

Data Validation Package

June 2016
Groundwater and Surface Water
Sampling at the
Green River, Utah, Disposal Site

October 2016



U.S. DEPARTMENT OF
ENERGY

Legacy
Management

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Sampling Event Summary

Site: Green River, Utah, Disposal Site

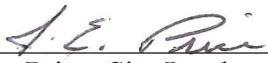
Sampling Period: June 13–14, 2016

This event included annual sampling of groundwater and surface water locations at the Green River, Utah, Disposal Site. Sampling and analyses were conducted as specified in *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>).

Samples were collected from 15 monitoring wells and two surface locations at the disposal site as specified in the draft 2011 *Ground Water Compliance Action Plan for the Green River, Utah, Disposal Site*. Planned monitoring locations are shown in Attachment 1, Sampling and Analysis Work Order. A duplicate sample was collected from location 0179. One equipment blank was collected during this sampling event. Water levels were measured at all monitoring wells that were sampled. See Attachment 2, Trip Reports 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/#>.

No issues were identified during the data validation process that requires additional action or follow-up. An assessment of anomalous data is included in Attachment 3.



Jeffrey Price, Site Lead
Navarro Research and Engineering, Inc.



Date

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Data Assessment Summary

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Water Sampling Field Activities Verification Checklist

Project	<u>Green River, Utah, Disposal Site</u>	Date(s) of Water Sampling	<u>June 13–14, 2016</u>
Date(s) of Verification	<u>August 10, 2016</u>	Name of Verifier	<u>Stephen Donovan</u>

	Response (Yes, No, NA)	Comments
1. Is the SAP the primary document directing field procedures? List any Program Directives or other documents, SOPs, instructions.	<u>Yes</u>	<u>Work Order letter dated May 13, 2016 (Attachment 1).</u>
2. Were the sampling locations specified in the planning documents sampled?	<u>Yes</u>	
3. Were field equipment calibrations conducted as specified in the above-named documents?	<u>Yes</u>	<u>Calibrations were performed on June 9, 2016.</u>
4. Was an operational check of the field equipment conducted daily? Did the operational checks meet criteria?	<u>Yes</u> <u>Yes</u>	
5. Were the number and types (alkalinity, temperature, specific conductance, pH, turbidity, DO, ORP) of field measurements taken as specified?	<u>Yes</u>	
6. Were wells categorized correctly?	<u>Yes</u>	
7. Were the following conditions met when purging a Category I well: Was one pump/tubing volume purged prior to sampling? Did the water level stabilize prior to sampling? Did pH, specific conductance, and turbidity measurements meet criteria prior to sampling? Was the flow rate less than 500 mL/min?	<u>Yes</u> <u>Yes</u> <u>Yes</u> <u>Yes</u>	

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	
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 0179.
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	

Laboratory Performance Assessment

General Information

Task ID: GRN01-16060001
Sample Event: June 13–14, 2016
Site(s): Green River, Utah, Disposal Site
Laboratory: ALS Laboratory Group, Fort Collins, Colorado
Work Order No.: 1606298
Analysis: Metals and Wet Chemistry
Validator: Stephen Donovan
Review Date: August 10, 2016

This validation was performed according to “Standard Practice for Validation of Environmental Data” found in Appendix A of *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, 2, and 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 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
Arsenic, Selenium, Uranium	LMM-02	SW-846 3005A	SW-846 6020A
Nitrate + Nitrite as N	WCH-A-022	EPA 353.2	EPA 353.2
Sulfate	MIS-A-045	SW-846 9056	SW-846 9056

Data Qualifier Summary

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

Table 2. Data Validation Qualifiers

Sample Number	Location	Analyte	Flag	Reason
All	All	Ammonia as N	J	Holding time
GRN01-16060001-015	0801	Selenium	J	Equipment blank detection
GRN01-16060001-015	0801	Uranium	J	Equipment blank detection
GRN01-16060001-017	0846	Selenium	J	Equipment blank detection
GRN01-16060001-017	0846	Uranium	J	Equipment blank detection
GRN01-16060001-018	0847	Selenium	J	Equipment blank detection
GRN01-16060001-018	0847	Uranium	J	Equipment blank detection

Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received 20 water samples on June 16, 2016, accompanied by a Chain of Custody form. Copies of the air bills were included in the receiving documentation. 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.

Preservation and Holding Times

The sample shipment was received with the temperature inside the iced cooler at 3.6 °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 with the following exceptions. The ammonia as N analyses were performed three days outside the holding time due to a laboratory error. This had minimal impact to data quality. The ammonia as N 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 percent 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 were 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 350.1, Ammonia as N

Calibrations were performed using six calibration standards on July 14, 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 June 21, 2016. Calibrations were performed using six calibration standards on July 14, 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 6020A, Arsenic, Selenium, and Uranium

Calibrations were performed on June 20, 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 SW-846 9056, Sulfate

Calibrations were performed using six calibration standards on June 14, 2016. Calibrations were performed using six calibration standards on July 14, 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 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.

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 is 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. For this task, the uranium MS/MSD data were not evaluated because the concentration of the unspiked sample was greater than 4 times the spike concentration.

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 percent. 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 (LCS) were analyzed at the correct frequency to provide information on the accuracy of the analytical method and the overall laboratory performance, including sample preparation. The LCS results were acceptable for all analysis.

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 serial dilution data evaluated met the acceptance criteria.

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 July 26, 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

Page 1 of 1

Task Code: GRN01-16060001 **Lab Code:** PAR **Validator:** Stephen Donovan **Validation Date:** 08-03-2016

Project: Green River Monitoring

Samples: 19

Analysis Type: General Chemistry Metals Organics Radiochemistry

Chain of Custody

Sample

Present: <u>OK</u> Signed: <u>OK</u> Dated: <u>OK</u>	Integrity: <u>OK</u> Preservation: <u>OK</u> Temperature: <u>OK</u>
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<u>Check</u>	<u>Summary</u>
Holding Times:	There were 21 analyses performed outside the applicable holding times.
Detection Limits:	The reported detection limits are equal to or below 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: Green River Monitoring			Task Code: GRN01-16060001				Lab Code: PAR			Page 1 of 2			
10-Aug-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	06-20-2016	LCS	97.00		80	120		20				
Arsenic	SW-846 6020	06-20-2016	MB							99		125	MB < MDL
Arsenic	SW-846 6020	06-20-2016	MS	105.00		75	125		20				
Arsenic	SW-846 6020	06-20-2016	MSD		104.00	75	125	1	20				
Arsenic	SW-846 6020	06-20-2016	R						20				
Selenium	SW-846 6020	06-20-2016	LCS	105.00		80	120		20				
Selenium	SW-846 6020	06-20-2016	MB							99	4	119	MB < MDL
Selenium	SW-846 6020	06-20-2016	MS	102.00		75	125		20				
Selenium	SW-846 6020	06-20-2016	MSD		104.00	75	125	1	20				
Selenium	SW-846 6020	06-20-2016	R					1	20				
Uranium	SW-846 6020	06-20-2016	LCS	103.00		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

Project: Green River Monitoring

Task Code: GRN01-16060001

Lab Code: PAR

10-Aug-2016

Analyte	Method	Analysis Date	QC Type	Spike Recovery	Spike Dup Recovery	Lower Limit	Upper Limit	RPD	RPD Limit	ICSAB	Serial Dilution	CRI	Comments
Uranium	SW-846 6020	06-20-2016	MB							102	7	120	MB < MDL
Uranium	SW-846 6020	06-20-2016	MS	72.00		75	125		20				Not evaluated, conc > 4X spike
Uranium	SW-846 6020	06-20-2016	MSD		78.00	75	125	0	20				
Uranium	SW-846 6020	06-20-2016	R					4	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

Page 1 of 1

Project: Green River Monitoring

Task Code: GRN01-16060001

Lab Code: PAR

10-Aug-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	07-14-2016	LCS	101.00		90	110		20	
Ammonia Total as N	EPA 350.1	07-14-2016	MB							MB < MDL
Ammonia Total as N	EPA 350.1	07-14-2016	MS	100.00		75	125		20	
Ammonia Total as N	EPA 350.1	07-14-2016	MSD		98.00	75	125	2	20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	06-21-2016	LCS	102.00		90	110		20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	06-21-2016	LCSD	102.00	102.00	90	110	0	20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	06-21-2016	MB							MB < MDL
Nitrate + Nitrite as Nitrogen	EPA 353.2	06-21-2016	MS	104.00		75	125		20	
Nitrate + Nitrite as Nitrogen	EPA 353.2	06-21-2016	MSD		99.00	75	125	2	20	
Sulfate	SW-846 9056	06-23-2016	LCS	104.00		90	110		15	
Sulfate	SW-846 9056	06-23-2016	MB							MB < MDL

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

Sample results for all monitoring wells were qualified with an “F” flag in the database, indicating the wells were purged and sampled using the low-flow sampling method. All wells met the Category I criteria with the following exceptions: wells 0171, 0176, 0182, 0184, 0185, 0189, and 0194 were classified as Category II or III because of water level drawdown. The sample results for these wells were qualified with a “Q” flag, indicating the data are qualitative because of the sampling technique.

Equipment Blank

An equipment blank (field ID 2358) was collected after decontamination of the non-dedicated sampling equipment used at surface water locations. Selenium, sulfate, and uranium were detected in the equipment blank (see Figure 4). Associated sample results for these analytes that are greater than the MDL but less than 5 times the blank concentration are qualified with a “J” flag as estimated values.

Field Duplicate Assessment

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. A duplicate sample was collected from location 0179. The relative percent difference for duplicate 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. The duplicate results met the criteria, demonstrating acceptable overall precision (see Figure 5).

Validation Report: Field Blanks

Project: Green River Monitoring

Task Code: GRN01-16060001 **Lab Code:** PAR

Blank Type	Sample Code	Location	Method	Analyte	Result	Lab Qualifiers
E	GRN01-16060001-020	2358	SW-846 6020	Selenium	0.0028	

Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
GRN01-16060001-015	0801	0.00095	10	J	J
GRN01-16060001-017	0846	0.00083	10	J	J
GRN01-16060001-018	0847	0.00081	10	J	J

Figure 4. Equipment Blank Validation Worksheet

Validation Report: Field Blanks

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08-Aug-2016

Project: Green River Monitoring

Task Code: GRN01-16060001 **Lab Code:** PAR

E	GRN01-16060001-020	2358	SW-846 9056	Sulfate	0.63	
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Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
GRN01-16060001-015	0801	72	5		
GRN01-16060001-017	0846	72	5		
GRN01-16060001-018	0847	77	5		

Figure 4 (continued). Equipment Blank Validation Worksheet

Validation Report: Field Blanks

Page 3 of 3

08-Aug-2016

Project: Green River Monitoring

Task Code: GRN01-16060001 **Lab Code:** PAR

E	GRN01-16060001-020	2358	SW-846 6020	Uranium	0.00089	
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Associated Samples:

Sample Code	Location	Result	Dilution	Lab Qualifiers	Validation Qualifier
GRN01-16060001-015	0801	0.0018	10		J
GRN01-16060001-017	0846	0.0013	10		J
GRN01-16060001-018	0847	0.0016	10		J

Figure 4 (continued). Equipment Blank Validation Worksheet

Validation Report: Field Duplicates

Project: Green River Monitoring **Task Code:** GRN01-16060001 Lab Code: PAR

Analyte	Duplicate: GRN01-16060001-019				Sample: GRN01-16060001-004 0179				RPD	RER	Units
	Result	Qualifiers	Uncert.	Dilution	Result	Qualifiers	Uncert.	Dilution			
Ammonia Total as N	0.1	U		1	0.1	U		1			mg/L
Arsenic	0.00058	J		10	0.00065	J		10			mg/L
Nitrate + Nitrite as Nitrogen	18			50	18			50	0		mg/L
Selenium	0.32			10	0.34			10	6.1		mg/L
Sulfate	4000			100	3800			100	5.1		mg/L
Uranium	0.14			10	0.15			10	6.9		mg/L

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

Figure 5. Field Duplicate Validation Worksheet

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 10-10-2016
Stephen Donovan Date

Data Validation Lead: Stephen Donovan 10-10-2016
Stephen Donovan Date

Attachment 1

Sampling and Analysis Work Order

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May 13, 2016

Task Assignment 103
Control Number 16-0572

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
June 2016 Environmental Sampling at the Green River, Utah, Disposal Site

REFERENCE: Task Assignment 103, 1-103-1-02-107, Green River, Utah, Disposal Site

Dear Mr. Linard:

The purpose of this letter is to inform you of the upcoming sampling event at the Green River, Utah, Disposal Site. Enclosed are the map and tables specifying sample locations and analytes for monitoring at the Green River site. Water quality data will be collected at this site as part of the routine environmental sampling currently scheduled to begin the week of June 13, 2016.

The following lists show the monitoring wells and surface locations scheduled for sampling during this event.

MONITORING WELLS

171 Cm	176 Cm	181 Cm	184 Cb	188 Al	192 Al	588 Cb	813 Cm
173 Cm	179 Cm	182 Cb	185 Cb	189 Al	194 Al	707 Al	

*NOTE: Al = Alluvium; Cb = Cedar Mountain Basal Sandstone Member; Cm = Middle Sandstone Unit

SURFACE LOCATIONS

801	846	847
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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. Water levels will be collected from additional (non-sampled) wells as shown in the attachment.

Joshua Linard
Control Number 16-0572
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Please contact me at (970) 248-6592 if you have any questions.

Sincerely,



Jeffrey E. Price
LMS Site Lead

JEP/lcg/bkb

Enclosures (3)

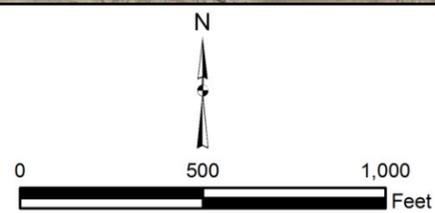
cc: (electronic)

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



Legend

- WELL TO BE SAMPLED
- WELL TO BE SAMPLED - WATER LEVEL ONLY
- 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 Green River, UT, Disposal Site June 2016	
DATE PREPARED: May 2, 2016	FILE NAME: S1415100-11x17

Green River, Utah, Disposal Site Planned Sample Locations

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**Sampling Frequencies for Locations at
Green River, Utah**

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
171			X			
173			X			
176			X			
179			X			
180					X	WL only
181			X			
182			X			
183					X	WL only
184			X			
185			X			
188			X			
189			X			
192			X			
194			X			
588			X			
707			X			
813			X			
Surface Locations						
801			X			
846			X			
847			X			

Annual sampling conducted in June

Constituent Sampling Breakdown

Site	Green River		Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Analyte	Groundwater	Surface Water			
Approx. No. Samples/yr	15	3			
Field Measurements					
Alkalinity	X	X			
Dissolved Oxygen	X				
Redox Potential	X	X			
pH	X	X			
Specific Conductance	X	X			
Turbidity	X	X			
Temperature	X	X			
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)	X	X	0.1	EPA 350.1	WCH-A-005
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	X	X	0.05	EPA 353.1	WCH-A-022
Potassium					
Radium-226					
Radium-228					
Selenium	X	X	0.1	SW-846 6010	LMM-01
Silica					
Sodium					
Strontium					
Sulfate	X	X	0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids					
Total Organic Carbon					
Uranium	X	X	0.0001	SW-846 6020	LMM-02
Vanadium					
Zinc					
Total No. of Analytes	6	6			

Note: The total number of analytes does not include field parameters.

Attachment 2

Trip Report

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To: Distribution
 From: Jeff Price, Navarro
 Date: June 22, 2016
 CC: Josh Linard, DOE
 Steve Donivan, Navarro
 Jeff Price, Navarro
 EDD Delivery
 Re: Sampling Trip Report

Site: Green River, Utah, Processing and Disposal Sites

Dates of Event: June 13-14, 2016

Team Members: Jennifer Graham and Jeff Price, Navarro

Number of Locations Sampled: Samples were collected from all 15 monitoring wells and 3 surface water locations identified on the sampling notification letter. The samples will be analyzed for arsenic, ammonia as N, nitrite+nitrate as N, selenium, sulfate, and uranium.

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

Location Specific Information:

Location IDs	Comments
0194	Will need to clear roots from well. Unable to collect DO field parameter; limited water; collected field parameters in an open container.

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
2357	GRN01-16060001-019	0179	Duplicate	Groundwater	N/A
2358	GRN01-16060001-020	N/A	Equipment Blank	Surface Water	0801, 0846, 0847

Task Code Assigned: Samples were assigned to Task Code GRN01-16060001. Field data sheets can be found in <\\crow\sms\GRN01-16060001\FieldData>.

Sample Shipment: Samples were shipped overnight via FedEx from Grand Junction to ALS in Fort Collins on June 15, 2016.

Water Level Measurements: Water levels were measured in all sampled wells and wells 0180 and 0183. Water level data can be found in the database.

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: None. Samples were collected according to the SAP.

Equipment: Except for the peristaltic pump (faulty circuit board), all equipment functioned properly.

Dataloggers: None at the site.

Stakeholder/Regulatory/DOE: Nothing to note.

Institutional Controls:

Fences, Gates, and Locks: All gates were locked and operable.

Signs: No issues were observed.

Trespassing/Site Disturbances: None observed.

Disposal Cell/Drainage Structure Integrity: No issues were observed.

Safety Issues: None.

Access Issues: None.

General Information: Nothing to note.

Immediate Actions Taken: None.

Future Actions Required or Suggested: Clean roots from well 0194.

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 six statistical outliers identified by ProUCL. There were no errors noted during the review of these data and the data for this event are acceptable as qualified.

Data Validation Outliers Report - No Field Parameters Report Date: 08/03/2016

Comparison to Historical Data Since: 1/1/2004 Fraction: Any

Task: GRN01-16060001

Analyte	Location	Analysis Location	Units	Fraction	Result	Type	HistMIN	HistMAX	HistSetSize	5% Critical value	Test Statistic	Outlier?
Uranium	0171	LB	mg/L	T	0.14	> HistMAX	0.0422	0.13	21	0.44	0.127	No
Sulfate	0171	LB	mg/L	N	3100	< HistMIN	3800	4200	15	0.525	0.800	Yes
Sulfate	0176	LB	mg/L	N	3100	< HistMIN	3700	4000	6	0.507	0.667	Yes
Nitrate + Nitrite as Nitrogen	0182	LB	mg/L	N	0.054	> HistMAX	0.01	0.023	6	0.941	0.969	Yes
Sulfate	0182	LB	mg/L	N	730	> HistMAX	570	640	5	0.56	0.563	Yes
Arsenic	0184	LB	mg/L	D	0.0022	> HistMAX	0.0016	0.002	6	0.56	0.333	No
Uranium	0184	LB	mg/L	D	0.00091	< HistMIN	0.0017	0.0029	6	0.56	0.397	No
Selenium	0184	LB	mg/L	D	0.00076	> HistMAX	0.00018	0.00045	6	0.642	0.707	Yes
Uranium	0185	LB	mg/L	D	0.0027	> HistMAX	0.00067	0.0015	5	0.642	0.591	No
Selenium	0188	LB	mg/L	T	0.014	< HistMIN	0.016	0.043	14	0.546	0.100	No
Sulfate	0188	LB	mg/L	N	4900	< HistMIN	5800	7900	9	0.554	0.360	No
Nitrate + Nitrite as Nitrogen	0192	LB	mg/L	N	64	< HistMIN	66	190	11	0.546	0.069	No
Sulfate	0192	LB	mg/L	N	7800	> HistMAX	4800	7400	7	0.554	0.133	No
Sulfate	0194	LB	mg/L	N	50000	> HistMAX	11000	41000	7	0.554	0.333	No
Uranium	0588	LB	mg/L	T	0.018	> HistMAX	0.00014	0.00025	5	0.56	0.994	Yes
Selenium	0846	LB	mg/L	D	0.00083	> HistMAX	0.00019	0.00077	12	0.546	0.366	No

FRACTION: D = Dissolved N = NA T = Total