

Data Validation Package

July 2016
Groundwater and Surface Water
Sampling at the
Naturita, Colorado, Processing Site

January 2017



U.S. DEPARTMENT OF
ENERGY

Legacy
Management

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Sampling Event Summary

Site: Naturita, Colorado, Processing Site

Sampling Period: July 26–27, 2016

This event includes sampling groundwater and surface water at the Naturita Processing Site. Sampling and analyses were conducted as specified in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated, <http://energy.gov/lm/downloads/sampling-and-analysis-plan-us-department-energy-office-legacy-management-sites>). A duplicate sample was collected from location MAU07.

The 2002 *Ground Water Compliance Action Plan for the Naturita, Colorado, UMTRA Project Site* requires annual monitoring to observe the effectiveness of the groundwater compliance strategy at the site. The sampling conducted included monitoring wells MAU07, MAU08, NAT01-1, NAT02, NAT08, NAT26, 0715 and 0718, and surface locations 0531, 0533, SM2, and SM4. Planned monitoring locations are shown in Attachment 1, Sampling and Analysis Work Order. Wells NAT20 and 0547 were also sampled during this event per site lead request. Wells NAT20 and 0547 are upgradient of the site and potential background wells after background well DM1 was abandoned on July 19, 2016.

The water level was measured at each sampled well with the exception of MAU08. Equipment installed in that well by Stanford Linear Accelerator Center prevents water level measurements from being obtained. See Attachment 2, Trip Report for additional details.

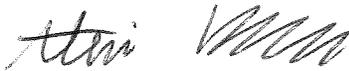
The analytical data and associated qualifiers can be viewed in environmental database reports and are also available for viewing with dynamic mapping via the GEMS (Geospatial Environmental Mapping System) website at <http://gems.lm.doe.gov/#>. An assessment of anomalous data is included in Attachment 3.

Surface water results from San Miguel River locations downstream of and adjacent to the site were compared to statistical background threshold values (BTVs) using historical data from location 0531, which is located upstream of the site on the San Miguel River. As shown in Table 1, no BTVs were exceeded during this event.

Table 1. Comparison of San Miguel River July 2016 Concentrations to Background Threshold Values

Analyte	BTV ^a for 0531 (mg/L)	0531 Concentration (mg/L)	SM2 Concentration (mg/L)	SM4 Concentration (mg/L)	0533 Concentration (mg/L)
Uranium	0.0056	0.0015	0.0022	0.0016	0.0016
Vanadium	0.0022	0.0009	0.0008	0.0009	0.0008

^a BTV = background threshold values based on historical data set from upstream location 0531. BTV values are calculated using ProUCL version 5.0 as provided by the EPA.



 Alison Kuhlman, Site Lead
 Navarro Research and Engineering, Inc.

1/20/17

 Date

Data Assessment Summary

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Water Sampling Field Activities Verification Checklist

Project	Naturita, Colorado, Processing Site	Date(s) of Water Sampling	July 26–27, 2016
Date(s) of Verification	November 1, 2016	Name of Verifier	Stephen Donovan

	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	Work Order letter dated July 15, 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	Calibrations were performed on July 25, 2016.
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?	Yes	
7. Were the following conditions met when purging a Category I well: Was one pump/tubing volume purged prior to sampling?	Yes	
Did the water level stabilize prior to sampling?	Yes	
Did pH, specific conductance, and turbidity measurements meet criteria prior to sampling?	Yes	
Was the flow rate less than 500 mL/min?	Yes	

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?	Yes	Wells NAT01-1 and MAU08 are Category II wells because the water level could not be monitored during purge.
Was one pump/tubing volume removed prior to sampling?	Yes	
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	A duplicate sample was collected at location MAU07.
10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	Yes	One equipment blank was collected.
11. Were trip blanks prepared and included with each shipment of VOC samples?	NA	
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?	Yes	Water level could not be measured in wells MAU08 and NAT01-1.

Laboratory Performance Assessment

General Information

Task ID: NAT01.1-16070002
Sample Event: July 26–27, 2016
Site(s): Naturita, CO, Processing Site
Laboratory: ALS Laboratory Group, Fort Collins, Colorado
Work Order No.: 1608004
Analysis: Metals and Wet Chemistry
Validator: Stephen Donovan
Review Date: October 26, 2016

This validation was performed according to “Standard Practice for Validation of Environmental Data” found in Appendix A of the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated, <http://energy.gov/lm/downloads/sampling-and-analysis-plan-us-department-energy-office-legacy-management-sites>). The procedure was applied at Level 3, Data Validation.

This validation includes the evaluation of data quality indicators (DQIs) associated with the data. DQIs are the quantitative and qualitative descriptors that are used to interpret the degree of acceptability or utility of data. Indicators of data quality include the analysis of laboratory control samples to assess accuracy; duplicates and replicates to assess precision; and interference check samples to assess bias (see Figures 1–3, Data Validation Worksheets). The DQIs comparability, completeness, and sensitivity are also evaluated in the sections to follow.

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 2.

Table 2. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Anions: Chloride, Sulfate	MIS-A-045	MIS-A-045	SW-846 9056
Ammonia as N	WCH-A-005	EPA 350.1	EPA 350.1
Nitrate+Nitrite as N	WCH-A-022	EPA 353.2	EPA 353.2
Metals: Calcium, Magnesium, Potassium, Sodium	LMM-01	SW-846 3005A	SW-846 6010
Metals: Arsenic, Uranium, Vanadium	LMM-02	SW-846 3005A	SW-846 6020
Total Dissolved Solids (TDS)	WCH-A-033	EPA 160.1	EPA 160.1

Data Qualifier Summary

Analytical results were qualified as listed in Table 3. Refer to the attached validation worksheets and the sections below for an explanation of the data qualifiers applied.

Table 3. Data Qualifiers

Sample Number	Location	Analyte	Flag	Reason
All	All	TDS	J	Sample preservation
1608007-8	NAT02	Chloride	J	Missed holding time
1608007-8	NAT02	Sulfate	J	Missed holding time
1608007-8	NAT02	Uranium	J	Serial dilution result
1608007-15	0547	Chloride	J	Missed holding time
1608007-15	0547	Sulfate	J	Missed holding time
1608007-16	NAT20	Chloride	J	Missed holding time
1608007-16	NAT02	Sulfate	J	Missed holding time

Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received 16 water samples on August 1, 2016, accompanied by a Chain of Custody form. The Chain of Custody 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 Chain of Custody form was complete with no errors or omissions. A copy of the air waybill was included with the receiving documentation.

Preservation and Holding Times

The sample shipment was received intact with the temperature inside the iced cooler at 14.8 °C, which does not comply with requirements. The samples were shipped on a Friday without requesting Saturday delivery and were received the following Monday. The TDS results are qualified with a “J” flag as estimated values. 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 with the following exceptions. The chloride and sulfate analyses were performed outside the holding time due to a laboratory error. The chloride and sulfate sample results are qualified with a “J” flag as estimated values.

Detection and Quantitation Limits

A method detection limit (MDL) is defined in 40 CFR 136 as the minimum concentration of an analyte that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. The MDLs reported by the laboratory were compared to the required MDLs to assess the sensitivity of the analyses and found to be in compliance with contractual requirements.

The practical quantitation limit (PQL) for an analyte, defined as 5 times the MDL, is the lowest concentration that can be quantitatively measured, and is used when evaluating laboratory method performance in the sections below.

Laboratory Instrument Calibration

Method requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for the analytes of interest. Initial Calibration Verification (ICV) demonstrates that the instrument is capable of acceptable performance at the beginning of the analytical run. Continuing Calibration Verification (CCV) demonstrates that the initial calibration is still valid by checking the performance of the instrument on a continuing basis. Initial and continuing calibration standards must be prepared from independent sources to ensure the validity of the calibration. All laboratory instrument calibrations and calibration verifications were performed correctly in accordance with the cited methods.

Method EPA 160.1, TDS

There are no calibration requirements associated with the determination of total dissolved solids.

Method SW-846 9056, Chloride and Sulfate

Calibrations were performed using six calibration standards on August 27, 2016. 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria.

Method EPA 350.1, Ammonia as N

Calibrations were performed using six calibration standards on August 8, 2016. 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria.

Method EPA 353.2, Nitrate + Nitrite as N

Calibrations were performed using seven calibration standards on August 3, 2016. 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks met the acceptance criteria.

Method SW-846 6010, Calcium, Magnesium, Potassium, Sodium

Calibrations were performed on August 10, 2016, using five 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks 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 6020, Arsenic, Uranium, Vanadium

Calibrations were performed on August 10, 2016, using four 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 as required by the cited method. The ICV and CCV checks were made at the required frequency. All calibration checks 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. Mass calibration and resolution verifications were performed at the beginning of each analytical run in accordance with the analytical procedure. Internal standard recoveries associated with requested analytes were stable and within acceptable ranges.

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 the samples were below the PQL for all analytes. In cases where the 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.

Inductively Coupled Plasma Interference Check Sample Analysis

Interference check samples are analyzed to verify the instrumental interelement and background correction factors and assess any bias due to interelement interferences. Interference check samples were analyzed at the required frequency with all results meeting the acceptance criteria.

Matrix Spike Analysis

Matrix spikes are aliquots of environmental samples to which a known concentration of an analyte has been added before analysis. Matrix spike and matrix-spike duplicate (MS/MSD) analysis are used to assess the performance of the method by measuring the effects of interferences caused by the sample matrix and reflects the bias of the method for the particular matrix in question. 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.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for replicate results that are greater than 5 times the PQL should be less than 20%. For results that are less than 5 times the PQL, the range should be no greater than the PQL. All replicate results met these criteria, demonstrating acceptable precision.

Laboratory Control Samples

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 to assess bias when the concentration of the undiluted sample is greater than 50 times the MDL. The uranium serial

dilution results associated with sample NAT02 did not meet the acceptance criteria. The associated sample uranium result is qualified with a “J” flag as an estimated value.

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 September 12, 2016. The EDD was examined to verify that the file was complete and in compliance with requirements. The contents of the file were compared to the requested analyses to ensure 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.

General Data Validation Report

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Task Code: NAT01.1-16070002

Lab Code: PAR **Validator:** Stephen Donovan

Validation Date: 10-31-2016

Project: Naturita Processing Site

Samples: 15

Analysis Type: General Chemistry Metals Organics Radiochemistry

Chain of Custody

Sample

Present: OK Signed: OK Dated: OK

Integrity: OK Preservation OK Temperature: NO

Check

Summary

Holding Times:	There were 22 analyses performed outside the applicable holding times.
Detection Limits:	There was 1 detection limit above the contract required limits.
Field Blanks:	There was 1 field blank associated with this task.
Field Duplicates:	There was 1 duplicate evaluated.

Figure 1. General Validation Worksheet

Metals Data Validation Worksheet													
Project: Naturita Processing Site		Task Code: NAT01.1-16070002				Lab Code: PAR				Page 1 of 3 01-Nov-2016			
Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Arsenic	SW-846 6020	08-10-2016	LCS	97.00		80	120		20				
Arsenic	SW-846 6020	08-10-2016	MB							92	2	119	MB < MDL
Arsenic	SW-846 6020	08-10-2016	MS	99.00		75	125		20				
Arsenic	SW-846 6020	08-10-2016	MSD		100.00	75	125	1	20				
Arsenic	SW-846 6020	08-10-2016	R						20				
Calcium	SW-846 6010	08-10-2016	LCS	100.00		80	120		20				
Calcium	SW-846 6010	08-10-2016	MB							106	2	104	MB < MDL
Calcium	SW-846 6010	08-10-2016	MS	98.00		80	120		20				
Calcium	SW-846 6010	08-10-2016	MSD		108.00	80	120	2	20				
Calcium	SW-846 6010	08-10-2016	R					2	20				
Magnesium	SW-846 6010	08-10-2016	LCS	97.00		80	120		20				

QC Types: LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

QC Checks: CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference

Figure 2. Metals Validation Worksheet

Metals Data Validation Worksheet

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01-Nov-2016

Project: Naturita Processing Site

Task Code: NAT01.1-16070002

Lab Code: PAR

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Magnesium	SW-846 6010	08-10-2016	MB							105	1	98	MB < MDL
Magnesium	SW-846 6010	08-10-2016	MS	95.00		80	120		20				
Magnesium	SW-846 6010	08-10-2016	MSD		99.00	80	120	2	20				
Magnesium	SW-846 6010	08-10-2016	R					2	20				
Potassium	SW-846 6010	08-10-2016	LCS	101.00		80	120		20				
Potassium	SW-846 6010	08-10-2016	MB								2	89	MB < PQL
Potassium	SW-846 6010	08-10-2016	MS	99.00		80	120		20				
Potassium	SW-846 6010	08-10-2016	MSD		102.00	80	120	2	20				
Potassium	SW-846 6010	08-10-2016	R					2	20				
Sodium	SW-846 6010	08-10-2016	LCS	99.00		80	120		20				
Sodium	SW-846 6010	08-10-2016	MB								3	90	MB < PQL
Sodium	SW-846 6010	08-10-2016	MS	101.00		80	120		20				

QC Types: LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

QC Checks: CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference

Figure 2 (continued). Metals Validation Worksheet

Metals Data Validation Worksheet													Page 3 of 3
Project: Naturita Processing Site			Task Code: NAT01.1-16070002				Lab Code: PAR						01-Nov-2016
Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Sodium	SW-846 6010	08-10-2016	MSD		105.00	80	120	2	20				
Sodium	SW-846 6010	08-10-2016	R					1	20				
Uranium	SW-846 6020	08-10-2016	LCS	103.00		80	120		20				
Uranium	SW-846 6020	08-10-2016	MB							93	17	110	MB < MDL
Uranium	SW-846 6020	08-10-2016	MS	29.00		75	125		20				Sample > 4 times the spike concentration
Uranium	SW-846 6020	08-10-2016	MSD		46.00	75	125	1	20				Sample > 4 times the spike concentration
Uranium	SW-846 6020	08-10-2016	R					7	20				
Vanadium	SW-846 6020	08-10-2016	LCS	98.00		80	120		20				
Vanadium	SW-846 6020	08-10-2016	MB							91		114	MB < MDL
Vanadium	SW-846 6020	08-10-2016	MS	103.00		75	125		20				Sample > 4 times the spike concentration
Vanadium	SW-846 6020	08-10-2016	MSD		106.00	75	125	1	20				Sample > 4 times the spike concentration
Vanadium	SW-846 6020	08-10-2016	R					2	20				

QC Types: LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

QC Checks: CRI: Quantitation limit check ICSAB: ICP interference check RPD: Relative Percent Difference

Figure 2 (continued). Metals Validation Worksheet

Wet Chemistry Data Validation Worksheet

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Project: Naturita Processing Site

Task Code: NAT01.1-16070002

Lab Code: PAR

01-Nov-2016

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	Comments
Ammonia Total as N	EPA 350.1	08-08-2016	LCS	107.00		90	110		20	
Ammonia Total as N	EPA 350.1	08-08-2016	MB							MB < PQL
Ammonia Total as N	EPA 350.1	08-08-2016	MS	97.00		75	125		20	
Ammonia Total as N	EPA 350.1	08-08-2016	MSD		100.00	75	125	3	20	
Chloride	SW-846 9056	08-31-2016	LCS	95.00		90	110		15	
Chloride	SW-846 9056	08-31-2016	MB							MB < MDL
Nitrate + Nitrite as Nitrogen	EPA 353.2	08-03-2016	LCS	107.00		90	110		20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	08-03-2016	LCS	104.00	104.00	90	110	3	20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	08-03-2016	MB							MB < MDL
Nitrate + Nitrite as Nitrogen	EPA 353.2	08-03-2016	MS	106.00		75	125		20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	08-03-2016	MSD		106.00	75	125	0	20	
Sulfate	SW-846 9056	08-31-2016	LCS	95.00		90	110		15	
Sulfate	SW-846 9056	08-31-2016	MB							MB < MDL
Total Dissolved Solids	EPA 160.1	08-04-2016	LCS	101.00		85	115		5	
Total Dissolved Solids	EPA 160.1	08-04-2016	LCS	99.00	99.00	85	115	1	5	
Total Dissolved Solids	EPA 160.1	08-04-2016	MB							MB < MDL
Total Dissolved Solids	EPA 160.1	08-04-2016	R					1	5	
Total Dissolved Solids	EPA 160.1	08-04-2016	R					3	5	

QC Types: LCS: Laboratory Control Sample MB: Method Blank MS: Matrix Spike MSD: Matrix Spike Duplicate R: Replicate

QC Checks: RPD: Relative Percent Difference

Figure 3. Wet Chemistry Validation Worksheet

Sampling Quality Control Assessment

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

Sampling Protocol

All monitoring wells were sampled using the low-flow sampling method meeting either Category I or Category II criteria. Monitoring well results were qualified with a “F” flag in the database, indicating the wells were purged and sampled using the low-flow sampling method. Sample results for monitoring wells MAU08 and NAT01-1 were further qualified with a “Q” flag indicating that these wells were Category II because the water levels could not be monitored during purge.

Surface water location 0533 was sampled using a peristaltic pump and hose reel. All other surface locations were sampled by container immersion.

Equipment Blank

Equipment blanks are prepared and analyzed to document contamination attributable to the sample collection process. One equipment blank was submitted with these samples. Uranium was detected in the equipment blank at a concentration less than one tenth of the associated sample, requiring no qualification (Figure 4).

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. The relative percent difference for duplicate results that are greater than 5 times the practical quantitation limit (PQL) should be less than 20%. For results that are less than 5 times the PQL, the range should be no greater than the PQL. A duplicate sample was collected from location MAU07 (field duplicate ID 2655). The duplicate results met the criteria demonstrating acceptable overall precision (Figure 5).

Validation Report: Field Blanks

Page 1 of 1

31-Oct-2016

Project: Naturita Processing Site

Task Code: NAT01.1-16070002

Lab Code: PAR

Blank Type	Sample Code	Location	Method	Analyte	Result	Lab Qualifiers
E	NAT01.1-16070002-014	2656	SW-846 6020	Uranium	0.00008	J

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
NAT01.1-16070002-002	0533	0.0016	10		

Figure 4. Equipment Blank Report

Validation Report: Field Duplicates

Project: Naturita Processing Site **Task Code:** NAT01.1-16070002 **Lab Code:** PAR

Analyte	Duplicate: NAT01.1-16070002-013				Sample: NAT01.1-16070002-005 MAU07				RPD	RER	Units
	Result	Qualifiers	Uncert.	Dilution	Result	Qualifiers	Uncert.	Dilution			
Arsenic	0.0044			10	0.0042			10	4.7		mg/L
Total Dissolved Solids	1100			1	1100			1	0		mg/L
Uranium	0.36			10	0.34			10	5.7		mg/L
Vanadium	0.00058	U		10	0.00058	U		10			mg/L

QC Checks: RPD: Relative Percent Difference RER: Relative Error Ratio

Figure 5. Field Duplicate Report

Certification

All laboratory analytical quality control criteria were met except as qualified in this report. The data qualifiers listed on the environmental 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 12-30-2016
Stephen Donovan Date

Data Validation Lead: Stephen Donovan 12-30-2016
Stephen Donovan Date

Attachment 1

Sampling and Analysis Work Order

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July 15, 2016

Task Assignment 103
Control Number 16-0716

U.S. Department of Energy
Office of Legacy Management
ATTN: Joshua Linard
Site Manager
2597 Legacy Way
Grand Junction, CO 81503

SUBJECT: Contract No. DE-LM0000421, Navarro Research & Engineering, Inc. (Navarro)
Task Assignment 103 LTS&M-UMTRCA TI & TII Sites, D&D Sites, Other
Sites, and Other
July 2016 Environmental Sampling at the Naturita, Colorado, Processing Site

REFERENCE: Task Assignment 103, 1-103-1-02-115, Naturita, Colorado, Processing Site

Dear Mr. Linard:

The purpose of this letter is to inform you of the upcoming sampling event at the Naturita, Colorado, Processing Site. Enclosed are the map and tables specifying sample locations and analytes for monitoring at the site. Water quality data will be collected at this site as part of the routine environmental sampling currently scheduled to begin the week of July 25, 2016.

The following lists show the monitoring wells (with zone of completion) and surface locations scheduled to be sampled during this event.

MONITORING WELLS*

NAT01-1 AI NAT 02 AI NAT08 AI NAT26 AI 0715 AI 0718 AI
MAU07 AI MAU08 AI

*NOTE: AI = Alluvium

SURFACE LOCATIONS

0531 0533 SM2 SM4

All samples will be collected as directed in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites*. Access agreements are being reviewed and are expected to be complete by the beginning of fieldwork.

Joshua Linard
Control Number 16-0716
Page 2

Please contact me at (970) 248-6557 if you have any questions.

Sincerely,

A handwritten signature in black ink that reads "David Traub" followed by "for DT". The signature is written in a cursive, flowing style.

David Traub
LMS Site Lead

DT/lcg/csa

Enclosures

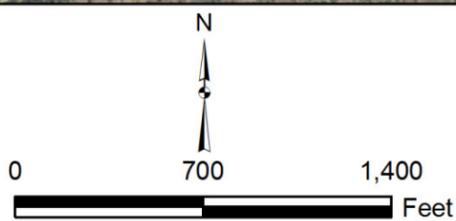
cc: (electronic)

Christina Pennal, DOE
Jeff Carman, Navarro
Beverly Cook, Navarro
Steve Donovan, Navarro
Lauren Goodknight, Navarro
Sam Marutzky, Navarro
Diana Osborne, Navarro
David Traub, Navarro
EDD Delivery
rc-grand.junction
File: NAP 400.02



LEGEND

- WELL TO BE SAMPLED
- SURFACE LOCATION TO BE SAMPLED
- - - SITE BOUNDARY



U.S. DEPARTMENT OF ENERGY OFFICE OF LEGACY MANAGEMENT		Work Performed by Navarro Research & Engineering, Inc. Under DOE Contract Number DE-LM0000421	
Planned Sample Locations Naturita, CO, Processing Site July 2016			
DATE PREPARED: July 29, 2016		FILE NAME: S1441000-11x17	

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Naturita, Colorado, Processing Site Planned Sample Locations

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**Sampling Frequencies for Locations at
Naturita, Colorado**

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
NAT01						
715			X			
718			X			
NAT01-1			X			
NAT02			X			
NAT08			X			
NAT26			X			
MAU07			X			
MAU08			X			
Surface Locations						
531			X			
533			X			
SM2			X			
SM4			X			

Annual sampling conducted in July

Constituent Sampling Breakdown

Site	Naturita		Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Analyte	Groundwater	Surface Water			
Approx. No. Samples/yr	8	4			
Field Measurements					
Alkalinity	X	X			
Dissolved Oxygen					
Redox Potential	X	X			
pH	X	X			
Specific Conductance	X	X			
Turbidity	X				
Temperature	X	X			
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Arsenic	X	X	0.0001	SW-846 6020	LMM-02
Calcium					
Chloride					
Chromium					
Gross Alpha					
Gross Beta					
Iron					
Lead					
Magnesium					
Manganese					
Molybdenum					
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N					
Potassium					
Radium-226					
Radium-228					
Selenium					
Silica					
Sodium					
Strontium					
Sulfate					
Sulfide					
Total Dissolved Solids	X	X	10	SM2540 C	WCH-A-033
Total Organic Carbon					
Uranium	X	X	0.0001	SW-846 6020	LMM-02
Vanadium	X	X	0.0003	SW-846 6020	LMM-02
Zinc					
Total No. of Analytes	4	4			

Note: All private well samples are to be unfiltered. The total number of analytes does not include field parameters.

Attachment 2

Trip Report

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To: David Miller, Navarro
 From: Rob Rice, Navarro
 Date: August 17, 2016
 CC: Josh Linard, DOE
 Steve Donovan, Navarro
 David Traub, Navarro
 EDD Delivery
 Re: Sampling Trip Report

Site: Naturita, CO, Processing Site

Dates of Event: July 26-27, 2016

Team Members: Rob Rice and Samantha Tigar, Navarro

Number of Locations Sampled: Samples were collected from all 12 of the locations identified in the sampling notification letter and from 2 additional wells per the site lead request.

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

Location Specific Information:

Location IDs	Comments
MAU08	SLAC sample equipment is installed in this well. The equipment prevents a water level measurement from being taken. The sample was collected through the tubing marked "Bottom" at 12.3 feet below TOC. "Middle" tubing, at 11.5 feet, was dry, sample depth had to be changed.
NAT01-01	The 0.5 inch casing prevents obtaining a water level measurement during purge. Equipment volume purge method was used, and well was sampled as Cat I after stability was met. Tubing was removed and water level was allowed to stabilize for ~30 minutes. Water level was then taken and recorded.
0715	Intake depth was measured and marked on sampling tubing. Depth was recorded in field notes.

All groundwater locations were sampled with a peristaltic pump and dedicated downhole tubing. The tubing is marked for sampling depth and the intake depth data can be found in [\\Im\projects\SamplingProg\Sampling Data](#).

Quality Control Sample Cross Reference: The following are the false identifications assigned to the quality control samples.

False ID	Sample ID	True ID	Sample Type	Associated Matrix	Associated Samples
2655	NAT01.1-16070002-013	MAU07	Duplicate	Groundwater	-
2656	NAT01.1-16070002-014	0999	Equipment Blank	Surface water	0533

Task Code Assigned: Samples were assigned to Task Code NAT01.1-16070002. Field data sheets can be found in [\\crow\sms\NAT01.1-16070002\FieldData](#).

Sample Shipment: Samples were shipped overnight via FedEx from Grand Junction, CO, to ALS Laboratory in Fort Collins, CO, on July 28, 2016.

Water Level Measurements: Water levels were measured in all sampled wells except MAU08.

Well Inspection Summary: No issues were identified.

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: SLAC sample equipment is installed in monitoring well MAU08 and prevents water level measurements from being obtained. Water level stability could not be verified at location NAT01-01. All other Category I criteria were met (flow rate and parameter stabilization).

Equipment: All equipment functioned properly.

Stakeholder/Regulatory/DOE: Nothing to note.

Institutional Controls:

Fences, Gates, and Locks: Replaced bent lock on the site gate. Gate leading to well 0715 was locked after sampling.

Signs: No issues were observed.

Trespassing/Site Disturbances: None observed.

Disposal Cell/Drainage Structure Integrity: N/A

Safety Issues: None.

Access Issues: Surface location SM2 is overgrown, access to river bank must be gained 100 meters upstream.

General Information: Nothing to note.

Immediate Actions Taken: None.

Future Actions Required or Suggested: Access to river locations, especially SM2, should be cleared before next event.

Attachment 3

Assessment of Anomalous Data

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Potential Outliers Report

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Potential Outliers Report

Potential outliers are results that lie outside the historical range, possibly due to transcription errors, data calculation errors, or measurement system problems. However, outliers can also represent true values outside the historical range. Potential outliers are identified by generating the Data Validation Outliers Report from data in the environmental database. The new data are compared to historical values and data that fall outside the historical data range are listed on the report along with the historical minimum and maximum values. The potential outliers are further reviewed and may be subject to statistical evaluation using the ProUCL application developed by the EPA (<https://www.epa.gov/land-research/proucl-software>). The review also includes an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values. There were 11 values that were outside the historical range (Table 4). None of these values were identified as outliers by ProUCL and the data for this task are acceptable as qualified.

Table 4. Potential Outliers

Data Validation Outliers Report - No Field Parameters Report Date: 10/25/2016

Comparison to Historical Data Since: 01/01/2006 12:00:00 AM Fraction: Any

Task: NAT01.1-16070002

Analyte	Location	Analysis Location	Units	Fraction	Result	Type	HistMIN	HistMAX	HistSetSize	5% Critical Value	Test Statistic	Outlier?
Total Dissolved Solids	0715	LB	mg/L	N	580	< HistMIN	600	1200	5	0.560	0.032	No
Arsenic	MAU07	LB	mg/L	T	0.0042	< HistMIN	0.0044	0.0097	7	0.554	0.125	No
Total Dissolved Solids	MAU08	LB	mg/L	N	1200	< HistMIN	1300	4300	11	0.576	0.154	No
Arsenic	MAU08	LB	mg/L	T	0.0013	> HistMAX	0.00044	0.0012	8	0.554	0.122	No
Uranium	MAU08	LB	mg/L	T	0.47	< HistMIN	0.49	1.6	11	0.576	0.158	No
Vanadium	NAT01-1	LB	mg/L	T	0.0016	< HistMIN	0.002	0.0039	11	0.512	0.364	No
Arsenic	NAT02	LB	mg/L	T	0.0033	< HistMIN	0.0038	0.0071	7	0.554	0.147	No
Vanadium	NAT02	LB	mg/L	T	0.28	< HistMIN	0.45	0.96	9	0.477	0.266	No
Uranium	NAT08	LB	mg/L	T	0.46	> HistMAX	0.26	0.44	9	0.576	0.267	No
Arsenic	NAT26	LB	mg/L	T	0.00018	< HistMIN	0.00024	0.001	5	0.560	0.073	No
Uranium	NAT26	LB	mg/L	T	0.83	< HistMIN	1.1	1.5	7	0.512	0.474	No

FRACTION: D = Dissolved N = NA T = Total