance	umhos/cm	09/11/2014	N001	28 - 28	12952		#		
Temperature	C	09/11/2014	N001	28 - 28	17.58		#		
Turbidity	NTU	09/11/2014	N001	28 - 28	7.04		#		
Uranium	mg/L	09/11/2014	0001	28 - 28	1.9	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0683 WELL Configuration 3

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	09/11/2014	0001	27 - 27	300		#	50	
Oxidation Reduction Potential	mV	09/11/2014	N001	27 - 27	-148		#		
pH	s.u.	09/11/2014	N001	27 - 27	7.83		#		
Specific Conductance	umhos/cm	09/11/2014	N001	27 - 27	13684		#		
Temperature	C	09/11/2014	N001	27 - 27	18.41		#		
Turbidity	NTU	09/11/2014	N001	27 - 27	113		#		
Uranium	mg/L	09/11/2014	0001	27 - 27	1.5	J	#	0.000029	

Appendix C. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0684 WELL Configuration 3

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	09/19/2014	0001	18 - 18	34		#	2.5	
Oxidation Reduction Potential	mV	09/19/2014	N001	18 - 18	-12		#		
pH	s.u.	09/19/2014	N001	18 - 18	6.84		#		
Specific Conductance	umhos/cm	09/19/2014	N001	18 - 18	11748		#		
Temperature	C	09/19/2014	N001	18 - 18	17.68		#		
Turbidity	NTU	09/19/2014	N001	18 - 18	9.98		#		
Uranium	mg/L	09/19/2014	0001	18 - 18	2.4	J	#	0.000029	

Appendix C. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site											
REPORT DATE: 4/2/2015											
Location: 0732 WELL Configuration 3											
Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty		
Ammonia Total as N	mg/L	09/19/2014	0001	18 - 18	30		#	2.5			
Ammonia Total as N	mg/L	09/19/2014	0002	18 - 18	30		#	2.5			
Oxidation Reduction Potential	mV	09/19/2014	N001	18 - 18	-22		#				
pH	s.u.	09/19/2014	N001	18 - 18	6.63		#				
Specific Conductance	umhos /cm	09/19/2014	N001	18 - 18	6687		#				
Temperature	C	09/19/2014	N001	18 - 18	17.78		#				
Turbidity	NTU	09/19/2014	N001	18 - 18	4.06		#				
Uranium	mg/L	09/19/2014	0001	18 - 18	0.92	J	#	0.000029			
Uranium	mg/L	09/19/2014	0002	18 - 18	0.92	J	#	0.000029			

Appendix C. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: ATP-1-1D WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	09/16/2014	0001	293 - 293	4.1		#	0.1	
Oxidation Reduction Potential	mV	09/16/2014	N001	293 - 293	-208		#		
pH	s.u.	09/16/2014	N001	293 - 293	8.67		#		
Specific Conductance	umhos/cm	09/16/2014	N001	293 - 293	135072		#		
Temperature	C	09/16/2014	N001	293 - 293	19.73		#		
Turbidity	NTU	09/16/2014	N001	293 - 293	21.2		#		
Uranium	mg/L	09/16/2014	0001	293 - 293	0.000029	U	J #	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: ATP-1-1S WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	09/16/2014	0001	213 - 213	4.1		#	0.1	
Oxidation Reduction Potential	mV	09/16/2014	N001	213 - 213	-165		#		
pH	s.u.	09/16/2014	N001	213 - 213	8.85		#		
Specific Conductance	umhos/cm	09/16/2014	N001	213 - 213	133275		#		
Temperature	C	09/16/2014	N001	213 - 213	20.0		#		
Turbidity	NTU	09/16/2014	N001	213 - 213	59.1		#		
Uranium	mg/L	09/16/2014	0001	213 - 213	0.00005		J #	0.000029	

Appendix C. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: ATP-1-D WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	09/16/2014	0001	395 - 395	4		#	0.1	
Oxidation Reduction Potential	mV	09/16/2014	N001	395 - 395	-214		#		
pH	s.u.	09/16/2014	N001	395 - 395	8.71		#		
Specific Conductance	umhos/cm	09/16/2014	N001	395 - 395	136399		#		
Temperature	C	09/16/2014	N001	395 - 395	19.84		#		
Turbidity	NTU	09/16/2014	N001	395 - 395	21.2		#		
Uranium	mg/L	09/16/2014	0001	395 - 395	0.00004	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: ATP-1-S WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	09/16/2014	0001	143 - 143	4		#	0.1	
Oxidation Reduction Potential	mV	09/16/2014	N001	143 - 143	-180		#		
pH	s.u.	09/16/2014	N001	143 - 143	8.83		#		
Specific Conductance	umhos/cm	09/16/2014	N001	143 - 143	129310		#		
Temperature	C	09/16/2014	N001	143 - 143	19.28		#		
Turbidity	NTU	09/16/2014	N001	143 - 143	23.3		#		
Uranium	mg/L	09/16/2014	0001	143 - 143	0.00009	J	#	0.000029	

Appendix C. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: CR3 SURFACE WATER

Parameter	Units	Sample ID	Date	Depth Range (BLS)	(Ft)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	09/11/2014	0001	0 -	0	0.14		#	0.1	
Oxidation Reduction Potential	mV	09/11/2014	N001	0 -	0	-138		#		
pH	s.u.	09/11/2014	N001	0 -	0	9.05		#		
Specific Conductance	umhos/cm	09/11/2014	N001	0 -	0	1613		#		
Temperature	C	09/11/2014	N001	0 -	0	21.08		#		
Turbidity	NTU	09/11/2014	N001	0 -	0	OR		#		
Uranium	mg/L	09/11/2014	0001	0 -	0	0.004	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: Z SURFACE WATER

Parameter	Units	Sample ID	Date	Depth Range (BLS)	(Ft)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	09/11/2014	0001	0 -	0	0.26		#	0.1	
Oxidation Reduction Potential	mV	09/11/2014	N001	0 -	0	-127		#		
pH	s.u.	09/11/2014	N001	0 -	0	8.99		#		
Specific Conductance	umhos/cm	09/11/2014	N001	0 -	0	1630		#		
Temperature	C	09/11/2014	N001	0 -	0	21.44		#		
Turbidity	NTU	09/11/2014	N001	0 -	0	OR		#		
Uranium	mg/L	09/11/2014	0001	0 -	0	0.0041	J	#	0.000029	

Appendix C. Water Quality Data (*continued*)

BLS = below land surface; $\mu\text{mhos/cm}$ = 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. G Possible grout contamination, pH > 9. J Estimated value.
L Less than 3 bore volumes purged prior to sampling. Q Qualitative result due to sampling technique. R Unusable result.
U Parameter analyzed for but was not detected. X Location is undefined.

QA QUALIFIER:

Validated according to quality assurance guidelines.

Appendix C. Water Level Data

STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site							
REPORT DATE: 3/15/2015							
Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Time	Date	Depth From Top of Casing (Ft)	Water Elevation (MSL)	Water Level Flag
682	O	3970.18	9/11/2014		13.54	3956.64	
683	O	3970.73	9/11/2014		14.05	3956.68	
684	O	3970.22	9/19/2014		14.13	3956.09	
732	O	3968.99	9/19/2014		12.43	3956.56	
ATP-1-D	O	3970.73	9/16/2014		7.89	3962.84	
ATP-1-ID	O	3970.87	9/16/2014		7.76	3963.11	
ATP-1-IS	O	3971	9/16/2014		7.74	3963.26	
ATP-1-S	O	3971.14	9/16/2014		7.9	3963.24	

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

Appendix C. September 2014 CF4 Surface Water and Tree Plot Area Ground Water Sampling Event Trip Report



DATE: December 18, 2014
TO: K. Pill
FROM: J. Ritchey
SUBJECT: September 2014 Surface Water and Tree Plot Sampling Event

Dates of Sampling Event: September 11 - 19, 2014

Team Members: Elizabeth Moran, James Ritchey

RIN Number Assigned: All samples were shipped to and analyzed by ALS Laboratory under RIN14091348. The results will be entered into SeePro under the corrected RIN1409073.

Sample Shipment: All samples were shipped in one cooler overnight UPS to ALS Laboratory from Moab, Utah on September 22, 2014 (Tracking Number 1Z5W1Y510198485569).

September 2014 CF4 Surface Water Sampling

Number of Locations Sampled: Four surface water samples (0274, 0278, CR3, and Z) and one equipment blank were collected during the September 2014 Sampling Event.

Locations Not Sampled: None.

Field Variance: None.

Quality Control Sample Cross Reference: None

Location Specific Information: Each surface water sample was collected in a dedicated open container and then filtered using a peristaltic pump and tubing. The tubing was cleaned with soap and de-ionized water between samples. The table below provides additional information:

Sample ID	Location	Date
SEP 004	0274	09/11/2014
SEP 003	0278	09/11/2014
SEP 006	CR3	09/11/2014
SEP 005	Z	09/11/2014

Appendix C. September 2014 CF4 Surface Water and Tree Plot Area Ground Water Sampling Event Trip Report (*continued*)

September 2014 Tree Plot Area Ground Water Sampling

Number of Locations Sampled: Eight observation wells (0682, 0683, 0684, 0732, ATP-1-D, ATP-1-ID, ATP-1-IS, and ATP-1-S) and one duplicate were sampled during the September 2014 Sampling Event.

Locations Not Sampled: None.

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	0732	Duplicate from 18 ft bgs.	Ground Water	SEP 013

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)	Pump Intake Depth (ft bgs)
0682	09/11/2014	11:46	13.54	28
0683	09/11/2014	12:08	14.05	27
0684	09/19/2014	9:06	14.13	18
0732	09/19/2014	9:38	12.43	18
ATP-1-D	09/16/2014	10:03	7.89	395
ATP-1-ID	09/16/2014	10:21	7.76	293
ATP-1-IS	09/16/2014	10:52	7.74	213
ATP-1-S	09/16/2014	11:13	7.90	143

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)
09/11/2014	7,260
09/12/2014	6,700
09/13/2014	6,000
09/14/2014	5,600
09/15/2014	5,330
09/16/2014	5,090
09/17/2014	4,880
09/18/2014	4,690
09/19/2014	4,490

Equipment Issues: None.

Corrective Action Required/Taken: None.

Appendix D.
November/December 2014 Site-wide Sampling Event

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

Appendix D. Water Sampling Field Activities Verification

Sampling Event/RIN	November 2014 Site-wide Sampling Event/1411074	Date(s) of Water Sampling	November 13 through December 11, 2014
Date(s) of Verification	January 16, 2015	Name of Verifier	Ken Pill
		Response (Yes, No, NA)	Comments
1.	Is the Sampling Analysis Plan (SAP) the primary document directing field procedures?	Yes	
2.	List other documents, standard operating procedures, instructions.	NA	
3.	Were the sampling locations specified in the planning documents sampled?	No	Well TP-19 could not be safely accessed and was not sampled.
4.	Was a pre-trip calibration conducted as specified in the aforementioned documents?	Yes	
5.	Was an operational check of the field equipment conducted in accordance with the SAP?	Yes	
6.	Did the operational checks meet criteria?	Yes	
7.	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.
8.	Was the category of the well documented?	Yes	
9.	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?	Yes	
	If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	NA	
10.	Were the following conditions met when purging a Category II well: Was the flow rate less than 500 milliliters per minute?	Yes	
	Was one pump/tubing volume removed before sampling?	Yes	
11.	Were duplicates taken at a frequency of one per 20 samples?	Yes	Three duplicates were collected for 63 samples.

Appendix D. Water Sampling Field Activities Verification (*continued*)

Sampling Event/RIN	May/June 2014 Site-wide Sampling Event/1405070	Date(s) of Water Sampling	May 19 through June 19, 2014
Date(s) of Verification	August 14, 2014	Name of Verifier	Ken Pill
		Response (Yes, No, NA)	Comments
12. Were EBs taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	Yes	One EB was collected for the seven surface water samples.	
13. Were trip blanks prepared and included with each shipment of volatile organic compound samples?	NA		
14. 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		
15. Were samples collected in the containers specified?	Yes		
16. Were samples filtered and preserved as specified?	Yes		
17. Were the number and types of samples collected as specified?	NA		
18. Were COC records completed, and was sample custody maintained?	Yes		
19. Are field data sheets signed and dated by both team members?	Yes		
20. Was all other pertinent information documented on the field data sheets?	NA		
21. Was the presence or absence of ice in the cooler documented at every sample location?	Yes		
22. Were water levels measured at the locations specified in the planning documents?	NA		

Appendix D. Minimums and Maximums Report

Data Validation Minimums and Maximums Report - No Field Parameters

Laboratory: ALS

RIN: 1411074

Comparison: All Historical Data

Report Date: 4/2/2015

Site Code	Location Code	Sample Date	Analyte	Current		Historical Maximum			Historical Minimum			Count	
				Result	Qualifiers Lab Data	Result	Qualifiers Lab Data	Qualifiers Lab Data	Result	Qualifiers Lab Data	Qualifiers Lab Data	N	N Below Detect
MOA01	0412	11/14/2014	Uranium	1.6		12.8		F	1.7			15	0
MOA01	0441	12/08/2014	Ammonia Total as N	0.12		0.1	U	J	0.1	U	J	6	6
MOA01	0683	11/24/2014	Uranium	1.2		3.2		F	1.3			42	0
MOA01	0732	11/25/2014	Ammonia Total as N	87		50		F	0.1	U	J	12	1
MOA01	0733	11/25/2014	Ammonia Total as N	200		190		F	0.19		J	13	0
MOA01	ATP-1-D	11/21/2014	Uranium	0.000029	U	0.0027			0.00004	B		5	1
MOA01	ATP-2-D	11/24/2014	Uranium	0.00061		8.64			0.00094			63	0
MOA01	SMI-PZ2M2	11/17/2014	Uranium	2.9		2.2			0.5			10	0
MOA01	SMI-PZ3D2	12/03/2014	Uranium	0.83		7			1			21	0
MOA01	TP-11	11/13/2014	Uranium	0.00068		0.002			0.00073			10	0
MOA01	TP-20	11/17/2014	Uranium	0.034		0.027			0.0005	B		18	1
MOA01	TP-22	11/14/2014	Ammonia Total as N	0.2		0.1	U	J	0.1	U	J	5	5
MOA01	UPD-18	12/02/2014	Uranium	0.81		1.4			0.87			7	0
MOA01	UPD-20	12/03/2014	Uranium	0.064		0.97			0.072			7	0
MOA01	UPD-21	12/03/2014	Uranium	18		13			5			8	0

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

DATA QUALIFIERS:

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

Appendix D. Water Quality Data

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0201 SURFACE LOCATION

Parameter	Units	Sample ID	Date	Depth Range (BLS)	(Ft)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/01/2014	0001	0 -	0	0.1	U	J #	0.1	
Oxidation Reduction Potential	mV	12/01/2014	N001	0 -	0	-165		#		
pH	s.u.	12/01/2014	N001	0 -	0	8.32		#		
Specific Conductance	umhos/cm	12/01/2014	N001	0 -	0	1195		#		
Temperature	C	12/01/2014	N001	0 -	0	6.7		#		
Turbidity	NTU	12/01/2014	N001	0 -	0	50.3		#		
Uranium	mg/L	12/01/2014	0001	0 -	0	0.005		J #	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0218 SURFACE LOCATION

Parameter	Units	Sample ID	Date	Depth Range (BLS)	(Ft)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/01/2014	0001	0 -	0	0.1	U	J #	0.1	
Oxidation Reduction Potential	mV	12/01/2014	N001	0 -	0	-144		#		
pH	s.u.	12/01/2014	N001	0 -	0	8.07		#		
Specific Conductance	umhos/cm	12/01/2014	N001	0 -	0	1227		#		
Temperature	C	12/01/2014	N001	0 -	0	6.45		#		
Turbidity	NTU	12/01/2014	N001	0 -	0	58		#		
Uranium	mg/L	12/01/2014	0001	0 -	0	0.0074		J #	0.000029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0226 SURFACE LOCATION

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/11/2014	0001	0 - 0	0.1	U	J #	0.1	
Oxidation Reduction Potential	mV	12/11/2014	N001	0 - 0	8.3		#		
pH	s.u.	12/11/2014	N001	0 - 0	8		#		
Specific Conductance	umhos/cm	12/11/2014	N001	0 - 0	1195		#		
Temperature	C	12/11/2014	N001	0 - 0	5.29		#		
Turbidity	NTU	12/11/2014	N001	0 - 0	56.5		#		
Uranium	mg/L	12/11/2014	0001	0 - 0	0.0053		J #	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0401 WELL Configuration 2

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/20/2014	0001	18 -	290		J #	50	
Oxidation Reduction Potential	mV	11/20/2014	N001	18 -	-197		#		
pH	s.u.	11/20/2014	N001	18 -	7.74		#		
Specific Conductance	umhos/cm	11/20/2014	N001	18 -	14161		#		
Temperature	C	11/20/2014	N001	18 -	17.9		#		
Turbidity	NTU	11/20/2014	N001	18 -	4.36		#		
Uranium	mg/L	11/20/2014	0001	18 -	1.7		J #	0.00029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0403 WELL Configuration 1

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/24/2014	0001	18 -	24	J	#	2	
Oxidation Reduction Potential	mV	11/24/2014	N001	18 -	-162		#		
pH	s.u.	11/24/2014	N001	18 -	7.67		#		
Specific Conductance	umhos/cm	11/24/2014	N001	18 -	3830		#		
Temperature	C	11/24/2014	N001	18 -	17.52		#		
Turbidity	NTU	11/24/2014	N001	18 -	3.36		#		
Uranium	mg/L	11/24/2014	0001	18 -	0.34	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0404 WELL Configuration 3

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/20/2014	0001	18 -	290	J	#	10	
Oxidation Reduction Potential	mV	11/20/2014	N001	18 -	-184		#		
pH	s.u.	11/20/2014	N001	18 -	7.5		#		
Specific Conductance	umhos/cm	11/20/2014	N001	18 -	12800		#		
Temperature	C	11/20/2014	N001	18 -	17.4		#		
Turbidity	NTU	11/20/2014	N001	18 -	1.36		#		
Uranium	mg/L	11/20/2014	0001	18 -	1.3	J	#	0.00029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0407 WELL Configuration 1

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/24/2014	0001	17 -	83	J	#	10	
Oxidation Reduction Potential	mV	11/24/2014	N001	17 -	-126		#		
pH	s.u.	11/24/2014	N001	17 -	7.14		#		
Specific Conductance	umhos/cm	11/24/2014	N001	17 -	8153		#		
Temperature	C	11/24/2014	N001	17 -	16.9		#		
Turbidity	NTU	11/24/2014	N001	17 -	5.4		#		
Uranium	mg/L	11/24/2014	0001	17 -	0.86	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0410 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/02/2014	0001	23.5 -	0.1	U	J	0.1	
Oxidation Reduction Potential	mV	12/02/2014	N001	23.5 -	-95		#		
pH	s.u.	12/02/2014	N001	23.5 -	6.96		#		
Specific Conductance	umhos/cm	12/02/2014	N001	23.5 -	3216		#		
Temperature	C	12/02/2014	N001	23.5 -	17.55		#		
Turbidity	NTU	12/02/2014	N001	23.5 -	194		#		
Uranium	mg/L	12/02/2014	0001	23.5 -	0.53	J	#	0.00029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0411 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/03/2014	0001	9 -	4.1	J	#	0.1	
Oxidation Reduction Potential	mV	12/03/2014	N001	9 -	-64.3		#		
pH	s.u.	12/03/2014	N001	9 -	6.64		#		
Specific Conductance	umhos/cm	12/03/2014	N001	9 -	6130		#		
Turbidity	NTU	12/03/2014	N001	9 -	153		#		
Uranium	mg/L	12/03/2014	0001	9 -	2.3	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0412 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/14/2014	0001	9.5 -	0.1	U	J	0.1	
Oxidation Reduction Potential	mV	11/14/2014	N001	9.5 -	-229		#		
pH	s.u.	11/14/2014	N001	9.5 -	7.72		#		
Specific Conductance	umhos/cm	11/14/2014	N001	9.5 -	1605		#		
Temperature	C	11/14/2014	N001	9.5 -	17.73		#		
Turbidity	NTU	11/14/2014	N001	9.5 -	8.45		#		
Uranium	mg/L	11/14/2014	0001	9.5 -	1.6	J	#	0.00029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0413 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/17/2014	0001	10.5 -	53	J	#	2.5	
Oxidation Reduction Potential	mV	11/17/2014	N001	10.5 -	-241		#		
pH	s.u.	11/17/2014	N001	10.5 -	8.21		#		
Specific Conductance	umhos/cm	11/17/2014	N001	10.5 -	5216		#		
Temperature	C	11/17/2014	N001	10.5 -	17.11		#		
Turbidity	NTU	11/17/2014	N001	10.5 -	5.33		#		
Uranium	mg/L	11/17/2014	0001	10.5 -	3.1	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0414 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/19/2014	0001	7.5 -	40	J	#	2	
Oxidation Reduction Potential	mV	11/19/2014	N001	7.5 -	-242		#		
pH	s.u.	11/19/2014	N001	7.5 -	7.7		#		
Specific Conductance	umhos/cm	11/19/2014	N001	7.5 -	7946		#		
Temperature	C	11/19/2014	N001	7.5 -	16.28		#		
Turbidity	NTU	11/19/2014	N001	7.5 -	3.71		#		
Uranium	mg/L	11/19/2014	0001	7.5 -	3.2	J	#	0.00029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0431 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/08/2014	0001	91 -	0.1	U	J	#	0.1	
Oxidation Reduction Potential	mV	12/08/2014	N001	91 -	-156			#		
pH	s.u.	12/08/2014	N001	91 -	7.25			#		
Specific Conductance	umhos/cm	12/08/2014	N001	91 -	33586			#		
Temperature	C	12/08/2014	N001	91 -	17.88			#		
Turbidity	NTU	12/08/2014	N001	91 -	1.35			#		
Uranium	mg/L	12/08/2014	0001	91 -	0.01		J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0433 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/11/2014	0001	99 -	0.1	U	J	#	0.1	
Oxidation Reduction Potential	mV	12/11/2014	N001	99 -	12			#		
pH	s.u.	12/11/2014	N001	99 -	7.97			#		
Specific Conductance	umhos/cm	12/11/2014	N001	99 -	4782			#		
Temperature	C	12/11/2014	N001	99 -	18.42			#		
Turbidity	NTU	12/11/2014	N001	99 -	2.48			#		
Uranium	mg/L	12/11/2014	0001	99 -	0.0019		J	#	0.000029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0439 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/02/2014	0001	120 -	9.2	J	#	0.5	
Oxidation Reduction Potential	mV	12/02/2014	N001	120 -	-146.9		#		
pH	s.u.	12/02/2014	N001	120 -	7.29		#		
Specific Conductance	umhos/cm	12/02/2014	N001	120 -	9455		#		
Temperature	C	12/02/2014	N001	120 -	15.92		#		
Turbidity	NTU	12/02/2014	N001	120 -	9.44		#		
Uranium	mg/L	12/02/2014	0001	120 -	1.2	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0440 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/02/2014	0001	119 -	0.1	U	J	0.1	
Oxidation Reduction Potential	mV	12/02/2014	N001	119 -	-125.7		#		
pH	s.u.	12/02/2014	N001	119 -	7.18		#		
Specific Conductance	umhos/cm	12/02/2014	N001	119 -	8006		#		
Temperature	C	12/02/2014	N001	119 -	16.93		#		
Turbidity	NTU	12/02/2014	N001	119 -	8.19		#		
Uranium	mg/L	12/02/2014	0001	119 -	0.032	J	#	0.000029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0441 WELL Queue/Support Area

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/08/2014	0001	53 -	0.12	J	#	0.1	
Oxidation Reduction Potential	mV	12/08/2014	N001	53 -	-158		#		
pH	s.u.	12/08/2014	N001	53 -	7.44		#		
Specific Conductance	umhos/cm	12/08/2014	N001	53 -	9354		#		
Temperature	C	12/08/2014	N001	53 -	18.06		#		
Turbidity	NTU	12/08/2014	N001	53 -	5.59		#		
Uranium	mg/L	12/08/2014	0001	53 -	0.043	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0443 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/08/2014	0001	73 -	0.1	U	J	0.1	
Oxidation Reduction Potential	mV	12/08/2014	N001	73 -	-216		#		
pH	s.u.	12/08/2014	N001	73 -	7.93		#		
Specific Conductance	umhos/cm	12/08/2014	N001	73 -	6043		#		
Temperature	C	12/08/2014	N001	73 -	18.02		#		
Turbidity	NTU	12/08/2014	N001	73 -	1.61		#		
Uranium	mg/L	12/08/2014	0001	73 -	0.011	J	#	0.000029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0453 WELL Contaminated Area

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/02/2014	0001	80 -	360	J	#	10	
Oxidation Reduction Potential	mV	12/02/2014	N001	80 -	-174.5		#		
pH	s.u.	12/02/2014	N001	80 -	7.62		#		
Specific Conductance	umhos/cm	12/02/2014	N001	80 -	27491		#		
Temperature	C	12/02/2014	N001	80 -	16.36		#		
Turbidity	NTU	12/02/2014	N001	80 -	1.08		#		
Uranium	mg/L	12/02/2014	0001	80 -	2	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0454 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/17/2014	0001	13 -	400	J	#	50	
Oxidation Reduction Potential	mV	11/17/2014	N001	13 -	-1.84		#		
pH	s.u.	11/17/2014	N001	13 -	7.17		#		
Specific Conductance	umhos/cm	11/17/2014	N001	13 -	52403		#		
Temperature	C	11/17/2014	N001	13 -	18.25		#		
Turbidity	NTU	11/17/2014	N001	13 -	9.56		#		
Uranium	mg/L	11/17/2014	0001	13 -	2	J	#	0.00029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0492 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/17/2014	0001	18 -	5.2	J	#	1	
Oxidation Reduction Potential	mV	11/17/2014	N001	18 -	-196		#		
pH	s.u.	11/17/2014	N001	18 -	7.28		#		
Specific Conductance	umhos/cm	11/17/2014	N001	18 -	2814		#		
Temperature	C	11/17/2014	N001	18 -	17.09		#		
Turbidity	NTU	11/17/2014	N001	18 -	1.82		#		
Uranium	mg/L	11/17/2014	0001	18 -	0.2	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0683 WELL Configuration 3

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/24/2014	0001	27 -	300	J	#	50	
Oxidation Reduction Potential	mV	11/24/2014	N001	27 -	-127		#		
pH	s.u.	11/24/2014	N001	27 -	7.11		#		
Specific Conductance	umhos/cm	11/24/2014	N001	27 -	13370		#		
Temperature	C	11/24/2014	N001	27 -	16.25		#		
Turbidity	NTU	11/24/2014	N001	27 -	9.98		#		
Uranium	mg/L	11/24/2014	0001	27 -	1.2	J	#	0.00029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0684 WELL Configuration 3

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/25/2014	0001	18 -	72	J	#	2.5	
Oxidation Reduction Potential	mV	11/25/2014	N001	18 -	-155		#		
pH	s.u.	11/25/2014	N001	18 -	7.71		#		
Specific Conductance	umhos/cm	11/25/2014	N001	18 -	10414		#		
Temperature	C	11/25/2014	N001	18 -	16.9		#		
Turbidity	NTU	11/25/2014	N001	18 -	3.83		#		
Uranium	mg/L	11/25/2014	0001	18 -	1.3	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: 0732 WELL Infiltration Trench

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/25/2014	0001	18 -	87	J	#	2.5	
Oxidation Reduction Potential	mV	11/25/2014	N001	18 -	-161		#		
pH	s.u.	11/25/2014	N001	18 -	7.68		#		
Specific Conductance	umhos/cm	11/25/2014	N001	18 -	9871		#		
Temperature	C	11/25/2014	N001	18 -	16.53		#		
Turbidity	NTU	11/25/2014	N001	18 -	2.23		#		
Uranium	mg/L	11/25/2014	0001	18 -	1.1	J	#	0.000029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site											
REPORT DATE: 4/2/2015											
Location: 0733 WELL Infiltration Trench											
Parameter	Units	Sample ID	Date	Depth	Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty	
Ammonia Total as N	mg/L	11/25/2014	0001	18	-	200	J	#	50		
Ammonia Total as N	mg/L	11/25/2014	0002	18	-	190	J	#	50		
Oxidation Reduction Potential	mV	11/25/2014	N001	18	-	-136		#			
pH	s.u.	11/25/2014	N001	18	-	7.34		#			
Specific Conductance	umhos /cm	11/25/2014	N001	18	-	10917		#			
Temperature	C	11/25/2014	N001	18	-	16.44		#			
Turbidity	NTU	11/25/2014	N001	18	-	637		#			
Uranium	mg/L	11/25/2014	0001	18	-	1.1	J	#	0.00029		
Uranium	mg/L	11/25/2014	0002	18	-	1.1	J	#	0.00029		

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: AMM-1 WELL NE corner of DOE property.

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/13/2014	0001	19 -	0.1	U	J	#	0.1	
Oxidation Reduction Potential	mV	11/13/2014	N001	19 -	-192			#		
pH	s.u.	11/13/2014	N001	19 -	6.92			#		
Specific Conductance	umhos/cm	11/13/2014	N001	19 -	11461			#		
Temperature	C	11/13/2014	N001	19 -	17.31			#		
Turbidity	NTU	11/13/2014	N001	19 -	1.15			#		
Uranium	mg/L	11/13/2014	0001	19 -	0.0063		J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: AMM-2 WELL East of pile along road.

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/17/2014	0001	48 -	480		J	#	50	
Oxidation Reduction Potential	mV	11/17/2014	N001	48 -	-206			#		
pH	s.u.	11/17/2014	N001	48 -	8.09			#		
Specific Conductance	umhos/cm	11/17/2014	N001	48 -	16037			#		
Temperature	C	11/17/2014	N001	48 -	16.52			#		
Turbidity	NTU	11/17/2014	N001	48 -	6.52			#		
Uranium	mg/L	11/17/2014	0001	48 -	2		J	#	0.00029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: AMM-3 WELL Near SE corner of pile.

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/24/2014	0001	48 -	200	J	#	50	
Oxidation Reduction Potential	mV	11/24/2014	N001	48 -	-167		#		
pH	s.u.	11/24/2014	N001	48 -	7.53		#		
Specific Conductance	umhos/cm	11/24/2014	N001	48 -	19139		#		
Temperature	C	11/24/2014	N001	48 -	19.45		#		
Turbidity	NTU	11/24/2014	N001	48 -	6.69		#		
Uranium	mg/L	11/24/2014	0001	48 -	1.3	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: ATP-1-D WELL Piezometer; see boring ATP-1 east of pile.

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/21/2014	0001	395 -	4	J	#	0.1	
Oxidation Reduction Potential	mV	11/21/2014	N001	395 -	-274		#		
pH	s.u.	11/21/2014	N001	395 -	8.81		#		
Specific Conductance	umhos/cm	11/21/2014	N001	395 -	12834		#		
Temperature	C	11/21/2014	N001	395 -	17.09		#		
Turbidity	NTU	11/21/2014	N001	395 -	6.7		#		
Uranium	mg/L	11/21/2014	0001	395 -	0.000029	U	J	0.000029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: ATP-1-ID WELL East of pile.

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/21/2014	0001	293 -	3.9	J	#	0.1	
Oxidation Reduction Potential	mV	11/21/2014	N001	293 -	-240		#		
pH	s.u.	11/21/2014	N001	293 -	8.72		#		
Specific Conductance	umhos/cm	11/21/2014	N001	293 -	127156		#		
Temperature	C	11/21/2014	N001	293 -	17.29		#		
Turbidity	NTU	11/21/2014	N001	293 -	3.6		#		
Uranium	mg/L	11/21/2014	0001	293 -	0.000029	U	J	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: ATP-1-IS WELL East of pile.

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/21/2014	0001	213 -	4.2	J	#	0.1	
Oxidation Reduction Potential	mV	11/21/2014	N001	213 -	-234		#		
pH	s.u.	11/21/2014	N001	213 -	8.77		#		
Specific Conductance	umhos/cm	11/21/2014	N001	213 -	126043		#		
Temperature	C	11/21/2014	N001	213 -	17.24		#		
Turbidity	NTU	11/21/2014	N001	213 -	6.59		#		
Uranium	mg/L	11/21/2014	0001	213 -	0.000029	U	J	0.000029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: ATP-1-S WELL Piezometer; see boring ATP-1 east of pile.

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/21/2014	0001	143 -	4	J	#	0.1	
Oxidation Reduction Potential	mV	11/21/2014	N001	143 -	-241		#		
pH	s.u.	11/21/2014	N001	143 -	8.94		#		
Specific Conductance	umhos/cm	11/21/2014	N001	143 -	121142		#		
Temperature	C	11/21/2014	N001	143 -	17.2		#		
Turbidity	NTU	11/21/2014	N001	143 -	32.9		#		
Uranium	mg/L	11/21/2014	0001	143 -	0.00006	B	J	#	0.000029

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: ATP-2-D WELL Piezometer; see boring ATP-2

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/24/2014	0001	88 -	460	J	#	20	
Oxidation Reduction Potential	mV	11/24/2014	N001	88 -	-259		#		
pH	s.u.	11/24/2014	N001	88 -	9.14		#		
Specific Conductance	umhos/cm	11/24/2014	N001	88 -	121071		#		
Temperature	C	11/24/2014	N001	88 -	16.81		#		
Turbidity	NTU	11/24/2014	N001	88 -	390		#		
Uranium	mg/L	11/24/2014	0001	88 -	0.00061	J	#	0.000029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: ATP-2-S WELL Piezometer; see boring ATP-2

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/24/2014	0001	25 -	350	J	#	20	
Oxidation Reduction Potential	mV	11/24/2014	N001	25 -	-181		#		
pH	s.u.	11/24/2014	N001	25 -	8.6		#		
Specific Conductance	umhos/cm	11/24/2014	N001	25 -	15000		#		
Temperature	C	11/24/2014	N001	25 -	17.07		#		
Turbidity	NTU	11/24/2014	N001	25 -	7.55		#		
Uranium	mg/L	11/24/2014	0001	25 -	0.0017	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: CR1 SURFACE LOCATION

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/01/2014	0001	0 - 0	0.1	U	J	0.1	
Oxidation Reduction Potential	mV	12/01/2014	N001	0 - 0	-147		#		
pH	s.u.	12/01/2014	N001	0 - 0	8.21		#		
Specific Conductance	umhos/cm	12/01/2014	N001	0 - 0	2336		#		
Temperature	C	12/01/2014	N001	0 - 0	6.38		#		
Turbidity	NTU	12/01/2014	N001	0 - 0	6.32		#		
Uranium	mg/L	12/01/2014	0001	0 - 0	0.0049	J	#	0.000029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: CR2 SURFACE LOCATION

Parameter	Units	Sample ID	Date	Depth Range (BLS)	(Ft)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/01/2014	0001	0 -	0	0.52	J	#	0.1	
Oxidation Reduction Potential	mV	12/01/2014	N001	0 -	0	-148		#		
pH	s.u.	12/01/2014	N001	0 -	0	8.11		#		
Specific Conductance	umhos/cm	12/01/2014	N001	0 -	0	1196		#		
Temperature	C	12/01/2014	N001	0 -	0	6.78		#		
Turbidity	NTU	12/01/2014	N001	0 -	0	53.4		#		
Uranium	mg/L	12/01/2014	0001	0 -	0	0.011	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: CR3 SURFACE LOCATION

Parameter	Units	Sample ID	Date	Depth Range (BLS)	(Ft)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/01/2014	0001	0 -	0	0.89	J	#	0.1	
Oxidation Reduction Potential	mV	12/01/2014	N001	0 -	0	-148		#		
pH	s.u.	12/01/2014	N001	0 -	0	8.05		#		
Specific Conductance	umhos/cm	12/01/2014	N001	0 -	0	1226		#		
Temperature	C	12/01/2014	N001	0 -	0	7.76		#		
Turbidity	NTU	12/01/2014	N001	0 -	0	311		#		
Uranium	mg/L	12/01/2014	0001	0 -	0	0.012	J	#	0.000029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: CR5 SURFACE LOCATION

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/01/2014	0001	0 - 0	0.1	U	J #	0.1	
Oxidation Reduction Potential	mV	12/01/2014	N001	0 - 0	-163		#		
pH	s.u.	12/01/2014	N001	0 - 0	8.28		#		
Specific Conductance	umhos/cm	12/01/2014	N001	0 - 0	1198		#		
Temperature	C	12/01/2014	N001	0 - 0	7.42		#		
Turbidity	NTU	12/01/2014	N001	0 - 0	208		#		
Uranium	mg/L	12/01/2014	0001	0 - 0	0.0054		J #	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: MW-3 WELL See borehole 8

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/17/2014	0001	44 -	470		J #	50	
Oxidation Reduction Potential	mV	11/17/2014	N001	44 -	-220		#		
pH	s.u.	11/17/2014	N001	44 -	7.89		#		
Specific Conductance	umhos/cm	11/17/2014	N001	44 -	21234		#		
Temperature	C	11/17/2014	N001	44 -	17.1		#		
Turbidity	NTU	11/17/2014	N001	44 -	3.44		#		
Uranium	mg/L	11/17/2014	0001	44 -	2.7		J #	0.00029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: SMI-MW01 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/14/2014	0001	40 -	2.2	J	#	0.1	
Oxidation Reduction Potential	mV	11/14/2014	N001	40 -	-258		#		
pH	s.u.	11/14/2014	N001	40 -	7.75		#		
Specific Conductance	umhos/cm	11/14/2014	N001	40 -	4610		#		
Temperature	C	11/14/2014	N001	40 -	17.39		#		
Turbidity	NTU	11/14/2014	N001	40 -	34.3		#		
Uranium	mg/L	11/14/2014	0001	40 -	4.8	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: SMI-PW02 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/11/2014	0001	55 -	520	J	#	20	
Oxidation Reduction Potential	mV	12/11/2014	N001	55 -	19		#		
pH	s.u.	12/11/2014	N001	55 -	7.98		#		
Specific Conductance	umhos/cm	12/11/2014	N001	55 -	26115		#		
Temperature	C	12/11/2014	N001	55 -	17.48		#		
Uranium	mg/L	12/11/2014	0001	55 -	3.3	J	#	0.00029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: SMI-PZ1S WELL Baseline Area

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/17/2014	0001	19 -	220	J	#	50	
Oxidation Reduction Potential	mV	11/17/2014	N001	19 -	-232		#		
pH	s.u.	11/17/2014	N001	19 -	8.09		#		
Specific Conductance	umhos/cm	11/17/2014	N001	19 -	9950		#		
Temperature	C	11/17/2014	N001	19 -	16.86		#		
Turbidity	NTU	11/17/2014	N001	19 -	9.94		#		
Uranium	mg/L	11/17/2014	0001	19 -	1.2	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: SMI-PZ2M2 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/17/2014	0001	56 -	640	J	#	50	
Oxidation Reduction Potential	mV	11/17/2014	N001	56 -	-182		#		
pH	s.u.	11/17/2014	N001	56 -	7.77		#		
Specific Conductance	umhos/cm	11/17/2014	N001	56 -	60136		#		
Temperature	C	11/17/2014	N001	56 -	16.14		#		
Turbidity	NTU	11/17/2014	N001	56 -	2.82		#		
Uranium	mg/L	11/17/2014	0001	56 -	2.9	J	#	0.00029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: SMI-PZ3D2 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/03/2014	0001	78 -	410	J	#	10	
Oxidation Reduction Potential	mV	12/03/2014	N001	78 -	-187		#		
pH	s.u.	12/03/2014	N001	78 -	7.82		#		
Specific Conductance	umhos/cm	12/03/2014	N001	78 -	19033		#		
Temperature	C	12/03/2014	N001	78 -	17.58		#		
Turbidity	NTU	12/03/2014	N001	78 -	7.12		#		
Uranium	mg/L	12/03/2014	0001	78 -	0.83	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: SMI-PZ3M WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/03/2014	0001	59 -	37	J	#	2	
Oxidation Reduction Potential	mV	12/03/2014	N001	59 -	-199		#		
pH	s.u.	12/03/2014	N001	59 -	8.14		#		
Specific Conductance	umhos/cm	12/03/2014	N001	59 -	7120		#		
Temperature	C	12/03/2014	N001	59 -	17.77		#		
Turbidity	NTU	12/03/2014	N001	59 -	3.49		#		
Uranium	mg/L	12/03/2014	0001	59 -	1.1	J	#	0.00029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: SMI-PZ3S WELL

Parameter	Units	Sample ID	Date	Depth Range (BLS)	(Ft)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/03/2014	0001	25	-	4.7	J	#	0.1	
Oxidation Reduction Potential	mV	12/03/2014	N001	25	-	-207		#		
pH	s.u.	12/03/2014	N001	25	-	8.51		#		
Specific Conductance	umhos/cm	12/03/2014	N001	25	-	4556		#		
Temperature	C	12/03/2014	N001	25	-	18.62		#		
Turbidity	NTU	12/03/2014	N001	25	-	3.65		#		
Uranium	mg/L	12/03/2014	0001	25	-	1.6	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: TP-01 WELL Date, GR_Elev, Boring_Depth frm SMIDoc#2 (ORNL 1/9/98)

Parameter	Units	Sample ID	Date	Depth Range (BLS)	(Ft)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/14/2014	0001	22	-	0.1	U	J	0.1	
Oxidation Reduction Potential	mV	11/14/2014	N001	22	-	-254		#		
pH	s.u.	11/14/2014	N001	22	-	7.72		#		
Specific Conductance	umhos/cm	11/14/2014	N001	22	-	6090		#		
Temperature	C	11/14/2014	N001	22	-	16.43		#		
Turbidity	NTU	11/14/2014	N001	22	-	2.01		#		
Uranium	mg/L	11/14/2014	0001	22	-	0.075	J	#	0.000029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 4/2/2015
Location: TP-11 WELL Date, GR_Elev, Boring_Depth frm SMIDoc#2 (ORNL 1/9/98);PWC_Moab.mdb chemistry data in both HLA Surface_Water and HLA Groundwater tables

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/13/2014	0001	30 -	0.84	J	#	0.1	
Oxidation Reduction Potential	mV	11/13/2014	N001	30 -	-277		#		
pH	s.u.	11/13/2014	N001	30 -	7.6		#		
Specific Conductance	umhos/cm	11/13/2014	N001	30 -	1713		#		
Temperature	C	11/13/2014	N001	30 -	16.35		#		
Turbidity	NTU	11/13/2014	N001	30 -	7.26		#		
Uranium	mg/L	11/13/2014	0001	30 -	0.00068	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 4/2/2015
Location: TP-17 WELL Date, GR_Elev, Boring_Depth frm SMIDoc#2 (ORNL 1/9/98)

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/01/2014	0001	28 -	2.2	J	#	0.1	
Oxidation Reduction Potential	mV	12/01/2014	N001	28 -	-218		#		
pH	s.u.	12/01/2014	N001	28 -	8.57		#		
Specific Conductance	umhos/cm	12/01/2014	N001	28 -	94300		#		
Temperature	C	12/01/2014	N001	28 -	13.76		#		
Turbidity	NTU	12/01/2014	N001	28 -	8.51		#		
Uranium	mg/L	12/01/2014	0001	28 -	0.027	J	#	0.000029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 4/2/2015
Location: TP-20 WELL Date, GR_Elev, Boring_Depth frm SMIDoc#2 (ORNL 1/9/98)

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/17/2014	0001	32 -	3.1	J	#	0.1	
Oxidation Reduction Potential	mV	11/17/2014	N001	32 -	-198		#		
pH	s.u.	11/17/2014	N001	32 -	7.42		#		
Specific Conductance	umhos/cm	11/17/2014	N001	32 -	120536		#		
Temperature	C	11/17/2014	N001	32 -	17.21		#		
Turbidity	NTU	11/17/2014	N001	32 -	3.15		#		
Uranium	mg/L	11/17/2014	0001	32 -	0.034	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 4/2/2015
Location: TP-22 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/14/2014	0001	17 -	0.2	J	#	0.1	
Oxidation Reduction Potential	mV	11/14/2014	N001	17 -	-185		#		
pH	s.u.	11/14/2014	N001	17 -	6.98		#		
Specific Conductance	umhos/cm	11/14/2014	N001	17 -	30350		#		
Temperature	C	11/14/2014	N001	17 -	18.18		#		
Turbidity	NTU	11/14/2014	N001	17 -	321		#		
Uranium	mg/L	11/14/2014	0001	17 -	0.35	J	#	0.000029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: TP-23 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/17/2014	0001	25 -	170	J	#	10	
Oxidation Reduction Potential	mV	11/17/2014	N001	25 -	-182		#		
pH	s.u.	11/17/2014	N001	25 -	7.1		#		
Specific Conductance	umhos/cm	11/17/2014	N001	25 -	43365		#		
Temperature	C	11/17/2014	N001	25 -	19.73		#		
Turbidity	NTU	11/17/2014	N001	25 -	38.8		#		
Uranium	mg/L	11/17/2014	0001	25 -	3.5	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: UPD-17 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/02/2014	0001	14.5 -	280	J	#	20	
Oxidation Reduction Potential	mV	12/02/2014	N001	14.5 -	-160.1		#		
pH	s.u.	12/02/2014	N001	14.5 -	7.49		#		
Specific Conductance	umhos/cm	12/02/2014	N001	14.5 -	10581		#		
Temperature	C	12/02/2014	N001	14.5 -	17.86		#		
Turbidity	NTU	12/02/2014	N001	14.5 -	5.8		#		
Uranium	mg/L	12/02/2014	0001	14.5 -	1.3	J	#	0.00029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: UPD-18 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/02/2014	0001	13 -	290	J	#	20	
Oxidation Reduction Potential	mV	12/02/2014	N001	13 -	-143		#		
pH	s.u.	12/02/2014	N001	13 -	7.3		#		
Specific Conductance	umhos/cm	12/02/2014	N001	13 -	8501		#		
Temperature	C	12/02/2014	N001	13 -	18.14		#		
Turbidity	NTU	12/02/2014	N001	13 -	6.66		#		
Uranium	mg/L	12/02/2014	0001	13 -	0.81	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: UPD-20 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/03/2014	0001	17 -	0.1	U	J	0.1	
Oxidation Reduction Potential	mV	12/03/2014	N001	17 -	-188		#		
pH	s.u.	12/03/2014	N001	17 -	8.07		#		
Specific Conductance	umhos/cm	12/03/2014	N001	17 -	3702		#		
Temperature	C	12/03/2014	N001	17 -	16.9		#		
Turbidity	NTU	12/03/2014	N001	17 -	9.85		#		
Uranium	mg/L	12/03/2014	0001	17 -	0.064	J	#	0.000029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: UPD-21 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/03/2014	0001	25 -	10	J	#	2.5	
Oxidation Reduction Potential	mV	12/03/2014	N001	25 -	-189		#		
pH	s.u.	12/03/2014	N001	25 -	7.95		#		
Specific Conductance	umhos/cm	12/03/2014	N001	25 -	3727		#		
Temperature	C	12/03/2014	N001	25 -	17.52		#		
Turbidity	NTU	12/03/2014	N001	25 -	3.31		#		
Uranium	mg/L	12/03/2014	0001	25 -	18	J	#	0.0029	

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site											
REPORT DATE: 4/2/2015											
Location: UPD-22 WELL											
Parameter	Units	Sample ID	Date	Depth	Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty	
Ammonia Total as N	mg/L	11/19/2014	0001	9	-	1.9	J	#	0.1		
Ammonia Total as N	mg/L	11/19/2014	0002	9	-	1.8	J	#	0.1		
Oxidation Reduction Potential	mV	11/19/2014	N001	9	-	-256		#			
pH	s.u.	11/19/2014	N001	9	-	7.79		#			
Specific Conductance	umhos /cm	11/19/2014	N001	9	-	2880		#			
Temperature	C	11/19/2014	N001	9	-	19.07		#			
Turbidity	NTU	11/19/2014	N001	9	-	3.96		#			
Uranium	mg/L	11/19/2014	0001	9	-	2.9	J	#	0.00029		
Uranium	mg/L	11/19/2014	0002	9	-	3	J	#	0.00029		

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site											
REPORT DATE: 4/2/2015											
Location: UPD-23 WELL											
Parameter	Units	Sample ID	Date	Depth	Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty	
Ammonia Total as N	mg/L	11/14/2014	0001	25	-	2.4	J	#	0.1		
Oxidation Reduction Potential	mV	11/14/2014	N001	25	-	-188		#			
pH	s.u.	11/14/2014	N001	25	-	6.99		#			
Specific Conductance	umhos/cm	11/14/2014	N001	25	-	2721		#			
Temperature	C	11/14/2014	N001	25	-	15.08		#			
Turbidity	NTU	11/14/2014	N001	25	-	324		#			
Uranium	mg/L	11/14/2014	0001	25	-	0.74	J	#	0.000029		

Appendix D. Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site

REPORT DATE: 4/2/2015

Location: UPD-24 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/03/2014	0001	27 -	1.9	J	#	0.1	
Ammonia Total as N	mg/L	12/03/2014	0002	27 -	1.9	J	#	0.1	
Oxidation Reduction Potential	mV	12/03/2014	N001	27 -	-197		#		
pH	s.u.	12/03/2014	N001	27 -	8.11		#		
Specific Conductance	umhos/cm	12/03/2014	N001	27 -	4433		#		
Temperature	C	12/03/2014	N001	27 -	18.01		#		
Turbidity	NTU	12/03/2014	N001	27 -	1.82		#		
Uranium	mg/L	12/03/2014	0001	27 -	10	J	#	0.0029	
Uranium	mg/L	12/03/2014	0002	27 -	10	J	#	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

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

LAB QUALIFIERS:

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

DATA QUALIFIERS:

- F Low flow sampling method used.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9. 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 D. Blanks Report

BLANKS REPORT
LAB: ALS
RIN: 1411074
Report Date: 4/2/2015

Parameter	Site Code	Location ID	Sample ID	Date	Units	Result	Qualifiers Lab Data	Detection Limit	Uncertainty	Sample Type
Ammonia Total as N	MOA01	0999	12/11/2014	0001	mg/L	.1	U	.1		E
Uranium	MOA01	0999	12/11/2014	0001	mg/L	.00006	B	.000029		E

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

LAB QUALIFIERS:

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

DATA QUALIFIERS:

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

SAMPLE TYPES:

- E Equipment Blank.

Appendix D. Water Level Data

STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site							
REPORT DATE: 3/15/2015							
Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Time	Date	Depth From Top of Casing (Ft)	Water Elevation (MSL)	Water Level Flag
401	O	3969.6	11/20/2014		13.51	3956.09	
403	O	3968.95	11/24/2014		15.57	3953.38	
404	O	3968.3	11/20/2014		14.07	3954.23	
407	O	3969.09	11/24/2014		15.8	3953.29	
410	O	3981.05	12/2/2014		25.03	3956.02	
411	O	3962.43	12/3/2014		8.57	3953.86	
412	O	3962.48	11/14/2014		5.76	3956.72	
413	O	3963.19	11/17/2014		7.82	3955.37	
414	U	3959.2	11/19/2014		4.4	3954.8	
431	O	4007.04	12/8/2014		47.46	3959.58	
433	U	3989.99	12/11/2014		31.56	3958.43	
439	O	4055.27	12/2/2014		93.26	3962.01	
440	U	4070.71	12/2/2014		111.27	3959.44	
441	O	4008.77	12/8/2014		48.95	3959.82	
443	O	4006.72	12/8/2014		46.68	3960.04	
453	O	4031.29	12/2/2014		73.66	3957.63	
454	O	3966.53	11/17/2014		12	3954.53	
492	O	3967.56	11/17/2014		15.4	3952.16	
AMM-1	O	3972.02	11/13/2014		16.35	3955.67	
AMM-2	O	3964.09	11/17/2014		9.87	3954.22	
AMM-3	O	3962.9	11/24/2014		8.43	3954.47	
ATP-2-D	O	3962.17	11/24/2014		6.76	3955.41	
ATP-2-S	U	3962.17	11/24/2014		11.8	3950.37	
MW-3	O	3965.98	11/17/2014		11.37	3954.61	
SMI-MW01	O	3960.22	11/14/2014		5.55	3954.67	
SMI-PZ1S	O	3964.13	11/17/2014		9.87	3954.26	
SMI-PZ2M2	O	3967.18	11/17/2014		13.96	3953.22	
SMI-PZ3D2	O	3975.13	12/3/2014		19.33	3955.8	

Appendix D. Water Level Data *(continued)*

STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site
REPORT DATE: 9/5/2014

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Time	Date	Depth From Top of Casing (Ft)	Water Elevation (MSL)	Water Level Flag
SMI-PZ3M	O	3975.23	12/3/2014		19.25	3955.98	
SMI-PZ3S	O	3975.03	12/3/2014		19.08	3955.95	
TP-11	O	3967.51	11/13/2014		11.7	3955.81	
TP-17	D	3963.69	12/1/2014		11.52	3952.17	
TP-20	O	3967.55	11/17/2014		15.36	3952.19	
TP-22	O	3966.51	11/14/2014		13.14	3953.37	
TP-23	O	3962.6	11/23/2014		8.8	3953.8	
UPD-17	O	3967.44	12/2/2014		12.86	3954.58	
UPD-18	O	3969	12/2/2014		12.54	3956.46	
UPD-20	O	3978.73	12/3/2014		22.07	3956.66	
UPD-21	O	3981.45	12/3/2014		25.05	3956.4	
UPD-22	O	3966.2	11/19/2014		10.44	3955.76	
UPD-23	O	3982.38	11/14/2014		26.07	3956.31	
UPD-24	O	3977.1	12/3/2014		21	3956.1	
683	O	3970.73	11/24/2014		14.15	3956.58	
684	O	3970.22	11/25/2014		13.81	3956.41	
732	O	3968.99	11/25/2014		12.4	3956.59	
733	O	3968.5	11/25/2014		11.96	3956.54	
ATP-1-D	O	3970.73	11/21/2014		7.86	3962.87	
ATP-1-ID	O	3970.87	11/21/2014		7.79	3963.08	
ATP-1-IS	O	3971	11/21/2014		7.77	3963.23	
ATP-1-S	O	3971.14	11/21/2014		7.94	3963.2	

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

Appendix D. November/December 2014 Site-wide Sampling Event Trip Report



Date: January 07, 2015
To: Ken Pill
From: James Ritchey
Subject: November 2014 Site Wide Sampling Event

Site: Moab – Site Wide Sampling Event –November 2014
Date of Sampling Event: November 13 – December 11, 2014
Team Members: E. Moran, K. Pill, and J. Ritchey
RIN Number Assigned: All samples were assigned to RIN 1411074.

Sample Shipment: The coolers were shipped overnight UPS to ALS Laboratory from Moab, Utah, on November 25 and December 11 of 2014 (Tracking numbers 1Z5W1Y510196949624 and 1Z5W1Y510197416840).

Number of Locations Sampled: The purpose of the Site Wide Sampling Event is to update contaminant plume maps. A total of 51 locations (seven surface samples and 44 monitoring wells) were sampled during this event. Including two duplicates and one equipment blank, a total of 54 samples were collected during the November 2014 sampling event.

Locations Not Sampled/Reason: Well TP-19 could not be safely accessed, and a sample was not collected from this location.

Field Variance: The turbidity calibration standards were expired and new standards were not received for calibration until November 24.

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	UPD-22	Duplicate from 9 ft bgs	Ground Water
2002	UPD-24	Duplicate from 27 ft bgs	Ground Water
2003	NA	Equipment Blank	De-ionized Water

Location Specific Information: All of the observation wells were sampled using a peristaltic pump and dedicated tubing unless otherwise noted. The surface water samples were collected with dedicated surface water tubing that was decontaminated with Alconox® and de-ionized water between locations. The table below provides additional information:

Appendix D. November/December 2014 Site-wide Sampling Event Trip Report *(continued)*

Location	Date	Sample Depth (ft bgs)	Ammonia Probe Results (mg/L)	Comments
0201	12/01/2014	–	–	~ 3ft deep, muddy substrate.
0218	12/01/2014	–	–	~1ft of water, rocky substrate.
0226	12/11/2014	–	–	Taken in ~5in of water, silty substrate.
0401	11/20/2014	18	290	
0403	11/24/2014	18	24.2	
0404	11/20/2014	18	255	
0407	11/24/2014	17	70.8	
0410	12/02/2014	23.5	–	Dewatered at 0.6L.
0411	12/03/2014	9	4.03	Dewatered at 0.1L. Temperature not recorded because it was recorded after purge.
0412	11/14/2014	9.5	–	
0413	11/17/2014	10.5	–	
0414	11/19/2014	7.5	–	Sulfur odor.
0431	12/08/2014	91	–	Sampled with bladder pump.
0433	12/11/2014	99	–	Sampled with bladder pump.
0439	12/02/2014	120	6.90	Sampled with bladder pump. Pump at 115.6 ft btoc.
0440	12/02/2014	119	–	Water level dropped below pump. Top of pump at 116 ft btoc.
0441	12/08/2014	53	–	Sampled with bladder pump.
0443	12/08/2014	73	–	Sampled with bladder pump.
0453	12/02/2014	80	–	Sampled with bladder pump. Water level dropped below pump.
0454	11/17/2014	13	–	
0492	11/17/2014	18	1.80	
AMM-1	11/13/2014	19	–	
AMM-2	11/17/2014	48	–	
AMM-3	11/24/2014	48	200	Sulfur odor.
ATP-2-D	11/24/2014	88	–	Water is gray.
ATP-2-S	11/24/2014	25	264	Metallic odor.
CR1	12/01/2014	–	–	~ 2ft deep, sandy substrate.
CR2	12/01/2014	–	–	~ 6in deep, muddy/rocky substrate.
CR3	12/01/2014	–	–	~ 2ft of water, muddy substrate.
CR5	12/01/2014	–	–	~ 6in of water, muddy/sandy substrate.
MW-3	11/17/2014	44	–	
SMI-MW01	11/14/2014	16	–	Red biological material in purge cup.
SMI-PW02	12/11/2014	55	–	
SMI-PZ1S	11/17/2014	19	385	
SMI-PZ2M2	11/17/2014	56	1084	
SMI-PZ3D2	12/03/2014	78	317	
SMI-PZ3M	12/03/2014	59	–	Sulfur odor.
SMI-PZ3S	12/03/2014	25	4.70	
TP-01	11/14/2014	22	–	Water level not obtainable.
TP-11	11/13/2014	30	<1	
TP-17	12/01/2014	28	–	Water is gray. Sulfur odor.
TP-20	11/17/2014	32	–	
TP-22	11/14/2014	17	–	Water is red. Well dewatered at 2 L.
TP-23	11/17/2014	25	–	
UPD-17	12/02/2014	14.5	247	
UPD-18	12/02/2014	13	258	
UPD-20	12/03/2014	17	<1	
UPD-21	12/03/2014	25	8.53	
UPD-22	11/19/2014	9	<1	Duplicate.
UPD-23	11/14/2014	25	–	Metallic odor. Dewatered a 0.25 L.
UPD-24	12/03/2014	27	1.72	Duplicate.

ft bgs = feet below ground surface; ft btoc = feet below top of casing

Appendix D. November/December 2014 Site-wide Sampling Event Trip Report (*continued*)

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

Well No.	Date	Depth to Water (ft btoc)
0401	11/20/2014	13.51
0403	11/24/2014	15.57
0404	11/20/2014	14.07
0407	11/24/2014	15.80
0410	12/02/2014	25.03
0411	12/03/2014	8.57
0412	11/14/2014	5.76
0413	11/17/2014	7.82
0414	11/19/2014	4.40
0431	12/08/2014	47.46
0433	12/11/2014	31.56
0439	12/02/2014	93.26
0440	12/02/2014	111.27
0441	12/08/2014	48.95
0443	12/08/2014	46.68
0453	12/02/2014	73.66
0454	11/17/2014	12.00
0492	11/17/2014	15.40
AMM-1	11/13/2014	16.35
AMM-2	11/17/2014	9.87
AMM-3	11/24/2014	8.43
ATP-2-D	11/24/2014	6.76
ATP-2-S	11/24/2014	11.80
MW-3	11/17/2014	11.37
SMI-MW01	11/14/2014	5.55
SMI-PW02	12/11/2014	–
SMI-PZ1S	11/17/2014	9.87
SMI-PZ2M2	11/17/2014	13.96
SMI-PZ3D2	12/03/2014	19.33
SMI-PZ3M	12/03/2014	19.25
SMI-PZ3S	12/03/2014	19.08
TP-01	11/14/2014	–
TP-11	11/13/2014	11.70
TP-17	12/01/2014	11.52
TP-20	11/17/2014	15.36
TP-22	11/14/2014	13.14
TP-23	11/23/2014	8.80
UPD-17	12/02/2014	12.86
UPD-18	12/02/2014	12.54
UPD-20	12/03/2014	22.07
UPD-21	12/03/2014	25.05
UPD-22	11/19/2014	10.44
UPD-23	11/14/2014	26.07
UPD-24	12/03/2014	21.00

ft btoc = feet below top of casing

Appendix D. November/December 2014 Site-wide Sampling Event Trip Report *(continued)*

November 2014 Tree Plot Area Ground Water Sampling

Number of Locations Sampled: Eight observation wells (0683, 0684, 0732, 0733, ATP-1-D, ATP-1-ID, ATP-1-IS, and ATP-1-S) and one duplicate were sampled during the November 2014 Sampling Event.

Locations Not Sampled: None.

Field Variance: The turbidity calibration standards were expired and new standards were not received for calibration until November 24.

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

False ID	True ID	Sample Type	Associated Matrix
2001	0733	Duplicate from 18 ft bgs	Ground Water

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

Well No.	Date	Time	Ammonia Probe Results (mg/L)	Depth to Water (ft btoc)	Pump Intake Depth (ft bgs)	Comments
0683	11/24/2014	14:17	305	14.15	27	
0684	11/25/2014	08:48	76.7	13.81	18	
0732	11/25/2014	09:10	74.0	12.40	18	
0733	11/25/2014	10:03	196	11.96	18	Duplicate.
ATP-1-D	11/21/2014	12:45	1.83	7.86	395	Black water. Sulfur odor.
ATP-1-ID	11/21/2014	12:22	2.14	7.79	293	
ATP-1-IS	11/21/2014	12:03	2.00	7.77	213	Water is black.
ATP-1-S	11/21/2014	11:45	2.04	7.94	143	Sulfur odor.

ft btoc = feet below top of casing

Well Inspection Summary: A well inspection was not conducted.

Equipment: None.

Regulatory: None.

Appendix D. November/December 2014 Site-wide Sampling Event Trip Report (*continued*)

Site Issues: According to the USGS Cisco Gaging Station (Station No. 09180500), the mean daily Colorado River flow during this sampling event is provided below:

Date	Daily Mean Flow (cfs)
11/13/2014	3,870
11/14/2014	3,760
11/15/2014	3,450
11/16/2014	3,690
11/17/2014	3,910
11/18/2014	3,680
11/19/2014	3,370
11/20/2014	3,610
11/21/2014	3,760
11/22/2014	3,860
11/23/2014	4,010
11/24/2014	4,030
11/25/2014	4,030
11/26/2014	3,910
11/27/2014	3,810
11/28/2014	3,960
11/29/2014	3,920
11/30/2014	3,910
12/1/2014	3,890
12/2/2014	3,850
12/3/2014	3,850
12/4/2014	3,940
12/5/2014	3,870
12/6/2014	3,890
12/7/2014	3,930
12/8/2014	3,900
12/9/2014	3,890
12/10/2014	3,880
12/11/2014	3,750

Corrective Action Required/Taken: None.