

Data Validation Package

**April and June 2016
Groundwater and Surface Water
Sampling at the
Gunnison, Colorado, Processing Site**

October 2016

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Potential Outliers Report

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Sampling Event Summary

Site: Gunnison, Colorado, Processing Site

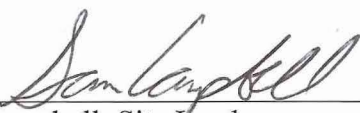
Sampling Period: April 18–21 and June 27, 2016

This event included annual sampling of groundwater and surface water locations at the Gunnison, Colorado, Processing 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 28 monitoring wells, three domestic wells, and six surface locations in April at the processing site as specified in the draft 2010 *Ground Water Compliance Action Plan for the Gunnison, Colorado, Processing Site*. Planned monitoring locations are shown in Attachment 1, Sampling and Analysis Work Order. Domestic wells 0476 and 0477 were sampled in June because the homes were unoccupied in April, and the wells were not in use. Duplicate samples were collected from locations 0126, 0477, and 0780. 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. Interpretation and presentation of results, including an assessment of the natural flushing compliance strategy, will be reported in the upcoming 2016 Verification Monitoring Report.



Sam Campbell, Site Lead
Navarro Research and Engineering, Inc.

10/13/2016
Date

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Data Assessment Summary

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Water Sampling Field Activities Verification Checklist

Project	Gunnison, Colorado	Date(s) of Water Sampling	April 18–21 & June 27, 2016
Date(s) of Verification	July 19, 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 March 18, 2016.
2. Were the sampling locations specified in the planning documents sampled?	Yes	Two locations that could not be sampled in April were sampled in June.
3. Were field equipment calibrations conducted as specified in the above-named documents?	Yes	Calibrations were performed on April 14 and June 23, 2016.
4. Was an operational check of the field equipment conducted daily? Did the operational checks meet criteria?	Yes	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? 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?	Yes	Yes
	Yes	Yes
	Yes	
	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? Was one pump/tubing volume removed prior to sampling?	NA	All monitoring wells were Category I.
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	Duplicate samples were collected from locations 0126, 0780, and 0477.
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?	NA	Sample cooling was not required.
19. Were water levels measured at the locations specified in the planning documents?	Yes	Water levels were measured in all sampled wells.

Laboratory Performance Assessment

General Information

Task ID: GUN01-16040001
Sample Event: April 18–21, 2016
Site(s): Gunnison, Colorado, Processing Site
Laboratory: ALS Laboratory Group, Fort Collins, Colorado
Work Order No.: 1604467
Analysis: Metals
Validator: Stephen Donovan
Review Date: June 17, 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 and 2, 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
Manganese	LMM-01	SW-846 3005A	SW-846 6010B
Uranium	LMM-02	SW-846 3005A	SW-846 6020A

Data Qualifier Summary

The analytical results were qualified as listed in Table 2. Refer to the sections below for an explanation of the data qualifiers applied.

Table 2. Data Qualifier Summary

Sample Number	Location	Analyte	Flag	Reason
1604467-1	0002	Uranium	J	Serial dilution result
1604467-21	0160	Uranium	J	Serial dilution result

Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received 40 water samples on April 26, 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. Copies of the air waybill labels were included with the receiving documentation.

Preservation and Holding Times

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

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 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 SW-846 6010B, Manganese

Calibrations were performed on May 7, 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 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 6020A, Uranium

Calibrations were performed on May 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 MDL for both 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 known a 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. 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 both 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 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 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 recoveries for samples 0002 and 0160 were 14% and 12% respectively, exceeding the acceptance limit of 10% (see Figure 2). The associated sample uranium results are qualified with a “J” flag as estimated values.

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 June 2, 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: GUN01-16040001 **Lab Code:** PAR **Validator:** Stephen Donovan **Validation Date:** 06-16-2016

Project: Gunnison Processing Site

Samples: 40

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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Check

Summary

Holding Times:	All analyses were completed within 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 were 2 duplicates evaluated.

Figure 1. General Validation Worksheet (GUN01-16040001)

Metals Data Validation Worksheet

Project: Gunnison Processing Site

Task Code: GUN01-16040001 **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
Manganese	SW-846 6010	05-07-2016	LCS	101.00		80	120		20	92	3	106	
Manganese	SW-846 6010	05-07-2016	LCS	102.00		80	120		20	98		113	
Manganese	SW-846 6010	05-07-2016	LCS	99.00		80	120		20				
Manganese	SW-846 6010	05-07-2016	MB										< MDL
Manganese	SW-846 6010	05-07-2016	MB										< MDL
Manganese	SW-846 6010	05-07-2016	MB										< MDL
Manganese	SW-846 6010	05-07-2016	MS	97.00		80	120		20				
Manganese	SW-846 6010	05-07-2016	MS	98.00		80	120		20				
Manganese	SW-846 6010	05-07-2016	MS	99.00		80	120		20				
Manganese	SW-846 6010	05-07-2016	MSD		99.00	80	120	0	20				
Manganese	SW-846 6010	05-07-2016	MSD		98.00	80	120	0	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 (GUN01-16040001)

Metals Data Validation Worksheet

Page 2 of 3

17-Jun-2016

Project: Gunnison Processing Site

Task Code: GUN01-16040001 **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
Manganese	SW-846 6010	05-07-2016	MSD		99.00	80	120	0	20				
Manganese	SW-846 6010	05-07-2016	R						20				
Manganese	SW-846 6010	05-07-2016	R					1	20				
Manganese	SW-846 6010	05-07-2016	R						20				
Uranium	SW-846 6020	05-10-2016	LCS	109.00		80	120		20				
Uranium	SW-846 6020	05-10-2016	MB										< MDL
Uranium	SW-846 6020	05-10-2016	MS	109.00		75	125		20		4		
Uranium	SW-846 6020	05-10-2016	MSD		108.00	75	125	1	20				
Uranium	SW-846 6020	05-10-2016	R					6	20	100	14	70	Serial dilution sample 0002
Uranium	SW-846 6020	05-11-2016	LCS	104.00		80	120		20				
Uranium	SW-846 6020	05-11-2016	LCS	111.00		80	120		20				
Uranium	SW-846 6020	05-11-2016	MB										< MDL

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 (GUN01-16040001) (continued)

Metals Data Validation Worksheet

Project: Gunnison Processing Site

Task Code: GUN01-16040001 **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
Uranium	SW-846 6020	05-11-2016	MB										< MDL
Uranium	SW-846 6020	05-11-2016	MS	100.00		75	125		20				
Uranium	SW-846 6020	05-11-2016	MS	110.00		75	125		20				
Uranium	SW-846 6020	05-11-2016	MSD		110.00	75	125	0	20				
Uranium	SW-846 6020	05-11-2016	MSD		77.00	75	125	6	20				
Uranium	SW-846 6020	05-11-2016	R					8	20		12	120	Serial dilution sample 0160
Uranium	SW-846 6020	05-11-2016	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. Metals Validation Worksheet (GUN01-16040001) (continued)

General Information

Task ID: GUN01-16060002
Sample Event: June 27, 2016
Site(s): Gunnison, Colorado, Processing Site
Laboratory: ALS Laboratory Group, Fort Collins, Colorado
Work Order No.: 1606559
Analysis: Metals
Validator: Stephen Donovan
Review Date: July 18, 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 3 and 4, 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 3.

Table 3. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Manganese	LMM-01	SW-846 3005A	SW-846 6010B
Uranium	LMM-02	SW-846 3005A	SW-846 6020A

Data Qualifier Summary

The analytical results were qualified as listed in Table 4. Refer to the sections below for an explanation of the data qualifiers applied.

Table 4. Data Qualifier Summary

Sample Number	Location	Analyte	Flag	Reason
1606559-1	0476	Manganese	U	Less than 5 times the calibration blank

Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received 3 water samples on June 30, 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. Copies of the air waybill labels were included with the receiving documentation.

Preservation and Holding Times

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

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 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 SW-846 6010B, Manganese

Calibrations were performed on July 7, 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 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 6020A, Uranium

Calibrations were performed on July 11, 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 MDL for both 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. 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 both 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 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 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 serial dilution results that were evaluated meet 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 15, 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: GUN01-16060002 **Lab Code:** PAR **Validator:** Steve Donovan **Validation Date:** 07-18-2016

Project: Gunnison Monitoring

Samples: 3

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>
---	--

Check

Summary

Holding Times:	All analyses were completed within the applicable holding times.
Detection Limits:	The reported detection limits are equal to or below the contract required limits.
Field Duplicates:	There was 1 duplicate evaluated.

Figure 3. General Validation Worksheet (GUN01-16060002)

Metals Data Validation Worksheet

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18-Jul-2016

Project: Gunnison Monitoring

Task Code: GUN01-16060002

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
Manganese	SW-846 6010	07-07-2016	LCS	101.00		80	120		20				
Manganese	SW-846 6010	07-07-2016	MB										< MDL
Manganese	SW-846 6010	07-07-2016	MS	87.00		80	120		20	91		100	
Manganese	SW-846 6010	07-07-2016	MSD		92.00	80	120	5	20	82		98	
Manganese	SW-846 6010	07-07-2016	R						20				
Uranium	SW-846 6020	07-11-2016	LCS	103.00		80	120		20				
Uranium	SW-846 6020	07-11-2016	MB										< MDL
Uranium	SW-846 6020	07-12-2016	MS	102.00		75	125		20	97		80	
Uranium	SW-846 6020	07-12-2016	MSD		106.00	75	125	3	20			120	
Uranium	SW-846 6020	07-12-2016	R					13	20		6		

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 4. Metals Validation Worksheet (GUN01-16060002)

Sampling Quality Control Assessment

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

Sampling Protocol

Sample results for all monitoring wells met the Category I low-flow sampling criteria and were qualified with an “F” flag in the database, indicating the wells were purged and sampled using the low-flow sampling method.

Equipment Blanks

Equipment blanks are prepared and analyzed to document contamination attributable to the sample collection process. One equipment blank was submitted with these samples. There were no analytes detected in the equipment blank.

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 (RPD) for duplicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than the PQL, the range should be no greater than the PQL. Duplicate samples were collected from locations 0126, 0477, and 0780. The duplicate results met these criteria, demonstrating acceptable overall precision.

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 10-12-2016
Stephen Donovan Date

Data Validation Lead: Stephen Donovan 10-12-2016
Stephen Donovan Date

Attachment 1

Sampling and Analysis Work Order

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March 18, 2016

Task Assignment 103
Control Number 16-0426

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
April 2016 Environmental Sampling at the Gunnison, Colorado, Processing Site

REFERENCE: Task Assignment 103,1-103-1-02-108, Gunnison, Colorado, Processing Site

Dear Mr. Linard:

The purpose of this letter is to inform you of the upcoming sampling event at the Gunnison, 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 April 18, 2016.

The following lists show the monitoring wells, along with zone of completion, surface locations, and private wells scheduled for sampling during this event.

MONITORING WELLS*

0002 A1	0013 A1	0065 A1	0106 A1	0126 A1	0136 A1	0181 A1	0187 A1
0005 A1	0062 A1	0066 A1	0112 A1	0127 A1	0160 A1	0183 A1	0188 A1
0006 A1	0063 A1	0102 A1	0113 A1	0135 A1	0161 A1	0186 A1	0189 A1
012R A1	0064 A1	0105 A1	0125 A1				

DOMESTIC WELLS*

0476 Nr	0477 Nr	0478 Nr	0667 A1	0683 Nr
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*NOTE: A1 = Alluvium; Nr = No recovery of data for classifying

SURFACE LOCATIONS

0248	0250	0251	0777	0780	0795
------	------	------	------	------	------

Joshua Linard
Control Number 16-0426
Page 2

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.

Please contact me at (970) 248-6654 if you have any questions.

Sincerely,



Sam Campbell
Site Lead

SC/lcg/bkb

Enclosures (3)

cc: (electronic)

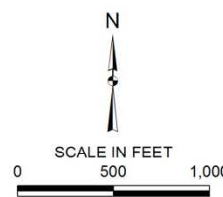
Christina Pennal, DOE
Sam Campbell, Navarro
Jeff Carman, Navarro
Beverly Cook, Navarro
Steve Donovan, Navarro
Lauren Goodknight, Navarro
Diana Osborne, Navarro
Sam Marutzky, Navarro
EDD Delivery
rc-grand.junction
File: GUN 400.02



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

LEGEND

- MONITORING WELL
- DOMESTIC WELL
- SURFACE LOCATION
- ┌──┐ FORMER MILLSITE 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 Gunnison, CO, Processing Site April 2016

DATE PREPARED: March 15, 2016	FILE NAME: S1397300-11x17
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Gunnison, Colorado, Processing Site Planned Sampling Map

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

Location ID	Quarterly	Semiannually	Annually	Every 5 years	Not Sampled	Notes
Monitoring Wells						
<i>GUN01</i>						
002			X			
005			X			
006			X			Data logger
012R			X			
013			X			
062			X			
063			X			
064			X			
065			X			
066			X			
102			X			
105			X			
106			X			
112			X			
113			X			
125			X			
126			X			
127			X			
135			X			
136			X			
160			X			
161			X			
181			X			
183			X			
186			X			
187			X			
188			X			
189			X			
Surface Locations						
<i>GUN01</i>						
248			X			
250			X			
251			X			
777			X			
780			X			
795			X			
Domestic Wells						
<i>GUN01</i>						
476			X			
477			X			
478			X			
667			X			
683			X			

GUN01 (Processing site) Sampling conducted in April

Constituent Sampling Breakdown

Site	Gunnison			Required Detection Limit (mg/L)	Analytical Method	Line Item Code
	Groundwater	Surface Water				
Analyte						
Approx. No. Samples/yr	33 (41 every 5th year)			6		
Field Measurements						
Alkalinity						
Dissolved Oxygen						
Redox Potential	X	X	X			
pH	X	X	X			
Specific Conductance	X	X	X			
Turbidity	X	X	X			
Temperature	X	X	X			
Laboratory Measurements						
	GUN01	GUN08	GUN01			
Aluminum						
Ammonia as N (NH3-N)						
Calcium		X		5	SW-846 6010	LMM-01
Chloride		X		0.5	SW-846 9056	WCH-A-039
Chromium						
Gross Alpha						
Gross Beta						
Iron		X		0.05	SW-846 6020	LMM-02
Lead						
Magnesium		X		5	SW-846 6010	LMM-01
Manganese	X	X	X	0.005	SW-846 6010	LMM-01
Molybdenum						
Nickel						
Nickel-63						
Nitrate + Nitrite as N (NO3+NO2)-N						
Potassium		X		1	SW-846 6010	LMM-01
Radium-226						
Radium-228						
Selenium						
Silica						
Sodium		X		1	SW-846 6010	LMM-01
Strontium						
Sulfate		X		0.5	SW-846 9056	MIS-A-044
Sulfide						
Total Dissolved Solids		X		10	SM2540 C	WCH-A-033
Total Organic Carbon						
Uranium	X	X	X	0.0001	SW-846 6020	LMM-02
Vanadium						
Zinc						
Total No. of Analytes	2	10	2			

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

Attachment 2

Trip Reports

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Navarro Research and Engineering

To: Sam Campbell
 From: Jennifer Graham
 CC: Josh Linard, DOE
 Steve Donivan, Navarro
 EDD Delivery
 Date: 4/26/2016
 Re: Sampling Trip Report

Site: Gunnison, Colorado, Processing Site

Dates of Sampling Event: April 18-21, 2016

Team Members: Jennifer Graham and Eric Szabelski

Number of Locations Sampled: Samples were collected from 37 of the 39 locations identified on the sampling notification letter as follows:

	Locations That Were Sampled	Planned Locations
Monitoring wells	28	28
Domestic Wells	3	5
Surface water locations	6	6

In addition to the regular samples, an additional sample was collected at domestic well location 0478. Samples collected at this location include the regularly sampled exterior tap and an interior sink. The additional interior sink sample was collected at DOE request.

Locations Not Sampled/Reason: Domestic wells 0476 and 0477 were not sampled during this event, there was no access permission granted and the homes were winterized. These locations will be sampled at a later date when homeowners are available.

Location Specific Information:

Location IDs	Comments
0012R, 0112	Water collected at these locations was collected initially in glass containers. Sample water was then transferred to 500 mL Nalgene container.
0105	All stability requirements were met at this location. pH was undulating slightly as the field reading was collected. The second reading was collected at an instant of a high outlier. Reading of 6.87 was deleted. pH was maintained an average of ~6.5 during field measurements. pH was considered to be stable at this location.
0112	Purge water was black with a strong sulfur smell and took 35 minutes to reach a turbidity < 10 NTUs.
0186	Initial pH field reading for this location was 9.14. pH stabilized at this well at approximately 7.6.
0478	Sample was collected after water flow was clear from tap. Sample ID GUN01-16040001-43 was collected after purging 15 L from the exterior tap.
0478	An interior sink adjacent to the exterior tap was sampled. 3 L of water was purged from this location before sample was collected. Homeowner indicated that this sink is used within the home and the home is occupied year round. Sample ID associated with this sample is GUN01-16040001-034
0667	Initial tap water was brown in color. 15L was purged before sample was collected.
0683	Tap was winterized on arrival. Cover was removed, and then replaced after sampling. 12L of water was purged before sampling

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
2597	GUN01-16040001-040	0126	Duplicate	Ground Water	N/A
2598	GUN01-16040001-041	0780	Duplicate	Surface Water	N/A
2695	GUN01-16040001-042	Equipment Blank	Equipment Blank	Surface Water	0250, 0777, 0780, and 0795

Task Code: Samples were assigned to task GUN01-16040001. Field data sheets can be found in <\\crow\SMS\GUN01-16040001\FieldData>.

Sample Shipment: Samples were shipped overnight via FedEx from Grand Junction to ALS Laboratory in Fort Collins, Colorado, on April 25, 2016.

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

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)*.
- Earthsoft EDGE version 6.4 software edition was used to collect field data for this event.

Field Variance: Locations 0012R and 0112 were collected in nonstandard sampling bottles. Samples were collected in glass jars with metal food preservation lids manufactured by Ball. Glass jars were rinsed with purge water from the corresponding sampled well before sample

water was collected. Samples were held for approximately 3 hours then transferred into sample collection bottles.

Equipment: All equipment functioned properly.

Dataloggers: Dataloggers were downloaded and checked for accuracy at monitoring well 0006. Data and information from each data logger can be viewed electronically using SEEPro.

Stakeholder/Regulatory/DOE: Contact was made with all homeowners prior to sampling their domestic wells. All other stakeholders were contacted per their request prior to sampling.

Institutional Controls:

Fences, Gates, and Locks: All gates were returned as found.

Signs: No issues were observed.

Trespassing/Site Disturbances: None observed.

Safety Issues: None

Access Issues: The barbed wire access gate to surface water location 0248 is difficult to open. A new fence has been constructed across this location. There is a gate for access; however, the barbed wire is stretched very taut and the team was unable to open the gate. The field team had to clamber underneath the gap below the bottom string of barbed wire to approach this location.

General Information: Nothing to note.

Immediate Actions Taken: New downhole tubing was installed at location 0013. New pump head tubing was installed at 0066.

Future Actions Required or Suggested: Well 0189 may need to be re-categorized to a CAT II well in the future. The team had difficulty meeting turbidity at the following locations: 0005, 0112, and 0189. These wells may need to be redeveloped.

To: Distribution
From: Sam Campbell, Navarro
Date: July 22, 2016
CC: Joshua Linard, DOE
Steve Donovan, Navarro
EDD Delivery
Re: Sampling Trip Report

Site: Gunnison, Colorado, Processing Site

Dates of Event: June 27, 2016

Team Members: Sam Campbell and Alison Kuhlman

Number of Locations Sampled: Two domestic wells (0476 and 0477) were sampled; these wells were not sampled during the April sampling event because the homes were vacant. This event was conducted in conjunction with the annual inspection of the Gunnison Disposal cell.

Locations Not Sampled/Reason: None.

Location Specific Information: Samples were collected from exterior taps on the houses using Category IV sampling protocol.

Quality Control Sample Cross Reference: A duplicate sample was collected at location 0477. The duplicate sample was assigned a false identification of 2597 and sample identification of GUN01-16060002-040.

Task Code Assigned: Samples were assigned to Task Code GUN01-16060002 and documentation of field activities can be viewed at <\\crow\SMS\GUN01-16060002\FieldData>

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

Water Level Measurements: Domestic wells – water levels were not measured.

Well Inspection Summary: Domestic wells – inspection was not conducted.

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). Earthsoft EDGE version 6.4 software edition was used to collect field data and document this sampling event.

Field Variance: None.

Equipment: All equipment functioned properly.

Stakeholder/Regulatory/DOE: Contact was made with the homeowners in the field prior to sampling their domestic wells.

Institutional Controls: Not applicable.

Fences, Gates, and Locks: Not applicable.

Signs: Not applicable.

Trespassing/Site Disturbances: Not applicable.

Safety Issues: None.

Access Issues: None.

General Information: Nothing to note.

Immediate Actions Taken: None.

Future Actions Required or Suggested: None.

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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 no outliers identified by ProUCL (Table 5) and the data for this event are acceptable as qualified.

Table 5. Data Validation Outliers Report

Data Validation Outliers Report - No Field Parameters Report Date: 06/16/2016

Comparison to Historical Data Since: 1/1/2006 12:00:00 AM Fraction: Any

Task: GUN01-16040001

Analyte	Location	Analysis Location	Units	Fraction	Result	Type	HistMIN	HistMAX	HistSetSize	5% Critical value	Test Statistic	Outlier?
Manganese	0005	LB	mg/L	T	1.30	> HistMAX	0.12	1.1	11	0.576	0.326	No
Manganese	0063	LB	mg/L	T	0.003	< HistMIN	0.0074	0.05	11	0.576	0.137	No
Uranium	0063	LB	mg/L	T	0.017	> HistMAX	0.011	0.014	11	0.576	0.500	No
Manganese	0064	LB	mg/L	T	0.072	> HistMAX	0.0025	0.038	11	0.576	.017	No
Manganese	0066	LB	mg/L	T	0.0066	< HistMIN	0.0075	0.1	11	0.576	0.082	No
Manganese	0106	LB	mg/L	T	4.00	< HistMIN	4.5	6.5	11	0.576	0.118	No
Uranium	0106	LB	mg/L	T	0.052	> HistMAX	0.01	0.038	11	0.576	0.476	No
Uranium	0126	LB	mg/L	T	0.013	> HistMAX	0.0097	0.012	11	0.576	0.303	No
Manganese	0136	LB	mg/L	T	3.10	> HistMAX	0.048	2.6	11	0.576	0.330	No
Uranium	0160	LB	mg/L	T	0.032	> HistMAX	0.021	0.027	11	0.576	0.500	No
Uranium	0161	LB	mg/L	T	0.023	> HistMAX	0.018	0.02	11	0.576	0.525	No
Manganese	0183	LB	mg/L	T	0.00011	< HistMIN	0.00057	0.012	14	0.477	0.039	No
Manganese	0188	LB	mg/L	T	0.00011	< HistMIN	0.00043	0.021	16	0.560	0.015	No
Uranium	0780	LB	mg/L	T	0.049	> HistMAX	0.013	0.042	11	0.576	0.343	No
Manganese	0795	LB	mg/L	T	0.028	< HistMIN	0.03	0.044	14	0.507	0.125	No
Manganese	0478	LB	mg/L	T	1.20	> HistMAX	0.42	1.1	15	0.512	0.128	No

FRACTION: D = Dissolved N = NA T = Total