

Data Validation Package

March 2016
Surface Water Sampling at the
Mexican Hat, Utah, Disposal Site

May 2016

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Sampling Event Summary

Site: Mexican Hat, Utah, Disposal Site

Sampling Period: March 15, 2016

Seep monitoring is performed at the Mexican Hat Disposal Site as a best management practice (BMP) according to the *Long-Term Surveillance Plan for the Mexican Hat, Utah (UMTRCA Title I), Disposal Site San Juan County, Utah* (DOE-M/1530-2007, DOE Office of Legacy Management, October 2007) and *Resolution of Seep and Ground Water Monitoring at the Mexican Hat, Utah, UMTRCA Title I Disposal Site*, (DOE-LM/GJ1139-2006, DOE Office of Legacy Management, March 2006).

Surface water samples were collected along Gypsum Creek at seep 0248 and at location 0267, which is upgradient of seep 0248 in the main Gypsum Creek drainage. A duplicate sample was collected from location 0267. Filtered and unfiltered samples were collected from location 0248. Sampling and analyses were conducted as specified in the *Sampling and Analysis Plan for the U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated).



Evan C. Tyrrell, Site Lead
Navarro Research and Engineering, Inc.

3/15/2017

Date

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Data Assessment Summary

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Water Sampling Field Activities Verification Checklist

Project	Mexican Hat, Utah	Date(s) of Water Sampling	March 15, 2016
Date(s) of Verification	April 27, 2016	Name of Verifier	Gretchen Baer

	Response (Yes, No, NA)	Comments
1. Is the SAP the primary document directing field procedures? List any Program Directives or other documents, SOPs, instructions.	Yes	Email from J Gillespie dated March 7, 2016.
2. Were the sampling locations specified in the planning documents sampled?	Yes	
3. Were field equipment calibrations conducted as specified in the above-named documents?	Yes	
4. Was an operational check of the field equipment conducted daily? Did the operational checks meet criteria?	Yes	
5. Were the number and types (alkalinity, temperature, specific conductance, pH, turbidity, DO, ORP) of field measurements taken as specified?	Yes	
6. Were wells categorized correctly?	NA	All locations are surface water.
7. Were the following conditions met when purging a Category I well: Was one pump/tubing volume purged prior to sampling?	NA	
Did the water level stabilize prior to sampling?	NA	
Did pH, specific conductance, and turbidity measurements meet criteria prior to sampling?	NA	
Was the flow rate less than 500 mL/min?	NA	

Water Sampling Field Activities Verification Checklist (continued)

	Response (Yes, No, NA)	Comments
8. Were the following conditions met when purging a Category II well:		
Was the flow rate less than 500 mL/min?	NA	
Was one pump/tubing volume removed prior to sampling?	NA	
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	A duplicate was collected at 0267.
10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	NA	All samples were collected with dedicated equipment, so equipment blanks are not applicable.
11. Were trip blanks prepared and included with each shipment of VOC samples?	NA	No VOC samples were collected.
12. Were the true identities of the QC samples documented?	Yes	
13. Were samples collected in the containers specified?	Yes	
14. Were samples filtered and preserved as specified?	Yes	
15. Were the number and types of samples collected as specified?	Yes	
16. Were chain of custody records completed and was sample custody maintained?	Yes	
17. Was all pertinent information documented on the field data sheets?	Yes	
18. Was the presence or absence of ice in the cooler documented at every sample location?	Yes	
19. Were water levels measured at the locations specified in the planning documents?	NA	

Laboratory Performance Assessment

General Information

Report Number (RIN): 16037680
 Sample Event: March 15, 2016
 Site(s): Mexican Hat, Utah, Disposal Site
 Laboratory: ALS Laboratory Group, Fort Collins, Colorado
 Work Order No.: 1603324
 Analysis: Metals, Wet Chemistry, and Radiochemistry
 Validator: Gretchen Baer
 Review Date: April 27, 2016

This validation was performed according to the *Environmental Procedures Catalog*, (LMS/POL/S04325, continually updated) “Standard Practice for Validation of Environmental Data.” The procedure was applied at Level 3, Data Validation. See attached Data Validation Worksheets for supporting documentation on the data review and validation. All analyses were successfully completed. The samples were prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 1.

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Ammonia as N	WCH-A-005	EPA 350.1	EPA 350.1
Total Dissolved Solids (TDS)	WCH-A-033	EPA 160.1	EPA 160.1
Boron, Silica	LMM-01	SW-846 3005B	SW-846 6010B
Cadmium, Selenium, Uranium	LMM-02	SW-846 3005B	SW-846 6020A
Isotopic Uranium	LMR-02	SOP 776, 778	SOP 714
Nitrate + Nitrite as N	WCH-A-022	EPA 353.2	EPA 353.2
Sulfate	MIS-A-044	SW-846 9056	SW-846 9056

Data Qualifier Summary

Analytical results were qualified as listed in Table 2. Refer to the attached validation worksheets and the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
1603324-1	0248	TDS	J	Exceeded weigh-back criteria
1603324-1	0248	Isotopic Uranium	J	Low tracer yield
1603324-2	0248	Isotopic Uranium	J	Low tracer yield

DATA QUALIFIERS:

- J Estimated
- U Analytical result below detection limit.

Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received four water samples on March 17, 2016, accompanied by a Chain of Custody (COC) form. Copies of the air bills were included in the receiving documentation. The COC form was checked to confirm that all of the samples were listed with sample collection dates and times and that signatures and dates were present, indicating sample relinquishment and receipt. The COC form was complete with no errors or omissions.

Preservation and Holding Times

The sample shipment was received intact with the temperature inside the iced cooler at 0.6 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all metal and wet chemical analytes as required. The MDL, as defined in 40 CFR 136, is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The practical quantitation limit (PQL) for these analytes is the lowest concentration that can be reliably measured, and is defined as 5 times the MDL.

For radiochemical analytes (those measured by radiometric counting) the MDL and PQL are not applicable, and these results are evaluated using the minimum detectable concentration (MDC), Decision Level Concentration (DLC), and Determination Limit (DL). The MDC is a measure of radiochemical method performance and was calculated and reported as specified in the *Quality Systems Manual*. The DLC is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero, and is estimated as 3 times the one-sigma total propagated uncertainty. Results that are greater than the MDC, but less than the DLC are qualified with a “U” flag (not detected). The DL for radiochemical results is the lowest concentration that can be reliably measured and is defined as 3 times the MDC. Results not previously “U” qualified that are less than the DL are qualified with a “J” flag as estimated values.

The reported MDLs for all metal and wet chemical analytes, and MDCs for radiochemical analytes demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrates that the instrument is capable of acceptable performance in the beginning of the analytical run. 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. All calibration and laboratory spike standards were prepared from independent sources.

Method EPA 350.1, Ammonia as N

Calibrations were performed using eight calibration standards on March 28, 2016. The correlation coefficient values were greater than 0.995, and the absolute values of the intercepts were less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency. All calibration checks met the acceptance criteria.

Method SW-846 6010B, Boron, Silica

Calibrations were performed on April 12, 2016, using three calibration standards. The calibration curve correlation coefficient values were greater than 0.995, and the absolute values of the intercepts were less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency. All calibration checks associated with the samples met the acceptance criteria. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curve near the PQL, and all results were within the acceptance range.

Method SW-846 6020A, Cadmium, Selenium, and Uranium

Calibrations were performed on April 13, 2016, using three calibration standards. The calibration curve correlation coefficient values were greater than 0.995, and the absolute values of the intercepts were less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency. All calibration checks associated with reported results met the acceptance criteria. Reporting limit verification checks (identified as low-level calibration verifications in the report) were made at the required frequency to verify the linearity of the calibration curve near the PQL, and all results were within the acceptance range. 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 353.2, Nitrate + Nitrite as N

Calibrations were performed using eight calibration standards on March 18, 2016. The correlation coefficient values were greater than 0.995, and the absolute values of the intercepts were less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency. All calibration checks associated with reported results met the acceptance criteria.

Method SW-846 9056, Sulfate

Calibrations were performed using six calibration standards on March 17, 2016. The correlation coefficient values were greater than 0.995, and the absolute values of the intercepts were less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency. All calibration checks met the acceptance criteria.

Method EPA 160.1, Total Dissolved Solids

There are no calibration requirements associated with the determination of total dissolved solids. The TDS sample for 0248 did not meet the weight check criteria. The TDS result is qualified with a “J” flag as an estimated value.

Method SOP 714, Isotopic Uranium

Alpha spectrometry calibrations and instrument backgrounds were performed less than a month prior to sample analysis. Calibration standards were counted to obtain a minimum of 10,000 counts per peak. Weekly instrument checks met the acceptance criteria. The tracer recoveries met the acceptance criteria of 30 to 110 percent with the exception of the two samples submitted for seep 0248. The tracer recoveries for these results were below 30 percent and the tracer area counts were less than 400. The associated results are flagged with a “J” as estimated values. The full width at half maximum (FWHM) was reviewed to evaluate the spectral resolution. All internal standard FWHM values were below 100 kiloelectron volts (keV), demonstrating acceptable resolution. All internal standard peaks were within 50 keV of the expected position. The regions of interest (ROIs) for analyte peaks were reviewed. All ROIs were satisfactory and all integrations were performed correctly.

A comparison was made between the uranium isotopic results and the uranium results measured by method SW-846 6020. The uranium isotopic results were in agreement with the total uranium results for all samples. All relative percent differences were below 10 percent.

Method and Calibration Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. Calibration blanks are analyzed to assess instrument contamination prior to and during sample analysis. All method blank and calibration blank results associated with reported results were below the PQL for all analytes. In cases where a blank concentration exceeds the MDL, associated sample results that are greater than the MDL but less than 5 times the blank concentration are qualified with a “U” flag as not detected. In cases where the absolute value of a negative blank concentration exceeds the MDL, associated sample results that are less than 5 times the MDL are qualified with a “J” flag as estimated values. The radiochemistry method blank results were less than the DLC.

Inductively Coupled Plasma Interference Check Sample Analysis

Interference check samples were analyzed at the required frequency to verify the instrumental interelement and background correction factors. All check sample results met the acceptance criteria.

Matrix Spike Analysis

Matrix spike and matrix spike duplicate (MS/MSD) samples are used to measure method performance in the sample matrix. The MS/MSD data are not evaluated when the concentration of the unspiked sample is greater than 4 times the spike concentration. The spike recoveries met the acceptance criteria for all analytes evaluated.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine the laboratory precision for each sample matrix. The relative percent difference for non-radiochemical replicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. For radiochemical measurements, the relative

error ratio (the ratio of the absolute difference between the sample and duplicate results and the sum of the 1 sigma uncertainties) is used to evaluate duplicate results and should be less than 3. All replicate results met these criteria, demonstrating acceptable precision.

Laboratory Control Sample

Laboratory control samples were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. All control sample results were acceptable.

Metals Serial Dilution

Serial dilutions were prepared and analyzed for the metals analyses to monitor chemical or physical interferences in the sample matrix. Serial dilution data are evaluated when the concentration of the undiluted sample is greater than 50 times the MDL. All evaluated serial dilution data were acceptable.

Chromatography Peak Integration

Peak integration is the process used by chromatographic software to determine the peak used for analyte quantitation. Analytical errors may result from incorrect software configuration or manual integration. The integration of analyte peaks was reviewed for all ion chromatography data. All peak integrations were determined to be performed correctly.

Completeness

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

Electronic Data Deliverable (EDD) File

The EDD file arrived on April 25, 2016. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure that all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

SAMPLE MANAGEMENT SYSTEM
General Data Validation Report

RIN: 16037680 Lab Code: PAR Validator: Gretchen Baer Validation Date: 4/27/2016

Project: Mexican Hat Disposal Site Analysis Type: Metals General Chem Rad Organics

of Samples: 4 Matrix: WATER Requested Analysis Completed: Yes

Chain of Custody

Present: OK Signed: OK Dated: OK

Sample

Integrity: OK Preservation: OK Temperature: OK

Select Quality Parameters

- Holding Times
- Detection Limits
- Field/Trip Blanks
- Field Duplicates

All analyses were completed within the applicable holding times.

The reported detection limits are equal to or below contract requirements.

There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM

Metals Data Validation Worksheet

RIN: 16037680 Lab Code: PAR Date Due: 4/14/2016
 Matrix: Water Site Code: HAT01 Date Completed: 4/26/2016

Analyte	Method Type	Date Analyzed	CALIBRATION				Method Blank	LCS %R	MS %R	MSD %R	Dup. RPD	ICSAB %R	Serial Dil. %R	CRI %R
			Int.	R^2	CCV	CCB								
Boron	ICP/ES	04/12/2016	0.0000	0.9996	OK	OK	OK	97.0	96.0	86.0	8.0	99.0		92.0
Cadmium	ICP/MS	04/14/2016	0.0000	1.0000	OK	OK	OK	101.0	102.0	99.0	3.0	100.0		
Selenium	ICP/MS	04/14/2016	0.0000	1.0000	OK	OK	OK	113.0	106.0	108.0	1.0	105.0		
Silicon	ICP/ES	04/12/2016	0.0000	0.9996	OK	OK	OK	103.0			7.0	102.0	7.0	125.0
Urarium	ICP/MS	04/14/2016	0.0000	1.0000	OK	OK	OK	99.0	102.0	90.0	4.0	104.0	1.0	

SAMPLE MANAGEMENT SYSTEM
Radiochemistry Data Validation Worksheet

RIN: 16037680 **Lab Code:** PAR **Date Due:** 4/14/2016
Matrix: Water **Site Code:** HAT01 **Date Completed:** 4/26/2016

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate RER
0248	U-234	04/07/2016			28.3			
0248	U-234	04/07/2016			28.3			
0267	U-234	04/07/2016			73.5			
2822	U-234	04/07/2016			69.4			
Blank_Spike	U-234	04/07/2016			86.1	108.00		
Blank_Spike_Du	U-234	04/07/2016			92.5	101.00		0.56
Blank	U-234	04/07/2016	0.0243	U	84.3			
Blank	Uranium-235	04/07/2016	0.0044	U	84.3			
Blank_Spike	Uranium-238	04/07/2016				110.00		
Blank_Spike_Du	Uranium-238	04/07/2016				100.00		0.76
Blank	Uranium-238	04/07/2016	0.0037	U	84.3			

SAMPLE MANAGEMENT SYSTEM
Wet Chemistry Data Validation Worksheet

RIN: 16037680 **Lab Code:** PAR **Date Due:** 4/14/2016
Matrix: Water **Site Code:** HAT01 **Date Completed:** 4/26/2016

Analyte	Date Analyzed	CALIBRATION				Method Blank	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	CCV	CCB						
AMMONIA AS N	03/28/2016	0.000	1.0000	OK	OK	OK	99	94	95	1	
Nitrate+Nitrite as N	03/18/2016	0.000	1.0000	OK	OK	OK	100	98	98	0	
SULFATE	03/22/2016	0.312	0.9999	OK	OK	OK	101	99	98	0	
TOTAL DISSOLVED SOLIDS	03/21/2016					OK	98			3	

Sampling Quality Control Assessment

The following information summarizes and assesses quality control for this sampling event.

Sampling Protocol

All locations were surface water locations and sampled according to requirements.

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 duplicates, which measure only laboratory performance. Duplicate samples were collected from location 0267 (field duplicate ID 2822). For non-radiochemical measurements, the relative percent difference for duplicate results that are greater than 5 times the PQL should be less than 20 percent. For results less than 5 times the PQL, the range should be no greater than the PQL. For radiochemical measurements, the relative error ratio (the ratio of the absolute difference between the sample and duplicate results and the sum of the 1-sigma uncertainties) is used to evaluate duplicate results and should be less than 3. All duplicate results met these criteria, demonstrating acceptable precision.

Equipment Blank

Equipment blanks are used to check for adequate decontamination of non-dedicated equipment used to collect samples. An equipment blank was not required for this sampling event because all samples were collected with dedicated equipment.

Certification

All laboratory analytical quality control criteria were met except as qualified in this report. The data qualifiers listed on the SEEPro database reports are defined on the last page of each report. All data in this package are considered validated and available for use.

Laboratory Coordinator:

Stephen Donovan
Stephen Donovan

3-15-2017
Date

Data Validation Lead:

Gretchen Baer
Gretchen Baer

3-15-2017
Date

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Attachment 1

Assessment of Anomalous Data

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Potential Outliers Report

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Potential Outliers Report

Potential outliers are measurements that are extremely large or small relative to the rest of the data and, therefore, are suspected of misrepresenting the population from which they were collected. Potential outliers can result from transcription errors, data-coding errors, or measurement system problems. However, outliers can also represent true extreme values of a distribution and can indicate more variability in the population than was expected.

Statistical outlier tests give probabilistic evidence that an extreme value does not “fit” with the distribution of the remainder of the data and is therefore a statistical outlier. These tests should only be used to identify data points that require further investigation. The tests alone cannot determine whether a statistical outlier should be discarded or corrected within a data set.

There are three steps involved in identifying extreme values or outliers:

1. **Identify extreme values that may be potential outliers.** Do this by generating the Outliers Report using the Sample Management System from data in the environmental database. The application compares the new data set (in standard environmental database units) with historical data and lists the new data that fall outside the historical data range. A determination is also made as to whether the data are normally distributed using the Shapiro-Wilk Test.
2. **Apply the appropriate statistical test.** Dixon's Test for extreme values is used to test for statistical outliers when the sample size is less than or equal to 25. This test considers both extreme values that are much smaller than the rest of the data (case 1) and extreme values that are much larger than the rest of the data (case 2). This test is valid only if the data without the suspected outlier are normally distributed. Rosner's Test is a parametric test that is used to detect outliers for sample sizes of 25 or more. This test also assumes that the data without the suspected outliers are normally distributed.
3. **Scientifically review statistical outliers and decide on their disposition.** The review should include an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values.

Outlier tests could not be performed for location 0267 because it has been sampled only twice and two data points are insufficient to perform outlier tests. The historical data for seep 0248 begins in 1997 and has a gap between 2006 and 2014 when samples were not collected. There were no outliers found in the results for seep 0248.

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Attachment 2

Data Presentation

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Surface Water Quality Data

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Surface Water Quality Data by Location (USEE102) FOR SITE HAT01, Mexican Hat Disposal Site

REPORT DATE: 4/27/2016

Location: 0248 SURFACE LOCATION GROUNDWATER SEEP

Parameter	Units	Sample		Result	Qualifiers			Detection Limit	Uncertainty
		Date	ID		Lab	Data	QA		
Alkalinity, Total (as CaCO ₃)	mg/L	03/15/2016	N001	200			#		
Ammonia Total as N	mg/L	03/15/2016	N001	0.1	U		#	0.1	
Boron	mg/L	03/15/2016	0001	1.1			#	0.02	
Boron	mg/L	03/15/2016	N001	1.1			#	0.02	
Cadmium	mg/L	03/15/2016	0001	0.000055	U		#	0.000055	
Cadmium	mg/L	03/15/2016	N001	0.000055	U		#	0.000055	
Nitrate + Nitrite as Nitrogen	mg/L	03/15/2016	N001	22			#	1	
Oxidation Reduction Potential	mV	03/15/2016	N001	140.5			#		
pH	s.u.	03/15/2016	N001	7.46			#		
Selenium	mg/L	03/15/2016	0001	0.16			#	0.00066	
Selenium	mg/L	03/15/2016	N001	0.16			#	0.00066	
Silica	mg/L	03/15/2016	0001	24			#	0.1	
Silica	mg/L	03/15/2016	N001	24			#	0.1	
Silicon	mg/L	03/15/2016	0001	11			#	0.048	
Silicon	mg/L	03/15/2016	N001	11			#	0.048	
Specific Conductance	µmhos/cm	03/15/2016	N001	4915			#		
Sulfate	mg/L	03/15/2016	N001	3000			#	25	
Temperature	C	03/15/2016	N001	8.71			#		

Surface Water Quality Data by Location (USEE102) FOR SITE HAT01, Mexican Hat Disposal Site

REPORT DATE: 4/27/2016

Location: 0248 SURFACE LOCATION GROUNDWATER SEEP

Parameter	Units	Sample		Result	Qualifiers			Detection Limit	Uncertainty
		Date	ID		Lab	Data	QA		
Total Dissolved Solids	mg/L	03/15/2016	N001	7800		J	#	1000	
Turbidity	NTU	03/15/2016	N001	3.02			#		
Uranium	mg/L	03/15/2016	0001	0.38			#	0.000012	
Uranium	mg/L	03/15/2016	N001	0.38			#	0.000012	
Uranium-234	pCi/L	03/15/2016	0001	170		J	#	0.1	31.9
Uranium-234	pCi/L	03/15/2016	N001	163		J	#	0.04	30.5
Uranium-235	pCi/L	03/15/2016	0001	6.22		J	#	0.048	1.34
Uranium-235	pCi/L	03/15/2016	N001	5.51		J	#	0.088	1.2
Uranium-238	pCi/L	03/15/2016	0001	137		J	#	0.076	25.7
Uranium-238	pCi/L	03/15/2016	N001	128		J	#	0.04	24

Surface Water Quality Data by Location (USEE102) FOR SITE HAT01, Mexican Hat Disposal Site

REPORT DATE: 4/27/2016

Location: 0267 SURFACE LOCATION Big Gypsum Creek Seep

Parameter	Units	Sample		Result	Qualifiers			Detection Limit	Uncertainty
		Date	ID		Lab	Data	QA		
Alkalinity, Total (as CaCO ₃)	mg/L	03/15/2016	N001	103			#		
Ammonia Total as N	mg/L	03/15/2016	N001	0.1	U		#	0.1	
Ammonia Total as N	mg/L	03/15/2016	N002	0.1	U		#	0.1	
Boron	mg/L	03/15/2016	N001	0.39			#	0.02	
Boron	mg/L	03/15/2016	N002	0.4			#	0.02	
Cadmium	mg/L	03/15/2016	N001	0.000055	U		#	0.000055	
Cadmium	mg/L	03/15/2016	N002	0.000055	U		#	0.000055	
Nitrate + Nitrite as Nitrogen	mg/L	03/15/2016	N001	0.7			#	0.1	
Nitrate + Nitrite as Nitrogen	mg/L	03/15/2016	N002	0.75			#	0.1	
Oxidation Reduction Potential	mV	03/15/2016	N001	86.9			#		
pH	s.u.	03/15/2016	N001	8.28			#		
Selenium	mg/L	03/15/2016	N001	0.03			#	0.00066	
Selenium	mg/L	03/15/2016	N002	0.031			#	0.00066	
Silica	mg/L	03/15/2016	N001	18			#	0.1	
Silica	mg/L	03/15/2016	N002	17			#	0.1	
Silicon	mg/L	03/15/2016	N001	8.2			#	0.048	
Silicon	mg/L	03/15/2016	N002	7.8			#	0.048	
Specific Conductance	µmhos/cm	03/15/2016	N001	4440			#		

Surface Water Quality Data by Location (USEE102) FOR SITE HAT01, Mexican Hat Disposal Site

REPORT DATE: 4/27/2016

Location: 0267 SURFACE LOCATION Big Gypsum Creek Seep

Parameter	Units	Sample		Result	Qualifiers			Detection Limit	Uncertainty
		Date	ID		Lab	Data	QA		
Sulfate	mg/L	03/15/2016	N001	2900			#	25	
Sulfate	mg/L	03/15/2016	N002	3000			#	25	
Temperature	C	03/15/2016	N001	13.32			#		
Total Dissolved Solids	mg/L	03/15/2016	N001	4000			#	1000	
Total Dissolved Solids	mg/L	03/15/2016	N002	5400			#	1000	
Turbidity	NTU	03/15/2016	N001	6.65			#		
Uranium	mg/L	03/15/2016	N001	0.021			#	0.000012	
Uranium	mg/L	03/15/2016	N002	0.021			#	0.000012	
Uranium-234	pCi/L	03/15/2016	N001	11.5			#	0.04	1.97
Uranium-234	pCi/L	03/15/2016	N002	11.3			#	0.034	1.92
Uranium-235	pCi/L	03/15/2016	N001	0.293			#	0.019	0.102
Uranium-235	pCi/L	03/15/2016	N002	0.352			#	0.018	0.113
Uranium-238	pCi/L	03/15/2016	N001	7.06			#	0.043	1.23
Uranium-238	pCi/L	03/15/2016	N002	7.1			#	0.039	1.23

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.

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Attachment 3

Trip Report

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Navarro Research and Engineering

To: Joey Gillespie
 From: Jennifer Graham
 CC: Angelita Denny, DOE; Steve Donivan, Navarro; Joey Gillespie, Navarro; EDD Delivery
 Date: 4/6/2016
 Re: Sampling Trip Report

Site: Mexican Hat, Utah, Disposal Site

Dates of Sampling Event: March 15, 2016

Team Members: Jennifer Graham and Joey Gillespie

Number of Locations Sampled: Samples were collected from 1 seep location and 1 surface water location identified on the sampling notification email.

Locations Not Sampled/Reason: All scheduled locations were sampled.

Location Specific Information:

Location IDs	Comments
0248	The presence of evaporate material was observed on the vegetation around this location. This powdery evaporate material was easily freed into the air. Sampling team attempted to minimize any airborne particulate from entering sample bottles by minimizing movement against any overhanging vegetation. Both filtered and unfiltered samples were collected for U-ISO and Metal analyte bottles.
0267	The presence of green algae was observed along the water's edge of Gypsum Creek; see Figures 1 and 2 below.

Quality Control Sample Cross Reference: The following is the false identification assigned to the quality control sample:

False ID	Ticket Number	True ID	Sample Type	Associated Matrix
2822	OEY 579	0267	Duplicate	Surface Water

Requisition Index Number (RIN) Assigned: Samples were assigned to RIN 16037680. Field data sheets can be found in \\crow\RAApps\SMS\16037680\FieldData.

Sample Shipment: Samples were shipped overnight via FedEx from Grand Junction, Colorado, to ALS Laboratory, Ft. Collins, Colorado, on March 16, 2016.

Sampling Method: Samples were collected according to the *Sampling and Analysis Plan (SAP) for the U. S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351, continually updated)*.

Field Variance: None. Samples were collected according to the SAP.

Equipment: All equipment functioned properly.

Stakeholder/Regulatory/DOE: Angelita Denny (DOE), Joni Nofchissey (AML), and Cameron Corley (AML) were present to observe seep sampling.

Institutional Controls:

Fences, Gates, and Locks: N/A

Signs: No issues observed.

Trespassing/Site Disturbances: No issues observed.

Disposal Cell/Drainage Structure Integrity: No issues observed.

Safety Issues: None

Access Issues: None

General Information: Location 0267, Gypsum Wash, was sampled approximately 75 feet upstream of seep location 0248.

Immediate Actions Taken: None

Future Actions Required or Suggested:

- GPS coordinates need to be collected in the field for location 0267 and recollected for 0248.
- Suggest a marker be placed for location 0267 and new high visibility tape to mark location 0248.
- GPS coordinates also need to be collected for a formerly sampled surface water location, 0266.



Figure 2: Gypsum Creek sample location 0267; picture shows the presence of green algae.



Figure 1: Green algae along Gypsum Creek looking downstream from location 0267.