

Office of Environmental Management – Grand Junction



Moab UMTRA Project
Ground Water and Surface Water Monitoring
Report July through December 2015

Revision 0

April 2016



U.S. Department
of Energy

Office of Environmental Management

**Moab UMTRA Project
Ground Water and Surface Water Monitoring Report
July through December 2015**

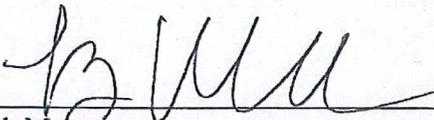
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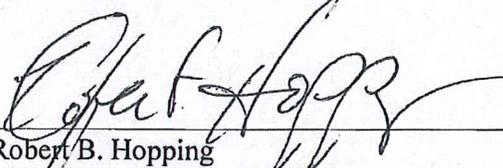
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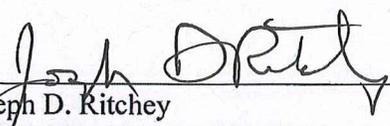
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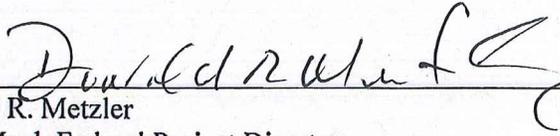

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Acronyms and Abbreviations

ALS	ALS Global
bgs	below ground surface
CCB	continuing calibration blank
CCV	continuing calibration verification
CF	Configuration
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm	centimeter
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
ICB	initial calibration blank
ICP	inductively coupled plasma
ICV	initial calibration verification
IDL	instrument detection limit
LCS	laboratory control sample
MB	method blank
MDL	method detection limit
µmhos	micromhos
mg/L	milligrams per liter
MS	matrix spike or mass spectroscopy
MSD	matrix spike duplicate
QC	quality control
r ²	correlation coefficient
RIN	report identification number
RL	reporting limit
RPD	relative percent difference
SD	serial dilution
SDG	sample data group
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 2015. The results of the data validation process are also presented.

Four sampling events were completed during this time frame. The first sampling event included the collection of ground water and surface water samples at the Crescent Junction site. Three samples were collected from well 0205 (two samples collected in July, and one in November), and ponded surface runoff in the vicinity of well 0205 was sampled twice (both in November). These samples were all collected to determine the source of water present in Crescent Junction monitoring well 0205; the locations are shown on Figure 1.

Ground water samples were collected from select monitoring locations in the vicinity of the well field, from Configuration (CF) 4 monitoring wells and locations adjacent to the tree plot area in the vicinity of CF3 as part of the second event. This event was conducted in October and was associated with the impending removal of the evaporation pond and cessation of pumping extracted ground water into the pond. The results will provide a baseline for contaminant ground water concentration distribution in this area of the site after the ground water extraction system operation schedule was altered due to the removal of the pond.

Included with this event was the collection of samples from CF4 to determine the effectiveness of the freshwater injection system by measuring the contaminant concentrations in monitoring wells upgradient and downgradient of the CF4 injection wells. Samples were also collected from the ground water monitoring wells adjacent to the tree plot area in an attempt to measure the impact of phytoremediation on the ammonia ground water plume. The site-wide locations are shown on Figure 2, and the CF4 and tree plot locations are shown on Figure 3.

The third event was conducted in November and included the collection of ground water samples at the Matheson Wetlands Preserve (Figure 4); it was conducted to measure the ammonia and uranium concentrations in ground water wells across the Colorado River from the site at the Matheson Wetlands Preserve. This was the first time samples were collected from these locations since 2010, and the results will be compared to these previous events to determine if there are any trends.

The fourth and final event was started in December 2015 and completed in January 2016, with samples collected from a variety of site-wide ground water and surface water locations. The site-wide event ground water and surface water sampling locations are shown on Figures 2 and 5, respectively. Site-wide ground water sampling was conducted to assess any changes and trends in water quality. 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.

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). All data validation follows the criteria according to the *Moab UMTRA Project Standard Practice for Validation of Laboratory Data* (DOE-EM/GJTAC1855).

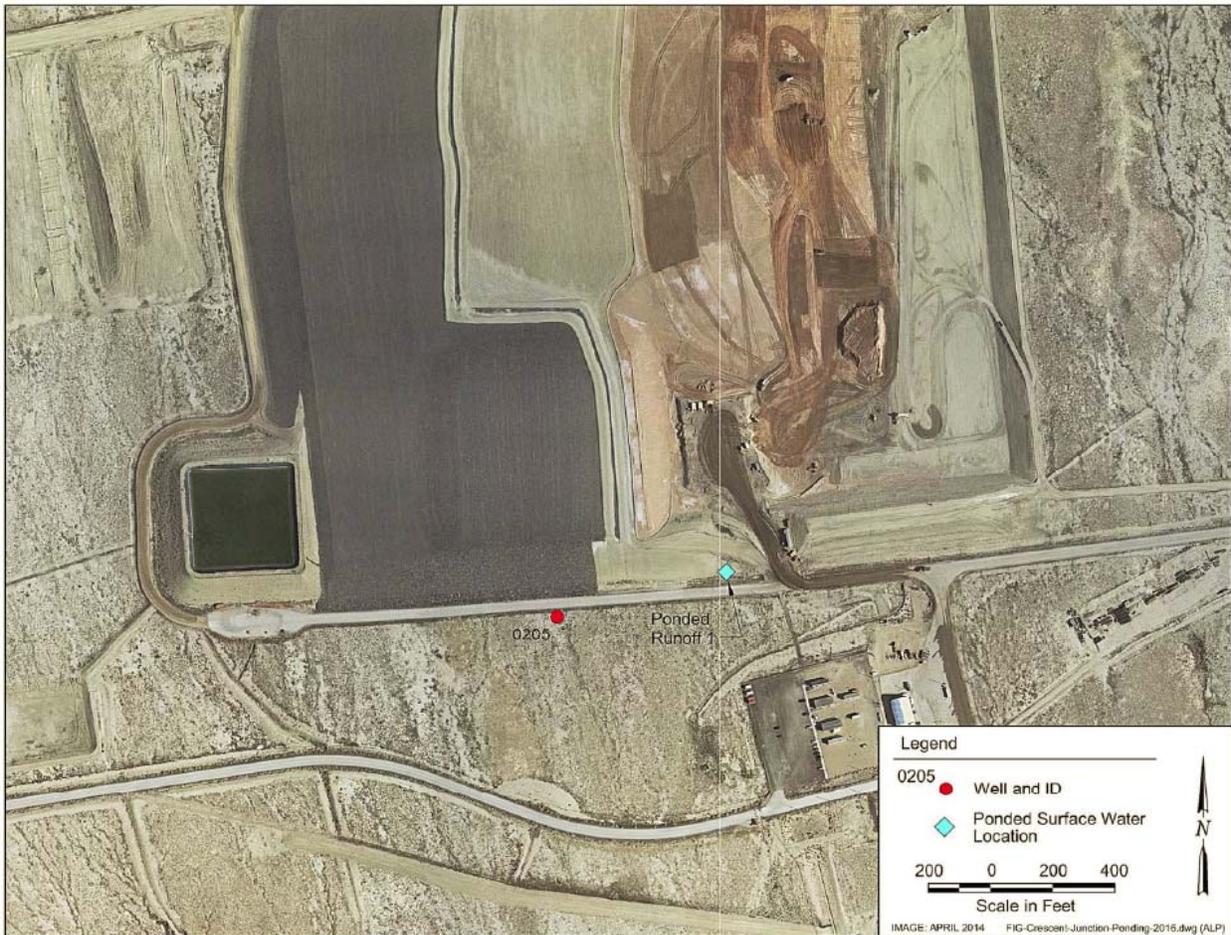


Figure 1. July through November 2015 Crescent Junction Sampling Locations

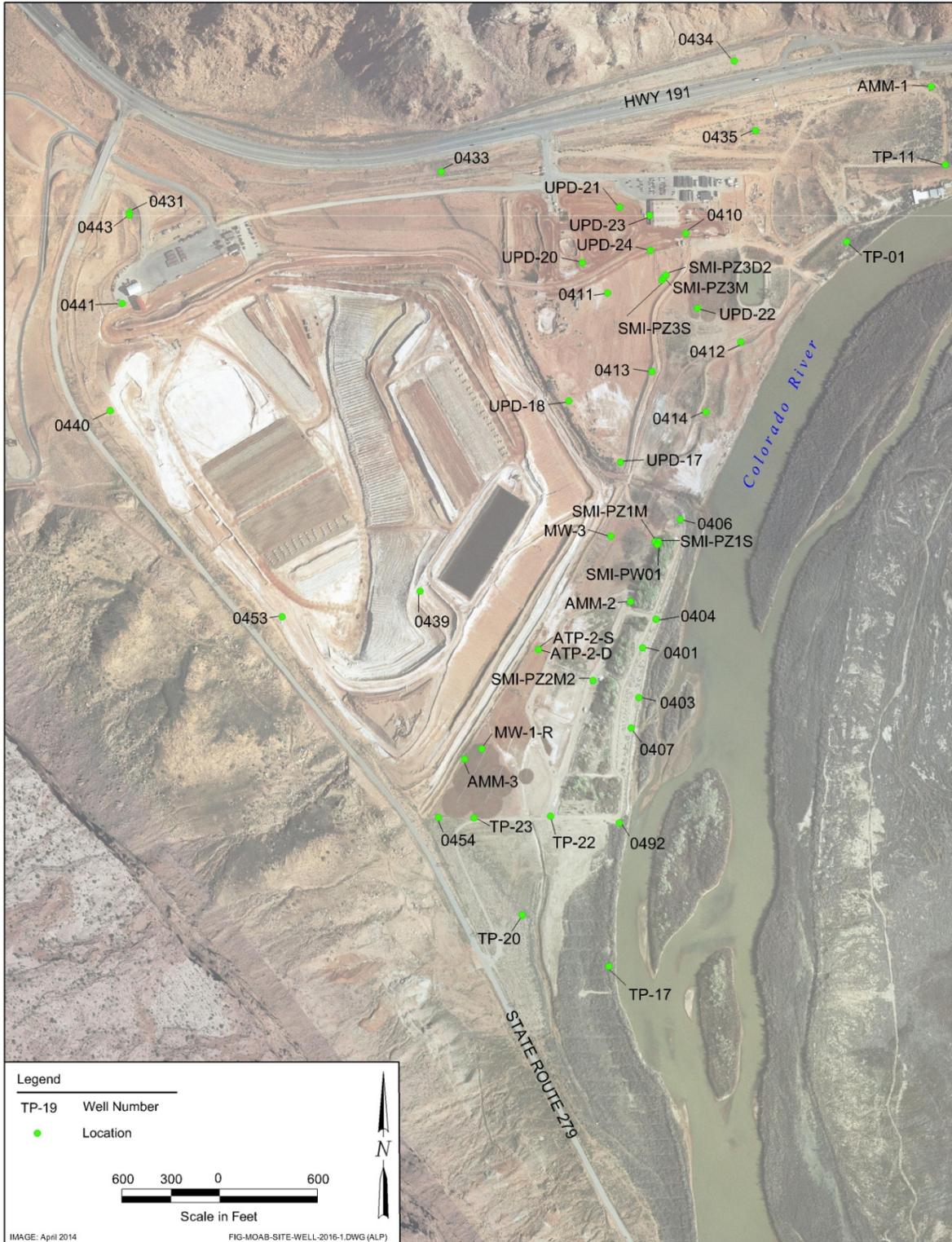


Figure 2. Site-wide Ground Water Sampling Locations



Figure 3. October 2015 CF4 and Tree Plot Area Ground Water Sampling Locations



Figure 4. November 2015 Matheson Wetlands Ground Water Sampling Locations

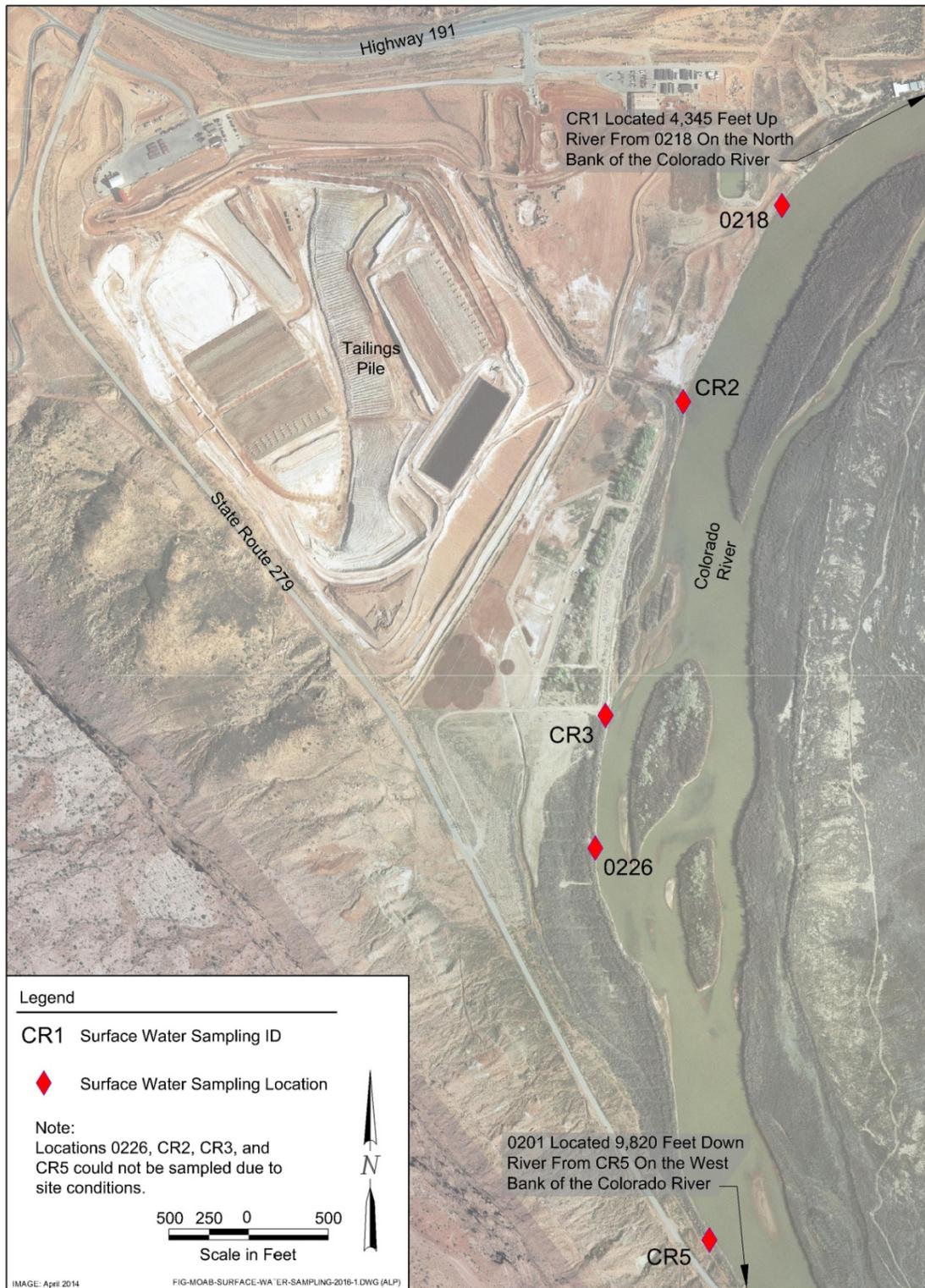


Figure 5. December 2015/January 2016 Surface Water Sampling Locations

Appendix A includes Water Sampling Field Activities Verification, Water Quality Data, and the trip report associated with the July through November 2015 Crescent Junction sampling event. Appendix B contains the Water Sampling Field Activities Verification, Minimums and Maximums Report, Water Quality Data, Water Level Data, and the trip report associated with the October 2015 site-wide, CF4, and Tree Plot sampling event. The Water Sampling Field Activities Verification, Water Quality Data, Water Level Data, and the trip report for the November 2015 sampling event are contained in Appendix C, and Appendix D includes the Water Sampling Field Activities Verification, Minimums and Maximums Report, Water Quality Data, Water Level Data, and the trip report associated with the December 2015/January 2016 Site-wide sampling event.

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 adjacent to the 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.

2.0 Summary of Sampling Events

2.1 July through November 2015 Crescent Junction Sampling Events

Ground water samples were collected from well 0205 (two samples collected in July and one in November) after water was first encountered in this well since it was modified in 2011. In an attempt to determine the source of this water, surface runoff from the disposal cell that ponded at the base of the cell was also sampled twice in November.

2.2 October 2015 Site-wide, CF4, and Tree Plot Sampling Event

Seventeen ground water samples were collected during this event from locations in the vicinity of the extraction wells in the well field. With the impending removal of the evaporation pond and cessation of pumping extracted ground water into the pond, the results will provide a baseline for contaminant ground water concentrations in this area of the site after alteration of the ground water extraction system operation schedule.

Ground water samples were also 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. Six ground water samples in the vicinity of the tree plot area (near CF3) were collected to determine if phytoremediation had impacted ammonia concentrations.

2.3 November 2015 Matheson Sampling Event

Eleven ground water samples were collected from the Matheson Wetlands Preserve to measure the ammonia and uranium concentrations in ground water wells across the Colorado River from the Moab site. This event represents the first time samples were collected from these locations since 2010.

2.4 December 2015/January 2016 Site-wide Sampling Event

Thirty-four ground water and surface water samples were collected 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 31 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. Select samples were analyzed for ammonia using a HACH sension 2 portable pH/ISE probe and meter. All samples were submitted to ALS Global (ALS) laboratory for ammonia and uranium analysis.

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

3.0 Data Assessment

3.1 July through November 2015 Crescent Junction Sampling Events

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)	1507078
Laboratory:	ALS, Fort Collins, Colorado
Sample Date Group (SDG) Numbers:	1507268, 1507552, 1508264, 1510522, 1511101
Analysis:	Metals, Inorganics, Gross Alpha/Beta, Ra-226, Ra-228
Validator:	Elizabeth Moran
Review Date:	7 March 2016

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

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 1. July through November 2015 Crescent Junction Sampling Events, Analytes and Methods

Analyte	Preparation Method	Analytical Method
Ammonia as N, NH ₃ -N	EPA 350.1	EPA 350.1
Alkalinity	EPA 310.1	EPA 310.1
Bicarbonate	EPA 310.1	EPA 310.1
Carbonate	EPA 310.1	EPA 310.1
Nitrate/Nitrite as N	EPA 353.2	EPA 353.2
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
Arsenic, Barium, Boron, Cadmium, Calcium, Chromium, Copper, Iron, Lead, Magnesium, Manganese, Molybdenum, Potassium, Selenium, Silver, Sodium	SW-6010B	EPA 6010B
Uranium	SW-846- 3005A	SW-846 6020A
Radium-226	SOP 712R16	EPA 903
Radium-228	SOP 749R2	EPA 904
Total Dissolved Solids	EPA 160.1	540 C
Gross Alpha/Beta	SOP 702R20	SOP724R8

Table 2. July through November 2015 Crescent Junction Sampling Events, Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
All Samples	0205, Poned Runoff 1 (all SDGs)	All inorganics, metals, rad	J	MS-1

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

Table 3. July through November 2015 Crescent Junction Sampling Events, 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 quality control sample.

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

Sample Shipping/Receiving

ALS received a total of five samples for RIN 1507078 in a shipment of four coolers. The table below (Table 4) summarizes the shipment details. The chain-of-custody (COC) forms were 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. It should be noted that SDG 1508264 consisted of samples that had already been shipped from the July 14 and 30 sampling event.

Table 4. July through November 2015 Crescent Junction Sampling Events, Shipment and Receipt Summary

SDG	No. of locations sampled	Date Shipped	Temperature of Cooler	Tracking Number
1507268	1	07/14/15	1.6°C	1Z5W1Y510195661767
1507552	1	07/30/15	2.2°C	1Z5W1Y510198004186
1510522	2	10/29/15	0.8°C	1Z5W1Y510198137042
1511101	1	11/5/15	0.8°C	1Z5W1Y510194236308

Preservation and Holding Times

All of the samples were received in the correct container types and had been preserved correctly for the requested analyses. All of the samples were analyzed within the applicable holding time with the exception of sample 1510552-2 that missed the hold time for total dissolved solids and samples 1507268-1 and 1507552-1 that missed the hold time for alkalinity.

Case Narratives

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

Matrix Spike and Replicate Analysis

Matrix Spike (MS) sample analysis, performed at a frequency of one per 20 samples unless otherwise noted, is a measure of the ability to recover analytes in a particular matrix. Replicate sample analysis consists of matrix spike duplicate (MSD) samples and field duplicates at a frequency of one per 20 samples per method or procedural requirements. All of the MS samples that were chosen were from another client, so all of the data were flagged “J” for reason 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. One EB should be prepared with each preparation batch.

No EBs were required for RIN 1507078.

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 1507078.

Completeness

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

Electronic Data Deliverable Files

The Electronic Data Deliverable (EDD) files arrived on July 22, August 5, November 23, November 28, and December 4, 2015. The contents of the files were manually examined to ensure all and only the requested data were delivered in compliance with requirements and that the sample results accurately reflected the data contained in the sample data package.

3.1.2 Minimums and Maximums Report and Anomalous Data Review

This sampling event represents the first time samples were collected from well 0205 after it was recompleted from a total depth of approximately 300 to 65 feet (ft) below ground surface (bgs) in 2011, so there were no historical data before this event. Because this event also represents the first time a sample has been collected of the ponded surface runoff, there were no anomalous data points associated with this event.

3.2 October 2015 Site-wide, CF4, and Tree Plot 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 1510079
Laboratory: ALS, Fort Collins, Colorado
SDG Numbers: 1510521, 1511102
Analysis: Inorganics and Metals
Validator: Elizabeth Moran
Review Date: 7 March 2016

The samples were prepared and analyzed using accepted procedures as shown in Table 5.

Table 5. October 2015 Site-wide, CF4, and Tree Plot Area 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 6. Refer to Table 7 for an explanation of the data qualifiers applied.

Table 6. October 2015 Site-wide, CF4, and Tree Plot Area Sampling Event Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1510521-1 through -16 1511102-1 through -15	All in SDGs 1510521 and 1511102	Uranium	J	MS-1
1510521-1 through -16	All in SDG 1510521	Ammonia as N	J	MS-2

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

Table 7. October 2015 Site-wide, CF4, and Tree Plot Area Sampling Event Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-detects)	Explanation
MS-1	J	U	Per method requirements, matrix quality control was performed for this analysis; however, a sample from this order number was not the selected QC sample, so the data were not included in the narrative.
MS-2	J	U	Per method requirements, matrix QC was performed for this analysis; however, a sample from this order number was not the selected QC sample, so the data were not included in the narrative.

QC = quality control

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

Sample Shipping/Receiving

ALS received a total of 31 samples for RIN 1510079 in two shipments of one cooler. SDG 1510521 consisted of 16 uranium and ammonia samples arrived on October 30, 2015 (UPS tracking number 1Z5W1Y510198137042). SDG 1511102 consisted of 15 uranium and ammonia samples that arrived on November 6, 2015 (UPS tracking number 1Z5W1Y510194236308).

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 1510521 and SDG 1511102, both packed in one cooler each, were received intact with a temperature of 0.8°C, which complies with all 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 QC procedures except the following.

Laboratory Instrument Calibration

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

Compliance requirements for continuing calibration checks are established to ensure the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods. Calibration standards were prepared from independent sources.

In addition, for inductively coupled plasma (ICP) analytes (uranium), reporting limit verifications (CRIs) verify the linearity of the calibration curve near the reporting limit (RL). For ICP-MS analytes (uranium), instrument tuning and performance criteria are checked for mass calibration and resolution verifications. Also, internal standards for ICP-MS analyte (uranium) are analyzed to indicate stability of the instruments.

Method SW-846 6020A, Uranium

The calibration for the uranium analyses for SDGs 1510521 and 1511102 was performed on November 10, 2015, and November 11, 2015. The initial calibrations were both performed using four calibration standards and four blanks, 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 three times the instrument detection limit (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 SDGs 1510521 and 1511102 was performed using two calibration standards and two blanks on November 9, 2015, and November 16, 2015. The calibration curve had an r^2 value greater than 0.995 and an intercept less than three times the method detection limit (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 (ICBs) and continuing calibration blanks (CCBs) are analyzed to assess instrument contamination before and during sample analysis. All but one of the uranium CCBs were less than the IDL on both of the SDGs. In SDG 1510521, CCB-10 had a result of 0.003 micrograms per liter, which is just slightly higher than the instrument detection limit; however, all of the samples had a concentration higher than five times CCB-10. No results needed qualification.

One ammonia CCB had a result that was greater than the ammonia MDL (CCB-4). One of the associated ammonia results (1510521-15) was less than five times the highest blank value; however, this sample result was at or below the RL of 0.1 milligrams per liter (mg/L), so the data did not need qualification.

Equipment Blanks

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

No EBs were collected during this sampling event. All samples were collected using dedicated equipment.

Matrix Spike 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.

Per method requirements, a matrix QC was performed for this analysis. Since a sample from this order number was not selected as the QC sample, the matrix QC results were not included in the report, so the uranium data were flagged “J” for reason MS-1.

The ammonia as N MS for SDG 1510521 was not from this sample group, so the ammonia data were flagged “J” for reason MS-2. The MS for SDG 1511102 met all the requirements, and the data do not need to be flagged.

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. A duplicate sample was collected from locations AMM-3 (1510521-9) and 0781 (1511102-7). The duplicate results met the U.S. Environmental Protection Agency (EPA) recommended laboratory duplicate criteria of less than 20 RPD for results greater than five 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 Serial Dilution

No serial dilution (SD) data were included with the uranium sample data, since the matrix spike/dilution for this sample batch was from another client. These data were flagged MS-1 for this reason.

Completeness

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

Electronic Data Deliverable Files

The EDD files arrived on November 28 and December 4, 2015. The contents of the 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 no anomalous data points associated with this sampling event.

3.3 November 2015 Matheson Wetlands 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 1510080
Laboratory: ALS, Fort Collins, Colorado
SDG Number: 1512004
Analysis: Inorganics and Metals
Validator: Elizabeth Moran
Review Date: 7 March 2016

The samples were prepared and analyzed using accepted procedures as shown in Table 8.

Table 8. November 2015 Matheson Wetlands 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 9. Refer to Table 10 for an explanation of the data qualifiers applied.

Table 9. November 2015 Matheson Wetlands Sampling Event Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1512004-10, -11	N3-8.3, N6-6.4	Ammonia as N	J	CB-1
1512004-1 through -11	All in SDG 1512004	Uranium	J	MS-1
1512004-1 through -11	All in SDG 1512004	Ammonia as N	J	MS-2
1512004-7 through -11	All in SDG 1512004	Uranium	J	SD-1

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

Table 10. November 2015 Matheson Wetlands Sampling Event Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-detects)	Explanation
CB-1	J	U	Per method requirements, when the sample concentration is <5x the blank concentration, the results must be qualified.
MS-1	J	U	Per method requirements, matrix QC was performed for this analysis, however, a sample from this order number was not the selected QC sample, so the data were not included in the narrative.
MS-2	J	U	Per method requirements, matrix QC was performed for this analysis, however, a sample from this order number was not the selected QC sample, so the data were not included in the narrative.
SD-1	J	U	Per method requirements, an SD was performed for this analysis; however, a sample from this order number was not the selected QC sample, so the SD data were not included in the narrative.

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

Sample Shipping/Receiving

ALS received a total of 11 samples for RIN 1510080 in one shipment of one cooler. SDG 1512004 consisted of 11 uranium and ammonia samples arrived on December 1, 2015 (UPS tracking number 1Z5W1Y510190477912). The SDG was accompanied by a COC form. The COC form was checked to confirm that all of the samples were listed on the form with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The sample submittal documents, including the COC forms, had no errors or omissions.

Preservation and Holding Times

SDG 1512004 was packed in one cooler and was received intact with a temperature of 0.8°C, which complies with all 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 QC procedures except the following.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates 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. Also, internal standards for ICP-MS analyte uranium are analyzed to indicate stability of the instruments.

Method SW-846 6020A, Uranium

The calibration for the uranium analyses for SDG 1512004 was performed on December 4, 2015. The initial calibrations were both performed using four calibration standards and four blanks, 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 calibration for ammonia as N for SDG 1512004 was performed using three calibration standards and two blanks on December 4, 2015. 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 before and during sample analysis. All of the uranium CCBs were less than the IDL on SDG 1512004. No results needed qualification.

Two ammonia CCBs had results greater than the ammonia MDL. Two of the associated ammonia results (1512004-10, -11) were less than five times the highest blank value, so the data from those two locations were flagged “J” for reason CB-1.

Equipment Blanks

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

No EBs were collected during this sampling event. All samples were collected using dedicated equipment.

Matrix Spike 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.

Per method requirements, a matrix QC was performed for this analysis. Since a sample from this order number was not selected quality control sample, the matrix QC results were not included in the report, so uranium data were flagged “J” for reason MS-1.

The ammonia as N MS for SDG 1512004 was not from this sample group, so ammonia data were 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 SDG did not include any laboratory replicate analysis information.

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 BL2-D (1512004-5). 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.

Laboratory Control Sample

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 Serial Dilution

No SD data were included with the uranium sample data, since the matrix spike/dilution for this sample batch was from another client. This data were flagged “J” for this reason.

Completeness

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

Electronic Data Deliverable File

The EDD files arrived on December 23, 2015. The contents of the 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 was one anomalous data point from location BL3-M, with the ammonia concentrations above the historic maximum. Table 11 presents a summary of the results of the Minimums and Maximums Report for this event.

Table 11. Anomalous Data Associated With the November 2015 Matheson Wetlands Sampling Event

Location	Sample Date	Analyte	Concentration (mg/L)	Historical Minimum (mg/L)	Historical Maximum (mg/L)	Disposition
BL3-M	11/24/2015	Ammonia Total as N	4.0	2.3	2.5	Concentration 0.25 mg/L above anomalous data criteria of greater than 50% of the historical maximum.

3.4 December 2015/January 2016 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 1512081
 Laboratory: ALS, Fort Collins, Colorado
 SDG Numbers: 1512344, 1601104, 1601252
 Analysis: Inorganics and Metals
 Validator: Elizabeth Moran
 Review Date: 1 March 2016

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

Table 12. December 2015/January 2016 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. December 2015/January 2016 Site-wide Sampling Event Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1601104-1 through -10	0201, 0218, 0410, 0411, 0431, 0433, 0434, 0439, 0440, 0443	Ammonia	J	CCB-1
All samples	All in SDG 1512344, 1601104, 1601252	Uranium	J	MS-1
1512344-1 through 1512344-12	All in SDG 1512344	Ammonia	J	MS-2
All samples	All in SDG 1512344, 1601104, 1601252	Uranium	J	SD-1

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

Table 14. December 2015/January 2016 Site-wide Sampling Event Reason Codes for Data Flags

Reason Code	Qualifier (Detects)	Qualifier (Non-detects)	Explanation
CCB-1	J	U	Two of the CCBs had a concentration less than five times the blank concentration.
MS-1	J	U	A matrix QC was performed with this analysis, but a sample from this order number was not selected as the QC sample.
MS-2	J	U	A matrix QC was performed with this analysis, but a sample from this order number was not selected as the QC sample.
SD-1	J	U	An SD was performed with this analysis, but a sample from this order number was not selected as the QC/SD 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 36 samples for RIN 1512081 in three shipments, as shown in Table 15.

Table 15. December 2015/January 2016 Site-wide Sampling Event Shipment and Receipt Summary

SDG	Number of Samples	Arrival Date	UPS Tracking Number(s)
1512344	12	12/18/15	1Z5W1Y510196909861
1601104	14	01/12/16	1Z5W1Y510192461961
1601252	10	01/22/16	1Z5W1Y510195967099

All three 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 1512344 was received intact with a temperature of 0°C, SDG 1601104 was received intact with temperatures of 1.2°C, and SDG 1601252 was received with a temperature of 1.6°C, which comply 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 QC procedures except the following.

Laboratory Instrument Calibration

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

Compliance requirements for continuing calibration checks are established to ensure the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods. Calibration standards were prepared from independent sources. In addition, for 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. Also, internal standards for ICP-MS analyte uranium are analyzed to indicate stability of the instruments.

Method SW-846 6020A, Uranium

The calibration for the uranium analyses was performed on December 23, January 15, and January 27. 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 were performed using four calibration standards and a blank on December 29, 2015, January 13, and January 28, 2016. 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 before and during sample analysis. Detected sample results associated with blank 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.

Uranium SDG 1601252 had one CCB that was slightly higher than the IDL. None of the sample locations had a concentration less than five times the blank concentration, so no data needed qualification.

The ammonia as N SDG 1512344 had four CBs that were higher than the MDL (ICB, CCB-2, CCB-5, and CCB-6). Only one sample location 0412 (1512344-1) had a concentration of 0.01 mg/L (the detection limit), so the data do not need qualification.

The ammonia as N SDG 1601104 had two CCBs that were higher than the MDL (CCB-2, CCB-5) and nine sample locations in the SDG had sample results that were less than five times the highest blank, so locations 1601104-1, 1601104-2, 1601104-3, 1601104-5, 1601104-6, 1601104-7, 1601104-9, and 1601104-10 were flagged CCB-1.

Five of the ammonia calibration blanks (CCB-2) on SDG 1601252 had a result that was >5x the detection limit. Two sample locations had results that were lower than the five times the highest blank concentration; however, both of these sample locations (1601252-1 and 1601252-7) were below the detection limit, so the data were not flagged.

Equipment Blanks

An EB is a sample of analyte-free media collected from a rinse of non-dedicated sampling equipment used to sample surface water. EBs are collected to document adequate decontamination of non-dedicated equipment. One EB should be prepared with each preparation batch. An EB was not collected during this sampling event.

Matrix Spike 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.

For all of the uranium SDGs, none of the Moab samples were selected for QC sample, so no MS, MSD, or SD data were included with narratives. All of the uranium data were flagged MS-1.

For the ammonia analysis, two of the SDGs contained MS data. All of the MS and MSD met the acceptable criteria; however, the MS sample for SDG 1512344 was from another client, and the data were not included in the narrative. All of the ammonia as N data from SDG 1512344 were flagged 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.

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 SMI-PZ1S (1512344-8) and 0218 (1601104-2). The field duplicate sample for uranium at location 0218 had an RPD of 23.9 percent, which is greater than the less than 20 percent recommended by the EPA. The rest of the results met the EPA-recommended laboratory duplicate criteria of less than 20 RPD for results that are greater than five times the RL.

Laboratory Control Sample

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 Serial Dilution

The SD data were not included in any of the SDGs since the sample chosen for the spike was from another client. All of the uranium data were flagged “J” for reason SD-1.

Detection Limits/Dilutions

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

Completeness

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

Electronic Data Deliverable File

The EDD files arrived on December 31, January 20, and January 30. The contents of the 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 was one anomalous data point from surface water location 0218 associated with the ammonia concentration above the historic maximum. Table 16 presents a summary of the results of the Minimums and Maximums Report for this event.

Table 16. Anomalous Data Associated With the December 2015/January 2016 Site-wide Sampling Event

Location	Sample Date	Analyte	Concentration (mg/L)	Historical Minimum (mg/L)	Historical Maximum (mg/L)	Disposition
0218	12/28/2015	Ammonia Total as N	0.16	0.1	0.1	Previous results all below detection limit of 0.1 mg/L, recent concentration 0.01 mg/L above criteria

4.0 Results

4.1 July through November 2015 Crescent Junction Sampling Event Results

Table 17 displays the analytical results of the three samples collected from well 0205 and the ponded surface runoff. The analyte concentrations of the three samples collected from well 0205 have in general not significantly changed between July and November with the exception of calcium (ranges from 280 to 400 mg/L), chloride (ranges from 2,000 to 5,200 mg/L) and magnesium (ranges from 370 to 1,100 mg/L). The change in concentrations cannot be explained at this time, and additional samples have been collected since November; this data will be used to provide additional insight.

As expected, the ponded surface runoff has in most instances significantly lower analyte concentrations. All analytical data associated with this Crescent Junction sampling event are provided in Appendix A.

Table 17. Crescent Junction Well 0205 and Ponded Surface Runoff Analyte Concentrations

Analyte	Analyte Concentration in Well 0205 on 7/15/15 (mg/L)	Analyte Concentration in Well 0205 on 7/29/15 (mg/L)	Analyte Concentration in Well 0205 on 11/4/15 (mg/L)	Analyte Concentration in Ponded Surface Runoff Water on 10/28/15 (mg/L)
Ammonia as N	16	17	18	0.1 ^B
Arsenic	0.039 ^B	0.039 ^B	0.039 ^B	0.002 ^B
Barium	0.027	0.019	0.024	0.026
Boron	1.6	1.3	1.4	0.490
Bromide	18	20 ^B	20 ^B	0.8 ^B
Cadmium	0.0033 ^B	0.0033 ^B	0.0035	0.00021 ^B
Calcium	280	400	380	190
Chloride	5,200	2,000	3,700	75
Chromium	0.0051 ^B	0.021	0.005	0.0052
Copper	0.0097	0.017	0.021	0.0022 ^B
Fluoride	5 ^B	10 ^B	10 ^B	0.64
Iron	0.06	0.083	0.049 ^B	0.013
Lead	0.013 ^B	0.013 ^B	0.016	0.0018 ^B
Magnesium	370	1,100	1,000	57
Manganese	0.45	0.71	0.570	0.0016
Molybdenum	0.054	0.022	0.011 ^B	0.0073
Nitrate/Nitrite as N	710	1,100	970	17 ^A
Potassium	57	59	57	6.2
Selenium	4.6	5.4	4.8	0.062
Sodium	12,000	11,000	9,900	320
Sulfate	20,000	20,000	21,000	1,300
Total Dissolved Solids	N/A	43,000	48,000	1,900
Uranium	0.017	0.000029 ^B	0.025	0.0058

^AConcentration of nitrate/nitrite in sample collected from same location on 10/21/2015 was also 17 mg/L

^BAt or below detection limit

4.2 October 2015 Site-wide, CF4, and Tree Plot Sampling Event Results

The site-wide ground water samples collected between October 21 and November 4 were limited to locations impacted by ground water extraction. Monitoring wells in the vicinity and downgradient of CF5 were sampled to eventually gauge the impacts of the alteration of the ground water extraction system schedule after the removal of the evaporation pond and cessation of pumping extracted ground water into the pond. These results, which will eventually provide a baseline for contaminant ground water concentrations in this area of the site, are discussed along with the other site-wide locations sampled in December 2015/January 2016 in Section 4.4.

The observation wells surrounding the CF4 injection wells (Figure 3) were sampled in early

November 2015 to evaluate the effectiveness of the freshwater injection system. These injection wells are screened and, therefore, deliver freshwater into the subsurface from 15 to 35 ft bgs.

The ammonia concentrations are displayed on Figure 6. The results show a significant reduction in concentrations in the downgradient (east) direction, particularly in the zone above 35 ft bgs. In the upgradient direction, the ground water system down to a depth of 35 ft bgs is also impacted by freshwater injection.

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.

Figure 7 presents the ground water mound developed as a result of the freshwater injection system on November 2, 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 surrounding observation wells.

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, and 0733 (sample depth of 18 ft bgs) on October 26. These locations are just downgradient of the tree plot in the vicinity of CF3 (Figure 3). Water chemistry data from well AMM-2 (sample depth of 48 ft bgs, collected on October 21) were also useful because it is located just upgradient of the tree plot area.

The influence of phytoremediation on the ground water system remains 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 riverbank and the 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 8 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. In addition, pressure transducers were installed in this area of the site to determine if the ground water surface elevation is impacted by plant transpiration during the spring through the fall.

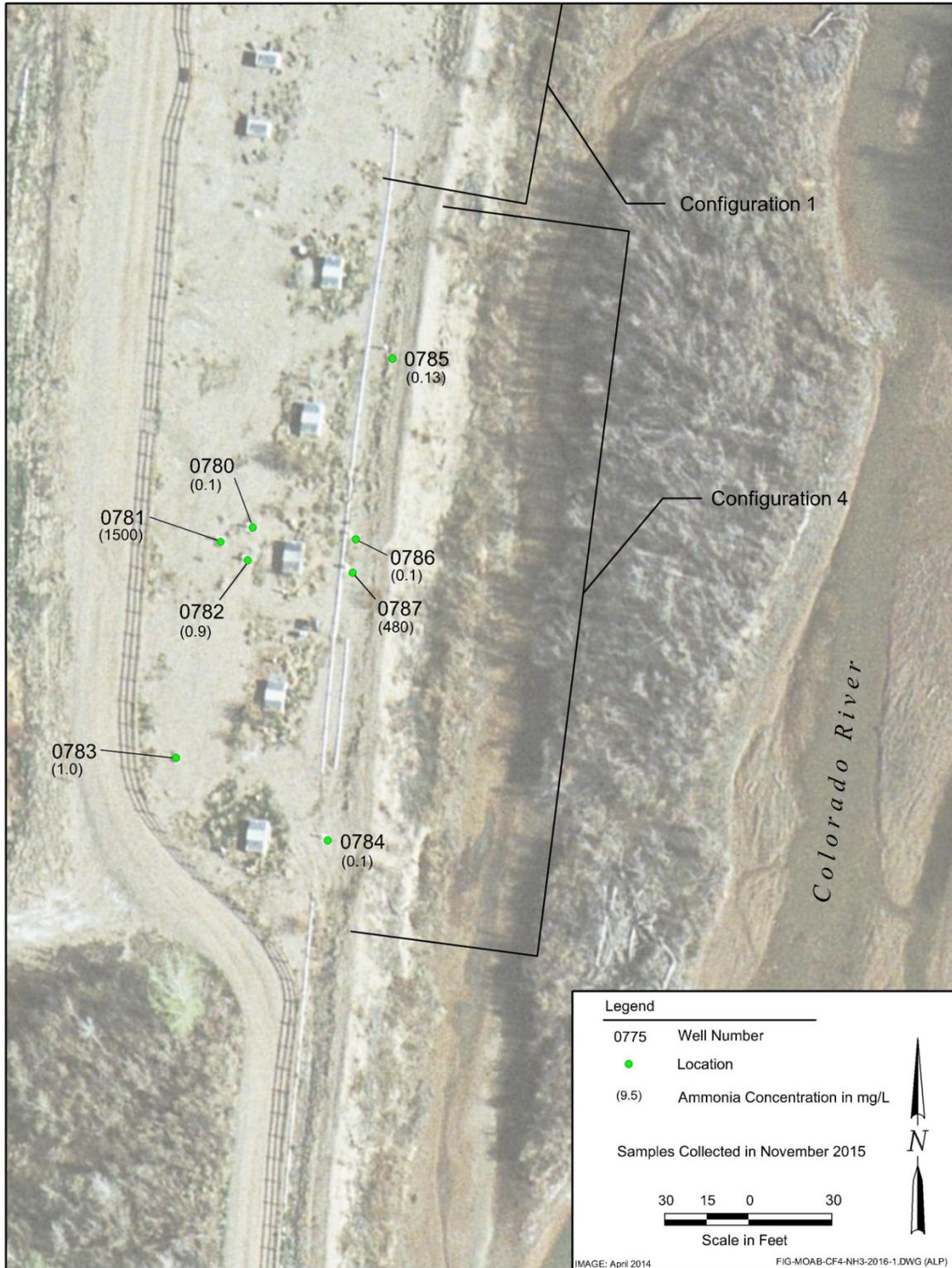


Figure 6. November 2015 CF4 Ground Water Ammonia Concentrations

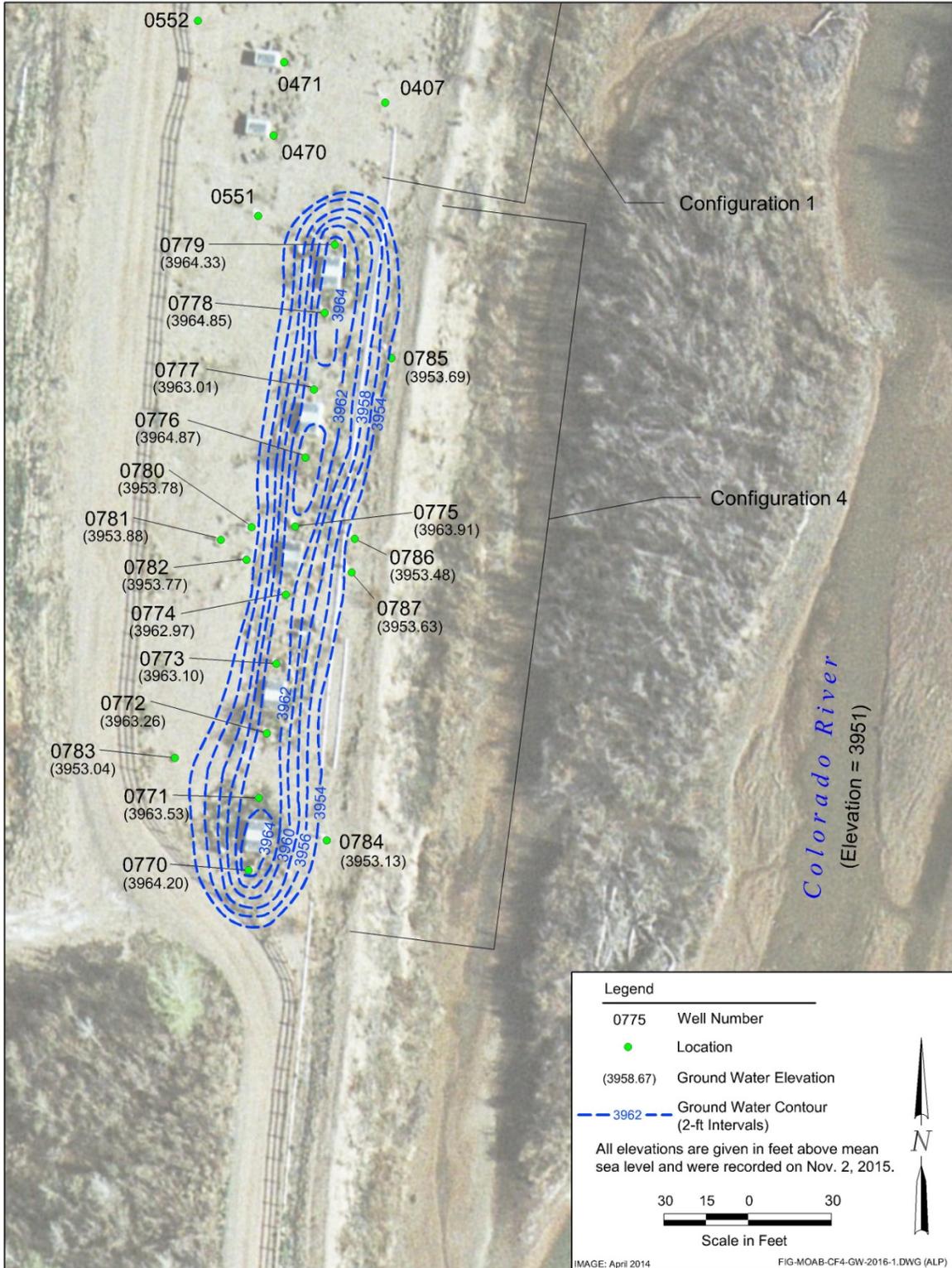


Figure 7. November 2015 CF4 Ground Water Elevation Contour Map During Injection

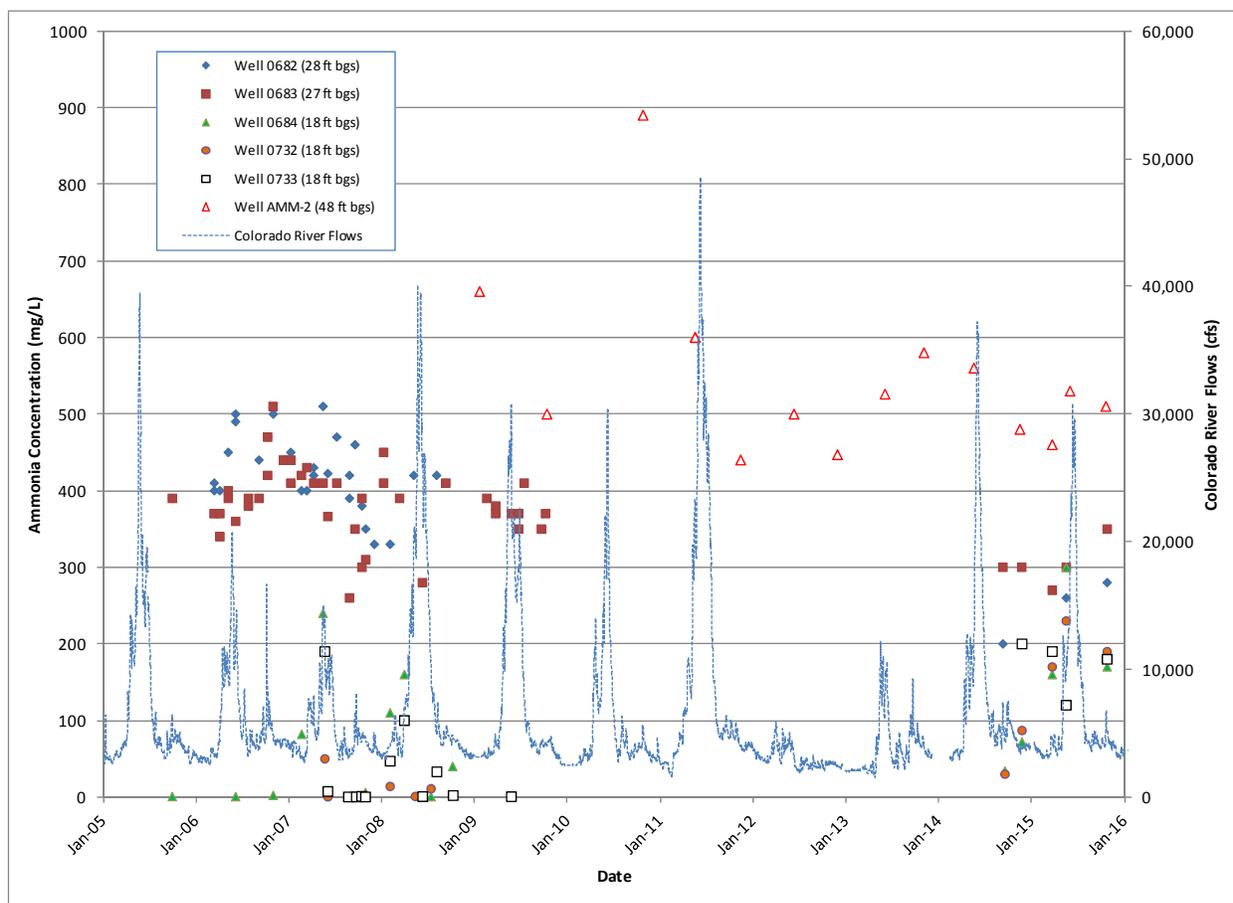


Figure 8. Ground Water Ammonia Concentrations in the Vicinity of the Tree Plot Area

4.3 November 2015 Matheson Sampling Event Results

Table 18 presents the results of the ground water samples collected from the Matheson Wetlands in late November 2015. Also included are the results of the samples collected in December 2005, May 2006, June 2006, and April 2010. With the exception of the ammonia concentration detected in the sample collected from well BL3-D from a depth of 100 ft bgs (which increased from 3.7 to 8.9 mg/L), the ammonia and uranium concentrations measured in 2015 have not significantly changed compared to previous sampling results. Based on the location of well BL3-D and the sample depth, it is not possible that this increase is associated with UMTRA site activities. All uranium concentrations measured during the November 2015 event were below the 0.044 mg/L uranium ground water standard. These ammonia and uranium concentrations represent natural background conditions.

The ground water surface contour map generated using November 2015 water level data (Figure 9) shows the overall ground water flow direction is towards the southwest, towards the Colorado River. This ground water surface contour map is similar to the maps generated using data collected during previous sampling events.

Table 18. Matheson Wetlands Ground Water Sampling Results, 2005 through 2015

Location	Sample Depth (ft btoc)	Analyte	December 2005 Concentration (mg/L)	May 2006 Concentration (mg/L)	June 2006 Concentration (mg/L)	April 2010 Concentration (mg/L)	November 2015 Concentration (mg/L)
BL1-S	55	Ammonia Total as N	0.51	0.37	0.49	0.23	0.62
		Uranium	0.007	0.0062	0.0078	0.011	0.0053
BL1-M	99	Ammonia Total as N	0.66	0.63	0.62	0.59	0.88
		Uranium	0.002	0.0024	0.0023	0.0034	0.0031
BL1-D	140	Ammonia Total as N	2.2	2.2	2.3	2.3	2.9
		Uranium	0.0011	0.0012	0.0011	0.0023	0.0019
BL2-S	57	Ammonia Total as N	2.1	2.1	2	1.9	1.7
		Uranium	0.0027	0.0032	0.003	0.0029	0.0025
BL2-M	100	Ammonia Total as N	2.9	2.8	2.7	2.9	3.9
		Uranium	0.003	0.003	0.0031	0.0049	0.0038
BL2-D	142	Ammonia Total as N	3.1	3.1	3	3.2	4.2
		Uranium	0.0028	0.0029	0.0029	0.0039	0.0035
BL3-M	47	Ammonia Total as N	2.4	2.3	2.5	2.5	4
		Uranium	0.00016	0.00015	0.00023	0.0003	0.00022
BL3-D	100	Ammonia Total as N	3.6	3.5	3.5	3.7	8.9
		Uranium	0.000058	0.000068	0.00015	0.000096	0.00008
N3-8.3	24	Ammonia Total as N	0.1 ¹	0.1	0.1	0.1	0.11
		Uranium	0.045 ¹	0.048	0.054	0.047	0.03
N6-6.4	12	Ammonia Total as N	0.1	0.1	0.1	N/A	0.26
		Uranium	0.0066	0.0072	0.0065	N/A	0.0095

NA = sample not collected

¹Samples collected in January 2006

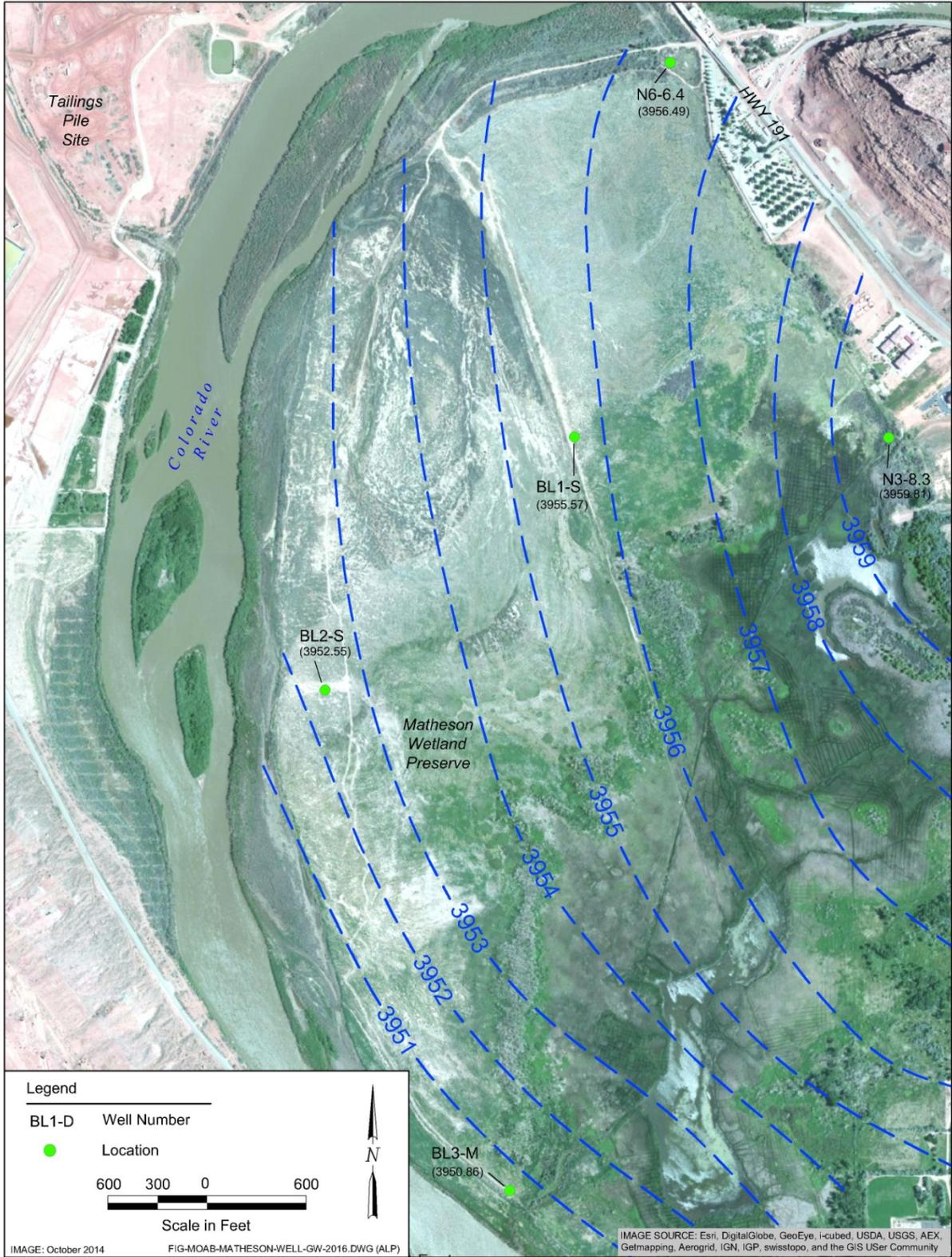


Figure 9. Matheson Wetlands Ground Water Surface Contour Map, November 2015

4.4 December 2015/January 2016 Site-wide Sampling Event Results

All samples collected during this event were analyzed for both ammonia and uranium. Table 19 presents all locations sampled between October 2015 and January 2016, including this site-wide event, and associated concentrations that exceeded the 0.044 mg/L uranium ground water standard. This standard 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.

Table 19. October 2015 through January 2016 Ground Water Locations Exceeding the 0.044 mg/L Uranium Ground Water Standard

Well Number	Date	Location	Sample Depth (ft bgs)	Uranium Concentration (mg/L)
0401	11/4/2015	CF2 Vicinity	18	1.5
0403	11/3/2015	CF1 Vicinity	18	0.43
0404	11/4/2015	CF3 Vicinity	18	1.4
0406	10/21/2015	Northern end of Well Field	18	0.94
0407	11/3/2015	CF1 Vicinity	17	1.1
0410	1/5/2016	NE Uranium Plume Area	24	0.59
0411	1/5/2016	NE Uranium Plume Area	8	1.4
0412	12/9/2015	NE Uranium Plume Area	10	2.1
0413	12/8/2015	NE Uranium Plume Area	10	3.0
0414	12/8/2015	NE Uranium Plume Area	8	3.2
0439	1/5/2016	On Tailings Pile	118	1.4
0441	1/13/2016	Support Area	117	0.059
0453	1/5/2016	Along SW Site Boundary	80	2.2
0454	12/16/2015	Along SW Site Boundary	13	1.4
0492	10/27/2015	Along S Site Boundary	18	0.20
0682	10/26/2015	CF3 / Tree Plot Vicinity	28	1.3
0683	10/26/2015	CF3 / Tree Plot Vicinity	28	1.4
0684	10/26/2015	CF3 / Tree Plot Vicinity	18	1.3
0732	10/26/2015	Tree Plot Vicinity	18	1.2
0733	10/26/2015	Tree Plot Vicinity	18	1.2
0781	11/2/2015	CF4 Vicinity	46	2.1
0787	11/2/2015	CF4 Vicinity	36	1.1
AMM-2	10/21/2015	CF5 Vicinity	48	2.1
AMM-3	10/27/2015	Near Base of Tailings Pile	48	1.1

Table 19. July 2015 through January 2016 Locations Exceeding the 0.044 mg/L Uranium Ground Water Standard (continued)

Well Number	Date	Location	Sample Depth (ft bgs)	Uranium Concentration (mg/L)
MW-1-R	10/27/2015	Near Base of Tailings Pile	13	1.1
MW-3	10/21/2015	CF5 Vicinity	44	2.7
SMI-PW01	10/21/2015	CF5 Vicinity	40	1.7
SMI-PZ1S	12/16/2015	CF5 Vicinity	18	1.1
SMI-PZ2M2	12/16/2015	CF5 Vicinity	56	2.8
SMI-PZ3D2	1/12/2016	NE Uranium Plume Area	78	0.92
SMI-PZ3M	1/13/2016	NE Uranium Plume Area	59	0.75
SMI-PZ3S	1/12/2016	NE Uranium Plume Area	25	1.8
TP-01	12/8/2015	NE Uranium Plume Area	22	0.073
TP-22	10/27/2015	NE Uranium Plume Area	17	0.47
TP-23	10/26/2015	NE Uranium Plume Area	25	2.8
UPD-17	1/12/2016	NE Uranium Plume Area	14	1.2
UPD-18	1/12/2016	NE Uranium Plume Area	13	0.88
UPD-20	1/12/2016	NE Uranium Plume Area	17	0.068
UPD-21	1/13/2016	NE Uranium Plume Area	25	6.9
UPD-22	12/8/2015	NE Uranium Plume Area	9	2.6
UPD-23	1/19/2016	NE Uranium Plume Area	26	0.72
UPD-24	1/12/2016	NE Uranium Plume Area	27	8.5

NE = northeastern; SW = southwestern

4.4.1 Northeastern Base of Tailings Pile

Figures 10 and 11 are time versus ammonia and uranium concentration plots, respectively, for locations UPD-17 and UPD-18. The ammonia concentrations display a general trend of higher ammonia concentrations during river base flows and, conversely, lower concentrations during the spring runoff or higher flows. This response suggests these locations are directly impacted by the Colorado River stage. The uranium concentrations have exhibited less fluctuation compared to the ammonia concentrations, but display the opposite trend (Figure 11).

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 12 and 13 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 12, the ammonia concentrations have remained consistently below 10 mg/L in the samples collected from wells UPD-20 and 0411. Ammonia concentrations have ranged from 49 to 62 mg/L since November 2013 in samples collected from 0413, while the concentrations have been more variable in the samples collected from well 0414 (from 14 to 50 mg/L) over the same time period.

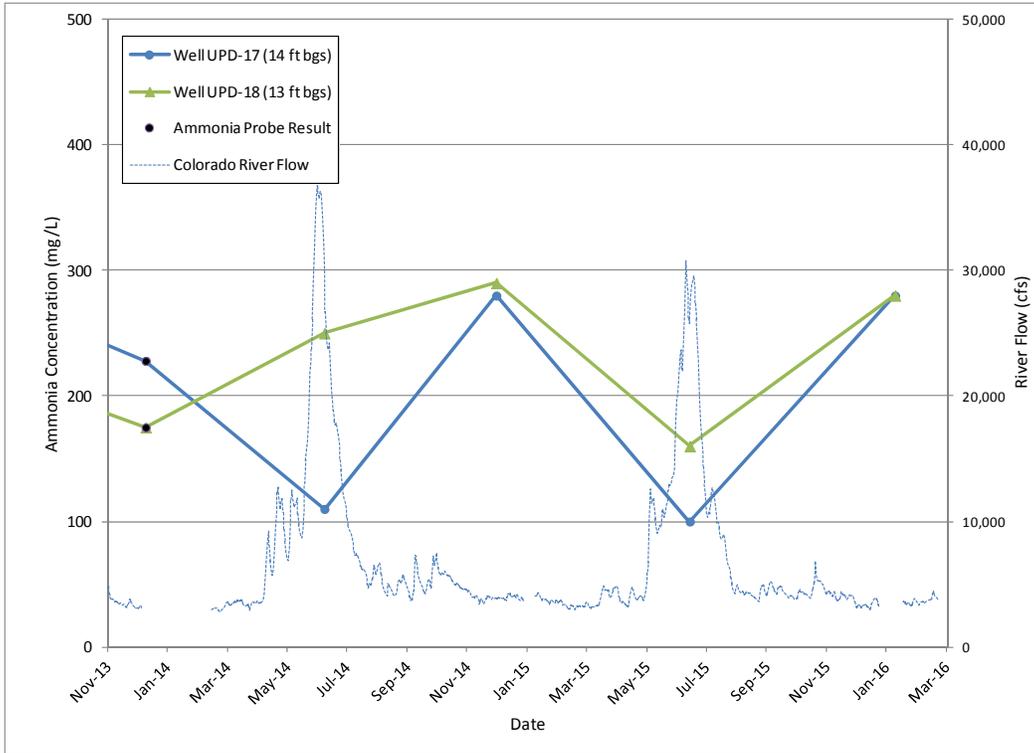


Figure 10. Wells UPD-17 and UPD-18 Time versus Ammonia Concentration Plot

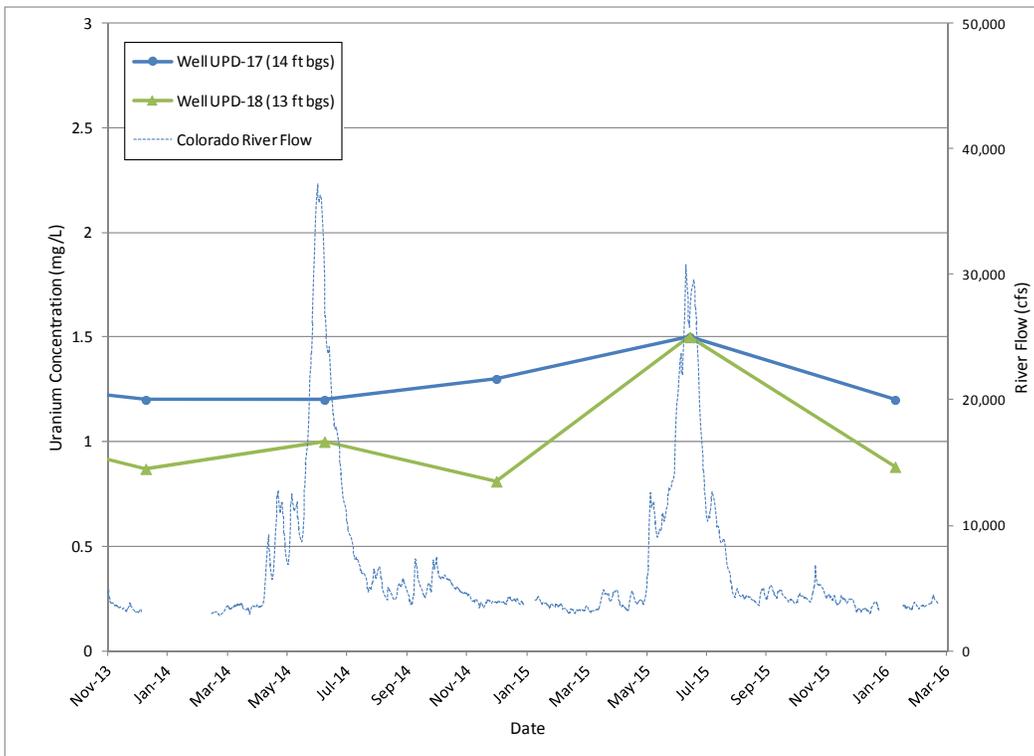


Figure 11. Wells UPD-17 and UPD-18 Time versus Uranium Concentration Plot

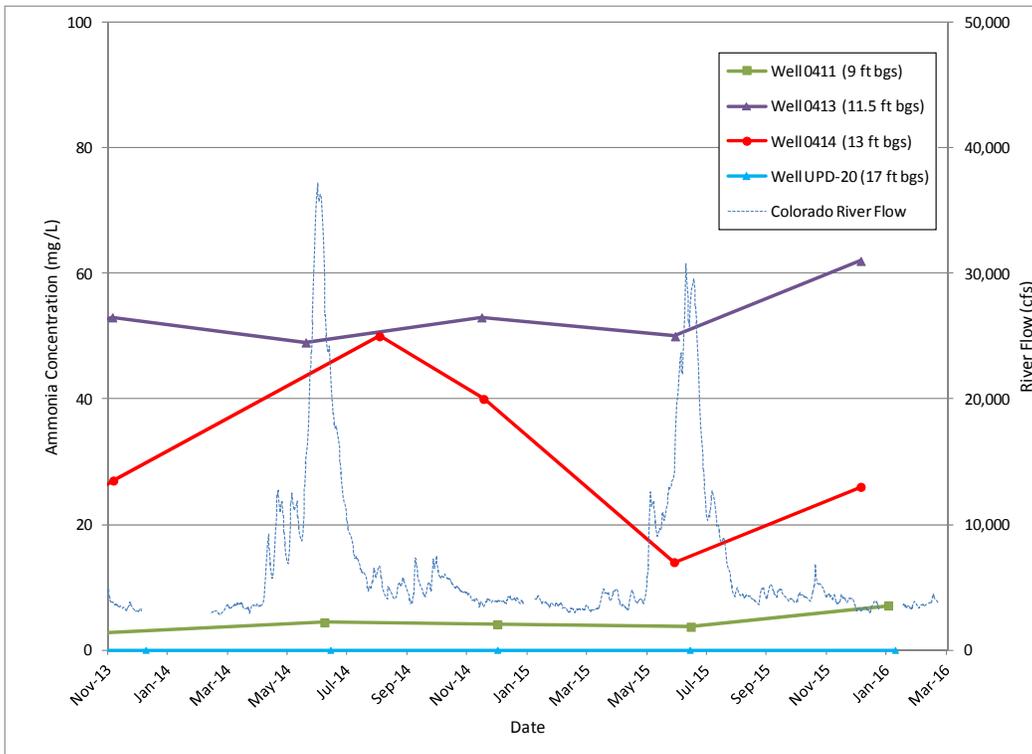


Figure 12. Center of Northeastern Uranium Plume Area Observation Wells 0411, 0413, 0414, and UPD-20 Time versus Ammonia Concentration Plot

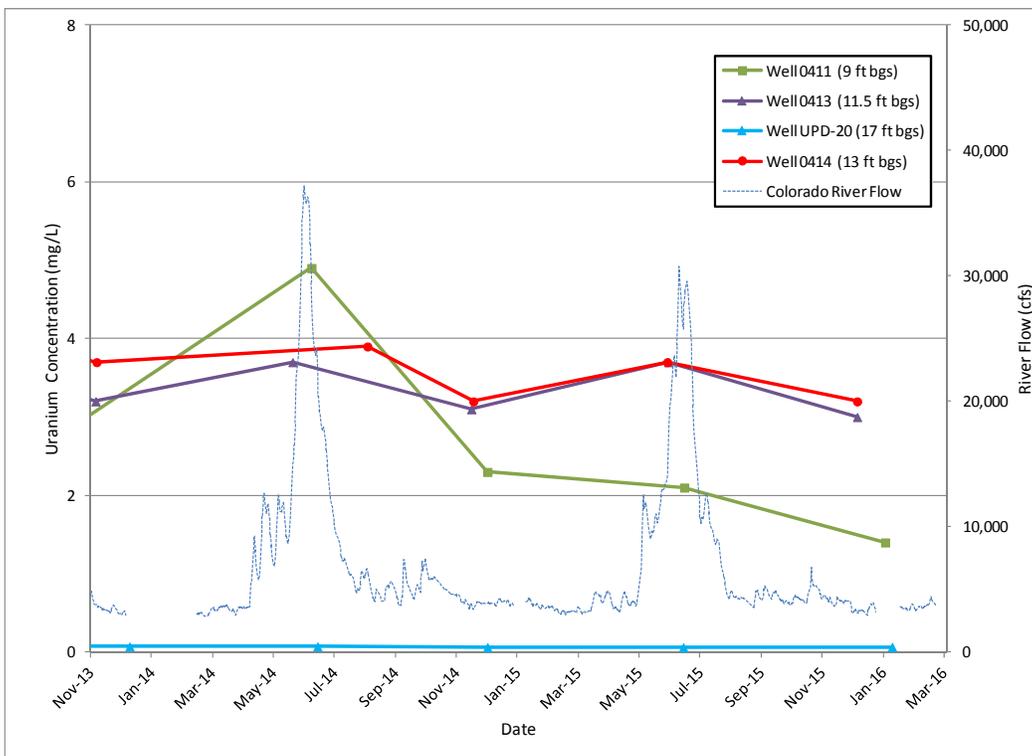


Figure 13. Center of Northeastern Uranium Plume Area Observation Wells 0411, 0413, 0414, and UPD-20 Time versus Uranium Concentration Plot

The uranium concentrations in samples collected from wells 0413, 0414, and UPD-20 have decreased approximately the same percentage between the two most recent sampling events (Figure 13). The sample collected from well UPD-20 remains below 0.1 mg/L.

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 14 and 15, respectively. These wells include 0410, UPD-21, UPD-23, and UPD-24. As shown in Figure 14, the ammonia concentrations in the samples collected from wells 0410, UPD-23, and UPD-24 have not changed significantly, and all remain less than 2.5 mg/L. The concentration in the sample collected from well UPD-21 has fluctuated between 2.2 and 10 mg/L since November 2013.

A similar trend was observed in the uranium concentration in the sample from UPD-21, where the concentration significantly decreased from 18 to 5.5 mg/L between December 2014 and June 2015 and then increased to 6.9 mg/L in January 2016. The concentration in the sample from UPD-24 also increased between the most recent sampling events. Figure 15 also displays that the uranium concentrations in samples collected from wells 0410 and UPD-23 remain below 0.8 mg/L.

4.4.5 Northeastern Edge of Uranium Plume Area

Figures 16 and 17 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 16 exhibits, with the exception of the ammonia concentration in the sample collected from UPD-22 (which has ranged between 1.7 to 4.4 mg/L), the concentrations have remained consistent since November 2013. During this time, the concentration in well SMI-PZ3S has ranged from 3.4 to 4.7 mg/L, and the concentration in well 0412 has remained at or below the detection limit of 0.1 mg/L. Well SMI-MW01 could not be sampled during this most recent event due to site conditions.

There is no general trend associated with the uranium concentrations (Figure 17). In the past 2 years, uranium concentrations have generally decreased in the samples collected from UPD-22 and have not significantly changed in the samples collected from wells 0412 and SMI-PZ3S.

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 18 and 19 for wells AMM-3, ATP-2-S, ATP-2-D, and MW-3 (listed from south to north). As Figure 18 exhibits, since November 2013, the ammonia concentrations in well MW-3 have not significantly changed (ranges between 460 and 490 mg/L), while the concentration in the samples collected from well AMM-3 have fluctuated between 200 and 320 mg/L. In general, the concentrations have gradually increased in samples collected from wells ATP-2-S (from 365 to 440 mg/L) and ATP-2-D (from 267 to 520 mg/L) between November 2013 and November 2015.

Uranium concentrations in wells ATP-2-S (sample depth 25 ft bgs) and ATP-2-D (sample depth 88 ft bgs) have been below 0.015 mg/L since 2010. Figure 19 suggests the uranium concentrations associated with the sample collected from wells MW-3 and AMM-3 continue to exhibit a strong seasonal fluctuation, which may be in response to the site flooding during spring runoff or flood irrigation activities over the past 2 years.

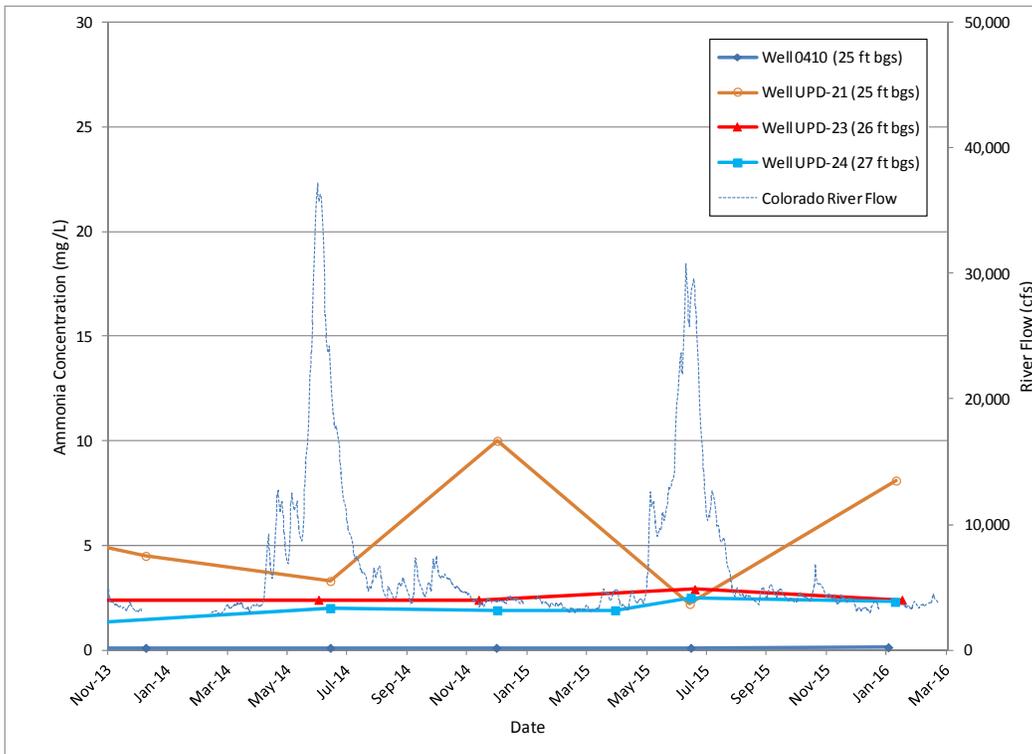


Figure 14. Vicinity of Atlas Building Observation Wells 0410, UPD-21, UPD-23, and UPD-24 Time versus Ammonia Concentration Plot

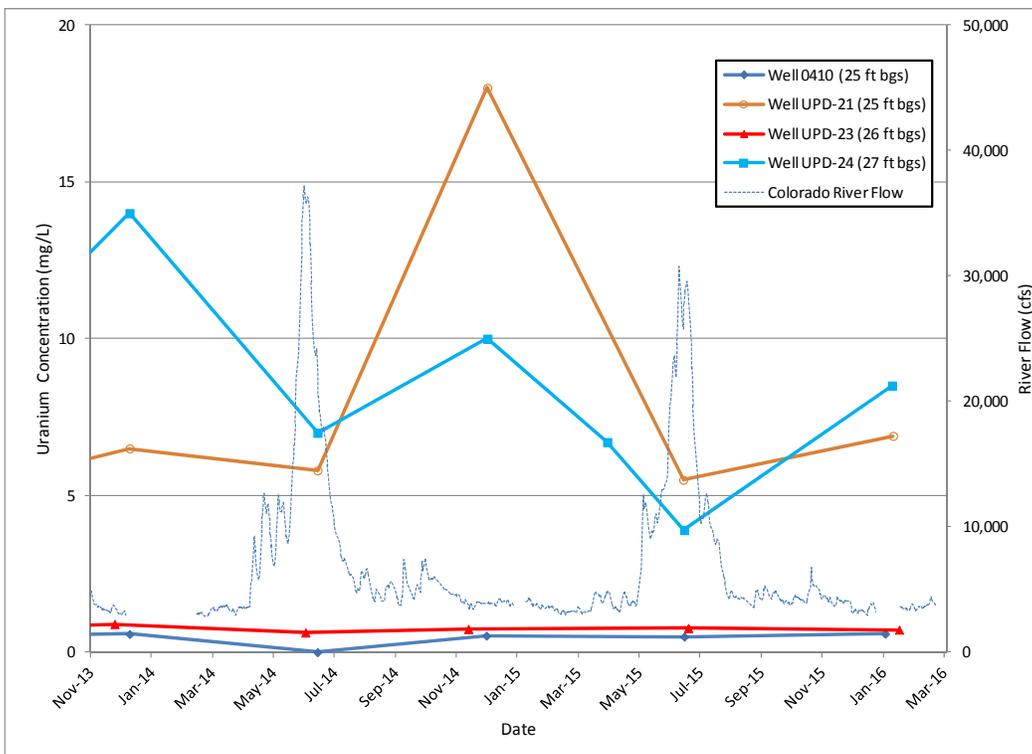


Figure 15. Vicinity of Atlas Building Observation Wells 0410, UPD-21, UPD-23, and UPD-24 Time versus Uranium Concentration Plot

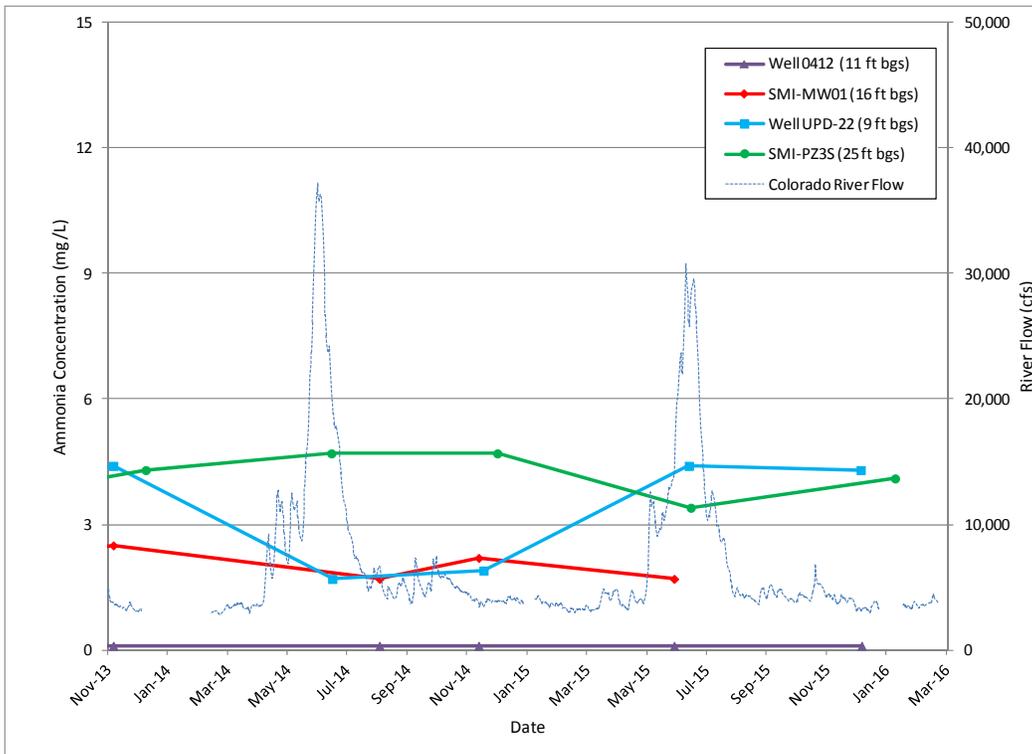


Figure 16. Northeastern Edge of Uranium Area Observation Wells 0412, SMI-MW01, SMI-PZ3S, and UPD-22 Time versus Ammonia Concentration Plot

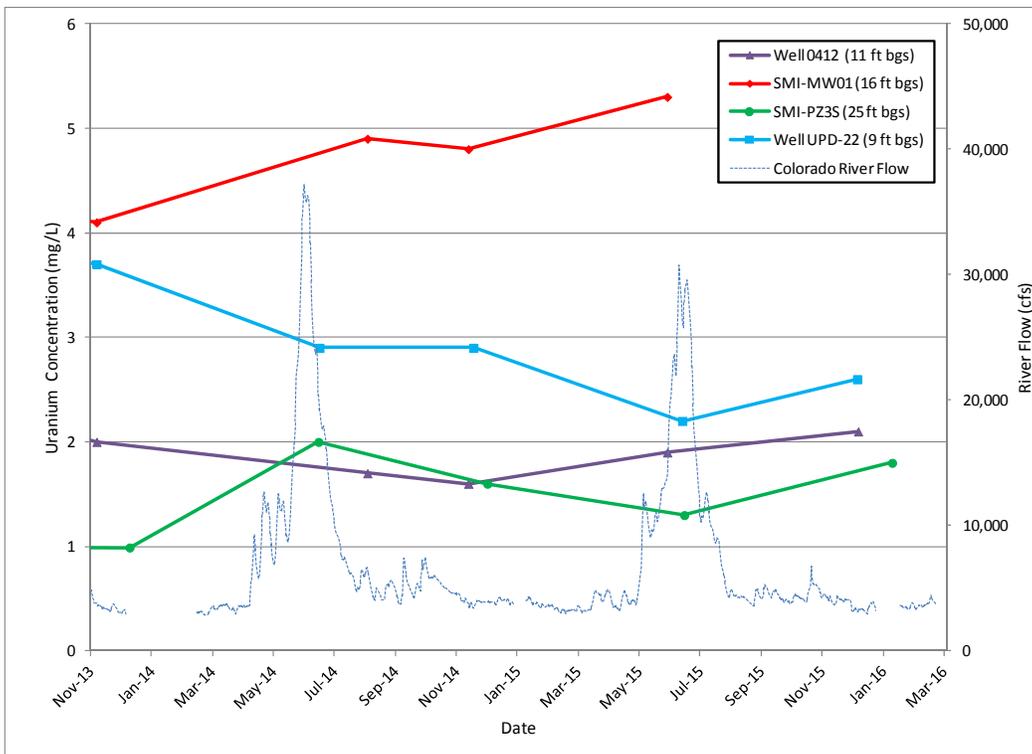


Figure 17. Northeastern Edge of Uranium Area Observation Wells 0412, SMI-MW01, SMI-PZ3S, and UPD-22 Time versus Uranium Concentration Plot

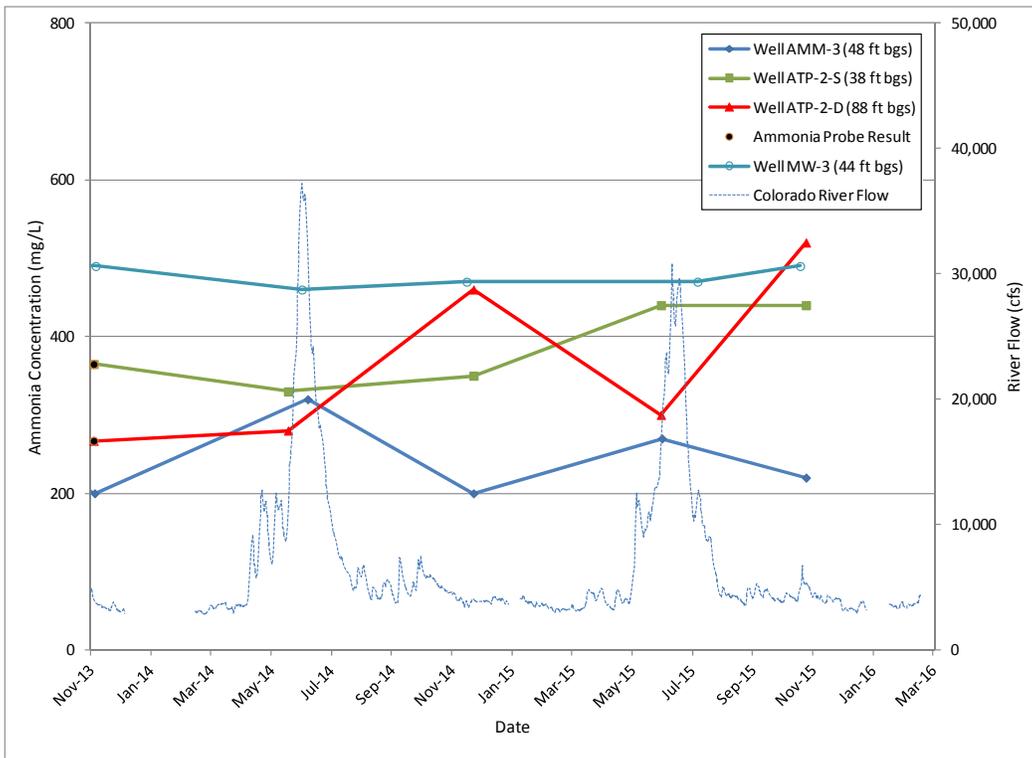


Figure 18. Base of Tailings Pile Observation Wells AMM-3, ATP-2-S, ATP-2-D, and MW-3 Time versus Ammonia Concentration Plot

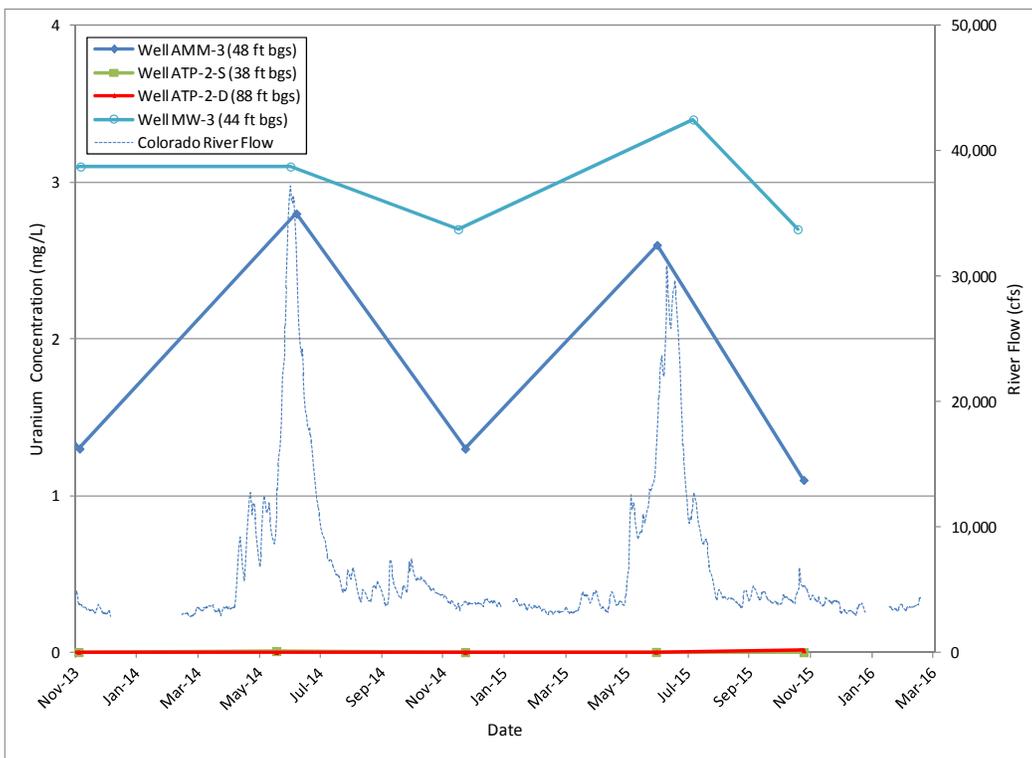


Figure 19. Base of Tailings Pile Observation Wells AMM-3, ATP-2-S, ATP-2-D, and MW-3 Time versus Uranium Concentration Plot

4.4.7 Southwestern Boundary

Figures 20 and 21 are time versus concentration plots for ammonia and uranium (respectively) for locations 0440, 0453, and 0454 (listed from northwest to southeast or from upgradient to downgradient ground water flow direction) along the southwestern site boundary. Figure 20 displays the gradual increase of the ammonia concentration measured in the sample collected from well 0454 between November 2013 and November 2014 (from 220 to 400 mg/L) and then the gradual decrease back down to 260 mg/L through November 2015.

Since November 2013, well 0453 ammonia concentrations have seasonally fluctuated (higher concentrations during the winter months and lower concentrations in the summer months) between 200 and 410 mg/L, while concentrations in the samples collected from well 0440 (the furthest upgradient location) have been at or below the 0.1 mg/L detection limit since 2009.

The uranium concentrations (Figure 21) in the samples collected from well 0453 display the same seasonal fluctuation, with the concentrations ranging from 0.89 to 2.7 mg/L over the past 2 years. Well 0454 uranium concentrations have in general been consistent (between 1.4 and 2.0 mg/L), while samples collected from well 0440 have had a uranium concentration below the 0.044 mg/L UMTRA standard since 2009.

4.4.8 Riverbank Area

Figures 22 and 23 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 riverbank, their water chemistry is heavily influenced by the seasonal changes of the Colorado River stage.

Ammonia concentrations historically have been low at the southern and northern ends of the site and increase near the middle. The ammonia concentration measured in the sample from well 0401 did not follow the historical trend, where lower concentrations are always detected during the spring runoff (the concentration increased from 290 to 440 mg/L between November 2014 and June 2015). By November 2015, the concentration decreased to 290 mg/L. Such a response is difficult to explain at this time, and monitoring will continue.

The expected seasonal trend is evident for the uranium concentrations measured at these locations (Figure 23). Samples collected from wells 0492, 0407, 0401, 0404, and TP-01 all had uranium concentrations that increased since the 2015 spring runoff flows.

4.4.9 Southern and Off-site Areas

Figures 24 and 25 are the plots for the two locations sampled to the south of the site, wells TP-17 and TP-20. A sample could not be safely collected in December 2015 from well TP-19, which is located further south of TP-17 along the riverbank. Well TP-20 is located approximately 600 ft off the bank. Typically, ammonia and uranium concentrations are low at TP-20 because it is located along the southern edge of the contaminant plumes. Ammonia concentrations (Figure 24) remain below 4 mg/L, with no significant changes since May 2013 in the samples collected from well TP-20, while the concentration in well TP-17 has gradually increased since June 2014 from 1.1 to 3.3 mg/L.

The uranium concentrations (Figure 25), while displaying seasonal fluctuations, have consistently been below the 0.044 mg/L UMTRA standard since 2008.

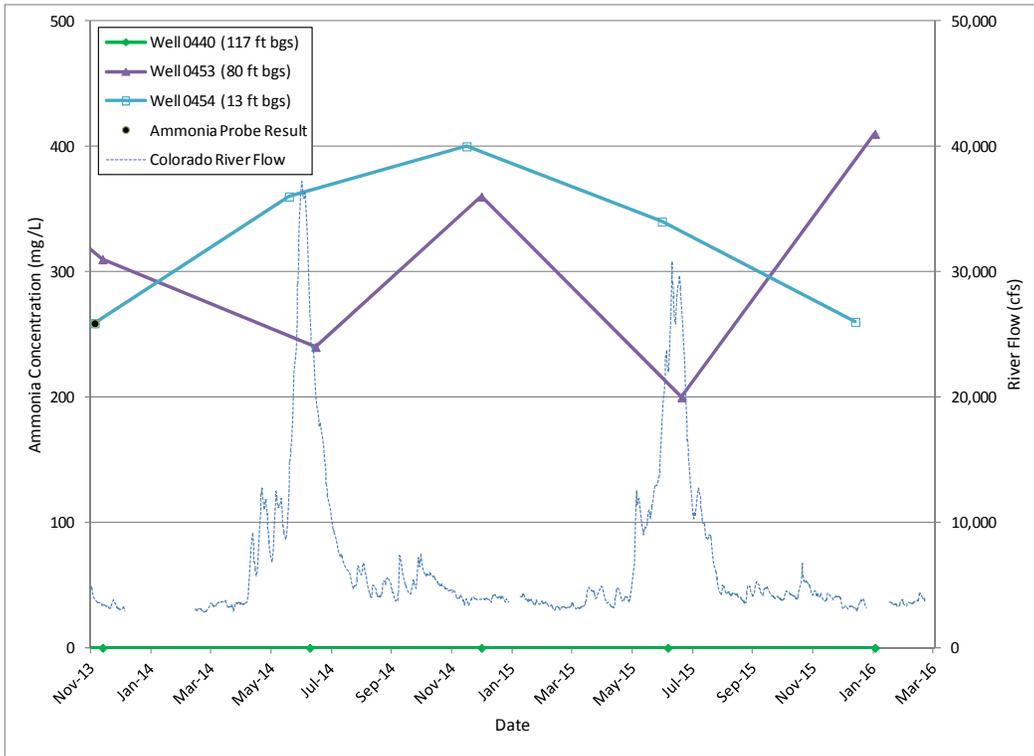


Figure 20. Southwestern Boundary Observation Wells 0453, 0454, and 0440 Time versus Ammonia Concentration Plot

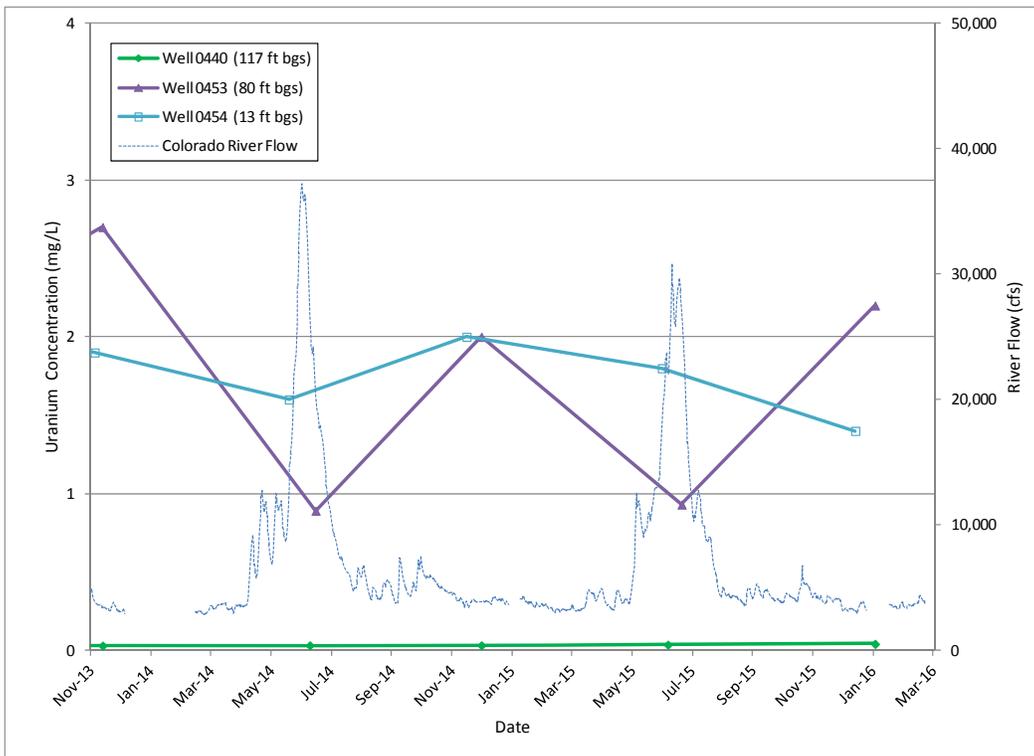


Figure 21. Southwestern Boundary Observation Wells 0453, 0454, and 0440 Time versus Uranium Concentration Plot

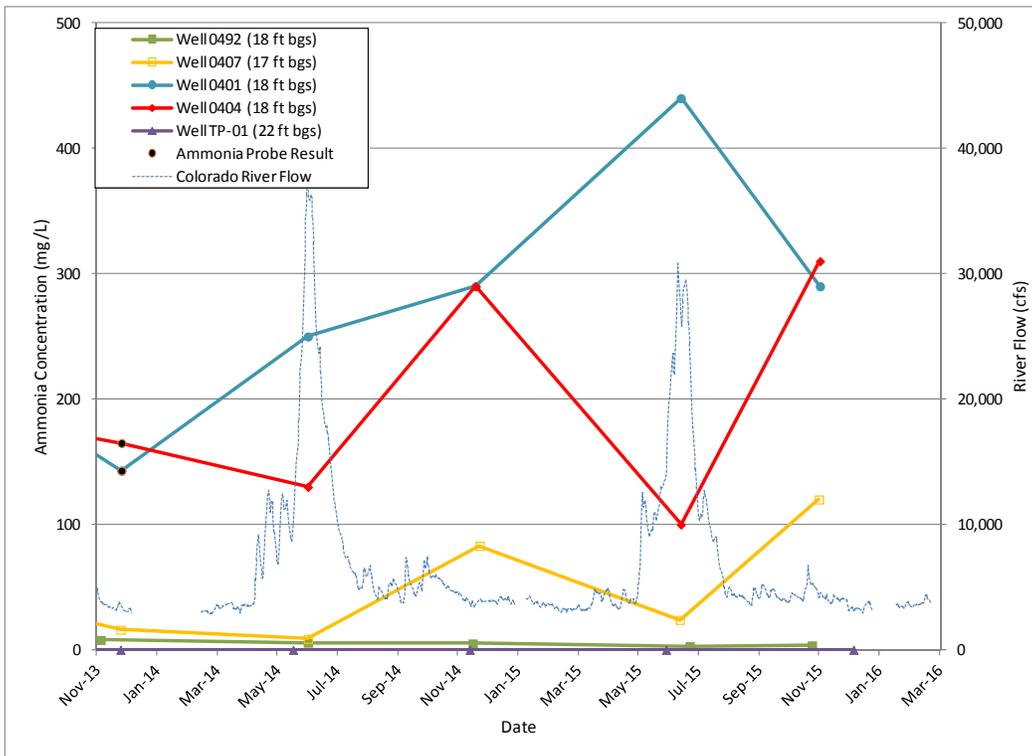


Figure 22. Riverbank Observation Wells 0492, 0407, 0401, 0404, and TP-01 Time versus Ammonia Concentration Plot

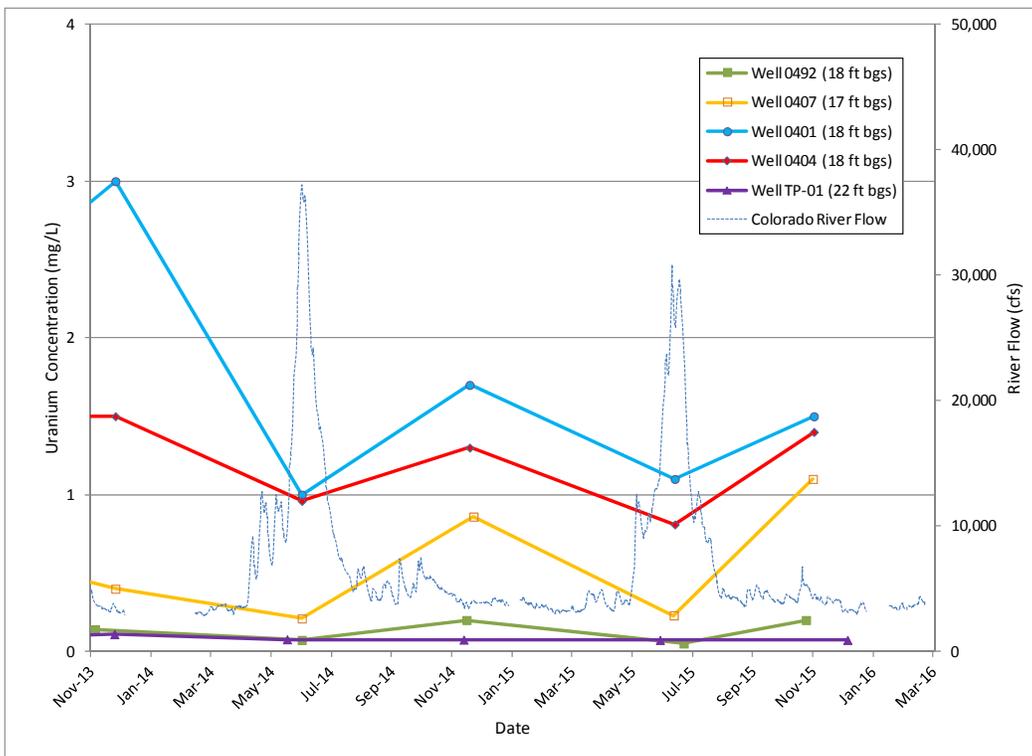


Figure 23. Riverbank Observation Wells 0492, 0407, 0401, 0404, and TP-01 Time versus Uranium Concentration Plot

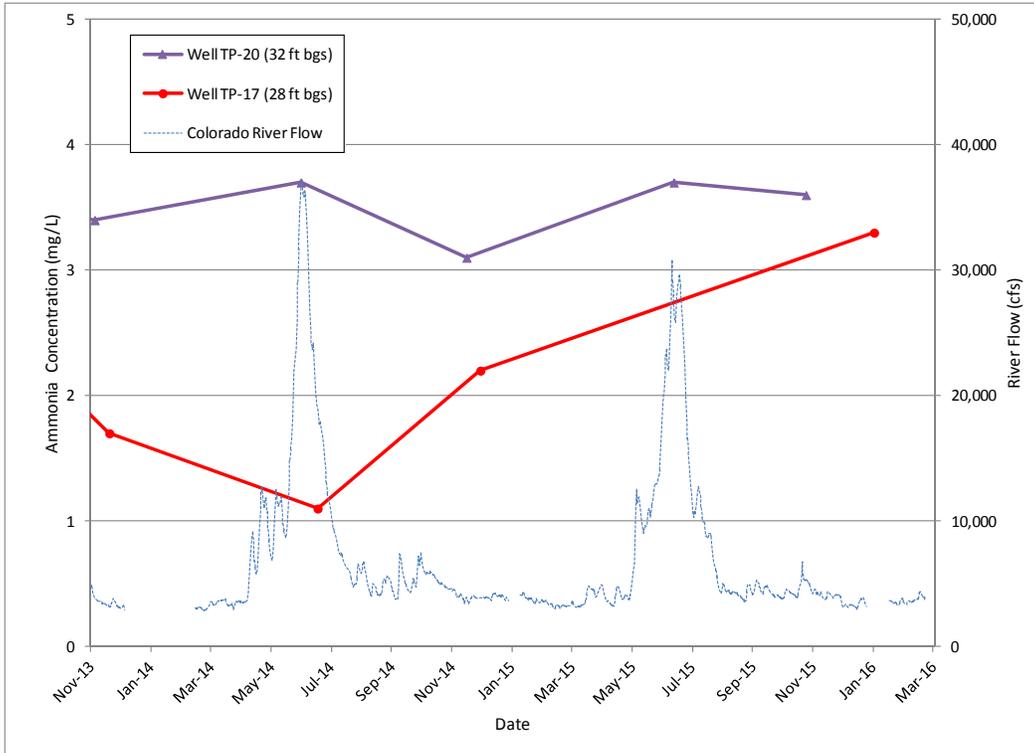


Figure 24. South of Site Observation Wells TP-17 and TP-20
Time versus Ammonia Concentration Plot

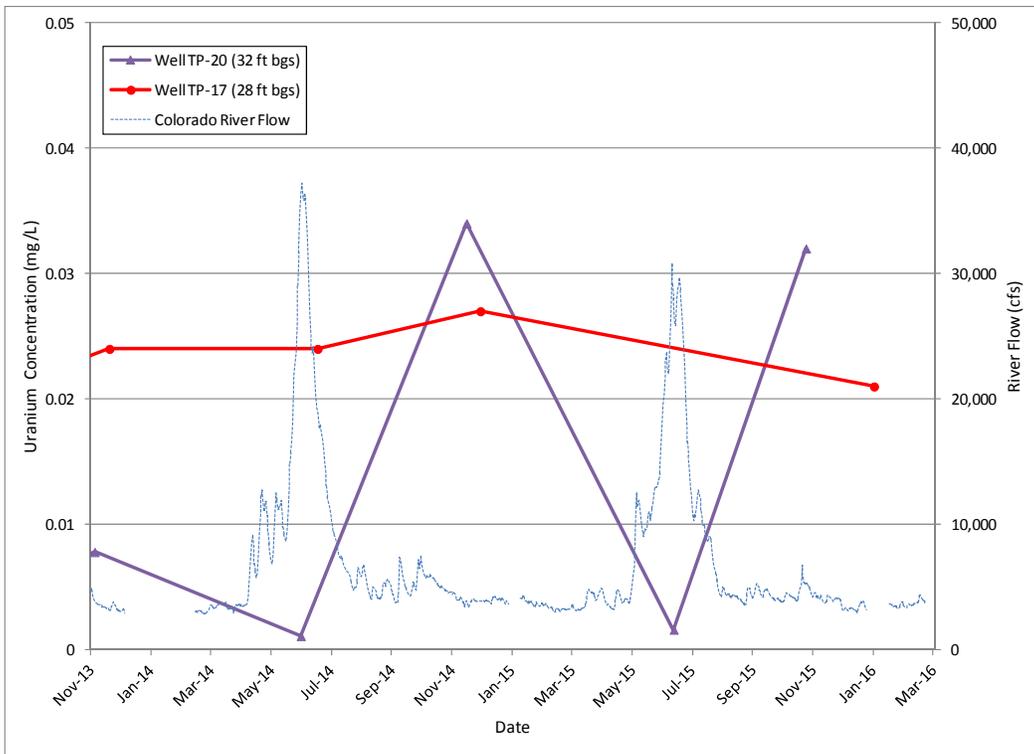


Figure 25. South of Site Observation Wells TP-17 and TP-20
Time versus Uranium Concentration Plot

4.4.10 Surface Water Sampling Results

Table 20 presents the ammonia results from the surface water sampling conducted in December 2015 from locations 0201, 0218, and CR1 (as shown on Figure 5). 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 20. The ammonia concentrations measured during this event, all of which were below 0.2 mg/L, were below both the acute and chronic criteria.

Table 20. December 2015 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	12/29/15	2.43	7.26	<0.1	27	3.8
0218	12/28/15	0.96	7.45	0.16	21	3.2
CR1	12/28/15	2.77	7.24	<0.1	31	4.0

*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 6., Temperature and pH-Dependent Values, Chronic Concentration of Total Ammonia as N (mg/L)

4.5 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 micromhos (µmhos) per centimeter (cm) and analyzed for ammonia using this equipment are presented in Table 21. 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 included.

Figure 26 is a graphic 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 0.94. This suggests the ammonia field probe provides comparable results for samples with a specific conductance below 20,000 µmhos/cm.

The fact that the trendline lies so closely, the dashed line representing a perfect match between the two data sets in Figure 26 suggests the field probe tends, on average, to measure comparable ammonia concentrations when compared to the method used by the analytical laboratory.

4.6 Ground Water Surface Elevation

Water level data were collected between December 9, 2015, through January 5, 2016, when the Colorado River mean daily flows ranged from 2,960 to 3,900 cubic feet per second (cfs), and the river stage at the site ranged from only from 3,950.4 to 3,950.9 cfs. Because ground water elevations during river base flow conditions do not fluctuate significantly during this time of the year, the data collected during this time frame were used to generate the ground water surface contour map displayed as Figure 27.

Ground water flow direction and gradient displayed in this contour map is comparable to historical contour maps generated using ground water data collected during this time of year.

Table 21. October 2015 through January 2016 Ammonia Field Analysis Results Compared to Analytical Laboratory Results

Well Number	Date	Ammonia Concentration (mg/L)	
		Analytical Laboratory Results	Field Results
0440	1/5/2016	0.1	<1
0441	1/13/2016	0.1	<1
0453	1/5/2016	410	288
0682	10/26/2015	280	288
0683	10/26/2015	350	362
0684	10/26/2015	170	206
0732	10/26/2015	190	214
0733	10/26/2015	180	188
0783	11/4/2015	1	2.4
0784	11/2/2015	0.1	<1
0785	11/4/2015	0.13	<1
0786	11/2/2015	0.1	<1
AMM-2	10/21/2015	510	625
SMI-PZ1S	12/16/2015	210	223
SMI-PZ3M	1/13/2016	30	25.5
SMI-PZ3S	1/12/2016	4.1	4.2
TP-11	12/8/2015	0.73	<1
UPD-17	1/12/2016	280	213
UPD-18	1/12/2016	280	256
UPD-20	1/12/2016	0.1	<1
UPD-21	1/13/2016	8.1	3.5
UPD-24	1/12/2016	2.3	1.7

4.7 Contaminant Distribution

Figures 28 and 29 are maps showing shallow ground water ammonia and uranium plumes, respectively, using data collected during the October 2015 and December 2015/January 2016 site-wide events. Contaminant distribution is generally comparable to previous plume maps generated using data collected during the past 2 years.

While Figure 28 displays the result associated with well ATP-2-S, this uranium 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.

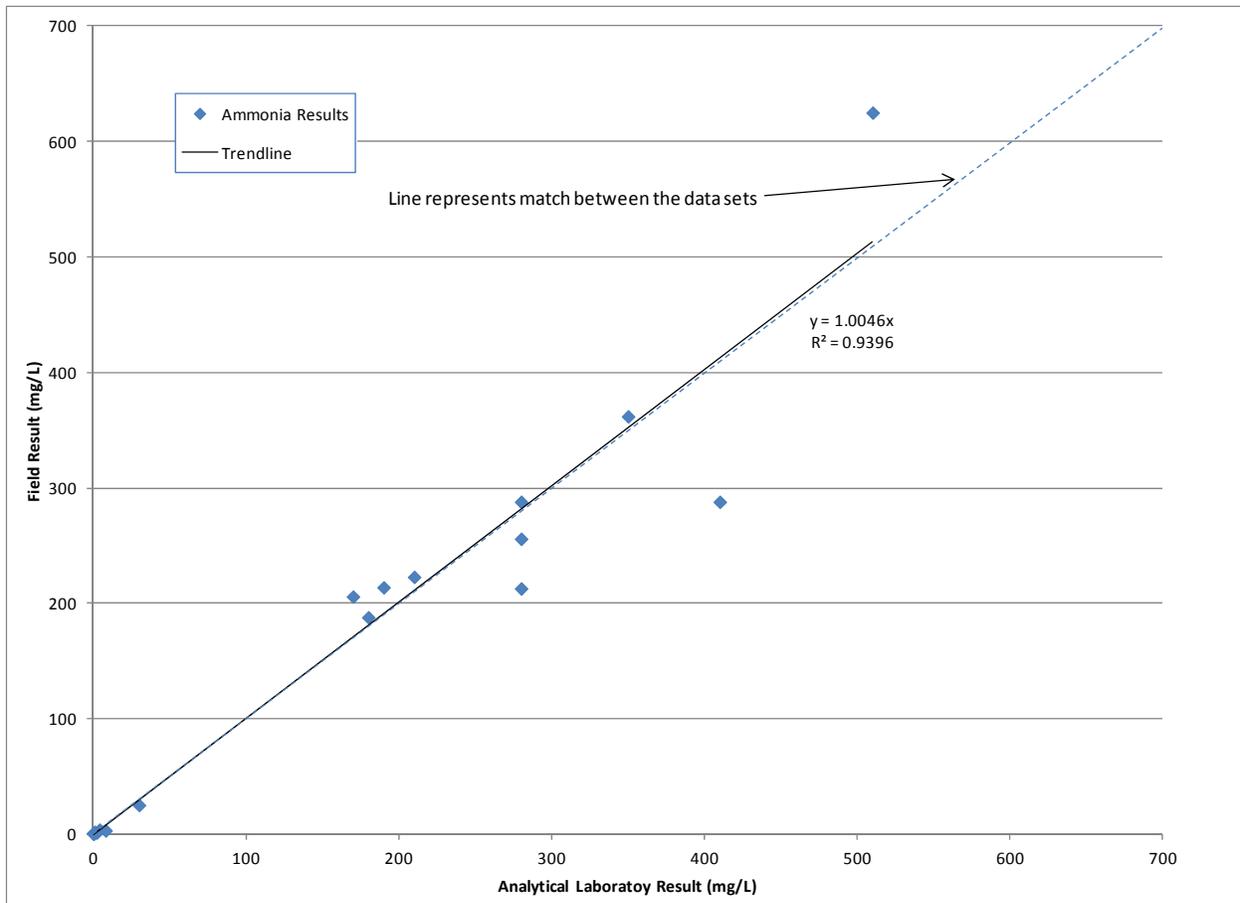


Figure 26. Graphic Comparison of Ammonia Results Generated from the Analytical Laboratory and Field Analyses

5.0 Conclusions

5.1 July through November 2015 Crescent Junction Sampling Event

The rationale for collecting three ground water samples from Crescent Junction monitoring well 0205 and two surface water samples of ponded surface runoff in the vicinity of well 0205 was to identify the source of the water present in well 0205. The analyte concentrations of the three samples collected from well 0205 have in general not significantly changed between July and November 2015, and the ponded surface runoff has in general lower analyte concentrations. Subsequent sampling, in addition to the sampling results associated with this sampling event, will provide further data to assist with identifying the water source.

Because this event represents the first time samples were collected after the well was modified in 2011 (the well was backfilled from 300 to 65 ft bgs), there were no anomalous data since fewer than five samples have historically been collected.

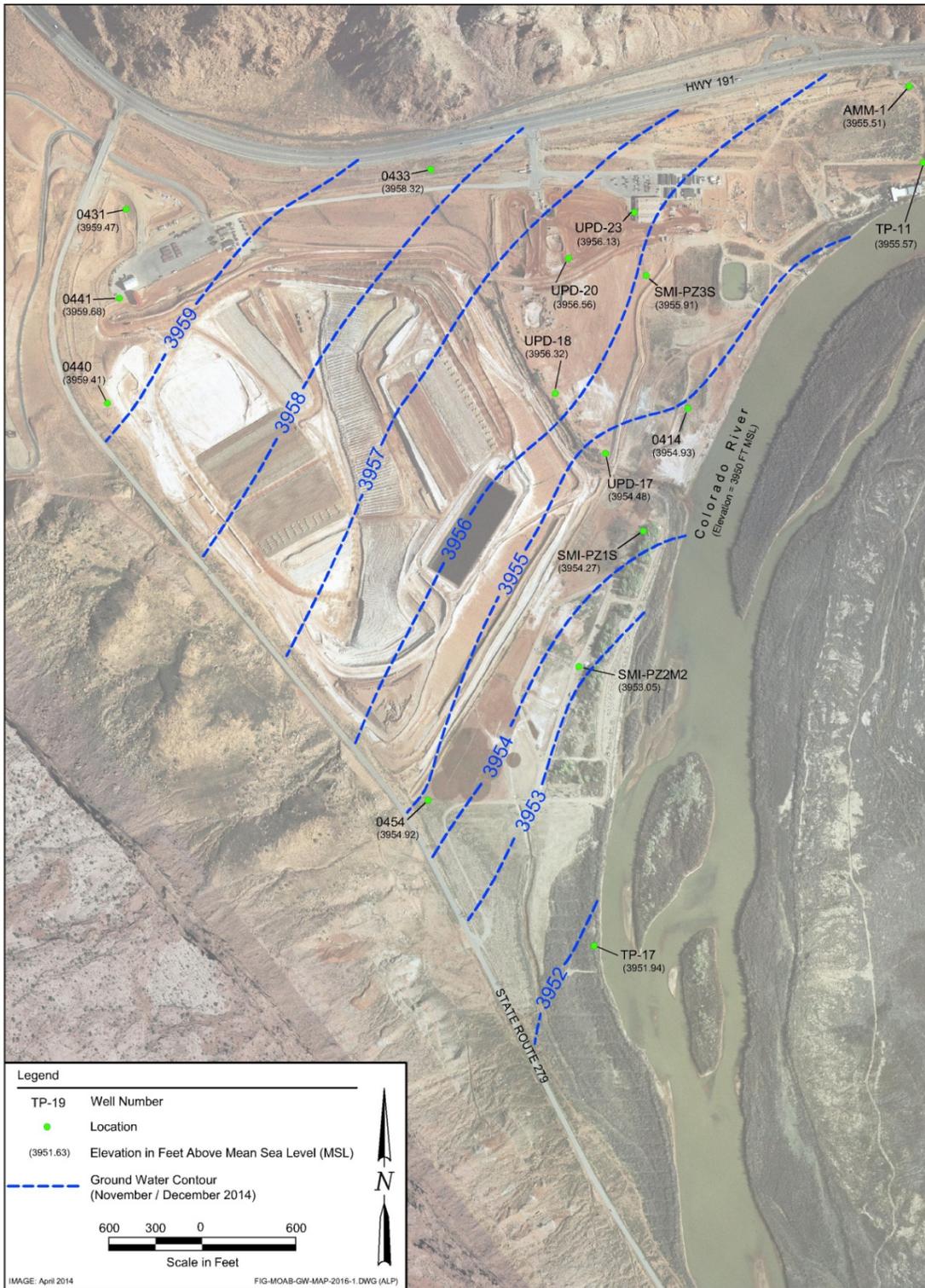


Figure 27. Site-wide Ground Water Elevations, December 9, 2015 through January 5, 2016

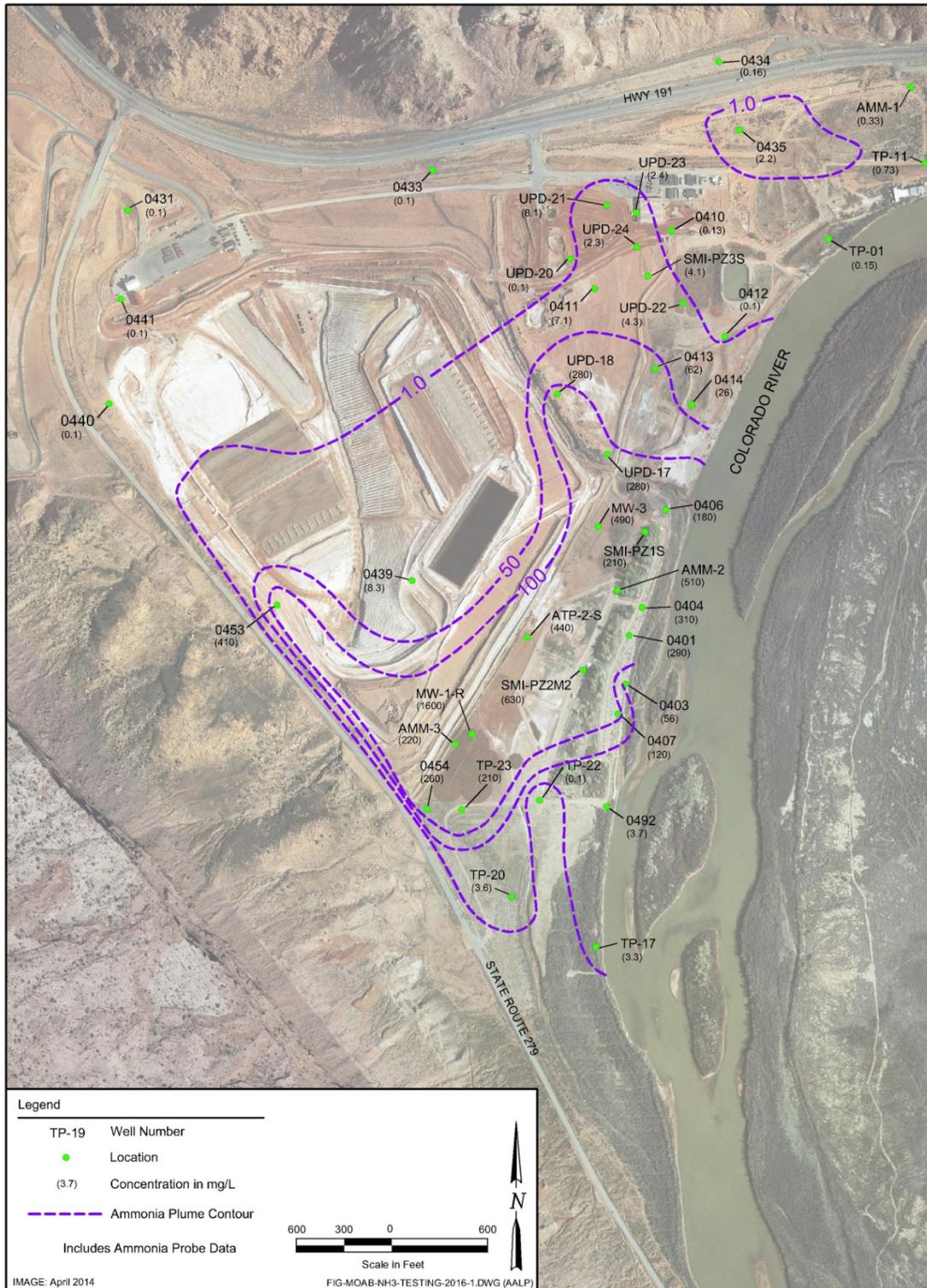


Figure 28. Ammonia Plume in Shallow Ground Water October 2015 through January 2016



Figure 29. Uranium Plume in Shallow Ground Water October 2015 through January 2016

5.2 October 2015 Site-wide, CF4, and Tree Plot Sampling Event

The rationale for collecting ground water samples from select site-wide monitoring locations in October 2015 in the vicinity of the well field was to provide baseline ground water chemistry water for when the evaporation pond is removed, and the ground water extraction system operation scheduled is altered. The collection of ground water samples from observation wells surrounding the CF4 injection wells was to evaluate the effectiveness of the freshwater injection system. At the time of the sampling event, the system had been actively injecting filtered freshwater consistently since August 2015. 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 11 ft of mounding was generated from this system.

Five ground water samples downgradient and one upgradient of the tree plot area (near CF3) were collected to determine if phytoremediation had impacted ammonia 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. CF5 ground water extraction and the area's close proximity to the riverbank further impact the ammonia concentrations.

The ammonia concentrations in samples collected from three of the five downgradient locations increased compared to the previous samples collected in May 2015, while the other two decreased. The upgradient ammonia concentration also decreased during this time frame. Taking into account the data collected since 2005 and considering the limited data from wells 0682, 0683, 0684, 0732, and 0733 since 2009, there are no obvious general trends, and it is difficult to assess the impacts of phytoremediation on the available data. Subsequent and more frequent sampling of these locations has been scheduled.

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

5.3 November 2015 Matheson Sampling Event

Ground water samples were collected from 11 Matheson Wetlands locations in November 2015. This represents the first time samples had been collected from this area located across the Colorado River from the Moab site since 2010. The ammonia and uranium concentrations measured in 2015 have not significantly changed when compared to the previous sampling results. Taking into account the ground water surface flow direction from the Matheson Wetlands towards the Colorado River, the concentrations represent natural background conditions.

With the exception of the sample analyzed for ammonia from location BL3-D (which was 0.25 mg/L above the anomalous data criteria of 50 percent above the maximum), all ammonia and uranium concentrations in the site-wide wells were within 50 percent of historical ranges during this sampling event.

5.4 December 2015/January 2016 Site-wide Sampling Event

The rationale for conducting the December 2015/January 2016 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. Only three of the seven usual surface water locations were accessible due to site conditions.

In general, with the exception of the locations in the vicinity of the Colorado River bank, the ammonia and uranium concentrations did not significantly change since the previous site-wide sampling event in May/June 2015. Concentrations associated with locations impacted by the river stage tend to increase during this time of the water year.

With the exception of one surface water sample analyzed for ammonia (which was 0.01 mg/L above the anomalous data criteria of 50 percent above the 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 EPA criteria (for a suitable habitat) for both acute and chronic concentrations.

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 through November 2015 Crescent Junction Sampling Event

Water Sampling Field Activities Verification
Water Quality Data
Water Level Data
Trip Report

Appendix A. July through November 2015 Crescent Junction Sampling Event

Water Sampling Field Activities Verification

Sampling Event/RIN	July through November 2015 Crescent Junction Sampling Event/1507078	Date(s) of Water Sampling	July 14 through November 4, 2015
Date(s) of Verification	March 8, 2016	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?	NA	These samples were collected in response to water encountered in well 0205, locations were not specified in planning documents
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, oxidation reduction potential) of field measurements taken as specified?	Yes	Field measurements for temperature, pH, turbidity, 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? Did the water level stabilize before sampling? Did pH, specific conductance, and turbidity measurements stabilize before sampling? Was the flow rate less than 500 milliliters per minute? If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	Yes	
		Yes	
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?	Yes	
		Yes	
9.	Were duplicates taken at a frequency of one per 20 samples?	No	One sample was collected at a time

Appendix A. July through November 2015 Crescent Junction Sampling Event (continued)

Water Sampling Field Activities Verification (continued)

Sampling Event/RIN	July through November 2015 Crescent Junction Sampling Event/1507078	Date(s) of Water Sampling	July 14 through November 4, 2015
Date(s) of Verification	March 8, 2016	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		
13. Was the true identity of the samples recorded on the quality assurance sample log?	Yes		
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?	Yes		
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?	Yes		
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?	Yes		

Appendix A. July through November 2015 Crescent Junction Sampling Event *(continued)*

Water Quality Data

General Water Quality Data by Location (USEE105) FOR SITE CRJ01, Crescent Junction Site
REPORT DATE: 3/10/2016
Location: 0205 WELL

Parameter	Units	Sample		Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
		Date	ID			Lab	Data	QA		
Ammonia Total as N	mg/L	7/15/2015	0001	68 -	16	J	#		2.5	
Ammonia Total as N	mg/L	7/29/2015	0001	68 -	17	J	#		2.5	
Ammonia Total as N	mg/L	11/04/2015	0001	68 -	18	J	#		2.5	
Arsenic	mg/L	7/15/2015	0001	68 -	0.039	U	J	#	0.039	
Arsenic	mg/L	7/29/2015	0001	68 -	0.039	U	J	#	0.039	
Arsenic	mg/L	11/04/2015	0001	68 -	0.039	U	J	#	0.039	
Barium	mg/L	7/15/2015	0001	68 -	0.027	J	J	#	0.0019	
Barium	mg/L	7/29/2015	0001	68 -	0.019	J	J	#	0.0019	
Barium	mg/L	11/04/2015	0001	68 -	0.024	J	J	#	0.0019	
BICARBONATE AS CaCO3	mg/L	07/14/2015	0001	68 -	1100			#	20	
BICARBONATE AS CaCO3	mg/L	07/29/2015	0001	68 -	1000			#	20	
BORON	ug/L	07/14/2015	0001	68 -	1600		J	#	31	
BORON	ug/L	07/29/2015	0001	68 -	1300		J	#	31	
BORON	ug/L	11/04/2015	0001	68 -	1400		J	#	31	
Bromide	mg/L	07/14/2015	0001	68 -	18		J	#	10	
Bromide	mg/L	07/29/2015	0001	68 -	20	U	J	#	20	
Bromide	mg/L	11/04/2015	0001	68 -	20	U	J	#	20	
Cadmium	mg/L	07/14/2015	0001	68 -	0.0033	U	J	#	0.0033	

Appendix A. July through November 2015 Crescent Junction Sampling Event *(continued)*

Water Quality Data *(continued)*

General Water Quality Data by Location (USEE105) FOR SITE CRJ01, Crescent Junction Site
 REPORT DATE: 3/10/2016
 Location: 0205 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Cadmium	mg/L	07/14/2015	0001	68	-	0.0033	U	J	#	0.0033
Cadmium	mg/L	07/29/2015	0001	68	-	0.0033	U	J	#	0.0033
Cadmium	mg/L	11/04/2015	0001	68	-	0.0035	J	J	#	0.0033
Calcium	mg/L	07/14/2015	0001	68	-	280		J	#	0.12
Calcium	mg/L	07/29/2015	0001	68	-	400		J	#	0.12
Calcium	mg/L	11/04/2015	0001	68	-	380		J	#	0.12
CARBONATE AS CaCO3	mg/L	07/14/2015	0001	68	-	20	U		#	20
CARBONATE AS CaCO3	mg/L	07/29/2015	0001	68	-	20	U		#	20
Chloride	mg/L	07/14/2015	0001	68	-	5200		J	#	50
Chloride	mg/L	07/29/2015	0001	68	-	2000		J	#	50
Chloride	mg/L	11/04/2015	0001	68	-	3700		J	#	50
Chromium	mg/L	07/14/2015	0001	68	-	0.0051	U	J	#	0.0051
Chromium	mg/L	07/29/2015	0001	68	-	0.021	J	J	#	0.0051
Chromium	mg/L	11/04/2015	0001	68	-	0.0054	J	J	#	0.0051
Copper	mg/L	07/14/2015	0001	68	-	0.0097	U	J	#	0.0097
Copper	mg/L	07/29/2015	0001	68	-	0.017	J	J	#	0.0097
Copper	mg/L	11/04/2015	0001	68	-	0.021	J	J	#	0.0097
Fluoride	mg/L	07/14/2015	0001	68	-	5	U	J	#	5

Appendix A. July through November 2015 Crescent Junction Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE CRJ01, Crescent Junction Site
 REPORT DATE: 3/10/2016
 Location: 0205 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Fluoride	mg/L	07/29/2015	0001	68	-	10	U	J	#	10
Fluoride	mg/L	11/04/2015	0001	68	-	10	U	J	#	10
Iron	mg/L	07/14/2015	0001	68	-	0.06		J	#	0.049
Iron	mg/L	07/29/2015	0001	68	-	0.083		J	#	0.049
Iron	mg/L	11/04/2015	0001	68	-	0.049	U	J	#	0.049
Lead	mg/L	07/14/2015	0001	68	-	0.013	U	J	#	0.013
Lead	mg/L	07/29/2015	0001	68	-	0.013	U	J	#	0.013
Lead	mg/L	11/04/2015	0001	68	-	0.016	J	J	#	0.013
Magnesium	mg/L	07/14/2015	0001	68	-	370		J	#	0.13
Magnesium	mg/L	07/29/2015	0001	68	-	1100		J	#	0.13
Magnesium	mg/L	11/04/2015	0001	68	-	1000		J	#	0.13
Manganese	mg/L	07/14/2015	0001	68	-	0.45		J	#	0.0011
Manganese	mg/L	07/29/2015	0001	68	-	0.71		J	#	0.0011
Manganese	mg/L	11/04/2015	0001	68	-	0.57		J	#	0.0011
MOLYBDENUM	ug/L	07/14/2015	0001	68	-	54		J	#	11
MOLYBDENUM	ug/L	07/29/2015	0001	68	-	22		J	#	11
MOLYBDENUM	ug/L	11/04/2015	0001	68	-	11	U	J	#	11
Nitrate + Nitrite as Nitrogen	mg/L	07/14/2015	0001	68	-	710		J	#	10

Appendix A. July through November 2015 Crescent Junction Sampling Event *(continued)*

Water Quality Data *(continued)*

General Water Quality Data by Location (USEE105) FOR SITE CRJ01, Crescent Junction Site
 REPORT DATE: 3/10/2016
 Location: 0205 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Nitrate + Nitrite as Nitrogen	mg/L	07/29/2015		0001 68	-	1100		J	#	10
Nitrate + Nitrite as Nitrogen	mg/L	11/04/2015		0001 68	-	970		J	#	10
Oxidation Reduction Potential	mV	07/14/2015		N001 68	-	77.7			#	
Oxidation Reduction Potential	mV	07/29/2015		N001 68	-	78			#	
Oxidation Reduction Potential	mV	11/04/2015		N001 68	-	-65			#	
pH	s.u.	07/14/2015		N001 68	-	6.91			#	
pH	s.u.	07/29/2015		N001 68	-	6.82			#	
pH	s.u.	11/04/2015		N001 68	-	7.09			#	
Potassium	mg/L	07/14/2015		0001 68	-	57		J	#	1.1
Potassium	mg/L	07/29/2015		0001 68	-	59		J	#	1.1
Potassium	mg/L	11/04/2015		0001 68	-	57		J	#	1.1
Selenium	mg/L	07/14/2015		0001 68	-	4.6		J	#	0.027
Selenium	mg/L	07/29/2015		0001 68	-	5.4		J	#	0.027
Selenium	mg/L	11/04/2015		0001 68	-	4.8		J	#	0.027
Sodium	mg/L	07/14/2015		0001 68	-	12000		J	#	0.66
Sodium	mg/L	07/29/2015		0001 68	-	11000		J	#	0.66
Sodium	mg/L	11/04/2015		0001 68	-	9900		J	#	0.66
Specific Conductance	umhos/cm	07/14/2015		N001 68	-	42656			#	

Appendix A. July through November 2015 Crescent Junction Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE CRJ01, Crescent Junction Site
REPORT DATE: 3/10/2016
Location: 0205 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Specific Conductance	umhos/cm	07/29/2015		N001 68	-	41148			#	
Specific Conductance	umhos/cm	11/04/2015		N001 68	-	44249			#	
Sulfate	mg/L	07/14/2015		0001 68	-	20000		J	#	500
Sulfate	mg/L	07/29/2015		0001 68	-	20000		J	#	2000
Sulfate	mg/L	11/04/2015		0001 68	-	21000		J	#	250
Temperature	C	07/14/2015		N001 68	-	18.63			#	
Temperature	C	07/29/2015		N001 68	-	19.34			#	
Temperature	C	11/04/2015		N001 68	-	14.39			#	
TOTAL ALKALINITY AS CaCO3	mg/L	07/14/2015		0001 68	-	1100			#	20
TOTAL ALKALINITY AS CaCO3	mg/L	07/29/2015		0001 68	-	1000			#	20
Total Dissolved Solids	mg/L	07/29/2015		0001 68	-	43000		J	#	1000
Total Dissolved Solids	mg/L	11/04/2015		0001 68	-	48000		J	#	1000
Turbidity	NTU	07/14/2015		N001 68	-	25.2			#	
Turbidity	NTU	11/04/2015		N001 68	-	4.34			#	
Uranium	mg/L	07/14/2015		0001 68	-	0.017		J	#	0.00015
Uranium	mg/L	07/29/2015		0001 68	-	0.000029		J	#	0.000029
Uranium	mg/L	11/04/2015		0001 68	-	0.025		J	#	0.00015

Appendix A. July through November 2015 Crescent Junction Sampling Event (continued)

Water Quality Data (continued)

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

REPORT DATE: 3/10/2016

Location: Poned Runoff 1 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	10/28/2015	0001	0 - 0	0.1	U	J #	0.1	
Arsenic	mg/L	10/28/2015	0001	0 - 0	0.002	U	J #	0.002	
Barium	mg/L	10/28/2015	0001	0 - 0	0.026	J	J #	0.00036	
BORON	ug/L	10/28/2015	0001	0 - 0	490		J #	4	
Bromide	mg/L	10/28/2015	0001	0 - 0	0.8	U	J #	0.8	
Cadmium	mg/L	10/28/2015	0001	0 - 0	0.00021	U	J #	0.00021	
Calcium	mg/L	10/28/2015	0001	0 - 0	190		J #	0.024	
Chloride	mg/L	10/28/2015	0001	0 - 0	75		J #	0.8	
Chromium	mg/L	10/28/2015	0001	0 - 0	0.0052	J	J #	0.00073	
Copper	mg/L	10/28/2015	0001	0 - 0	0.0022	U	J #	0.0022	
Fluoride	mg/L	10/28/2015	0001	0 - 0	0.64		J #	0.4	
Iron	mg/L	10/28/2015	0001	0 - 0	0.013	J	J #	0.0067	
Lead	mg/L	10/28/2015	0001	0 - 0	0.0018	U	J #	0.0018	
Magnesium	mg/L	10/28/2015	0001	0 - 0	57		J #	0.03	
Manganese	mg/L	10/28/2015	0001	0 - 0	0.0016	J	J #	0.00024	
MOLYBDENUM	ug/L	10/28/2015	0001	0 - 0	7.3	J	J #	4.7	

Appendix A. July through November 2015 Crescent Junction Sampling Event (continued)

Water Quality Data (continued)

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

REPORT DATE: 3/10/2016

Location: Poned Runoff 1 SURFACE LOCATION

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Nitrate + Nitrite as Nitrogen	mg/L	10/21/2015	0001	0 - 0	17	J	#	0.5	
Nitrate + Nitrite as Nitrogen	mg/L	10/28/2015	0001	0 - 0	17	J	#	0.5	
Oxidation Reduction Potential	mV	10/28/2015	N001	0 - 0	143.7		#		
pH	s.u.	10/28/2015	N001	0 - 0	7.4		#		
Potassium	mg/L	10/28/2015	0001	0 - 0	6.2	J	#	0.052	
Selenium	mg/L	10/28/2015	0001	0 - 0	0.062	J	#	0.003	
Sodium	mg/L	10/28/2015	0001	0 - 0	320	J	#	0.047	
Specific Conductance	umhos /cm	10/28/2015	N001	0 - 0	2710		#		
Sulfate	mg/L	10/28/2015	0001	0 - 0	1300	J	#	40	
Temperature	C	10/28/2015	N001	0 - 0	15.08		#		
Total Dissolved Solids	mg/L	10/28/2015	0001	0 - 0	1900	J	#	400	
Turbidity	NTU	10/28/2015	N001	0 - 0	928		#		
Uranium	mg/L	10/28/2015	0001	0 - 0	0.0058	J	#	0.00015	

Appendix A. July through November 2015 Crescent Junction Sampling Event (*continued*)

Water Quality Data (*continued*)

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. 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 A. July through November 2015 Crescent Junction Sampling Event (*continued*)

Water Level Data

STATIC WATER LEVELS (USEE700) FOR SITE MOA01, Moab Site						
REPORT DATE: 9/28/2015						
Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date Time	Depth From Top of Casing (Ft)	Water Elevation (MSL)	Water Level Flag
0205	O	4949.0	07/14/2015	59.04	4889.96	
0205	O	4949.0	07/29/2015	58.79	4890.21	
0205	O	4949.0	11/4/2015	57.74 ¹	4891.26 ¹	

Note: 1 = Water level measured on 11/4/2015 after pump installed

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

Appendix A. July through November 2015 Crescent Junction Sampling Event *(continued)*

Trip Report



Date: September 02, 2015
To: Ken Pill
From: James Ritchey
Subject: July 2015 CJ Sampling Event

Site: CJ Well 0205 and Poned Surface Runoff Sampling Event

Date of Sampling Event: July 14 – November 04, 2015

Team Members: E. Moran, K. Pill, and J. Ritchey

RIN Number Assigned: All samples were assigned to RIN 1507078.

Sample Shipment: Samples coolers were shipped overnight UPS to ALS from Moab, Utah, on June 04, 18, and 30, and on July 14 of 2015 (Tracking numbers 1Z5W1Y510193085769, 1Z5W1Y510191572209, 1Z5W1Y510199890155, and 1Z5W1Y510195661767).

Number of Locations Sampled: A total of five samples were collected at two different locations (well 0205 and ponded runoff 1) during the July 2015 CJ sampling event.

Locations Not Sampled/Reason: None.

Field Variance: None.

Quality Control Sample Cross Reference: None.

Location Specific Information: All of the observation wells were sampled using a dedicated bladder pump and dedicated tubing. The surface water samples were collected at surface with open bottles and filtered with dedicated tubing. The table below provides additional information:

Location	Date	Sample Depth (ft bgs)	Depth to Water (ft btoc)	Comments
0205	7/14/2015	68	59.04	Yellow color.
0205	7/29/2015	68	58.79	Yellow color.
Ponded Runoff 1	10/21/2015	NA	NA	Collected by Ed Baker. No parameters collected
Ponded Runoff 1	10/28/2015	NA	NA	
0205	11/04/2015	68	57.74	DTW taken after installing pump, yellow color

ft boc = feet below top of casing

Appendix A. July through November 2015 Crescent Junction Sampling Event (*continued*)

Trip Report (*continued*)

Well Inspection Summary: A well inspection was not conducted.

Equipment: None.

Regulatory: None.

Corrective Action Required/Taken: None.

Appendix B.
October 2015 Site-wide, CF4, and Tree Plot Sampling Event

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

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling Event

Water Sampling Field Activities Verification

Sampling Event/RIN	October 2015 Site-wide, CF4 and Tree Plot Area Sampling Event/1510079	Date(s) of Water Sampling	October 21 through November 4, 2015
Date(s) of Verification	March 8, 2016	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, oxidation reduction potential) of field measurements taken as specified?	Yes	Field measurements for temperature, pH, turbidity, 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? Was one pump/tubing volume removed before sampling?	NA	
		NA	
9.	Were duplicates taken at a frequency of one per 20 samples?	Yes	One duplicate was collected for 16 samples.

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)

Water Sampling Field Activities Verification Event (continued)

Sampling Event/RIN	Date(s) of Water Sampling	Date(s) of Verification	Name of Verifier	Response (Yes, No, NA)	Comments
October 2015 Site-wide, CF4 and Tree Plot Area Sampling Event/1510079	October 21 through November 4, 2015	March 8, 2016	Ken Pill		
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. October 2015 Site-wide, CF4, and Tree Plot Sampling *(continued)*

Minimums and Maximums Report

Data Validation Minimums and Maximums Report - No Field Parameters

Laboratory: ALS

RIN: 1510079

Comparison: All Historical Data

Report Date: 3/8/2016

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	0406	10/21/2015	Uranium	0.94		2.2	F	0.96		19	0
MOA01	0682	10/26/2015	Uranium	1.3		3.1	F	1.6		31	0
MOA01	0780	11/02/2015	Ammonia Total as N	0.1	U	890	F	0.12		40	0
MOA01	0781	11/02/2015	Uranium	2.4		2.2		0.032	J	32	0
MOA01	0781	11/02/2015	Uranium	2.3		2.2		0.032	J	32	0
MOA01	0782	11/02/2015	Ammonia Total as N	0.9		2300		1		40	0
MOA01	0786	11/02/2015	Ammonia Total as N	0.1	U	820	J	0.19		38	0
MOA01	0786	11/02/2015	Uranium	0.007		3.2	F	0.0076		39	0
MOA01	MW-1-R	10/27/2015	Ammonia Total as N	1600		1250	FQ	19		7	0
MOA01	TP-23	10/26/2015	Uranium	2.8		4.1		3		10	0

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

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (*continued*)

Minimums and Maximums Report (*continued*)

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 B. October 2015 Site-wide, CF4, and Tree Plot Sampling (*continued*)

Water Quality Data

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

REPORT DATE: 3/8/2016

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	11/04/2015	0001	18 -	290		#	20	
Oxidation Reduction Potential	mV	11/04/2015	N001	18 -	-71		#		
pH	s.u.	11/04/2015	N001	18 -	7.3		#		
Specific Conductance	umhos/cm	11/04/2015	N001	18 -	12614		#		
Temperature	C	11/04/2015	N001	18 -	18.74		#		
Turbidity	NTU	11/04/2015	N001	18 -	2.2		#		
Uranium	mg/L	11/04/2015	0001	18 -	1.5	J	#	0.00015	

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

REPORT DATE: 3/8/2016

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	11/03/2015	0001	18 -	56		#	2.5	
Oxidation Reduction Potential	mV	11/03/2015	N001	18 -	-40		#		
pH	s.u.	11/03/2015	N001	18 -	7.19		#		
Specific Conductance	umhos/cm	11/03/2015	N001	18 -	3164		#		
Temperature	C	11/03/2015	N001	18 -	17.77		#		
Turbidity	NTU	11/03/2015	N001	18 -	3.6		#		
Uranium	mg/L	11/03/2015	0001	18 -	0.43	J	#	0.00015	

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
Location: 0404 WELL Configuration 3

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/04/2015	0001	18 -	310		#	30	
Oxidation Reduction Potential	mV	11/04/2015	N001	18 -	-83		#		
pH	s.u.	11/04/2015	N001	18 -	7.31		#		
Specific Conductance	umhos /cm	11/04/2015	N001	18 -	13894		#		
Temperature	C	11/04/2015	N001	18 -	17.68		#		
Turbidity	NTU	11/04/2015	N001	18 -	2.16		#		
Uranium	mg/L	11/04/2015	0001	18 -	1.4	J	#	0.00015	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
Location: 0406 WELL Baseline Area

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	10/21/2015	0001	18 -	180	J	#	20	
Oxidation Reduction Potential	mV	10/21/2015	N001	18 -	140		#		
pH	s.u.	10/21/2015	N001	18 -	6.93		#		
Specific Conductance	umhos /cm	10/21/2015	N001	18 -	9539		#		
Temperature	C	10/21/2015	N001	18 -	18.61		#		
Turbidity	NTU	10/21/2015	N001	18 -	6.95		#		
Uranium	mg/L	10/21/2015	0001	18 -	0.94	J	#	0.00029	

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
Location: 0407 WELL Configuration 1

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/03/2015	0001	17 -	120		#	20	
Oxidation Reduction Potential	mV	11/03/2015	N001	17 -	144		#		
pH	s.u.	11/03/2015	N001	17 -	6.73		#		
Specific Conductance	umhos /cm	11/03/2015	N001	17 -	10021		#		
Temperature	C	11/03/2015	N001	17 -	17.53		#		
Turbidity	NTU	11/03/2015	N001	17 -	2.35		#		
Uranium	mg/L	11/03/2015	0001	17 -	1.1	J	#	0.00015	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
Location: 0492 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	10/27/2015	0001	18 -	3.7		#	0.1	
Oxidation Reduction Potential	mV	10/27/2015	N001	18 -	94		#		
pH	s.u.	10/27/2015	N001	18 -	7.5		#		
Specific Conductance	umhos /cm	10/27/2015	N001	18 -	5795		#		
Temperature	C	10/27/2015	N001	18 -	18.69		#		
Turbidity	NTU	10/27/2015	N001	18 -	2.31		#		
Uranium	mg/L	10/27/2015	0001	18 -	0.2	J	#	0.00015	

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
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	10/26/2015	0001	28 -	280	J	#	20	
Oxidation Reduction Potential	mV	10/26/2015	N001	28 -	138		#		
pH	s.u.	10/26/2015	N001	28 -	6.76		#		
Specific Conductance	umhos /cm	10/26/2015	N001	28 -	12790		#		
Temperature	C	10/26/2015	N001	28 -	17.63		#		
Turbidity	NTU	10/26/2015	N001	28 -	2.69		#		
Uranium	mg/L	10/26/2015	0001	28 -	1.3	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
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	10/26/2015	0001	27 -	350	J	#	30	
Oxidation Reduction Potential	mV	10/26/2015	N001	27 -	140		#		
pH	s.u.	10/26/2015	N001	27 -	6.73		#		
Specific Conductance	umhos /cm	10/26/2015	N001	27 -	14370		#		
Temperature	C	10/26/2015	N001	27 -	17.37		#		
Turbidity	NTU	10/26/2015	N001	27 -	2.06		#		
Uranium	mg/L	10/26/2015	0001	27 -	1.4	J	#	0.00029	

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
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	10/26/2015	0001	18 -	170	J	#	20	
Oxidation Reduction Potential	mV	10/26/2015	N001	18 -	145		#		
pH	s.u.	10/26/2015	N001	18 -	6.7		#		
Specific Conductance	umhos /cm	10/26/2015	N001	18 -	12029		#		
Temperature	C	10/26/2015	N001	18 -	18.19		#		
Turbidity	NTU	10/26/2015	N001	18 -	4.16		#		
Uranium	mg/L	10/26/2015	0001	18 -	1.3	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
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	10/26/2015	0001	18 -	190	J	#	20	
Oxidation Reduction Potential	mV	10/26/2015	N001	18 -	143		#		
pH	s.u.	10/26/2015	N001	18 -	6.69		#		
Specific Conductance	umhos /cm	10/26/2015	N001	18 -	12358		#		
Temperature	C	10/26/2015	N001	18 -	17.39		#		
Turbidity	NTU	10/26/2015	N001	18 -	2.45		#		
Uranium	mg/L	10/26/2015	0001	18 -	1.2	J	#	0.00029	

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
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	10/26/2015	0001	18 -	180	J	#	20	
Oxidation Reduction Potential	mV	10/26/2015	N001	18 -	141		#		
pH	s.u.	10/26/2015	N001	18 -	6.73		#		
Specific Conductance	umhos /cm	10/26/2015	N001	18 -	10408		#		
Temperature	C	10/26/2015	N001	18 -	17.66		#		
Turbidity	NTU	10/26/2015	N001	18 -	1.89		#		
Uranium	mg/L	10/26/2015	0001	18 -	1.2	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
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	11/02/2015	0001	28 -	0.1	U	#	0.1	
Oxidation Reduction Potential	mV	11/02/2015	N001	28 -	-60		#		
pH	s.u.	11/02/2015	N001	28 -	7.9		#		
Specific Conductance	umhos /cm	11/02/2015	N001	28 -	1131		#		
Temperature	C	11/02/2015	N001	28 -	16.67		#		
Turbidity	NTU	11/02/2015	N001	28 -	12.8		#		
Uranium	mg/L	11/02/2015	0001	28 -	0.0057	J	#	0.00015	

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site										
REPORT DATE: 3/8/2016										
Location: 0781 WELL Configuration 4										
Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/02/2015	0001	46 -	1500			#	50	
Ammonia Total as N	mg/L	11/02/2015	0002	46 -	1500			#	30	
Oxidation Reduction Potential	mV	11/02/2015	N001	46 -	-26			#		
pH	s.u.	11/02/2015	N001	46 -	6.86			#		
Specific Conductance	umhos /cm	11/02/2015	N001	46 -	55727			#		
Temperature	C	11/02/2015	N001	46 -	16.98			#		
Turbidity	NTU	11/02/2015	N001	46 -	1.93			#		
Uranium	mg/L	11/02/2015	0001	46 -	2.3	J		#	0.00015	
Uranium	mg/L	11/02/2015	0002	46 -	2.4	J		#	0.00015	

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)
Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
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	11/02/2015	0001	33 -	0.9		#	0.1	
Oxidation Reduction Potential	mV	11/02/2015	N001	33 -	-125		#		
pH	s.u.	11/02/2015	N001	33 -	7.53		#		
Specific Conductance	umhos /cm	11/02/2015	N001	33 -	1178		#		
Temperature	C	11/02/2015	N001	33 -	17.03		#		
Turbidity	NTU	11/02/2015	N001	33 -	2.54		#		
Uranium	mg/L	11/02/2015	0001	33 -	0.017	J	#	0.00015	

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
Location: 0783 WELL Configuration 4

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/04/2015	0001	18 -	1		#	0.1	
Oxidation Reduction Potential	mV	11/04/2015	N001	18 -	-17		#		
pH	s.u.	11/04/2015	N001	18 -	7.28		#		
Specific Conductance	umhos /cm	11/04/2015	N001	18 -	1243		#		
Temperature	C	11/04/2015	N001	18 -	16.24		#		
Turbidity	NTU	11/04/2015	N001	18 -	2.86		#		
Uranium	mg/L	11/04/2015	0001	18 -	0.071	J	#	0.00015	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
Location: 0784 WELL Configuration 4

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/02/2015	0001	18 -	0.1	U	#	0.1	
Oxidation Reduction Potential	mV	11/02/2015	N001	18 -	-96		#		
pH	s.u.	11/02/2015	N001	18 -	7.24		#		
Specific Conductance	umhos /cm	11/02/2015	N001	18 -	1179		#		
Temperature	C	11/02/2015	N001	18 -	19.5		#		
Turbidity	NTU	11/02/2015	N001	18 -	4.42		#		
Uranium	mg/L	11/02/2015	0001	18 -	0.014	J	#	0.00015	

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
Location: 0785 WELL Configuration 4

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/04/2015	0001	18 -	0.13		#	0.1	
Oxidation Reduction Potential	mV	11/04/2015	N001	18 -	-90		#		
pH	s.u.	11/04/2015	N001	18 -	7.41		#		
Specific Conductance	umhos /cm	11/04/2015	N001	18 -	1234		#		
Temperature	C	11/04/2015	N001	18 -	18.88		#		
Turbidity	NTU	11/04/2015	N001	18 -	9.89		#		
Uranium	mg/L	11/04/2015	0001	18 -	0.01	J	#	0.00015	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
Location: 0786 WELL Configuration 4

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/02/2015	0001	28 -	0.1	U	#	0.1	
Oxidation Reduction Potential	mV	11/02/2015	N001	28 -	-90		#		
pH	s.u.	11/02/2015	N001	28 -	7.62		#		
Specific Conductance	umhos /cm	11/02/2015	N001	28 -	1140		#		
Temperature	C	11/02/2015	N001	28 -	18		#		
Turbidity	NTU	11/02/2015	N001	28 -	2.93		#		
Uranium	mg/L	11/02/2015	0001	28 -	0.007	J	#	0.00015	

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
Location: 0787 WELL Configuration 4

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/02/2015	0001	36 -	480		#	30	
Oxidation Reduction Potential	mV	11/02/2015	N001	36 -	-72		#		
pH	s.u.	11/02/2015	N001	36 -	7.36		#		
Specific Conductance	umhos /cm	11/02/2015	N001	36 -	21623		#		
Temperature	C	11/02/2015	N001	36 -	18.83		#		
Turbidity	NTU	11/02/2015	N001	36 -	2.62		#		
Uranium	mg/L	11/02/2015	0001	36 -	0.9	J	#	0.00015	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
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	10/21/2015	0001	48 -	510	J	#	30	
Oxidation Reduction Potential	mV	10/21/2015	N001	48 -	136		#		
pH	s.u.	10/21/2015	N001	48 -	6.77		#		
Specific Conductance	umhos /cm	10/21/2015	N001	48 -	18250		#		
Temperature	C	10/21/2015	N001	48 -	17.76		#		
Turbidity	NTU	10/21/2015	N001	48 -	7.86		#		
Uranium	mg/L	10/21/2015	0001	48 -	2.1	J	#	0.00029	

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site										
REPORT DATE: 3/8/2016										
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	10/27/2015	0001	48 -	220	J	#	20		
Ammonia Total as N	mg/L	10/27/2015	0002	48 -	250	J	#	20		
Oxidation Reduction Potential	mV	10/27/2015	N001	48 -	-21		#			
pH	s.u.	10/27/2015	N001	48 -	7.27		#			
Specific Conductance	umhos /cm	10/27/2015	N001	48 -	20268		#			
Temperature	C	10/27/2015	N001	48 -	19.78		#			
Turbidity	NTU	10/27/2015	N001	48 -	3.76		#			
Uranium	mg/L	10/27/2015	0001	48 -	1.1	J	#	0.00029		
Uranium	mg/L	10/27/2015	0002	48 -	1.1	J	#	0.00029		

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)
Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
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	10/27/2015	0001	88 -	520	J	#	30	
Oxidation Reduction Potential	mV	10/27/2015	N001	88 -	-231		#		
pH	s.u.	10/27/2015	N001	88 -	7.8		#		
Specific Conductance	umhos /cm	10/27/2015	N001	88 -	113658		#		
Temperature	C	10/27/2015	N001	88 -	18.32		#		
Turbidity	NTU	10/27/2015	N001	88 -	9.79		#		
Uranium	mg/L	10/27/2015	0001	88 -	0.012	J	#	0.000029	

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
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	10/27/2015	0001	25 -	440	J	#	30	
Oxidation Reduction Potential	mV	10/27/2015	N001	25 -	112		#		
pH	s.u.	10/27/2015	N001	25 -	7.64		#		
Specific Conductance	umhos /cm	10/27/2015	N001	25 -	14739		#		
Temperature	C	10/27/2015	N001	25 -	18.25		#		
Turbidity	NTU	10/27/2015	N001	25 -	5.06		#		
Uranium	mg/L	10/27/2015	0001	25 -	0.0015	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
Location: MW-1-R WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	10/27/2015	0001	13 -	1600	J	#	50	
Oxidation Reduction Potential	mV	10/27/2015	N001	13 -	134		#		
pH	s.u.	10/27/2015	N001	13 -	7.23		#		
Specific Conductance	umhos /cm	10/27/2015	N001	13 -	37743		#		
Temperature	C	10/27/2015	N001	13 -	18.89		#		
Turbidity	NTU	10/27/2015	N001	13 -	73		#		
Uranium	mg/L	10/27/2015	0001	13 -	1.1	J	#	0.00029	

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
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	10/21/2015	0001	44 -	490	J	#	30	
Oxidation Reduction Potential	mV	10/21/2015	N001	44 -	138		#		
pH	s.u.	10/21/2015	N001	44 -	6.8		#		
Specific Conductance	umhos /cm	10/21/2015	N001	44 -	26539		#		
Temperature	C	10/21/2015	N001	44 -	18.32		#		
Turbidity	NTU	10/21/2015	N001	44 -	3.26		#		
Uranium	mg/L	10/21/2015	0001	44 -	2.7	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
Location: SMI-PW01 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	10/21/2015	0001	40 -	420	J	#	30	
Oxidation Reduction Potential	mV	10/21/2015	N001	40 -	1		#		
pH	s.u.	10/21/2015	N001	40 -	6.8		#		
Specific Conductance	umhos /cm	10/21/2015	N001	40 -	14357		#		
Temperature	C	10/21/2015	N001	40 -	16.3		#		
Turbidity	NTU	10/21/2015	N001	40 -	3.21		#		
Uranium	mg/L	10/21/2015	0001	40 -	1.7	J	#	0.00029	

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
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	QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	10/27/2015	0001	32 -	3.6			#	0.1	
Oxidation Reduction Potential	mV	10/27/2015	N001	32 -	-268			#		
pH	s.u.	10/27/2015	N001	32 -	7.6			#		
Specific Conductance	umhos /cm	10/27/2015	N001	32 -	122314			#		
Temperature	C	10/27/2015	N001	32 -	18.78			#		
Turbidity	NTU	10/27/2015	N001	32 -	3.6			#		
Uranium	mg/L	10/27/2015	0001	32 -	0.032		J	#	0.00015	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
Location: TP-22 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	10/27/2015	0001	17 -	0.1	U	J	#	0.1	
Oxidation Reduction Potential	mV	10/27/2015	N001	17 -	143			#		
pH	s.u.	10/27/2015	N001	17 -	6.75			#		
Specific Conductance	umhos /cm	10/27/2015	N001	17 -	34478			#		
Temperature	C	10/27/2015	N001	17 -	19.61			#		
Turbidity	NTU	10/27/2015	N001	17 -	578			#		
Uranium	mg/L	10/27/2015	0001	17 -	0.47		J	#	0.000029	

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (continued)

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
401	O	3969.6	11/4/2015	13.35	3956.25	
403	O	3968.95	11/3/2015	15.44	3953.51	
404	O	3968.3	11/4/2015	14	3954.3	
406	O	3964.59	10/21/2015	10.35	3954.24	
407	O	3969.09	11/3/2015	15.96	3953.13	
492	O	3967.56	10/27/2015	14.89	3952.67	
682	O	3970.18	10/26/2015	13.44	3956.74	
683	O	3970.73	10/26/2015	13.92	3956.81	
684	O	3970.22	10/26/2015	13.83	3956.39	
732	O	3968.99	10/26/2015	12.19	3956.8	
733	O	3964.45	10/26/2015	11.75	3952.7	
780	O	3968.45	11/2/2015	14.67	3953.78	
781	O	3968.56	11/2/2015	14.68	3953.88	
782	O	3968.46	11/2/2015	14.69	3953.77	
783	O	3966.16	11/4/2015	13.12	3953.04	
784	O	3968.73	11/2/2015	15.6	3953.13	
785	O	3969.24	11/4/2015	15.55	3953.69	
786	O	3968.14	11/2/2015	14.66	3953.48	
787	O	3968.43	11/2/2015	14.8	3953.63	
AMM-2	O	3964.09	10/21/2015	9.83	3954.26	
AMM-3	O	3962.9	10/26/2015	8.2	3954.7	
ATP-2-D	O	3962.17	10/27/2015	6.49	3955.68	
ATP-2-S	O	3962.17	10/27/2015	13.35	3948.82	
MW-1-R	D	3962.6	10/27/2015	6.32	3956.28	
MW-3	O	3965.98	10/21/2015	11.43	3954.55	
SMI-PW01	O	3963.96	10/21/2015	9.56	3954.4	

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (*continued*)
Water Level Data (*continued*)

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
TP-20	O	3967.55	10/27/2015	15.44	3952.11	
TP-22	O	3966.51	10/27/2015	13.16	3953.35	
TP-23	O	3962.6	10/26/2015	8.58	3954.02	

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. October 2015 Site-wide, CF4, and Tree Plot Sampling (*continued*)

Trip Report



Date: January 15, 2016
To: Ken Pill
From: James Ritchey
Subject: October/November 2015 Site-wide Sampling Event

Site: Moab – Site-wide Sampling Event –October 2015

Date of Sampling Event: October 21 – November 04, 2015

Team Members: E. Moran, K. Pill, and J. Ritchey

RIN Number Assigned: All samples were assigned to RIN 151077

Sample Shipment: Samples coolers were shipped overnight UPS to ALS from Moab, Utah, on October 29 and on November 06 of 2015 (Tracking numbers 1Z5W1Y510198137042 and 1Z5W1Y510194236308).

October 2015 Site-wide Sampling

Number of Locations Sampled: The purpose of the site-wide sampling event is to update contaminant plume maps. A total of 16 locations were sampled during this event. Including one duplicate, a total of 17 samples were collected during the October 2015 sampling event.

Locations Not Sampled/Reason: 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
2000	AMM-3	Duplicate from 48 ft bgs	Ground Water

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

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (*continued*)

Trip Report (*continued*)

Location	Date	Sample Depth (ft bgs)	Ammonia Probe Result (mg/L)	Comments
0401	11/04/2015	18	247	
0403	11/03/2015	18	44.9	
0404	11/04/2015	18	261	
0406	10/21/2015	18	131	
0407	11/03/2015	17	98.6	
0492	10/27/2015	18	<10	
AMM-2	10/21/2015	48	–	
AMM-3	10/26/2015	48	450	Duplicate 2000
ATP-2-D	10/27/2015	88	–	
ATP-2-S	10/27/2015	25	–	
MW-1-R	10/27/2015	13	–	
MW-3	10/21/2015	44	–	
SMI-PW01	10/21/2015	40	372	
TP-20	10/27/2015	32	–	Strong sulfur odor.
TP-22	10/27/2015	17	–	Dewatered at 2.0 L.
TP-23	10/26/2015	25	–	

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	11/04/2015	13.35
0403	11/03/2015	15.44
0404	11/04/2015	14.00
0406	10/21/2015	10.35
0407	11/03/2015	15.96
0492	10/27/2015	14.89
AMM-2	10/21/2015	9.83
AMM-3	10/26/2015	8.20
ATP-2-D	10/27/2015	6.49
ATP-2-S	10/27/2015	13.35
MW-1-R	10/27/2015	6.32
MW-3	10/21/2015	11.43
SMI-PW01	10/21/2015	9.56
TP-20	10/27/2015	15.44
TP-22	10/27/2015	13.16
TP-23	10/26/2015	8.58

November 2015 Configuration 4 Sampling

Number of Locations Sampled: Eight observation wells (0780, 0781, 0782, 0783, 0784, 0785, 0786, and 0787) and one duplicate were sampled during the November 2015 sampling event.

Locations Not Sampled: None.

Field Variance: None.

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (*continued*)

Trip Report (*continued*)

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	0781	Duplicate from 46 ft bgs	Ground Water

ft boc = feet below top of casing

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)	Ammonia Probe Result (mg/L)
0780	11/02/2015	14:55	14.67	28	<1
0781	11/02/2015	15:10	14.68	46	–
0782	11/02/2015	15:40	14.69	33	<10
0783	11/04/2015	10:00	13.12	18	<10
0784	11/02/2015	13:45	15.60	18	<1
0785	11/04/2015	10:20	15.55	18	<10
0786	11/02/2015	14:25	14.66	28	<1
0787	11/02/2015	14:05	14.80	36	–

ft boc = feet below top of casing

October 2015 Tree Plot Sampling

Number of Locations Sampled: Five observations wells (0682, 0683, 0684, 0732, and 0733) and were sampled during the September 2015 Sampling event. (AMM-2 and SMI-PW01 were also sampled; the data are included in the Site-wide portion of this report.)

Locations Not Sampled: None.

Field Variance: None.

Quality Control Sample Cross Reference: 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)	Pump Intake Depth (ft bgs)	Ammonia Probe Result (mg/L)
0682	10/26/2015	13:50	13.44	28	249
0683	10/26/2015	14:10	13.92	28	317
0684	10/26/2015	11:25	13.83	18	147.2
0732	10/26/2015	11:40	12.19	18	<1
0733	10/26/2015	14:40	11.75	18	165

ft boc = feet below top of casing

Appendix B. October 2015 Site-wide, CF4, and Tree Plot Sampling (*continued*)

Trip Report (*continued*)

Well Inspection Summary: A well inspection was not conducted.

Equipment: None.

Regulatory: None.

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)
10/21/2015	4,930
10/22/2015	5,130
10/23/2015	6,740
10/24/2015	5,770
10/25/2015	5,350
10/26/2015	5,260
10/27/2015	5,250
10/28/2015	5,300
10/29/2015	5,090
10/30/2015	5,070
10/31/2015	4,960
11/1/2015	4,710
11/2/2015	4,420
11/3/2015	4,180
11/4/2015	4,430

Corrective Action Required/Taken: None.

Appendix C.
November 2015 Matheson Sampling Event
Water Sampling Field Activities Verification
Minimums and Maximums Report
Water Quality Data
Water Level Data
Trip Report

Appendix C. November 2015 Matheson Sampling Event

Water Sampling Field Activities Verification

Sampling Event/RIN	November 2015 Matheson Sampling Event/1510080	Date(s) of Water Sampling	November 23-24, 2015
Date(s) of Verification	March 8, 2016	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, oxidation reduction potential) of field measurements taken as specified?	Yes	Field measurements for temperature, pH, turbidity, 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? Did the water level stabilize before sampling? Did pH, specific conductance, and turbidity measurements stabilize before sampling? Was the flow rate less than 500 milliliters per minute? If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	Yes Yes Yes Yes NA	
10.	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?	Yes Yes	
11.	Were duplicates taken at a frequency of one per 20 samples?	Yes	One duplicate was collected for 9 samples.

Appendix C. November 2015 Matheson Sampling Event (continued)
Water Sampling Field Activities Verification (continued)

Sampling Event/RIN	November 2015 Matheson Sampling Event/1510080	Date(s) of Water Sampling	November 23-24, 2015
Date(s) of Verification	March 8, 2016	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?	NA	All samples were collected using dedicated equipment.	
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?	Yes		

Appendix C. November 2015 Matheson Sampling Event (continued)

Minimums and Maximums Report

Data Validation Minimums and Maximums Report - No Field Parameters

Laboratory: ALS

RIN: 1511080

Comparison: All Historical Data

Report Date: 3/8/2016

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	BL1-D	11/23/2015	Ammonia Total as N	2.9		2.3	F	2.1	F	5	0		
MOA01	BL2-M	11/24/2015	Ammonia Total as N	3.9		2.9	J	2.7	F	5	0		
MOA01	BL2-S	11/24/2015	Ammonia Total as N	1.7		2.1		1.9	J	5	0		
MOA01	BL3-M	11/24/2015	Ammonia Total as N	4		2.5	F	2.3		5	0		

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

SAMPLE ID CODES: 000X = Filtered sample (0.45 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. November 2015 Matheson Sampling Event (continued)
Water Quality Data

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
Location: BL1-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	11/23/2015	0001	140 -	2.9	J	#	0.1	
Oxidation Reduction Potential	mV	11/23/2015	N001	140 -	-291		#		
pH	s.u.	11/23/2015	N001	140 -	6.93		#		
Specific Conductance	umhos/cm	11/23/2015	N001	140 -	111235		#		
Temperature	C	11/23/2015	N001	140 -	13.88		#		
Turbidity	NTU	11/23/2015	N001	140 -	163		#		
Uranium	mg/L	11/23/2015	0001	140 -	0.0019	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/8/2016
Location: BL1-M WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/23/2015	0001	99 -	0.88	J	#	0.1	
Oxidation Reduction Potential	mV	11/23/2015	N001	99 -	-274		#		
pH	s.u.	11/23/2015	N001	99 -	6.6		#		
Specific Conductance	umhos/cm	11/23/2015	N001	99 -	87480		#		
Temperature	C	11/23/2015	N001	99 -	13.85		#		
Turbidity	NTU	11/23/2015	N001	99 -	26.7		#		
Uranium	mg/L	11/23/2015	0001	99 -	0.0031	J	#	0.000029	

Appendix C. November 2015 Matheson Sampling Event (continued)
Water Quality Data (continued)

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

REPORT DATE: 3/8/2016

Location: BL1-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	11/23/2015	0001	55 -	0.62	J	#	0.1	
Oxidation Reduction Potential	mV	11/23/2015	N001	55 -	-183		#		
pH	s.u.	11/23/2015	N001	55 -	6.76		#		
Specific Conductance	umhos/cm	11/23/2015	N001	55 -	31828		#		
Temperature	C	11/23/2015	N001	55 -	13.88		#		
Turbidity	NTU	11/23/2015	N001	55 -	87.8		#		
Uranium	mg/L	11/23/2015	0001	55 -	0.0053	J	#	0.000029	

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

REPORT DATE: 3/8/2016

Location: BL2-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	11/24/2015	0001	142 -	4.2	J	#	0.1	
Ammonia Total as N	mg/L	11/24/2015	0002	142 -	3.9	J	#	0.1	
Oxidation Reduction Potential	mV	11/24/2015	N001	142 -	-259		#		
pH	s.u.	11/24/2015	N001	142 -	7.3		#		
Specific Conductance	umhos/cm	11/24/2015	N001	142 -	117963		#		
Temperature	C	11/24/2015	N001	142 -	15.24		#		
Turbidity	NTU	11/24/2015	N001	142 -	51.7		#		
Uranium	mg/L	11/24/2015	0001	142 -	0.0031	J	#	0.000029	
Uranium	mg/L	11/24/2015	0002	142 -	0.0035	J	#	0.000029	

Appendix C. November 2015 Matheson Sampling Event (continued)
Water Quality Data (continued)

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

REPORT DATE: 3/8/2016

Location: BL2-M WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/24/2015	0001	100 -	3.9	J	#	0.1	
Oxidation Reduction Potential	mV	11/24/2015	N001	100 -	-227		#		
pH	s.u.	11/24/2015	N001	100 -	7.22		#		
Specific Conductance	umhos/cm	11/24/2015	N001	100 -	114214		#		
Temperature	C	11/24/2015	N001	100 -	15.29		#		
Turbidity	NTU	11/24/2015	N001	100 -	30.8		#		
Uranium	mg/L	11/24/2015	0001	100 -	0.0038	J	#	0.000029	

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

REPORT DATE: 3/8/2016

Location: BL2-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	11/24/2015	0001	57 -	1.7	J	#	0.1	
Oxidation Reduction Potential	mV	11/24/2015	N001	57 -	-241		#		
pH	s.u.	11/24/2015	N001	57 -	6.92		#		
Specific Conductance	umhos/cm	11/24/2015	N001	57 -	86020		#		
Temperature	C	11/24/2015	N001	57 -	15.05		#		
Turbidity	NTU	11/24/2015	N001	57 -	117		#		
Uranium	mg/L	11/24/2015	0001	57 -	0.0025	J	#	0.000029	

Appendix C. November 2015 Matheson Sampling Event (continued)
Water Quality Data (continued)

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

REPORT DATE: 3/8/2016

Location: BL3-D WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/24/2015	0001	100 -	8.9	J		#	2.5	
Oxidation Reduction Potential	mV	11/24/2015	N001	100 -	-287			#		
pH	s.u.	11/24/2015	N001	100 -	6.9			#		
Specific Conductance	umhos /cm	11/24/2015	N001	100 -	129113			#		
Temperature	C	11/24/2015	N001	100 -	12.53			#		
Turbidity	NTU	11/24/2015	N001	100 -	3.22			#		
Uranium	mg/L	11/24/2015	0001	100 -	0.00008	J	J	#	0.000029	

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

REPORT DATE: 3/8/2016

Location: BL3-M WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/24/2015	0001	47 -	4	J		#	0.1	
Oxidation Reduction Potential	mV	11/24/2015	N001	47 -	-272			#		
pH	s.u.	11/24/2015	N001	47 -	6.98			#		
Specific Conductance	umhos /cm	11/24/2015	N001	47 -	113448			#		
Temperature	C	11/24/2015	N001	47 -	12.29			#		
Turbidity	NTU	11/24/2015	N001	47 -	83.1			#		
Uranium	mg/L	11/24/2015	0001	47 -	0.00022	J		#	0.000029	

Appendix C. November 2015 Matheson Sampling Event (continued)
Water Quality Data (continued)

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

REPORT DATE: 3/8/2016

Location: N3-8.3 WELL Matheson Wetlands Preserve

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/24/2015	0001	24 -	0.11	J	#	0.1	
Oxidation Reduction Potential	mV	11/24/2015	N001	24 -	-334		#		
pH	s.u.	11/24/2015	N001	24 -	8.46		#		
Specific Conductance	umhos/cm	11/24/2015	N001	24 -	1345		#		
Temperature	C	11/24/2015	N001	24 -	13.84		#		
Turbidity	NTU	11/24/2015	N001	24 -	7.78		#		
Uranium	mg/L	11/24/2015	0001	24 -	0.03	J	#	0.000029	

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

REPORT DATE: 3/8/2016

Location: N6-6.4 WELL Matheson Wetlands Preserve

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	11/23/2015	0001	12 -	0.26	J	#	0.1	
Oxidation Reduction Potential	mV	11/23/2015	N001	12 -	-313		#		
pH	s.u.	11/23/2015	N001	12 -	7.35		#		
Specific Conductance	umhos/cm	11/23/2015	N001	12 -	4590		#		
Temperature	C	11/23/2015	N001	12 -	15.02		#		
Turbidity	NTU	11/23/2015	N001	12 -	2.43		#		
Uranium	mg/L	11/23/2015	0001	12 -	0.0095	J	#	0.000029	

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

Appendix C. November 2015 Matheson Sampling Event (*continued*) Water Quality Data (*continued*)

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

LAB QUALIFIERS:

* Replicate analysis not within control limits.
> Result above upper detection limit.
A 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. November 2015 Matheson Sampling Event *(continued)*

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
BL1-S	O	3966.91	11/23/2015	11.34	3955.57	
BL1-M	O	3967.21	11/23/2015	13.66	3953.55	
BL1-D	O	3967.33	11/23/2015	14.57	3952.76	
BL2-S	O	3967.67	11/24/2015	15.12	3952.55	
BL2-M	O	3967.78	11/24/2015	16.2	3951.58	
BL2-D	O	3967.96	11/24/2015	16.51	3951.45	
BL3-M	O	3964.93	11/24/2015	14.07	3950.86	
BL3-D	O	3965.02	11/24/2015	14.83	3950.19	
N3-8.3	O	3965.03	11/24/2015	5.22	3959.81	
N6-6.4	O	3962.69	11/23/2015	6.2	3956.49	

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. November 2015 Matheson Sampling Event (continued)
Trip Report



DATE: January 15, 2016
TO: K. Pill
FROM: J. Ritchey
SUBJECT: Matheson Wetlands Preserve Sampling Trip Report

Site: Scott M. Matheson Wetlands Preserve – November 2015
Date of Sampling Event: November 23 - 24, 2015
Team Members: Elizabeth Moran, James Ritchey
RIN Number Assigned: All samples were assigned to RIN 1511080.
Sample Shipment: All samples were shipped in one cooler overnight UPS to ALS Laboratory Group from Moab, Utah, on November 30, 2015 (Tracking Number 0196909864).

November 2015 Matheson Wetlands Sampling

Number of Locations Sampled: Ten observation wells were sampled at the Scott M. Matheson Wetlands Preserve. Including one duplicate, a total of 11 samples were collected during the November 2015 Matheson 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	BL2-D	Duplicate Sample from 142 ft.	Ground Water	NOV 009

**Appendix C. November 2015 Matheson Sampling Event (continued)
Trip Report (continued)**

Location Specific Information – Observation Wells: All observation wells were sampled using micro-purge techniques. All wells were sampled with a peristaltic pump and dedicated downhole and pump-head tubing.

Well No.	Date	Time	Depth to Water (ft btoc)	Sample Depth (ft bgs)
BL1-S	11/23/2015	13:50	11.34	55
BL1-M	11/23/2015	14:10	13.66	99
BL1-D	11/23/2015	14:20	14.57	140
BL2-S	11/24/2015	11:20	15.12	57
BL2-M	11/24/2015	11:40	16.20	100
BL2-D	11/24/2015	11:55	16.51	142
BL3-M	11/24/2015	10:40	14.07	47
BL3-D	11/24/2015	10:55	14.83	100
N3-8.3	11/24/2015	15:25	5.22	24
N6-6.4	11/23/2015	14:55	6.20	12

ft boc = feet below top of casing

Site Issues: According to the USGS Cisco Gaging Station (Station No. 09180500):

Date	Daily Mean Flow (cfs)
11/23/2015	4,000
11/24/2015	3,820

Equipment Issues: None.

Corrective Action Required/Taken: None.

Appendix D.
December 2015/January 2016 Site-wide Sampling Event

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

Appendix D. December 2015/January 2016 Site-wide Sampling Event

Water Sampling Field Activities Verification

Sampling Event/RIN	December 2015/January 2016 Site-wide Sampling Event/1512081	Date(s) of Water Sampling	December 8, 2015 through January 19, 2016
Date(s) of Verification	March 8, 2016	Name of Verifier	Ken Pill
		Response (Yes, No, NA)	Comments
21. Is the Sampling Analysis Plan (SAP) the primary document directing field procedures?		Yes	
List other documents, standard operating procedures, instructions.		NA	
22. Were the sampling locations specified in the planning documents sampled?		Yes	
23. Was a pre-trip calibration conducted as specified in the aforementioned documents?		Yes	
24. Was an operational check of the field equipment conducted in accordance with the SAP?		Yes	
Did the operational checks meet criteria?		Yes	
25. Were the number and types (alkalinity, temperature, electrical conductivity, pH, turbidity, oxidation reduction potential) of field measurements taken as specified?		Yes	Field measurements for temperature, pH, turbidity, oxidation reduction potential, and conductivity were collected.
26. Was the category of the well documented?		Yes	
27. 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	
28. 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	
29. Were duplicates taken at a frequency of one per 20 samples?		Yes	Two duplicates were collected for 34 samples.

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Sampling Field Activities Verification (continued)

Sampling Event/RIN	December 2015/January 2016 Site-wide Sampling Event/1512081	Date(s) of Water Sampling	December 8, 2015 through January 19, 2016
Date(s) of Verification	March 8, 2016	Name of Verifier	Ken Pill
	Response (Yes, No, NA)	Comments	
30. 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.	
31. Were trip blanks prepared and included with each shipment of volatile organic compound samples?	NA		
32. 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		
33. Were samples collected in the containers specified?	Yes		
34. Were samples filtered and preserved as specified?	Yes		
35. Were the number and types of samples collected as specified?	NA		
36. Were COC records completed, and was sample custody maintained?	Yes		
37. Are field data sheets signed and dated by both team members?	Yes		
38. Was all other pertinent information documented on the field data sheets?	NA		
39. Was the presence or absence of ice in the cooler documented at every sample location?	Yes		
40. Were water levels measured at the locations specified in the planning documents?	Yes		

Appendix D. December 2015/January 2016 Site-wide Sampling Event *(continued)*

Minimums and Maximums Report

Data Validation Minimums and Maximums Report - No Field Parameters

Laboratory: ALS

RIN: 1512081

Comparison: All Historical Data

Report Date: 3/10/2016

Site Code	Location Code	Sample Date	Analyte	Current		Historical Maximum		Historical Minimum		Count	
				Result	Qualifiers Lab Data	Result	Qualifiers Lab Data	Result	Qualifiers Lab Data	N	N Below Detect
MOA01	0218	12/28/2015	Ammonia Total as N	0.16		0.1	U J	0.1	U J	16	16
MOA01	0411	01/05/2016	Uranium	1.4		19		1.7		11	0
MOA01	0413	12/08/2015	Ammonia Total as N	62		53		7		17	0
MOA01	0431	12/30/2015	Uranium	0.016		0.013		0.009	FQ	14	0
MOA01	0433	01/04/2016	Uranium	0.0023		0.0021	F	0.0017		13	0
MOA01	0441	01/13/2016	Uranium	0.059		0.052		0.025		8	0
MOA01	0443	12/30/2015	Uranium	0.013		0.012	J	0.0049		12	0
MOA01	SMI-PZ3M	01/13/2016	Ammonia Total as N	30		97		34		17	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.

Appendix D. December 2015/January 2016 Site-wide Sampling Event (*continued*)
Minimums and Maximums Report (*continued*)

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. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: 0201 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	12/29/2015	0001	0 - 0	0.1	U	J #	0.1	
Oxidation Reduction Potential	mV	12/29/2015	N001	0 - 0	137		#		
pH	s.u.	12/29/2015	N001	0 - 0	7.26		#		
Specific Conductance	umhos/cm	12/29/2015	N001	0 - 0	1279		#		
Temperature	C	12/29/2015	N001	0 - 0	2.43		#		
Turbidity	NTU	12/29/2015	N001	0 - 0	64.6		#		
Uranium	mg/L	12/29/2015	0001	0 - 0	0.0054		J #	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: 0218 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	12/28/2015	0001	0 - 0	0.16		J #	0.1	
Ammonia Total as N	mg/L	12/28/2015	0002	0 - 0	0.1	U	#	0.1	
Oxidation Reduction Potential	mV	12/28/2015	N001	0 - 0	103		#		
pH	s.u.	12/28/2015	N001	0 - 0	7.45		#		
Specific Conductance	umhos/cm	12/28/2015	N001	0 - 0	1166		#		
Temperature	C	12/28/2015	N001	0 - 0	0.96		#		
Turbidity	NTU	12/28/2015	N001	0 - 0	190		#		
Uranium	mg/L	12/28/2015	0001	0 - 0	0.012		J #	0.000029	
Uranium	mg/L	12/28/2015	0002	0 - 0	0.034		J #	0.000029	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
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	01/05/2016	0001	23.5 -	0.13	J	#	0.1	
Oxidation Reduction Potential	mV	01/05/2016	N001	23.5 -	46		#		
pH	s.u.	01/05/2016	N001	23.5 -	7.15		#		
Specific Conductance	umhos/cm	01/05/2016	N001	23.5 -	3454		#		
Temperature	C	01/05/2016	N001	23.5 -	14.79		#		
Turbidity	NTU	01/05/2016	N001	23.5 -	29.6		#		
Uranium	mg/L	01/05/2016	0001	23.5 -	0.59	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
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	01/05/2016	0001	8 -	7.1	J	#	1	
Oxidation Reduction Potential	mV	01/05/2016	N001	8 -	159		#		
pH	s.u.	01/05/2016	N001	8 -	6.82		#		
Specific Conductance	umhos/cm	01/05/2016	N001	8 -	5678		#		
Turbidity	NTU	01/05/2016	N001	8 -	202		#		
Uranium	mg/L	01/05/2016	0001	8 -	1.4	J	#	0.00029	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: 0412 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/09/2015	0001	9.5 -	0.1	U	J	#	0.1	
Oxidation Reduction Potential	mV	12/09/2015	N001	9.5 -	-28			#		
pH	s.u.	12/09/2015	N001	9.5 -	7.65			#		
Specific Conductance	umhos/cm	12/09/2015	N001	9.5 -	1383			#		
Temperature	C	12/09/2015	N001	9.5 -	15.46			#		
Turbidity	NTU	12/09/2015	N001	9.5 -	671			#		
Uranium	mg/L	12/09/2015	0001	9.5 -	2.1		J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: 0413 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/08/2015	0001	10.5 -	62		J	#	2.5	
Oxidation Reduction Potential	mV	12/08/2015	N001	10.5 -	-95			#		
pH	s.u.	12/08/2015	N001	10.5 -	7.48			#		
Specific Conductance	umhos/cm	12/08/2015	N001	10.5 -	5622			#		
Temperature	C	12/08/2015	N001	10.5 -	14.98			#		
Turbidity	NTU	12/08/2015	N001	10.5 -	7.94			#		
Uranium	mg/L	12/08/2015	0001	10.5 -	3		J	#	0.00029	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: 0414 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/08/2015	0001	7.5 -	26	J	#	2.5	
Oxidation Reduction Potential	mV	12/08/2015	N001	7.5 -	-131		#		
pH	s.u.	12/08/2015	N001	7.5 -	7.29		#		
Specific Conductance	umhos/cm	12/08/2015	N001	7.5 -	6027		#		
Temperature	C	12/08/2015	N001	7.5 -	14.9		#		
Turbidity	NTU	12/08/2015	N001	7.5 -	439		#		
Uranium	mg/L	12/08/2015	0001	7.5 -	3.2	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
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	12/30/2015	0001	91 -	0.1	U J	#	0.1	
Oxidation Reduction Potential	mV	12/30/2015	N001	91 -	238		#		
pH	s.u.	12/30/2015	N001	91 -	7.09		#		
Specific Conductance	umhos/cm	12/30/2015	N001	91 -	34111		#		
Temperature	C	12/30/2015	N001	91 -	17.39		#		
Turbidity	NTU	12/30/2015	N001	91 -	2.21		#		
Uranium	mg/L	12/30/2015	0001	91 -	0.016	J	#	0.000029	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
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	01/04/2016	0001	99 -	0.1	U	J	#	0.1	
Oxidation Reduction Potential	mV	01/04/2016	N001	99 -	180			#		
pH	s.u.	01/04/2016	N001	99 -	7.47			#		
Specific Conductance	umhos/cm	01/04/2016	N001	99 -	4858			#		
Temperature	C	01/04/2016	N001	99 -	18.09			#		
Turbidity	NTU	01/04/2016	N001	99 -	3.58			#		
Uranium	mg/L	01/04/2016	0001	99 -	0.0023		J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: 0434 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	01/04/2016	0001	35 -	0.16		J	#	0.1	
Oxidation Reduction Potential	mV	01/04/2016	N001	35 -	-67			#		
pH	s.u.	01/04/2016	N001	35 -	7.16			#		
Specific Conductance	umhos/cm	01/04/2016	N001	35 -	45779			#		
Temperature	C	01/04/2016	N001	35 -	18.02			#		
Turbidity	NTU	01/04/2016	N001	35 -	3.43			#		
Uranium	mg/L	01/04/2016	0001	35 -	0.026		J	#	0.000029	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data (continued)

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

REPORT DATE: 3/10/2016

Location: 0435 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/08/2015	0001	173 -	2.2	J	#	0.1	
Oxidation Reduction Potential	mV	12/08/2015	N001	173 -	-201		#		
pH	s.u.	12/08/2015	N001	173 -	7.13		#		
Specific Conductance	umhos/cm	12/08/2015	N001	173 -	113009		#		
Temperature	C	12/08/2015	N001	173 -	16.08		#		
Turbidity	NTU	12/08/2015	N001	173 -	1.66		#		
Uranium	mg/L	12/08/2015	0001	173 -	0.034	J	#	0.000029	

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

REPORT DATE: 3/10/2016

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	01/05/2016	0001	118 -	8.3	J	#	2.5	
Oxidation Reduction Potential	mV	01/05/2016	N001	118 -	224		#		
pH	s.u.	01/05/2016	N001	118 -	6.93		#		
Specific Conductance	umhos/cm	01/05/2016	N001	118 -	10244		#		
Temperature	C	01/05/2016	N001	118 -	15.59		#		
Turbidity	NTU	01/05/2016	N001	118 -	553		#		
Uranium	mg/L	01/05/2016	0001	118 -	1.4	J	#	0.00029	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: 0440 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	01/05/2016	0001	117 -	0.1	U	J	#	0.1	
Oxidation Reduction Potential	mV	01/05/2016	N001	117 -	15			#		
pH	s.u.	01/05/2016	N001	117 -	7.31			#		
Specific Conductance	umhos/cm	01/05/2016	N001	117 -	8448			#		
Temperature	C	01/05/2016	N001	117 -	17.1			#		
Turbidity	NTU	01/05/2016	N001	117 -	35.9			#		
Uranium	mg/L	01/05/2016	0001	117 -	0.041		J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: 0441 WELL Queue/Support Area

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	01/13/2016	0001	53 -	0.1	U		#	0.1	
Oxidation Reduction Potential	mV	01/13/2016	N001	53 -	143			#		
pH	s.u.	01/13/2016	N001	53 -	7.39			#		
Specific Conductance	umhos/cm	01/13/2016	N001	53 -	20873			#		
Temperature	C	01/13/2016	N001	53 -	16.58			#		
Turbidity	NTU	01/13/2016	N001	53 -	12.2			#		
Uranium	mg/L	01/13/2016	0001	53 -	0.059		J	#	0.000029	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: 0443 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/30/2015	0001	73 -	0.1	U	J	#	0.1	
Oxidation Reduction Potential	mV	12/30/2015	N001	73 -	66			#		
pH	s.u.	12/30/2015	N001	73 -	7.32			#		
Specific Conductance	umhos/cm	12/30/2015	N001	73 -	6295			#		
Temperature	C	12/30/2015	N001	73 -	17.73			#		
Turbidity	NTU	12/30/2015	N001	73 -	6.33			#		
Uranium	mg/L	12/30/2015	0001	73 -	0.013		J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: 0453 WELL Contaminated Area

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data	QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	01/05/2016	0001	80 -	410			#	40	
Oxidation Reduction Potential	mV	01/05/2016	N001	80 -	235			#		
pH	s.u.	01/05/2016	N001	80 -	7.14			#		
Specific Conductance	umhos/cm	01/05/2016	N001	80 -	33352			#		
Temperature	C	01/05/2016	N001	80 -	11.93			#		
Turbidity	NTU	01/05/2016	N001	80 -	15.7			#		
Uranium	mg/L	01/05/2016	0001	80 -	2.2		J	#	0.00029	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: 0454 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/16/2015	0001	13 -	260	J	#	20	
Oxidation Reduction Potential	mV	12/16/2015	N001	13 -	-87		#		
pH	s.u.	12/16/2015	N001	13 -	7.04		#		
Specific Conductance	umhos/cm	12/16/2015	N001	13 -	71259		#		
Temperature	C	12/16/2015	N001	13 -	17.78		#		
Turbidity	NTU	12/16/2015	N001	13 -	19.1		#		
Uranium	mg/L	12/16/2015	0001	13 -	1.4	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
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	12/08/2015	0001	19 -	0.33	J	#	0.1	
Oxidation Reduction Potential	mV	12/08/2015	N001	19 -	-211		#		
pH	s.u.	12/08/2015	N001	19 -	7.52		#		
Specific Conductance	umhos/cm	12/08/2015	N001	19 -	12270		#		
Temperature	C	12/08/2015	N001	19 -	16.9		#		
Turbidity	NTU	12/08/2015	N001	19 -	1.3		#		
Uranium	mg/L	12/08/2015	0001	19 -	0.012	J	#	0.000029	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
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	12/28/2015	0001	0 - 0	0.1	U	#	0.1	
Oxidation Reduction Potential	mV	12/28/2015	N001	0 - 0	193		#		
pH	s.u.	12/28/2015	N001	0 - 0	7.24		#		
Specific Conductance	umhos/cm	12/28/2015	N001	0 - 0	1202		#		
Temperature	C	12/28/2015	N001	0 - 0	2.77		#		
Turbidity	NTU	12/28/2015	N001	0 - 0	27.8		#		
Uranium	mg/L	12/28/2015	0001	0 - 0	0.0053		J #	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
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	12/16/2015	0001	18 -	210		J #	20	
Ammonia Total as N	mg/L	12/16/2015	0002	18 -	200		#	20	
Oxidation Reduction Potential	mV	12/16/2015	N001	18 -	-94		#		
pH	s.u.	12/16/2015	N001	18 -	7.07		#		
Specific Conductance	umhos/cm	12/16/2015	N001	18 -	11121		#		
Temperature	C	12/16/2015	N001	18 -	14.97		#		
Turbidity	NTU	12/16/2015	N001	18 -	25.7		#		
Uranium	mg/L	12/16/2015	0001	18 -	1.1		J #	0.00029	
Uranium	mg/L	12/16/2015	0002	18 -	1.2		J #	0.00029	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: SMI-PZ2M2 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/16/2015	0001	56 -	630	J	#	30	
Oxidation Reduction Potential	mV	12/16/2015	N001	56 -	95		#		
pH	s.u.	12/16/2015	N001	56 -	7.03		#		
Specific Conductance	umhos/cm	12/16/2015	N001	56 -	60761		#		
Temperature	C	12/16/2015	N001	56 -	15.13		#		
Turbidity	NTU	12/16/2015	N001	56 -	3.12		#		
Uranium	mg/L	12/16/2015	0001	56 -	2.8	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: SMI-PZ3D2 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	01/12/2016	0001	78 -	340		#	30	
Oxidation Reduction Potential	mV	01/12/2016	N001	78 -	136		#		
pH	s.u.	01/12/2016	N001	78 -	7.16		#		
Specific Conductance	umhos/cm	01/12/2016	N001	78 -	21000		#		
Temperature	C	01/12/2016	N001	78 -	15.71		#		
Turbidity	NTU	01/12/2016	N001	78 -	3.66		#		
Uranium	mg/L	01/12/2016	0001	78 -	0.92	J	#	0.000029	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: SMI-PZ3M WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	01/13/2016	0001	59 -	30		#	2.5	
Oxidation Reduction Potential	mV	01/13/2016	N001	59 -	189		#		
pH	s.u.	01/13/2016	N001	59 -	7.59		#		
Specific Conductance	umhos/cm	01/13/2016	N001	59 -	9707		#		
Temperature	C	01/13/2016	N001	59 -	16.59		#		
Turbidity	NTU	01/13/2016	N001	59 -	1.7		#		
Uranium	mg/L	01/13/2016	0001	59 -	0.75	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: SMI-PZ3S WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	01/12/2016	0001	25 -	4.1		#	0.1	
Oxidation Reduction Potential	mV	01/12/2016	N001	25 -	74		#		
pH	s.u.	01/12/2016	N001	25 -	7.8		#		
Specific Conductance	umhos/cm	01/12/2016	N001	25 -	4649		#		
Temperature	C	01/12/2016	N001	25 -	16.94		#		
Turbidity	NTU	01/12/2016	N001	25 -	4.7		#		
Uranium	mg/L	01/12/2016	0001	25 -	1.8	J	#	0.00029	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: TP-01 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	12/08/2015	0001	22 -	0.15	J	#	0.1	
Oxidation Reduction Potential	mV	12/08/2015	N001	22 -	-221		#		
pH	s.u.	12/08/2015	N001	22 -	7.48		#		
Specific Conductance	umhos/cm	12/08/2015	N001	22 -	6712		#		
Temperature	C	12/08/2015	N001	22 -	15.29		#		
Turbidity	NTU	12/08/2015	N001	22 -	2.43		#		
Uranium	mg/L	12/08/2015	0001	22 -	0.073	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
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	12/08/2015	0001	30 -	0.73	J	#	0.1	
Oxidation Reduction Potential	mV	12/08/2015	N001	30 -	-218		#		
pH	s.u.	12/08/2015	N001	30 -	7.44		#		
Specific Conductance	umhos/cm	12/08/2015	N001	30 -	17651		#		
Temperature	C	12/08/2015	N001	30 -	16.4		#		
Turbidity	NTU	12/08/2015	N001	30 -	8.9		#		
Uranium	mg/L	12/08/2015	0001	30 -	0.0016	J	#	0.000029	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
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 QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	01/04/2016	0001	28 -	3.3		#	1	
Oxidation Reduction Potential	mV	01/04/2016	N001	28 -	-148		#		
pH	s.u.	01/04/2016	N001	28 -	7.24		#		
Specific Conductance	umhos/cm	01/04/2016	N001	28 -	103847		#		
Temperature	C	01/04/2016	N001	28 -	13.38		#		
Turbidity	NTU	01/04/2016	N001	28 -	14.2		#		
Uranium	mg/L	01/04/2016	0001	28 -	0.021	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: UPD-17 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	01/12/2016	0001	14.5 -	280		#	20	
Oxidation Reduction Potential	mV	01/12/2016	N001	14.5 -	227		#		
pH	s.u.	01/12/2016	N001	14.5 -	6.88		#		
Specific Conductance	umhos/cm	01/12/2016	N001	14.5 -	10500		#		
Temperature	C	01/12/2016	N001	14.5 -	15.83		#		
Turbidity	NTU	01/12/2016	N001	14.5 -	7.54		#		
Uranium	mg/L	01/12/2016	0001	14.5 -	1.2	J	#	0.00029	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: UPD-18 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	01/12/2016	0001	13 -	280		#	20	
Oxidation Reduction Potential	mV	01/12/2016	N001	13 -	214		#		
pH	s.u.	01/12/2016	N001	13 -	7.05		#		
Specific Conductance	umhos /cm	01/12/2016	N001	13 -	9209		#		
Temperature	C	01/12/2016	N001	13 -	16.29		#		
Turbidity	NTU	01/12/2016	N001	13 -	6.24		#		
Uranium	mg/L	01/12/2016	0001	13 -	0.88	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: UPD-20 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	01/12/2016	0001	17 -	0.1	U	#	0.1	
Oxidation Reduction Potential	mV	01/12/2016	N001	17 -	119		#		
pH	s.u.	01/12/2016	N001	17 -	7.33		#		
Specific Conductance	umhos /cm	01/12/2016	N001	17 -	4696		#		
Temperature	C	01/12/2016	N001	17 -	15.22		#		
Turbidity	NTU	01/12/2016	N001	17 -	23.7		#		
Uranium	mg/L	01/12/2016	0001	17 -	0.068	J	#	0.000029	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: UPD-21 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	01/13/2016	0001	25 -	8.1		#	2.5	
Oxidation Reduction Potential	mV	01/13/2016	N001	25 -	173		#		
pH	s.u.	01/13/2016	N001	25 -	7.54		#		
Specific Conductance	umhos /cm	01/13/2016	N001	25 -	4047		#		
Temperature	C	01/13/2016	N001	25 -	14.25		#		
Turbidity	NTU	01/13/2016	N001	25 -	9.49		#		
Uranium	mg/L	01/13/2016	0001	25 -	6.9	J	#	0.00029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: UPD-22 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	12/08/2015	0001	9 -	4.3	J	#	0.1	
Oxidation Reduction Potential	mV	12/08/2015	N001	9 -	-207		#		
pH	s.u.	12/08/2015	N001	9 -	7.77		#		
Specific Conductance	umhos /cm	12/08/2015	N001	9 -	2895		#		
Temperature	C	12/08/2015	N001	9 -	18.41		#		
Turbidity	NTU	12/08/2015	N001	9 -	4.25		#		
Uranium	mg/L	12/08/2015	0001	9 -	2.6	J	#	0.00029	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)

Water Quality Data (continued)

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: UPD-23 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	01/19/2016	0001	26 -	2.4		#	0.5	
Oxidation Reduction Potential	mV	01/19/2016	N001	26 -	104		#		
pH	s.u.	01/19/2016	N001	26 -	7.23		#		
Specific Conductance	umhos/cm	01/19/2016	N001	26 -	4507		#		
Temperature	C	01/19/2016	N001	26 -	16.46		#		
Turbidity	NTU	01/19/2016	N001	26 -	19.3		#		
Uranium	mg/L	01/19/2016	0001	26 -	0.72	J	#	0.000029	

General Water Quality Data by Location (USEE105) FOR SITE MOA01, Moab Site
REPORT DATE: 3/10/2016
Location: UPD-24 WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)	Result	Qualifiers Data QA	Lab	Detection Limit	Uncertainty
Ammonia Total as N	mg/L	01/12/2016	0001	27 -	2.3		#	0.5	
Oxidation Reduction Potential	mV	01/12/2016	N001	27 -	79		#		
pH	s.u.	01/12/2016	N001	27 -	7.42		#		
Specific Conductance	umhos/cm	01/12/2016	N001	27 -	4534		#		
Temperature	C	01/12/2016	N001	27 -	17.56		#		
Turbidity	NTU	01/12/2016	N001	27 -	4.01		#		
Uranium	mg/L	01/12/2016	0001	27 -	8.5	J	#	0.00029	

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

Appendix D. December 2015/January 2016 Site-wide Sampling Event (*continued*)

Water Quality Data (*continued*)

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

LAB QUALIFIERS:

- * Replicate analysis not within control limits.
- > Result above upper detection limit.
- A 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. December 2015/January 2016 Site-wide Sampling Event (continued)
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
410	O	3981.05	1/5/2016	25.03	3956.02	
411	O	3962.43	1/5/2016	8.65	3953.78	
412	O	3962.48	12/9/2015	7.51	3954.97	
413	O	3963.19	12/9/2015	7.82	3955.37	
414	O	3959.2	12/9/2015	4.27	3954.93	
431	O	4007.04	12/30/2015	47.57	3959.47	
433	O	3989.99	1/4/2016	31.67	3958.32	
434	O	3990.21	1/4/2016	34.08	3956.13	
435	O	3971.67	12/8/2015	14.51	3957.16	
439	O	4055.27	1/5/2016	93.23	3962.04	
440	O	4070.71	1/5/2016	111.3	3959.41	
441	O	4008.77	1/13/2016	49.09	3959.68	
443	O	4006.72	12/30/2015	46.77	3959.95	
454	O	3966.53	12/16/2015	12.24	3954.29	
AMM-1	O	3972.02	12/8/2015	16.51	3955.51	
SMI-PZ1S	O	3964.13	12/16/2015	9.86	3954.27	
SMI-PZ2M2	O	3967.18	12/16/2015	14.13	3953.05	
SMI-PZ3D2	O	3975.13	1/12/2016	19.4	3955.73	
SMI-PZ3M	O	3975.23	1/13/2016	19.22	3956.01	
SMI-PZ3S	O	3975.03	1/12/2016	19.12	3955.91	
TP-11	O	3967.51	12/8/2015	11.94	3955.57	
TP-17	O	3963.69	1/4/2016	11.75	3951.94	
UPD-17	O	3967.44	1/12/2016	12.96	3954.48	
UPD-18	O	3969	1/12/2016	12.68	3956.32	
UPD-20	O	3978.73	1/12/2016	22.17	3956.56	
UPD-21	O	3981.45	1/13/2016	25.05	3956.4	
UPD-22	O	3966.2	12/8/2015	10.54	3955.66	
UPD-23	O	3982.38	1/19/2016	26.25	3956.13	
UPD-24	O	3977.1	1/12/2016	21.05	3956.05	

Appendix D. December 2015/January 2016 Site-wide Sampling Event (*continued*) Water Level Data

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. December 2015/January 2016 Site-wide Sampling Event (continued)
Trip Report



Date: March 14, 2016
To: Ken Pill
From: James Ritchey
Subject: December 2015 Site-wide Sampling Event
Site: Moab – Site-wide Sampling Event –December 2015
Date of Sampling Event: December 08, 2015 – January 19, 2016
Team Members: E. Moran, K. Pill, and J. Ritchey
RIN Number Assigned: All samples were assigned to RIN 1512081.
Sample Shipment: Three coolers were shipped overnight UPS to ALS Laboratory from Moab, Utah, on December 15 of 2015 and on January 11 and 20 of 2016 (Tracking numbers 1Z5W1Y510196909864, 1Z5W1Y510192461961 and 1Z5W1Y510195967099).

Number of Locations Sampled: The purpose of the site-wide sampling event is to update contaminant plume maps. A total of 34 locations (three surface samples and 31 monitoring wells) were sampled during this event. Including two duplicates, a total of 36 samples were collected during the December 2015 sampling event.

Locations Not Sampled/Reason: Surface water locations 0226, 0228, CR2, CR3, and CR5 were not sampled due to ice along the river bank. Well TP-19 was difficult to access and not sampled. Well SMI-MW01 was buried from summer flooding and was not sampled due to frozen ground conditions.

Field Variance: None.

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

False ID	True ID	Sample Type	Associated Matrix
2000	SMI-PZ1S	Duplicate from 18 ft bgs	Ground Water
2001	0218	Duplicate	Surface 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. December 2015/January 2016 Site-wide Sampling Event (continued)
Trip Report (continued)**

Location	Date	Sample Depth (ft bgs)	Ammonia Probe Results (mg/L)	Comments
0201	12/29/2015	–	NA	
0218	12/28/2015	–	NA	Duplicate 2001. Collected ~4 ft from back in flowing water within a broken ice shelf.
0410	01/05/2016	23.5	NA	Dewatered at ~0.75 L.
0411	01/05/2016	8	NA	Dewatered at ~0.15 L.
0412	12/09/2015	9.5	NA	
0413	12/09/2015	10.5	NA	
0414	12/09/2015	7.5	NA	
0431	12/30/2015	91	NA	Sampled with bladder pump.
0433	01/04/2016	99	NA	Sampled with bladder pump.
0434	01/04/2016	35	NA	Sampled with bladder pump.
0435	12/08/2015	173	NA	Sulfur Odor
0439	01/05/2016	120	NA	Sampled with bladder pump.
0440	01/05/2016	119	<1	Sampled with bladder pump.
0441	01/13/2016	53	<1	Sampled with bladder pump. Turbidity stable.
0443	12/30/2015	73	NA	Sampled with bladder pump.
0453	01/05/2016	80	288	Sampled with bladder pump. Water level below top of pump.
0454	12/16/2015	13	NA	
AMM-1	12/08/2015	19	NA	
CR1	12/28/2015	–	NA	Taken a few feet from the bank off an ice shelf.
SMI-PZ1S	12/16/2015	18	234	Duplicate 2000
SMI-PZ2M2	12/16/2015	56	NA	
SMI-PZ3D2	01/12/2016	78	NA	
SMI-PZ3M	01/13/2016	59	25.5	
SMI-PZ3S	01/12/2016	25	4.15	
TP-01	12/08/2015	22	NA	Water level is not obtainable.
TP-11	12/08/2015	30	<1	
TP-17	01/04/2016	28	NA	Water is still black and smells. Black articles in water.
UPD-17	01/12/2016	14.5	213	
UPD-18	01/12/2016	13	256	
UPD-20	01/12/2016	17	<1	
UPD-21	01/13/2016	25	*3.52	Sample collected by pulling up tubing from well still under suction created by peristaltic pump. Peristaltic pump not strong enough to pull water to ground surface.
UPD-22	12/08/2015	9	NA	
UPD-23	1/19/2016	26	NA	Dewatered at ~0.6 L.
UPD-24	01/12/2016	27	*1.66	

*Below calibration

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

**Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)
Trip Report (continued)**

Well No.	Date	Depth to Water (ft btoc)
0410	01/05/2016	25.03
0411	01/05/2016	8.65
0412	12/09/2015	7.51
0413	12/09/2015	7.82
0414	12/09/2015	4.27
0431	12/30/2015	47.57
0433	01/04/2016	31.67
0434	01/04/2016	34.08
0435	12/08/2015	14.51
0439	01/05/2016	93.23
0440	01/05/2016	111.30
0441	01/13/2016	49.09
0443	12/30/2015	46.77
0453	01/05/2016	*
0454	12/16/2015	12.24
AMM-1	12/08/2015	16.51
SMI-PZ1S	12/16/2015	9.86
SMI-PZ2M2	12/16/2015	14.13
SMI-PZ3D2	01/12/2016	19.40
SMI-PZ3M	01/13/2016	19.22
SMI-PZ3S	01/12/2016	19.12
TP-01	12/08/2015	*
TP-11	12/08/2015	11.94
TP-17	01/04/2016	11.75
UPD-17	01/12/2016	12.96
UPD-18	01/12/2016	12.68
UPD-20	01/12/2016	22.17
UPD-21	01/13/2016	25.05
UPD-22	12/08/2015	10.54
UPD-23	01/19/2016	26.25
UPD-24	01/12/2016	21.05

*Water level could not be obtained.

Well Inspection Summary: A well inspection was not conducted.

Equipment: None.

Regulatory: None.

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:

**Appendix D. December 2015/January 2016 Site-wide Sampling Event (continued)
Trip Report (continued)**

Date	Daily Mean Flow (cfs)
12/08/2015	3,150
12/09/2015	3,130
12/10/2015	3,320
12/11/2015	3,320
12/12/2015	3,340
12/13/2015	3,340
12/14/2015	3,270
12/15/2015	3,200
12/16/2015	3,160
12/17/2015	3,070
12/18/2015	2,960
12/19/2015	3,370
12/20/2015	3,520
12/21/2015	3,700
12/22/2015	3,830
12/23/2015	3,780
12/24/2015	3,900
12/25/2015	3,700
12/26/2015	3,410
12/27/2015	3,420
12/28/2015	Ice
12/29/2015	Ice
12/30/2015	Ice
12/31/2015	Ice
01/01/2016	Ice
01/02/2016	Ice
01/03/2016	Ice
01/04/2016	Ice
01/05/2016	Ice
01/06/2016	Ice
01/07/2016	Ice
01/08/2016	Ice
01/09/2016	Ice
01/10/2016	Ice
01/11/2016	Ice
01/12/2016	Ice
01/13/2016	Ice
01/14/2016	---
01/15/2016	Ice
01/16/2016	Ice
01/17/2016	Ice
01/18/2016	Ice
01/19/2016	Ice

Corrective Action Required/Taken: None.