Data Validation Package

May 2015
Groundwater and Surface Water Sampling at the Rulison, Colorado, Site

October 2015

U.S. DEPARTMENT OF ENERGY | Legacy Management

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Sampling Event Summary

Site: Rulison, Colorado, Site

Sampling Period: May 20-22 and 27, 2015

Annual sampling was conducted at the Rulison, Colorado, site for the Long-Term Hydrologic Monitoring Program May 20-22 and 27, 2015, to monitor groundwater and surface water for potential radionuclide contamination. 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). A duplicate sample was collected from location "Cary Weldon House W." Samples were analyzed by GEL Laboratories in Charleston, South Carolina. Samples were analyzed for gamma-emitting radionuclides by high-resolution gamma spectrometry and for tritium using the conventional and enrichment methods.

The electrolytic enrichment method for tritium analysis yielded positive results for the samples analyzed ranging from 10.2 to 11.6 picocuries per liter (pCi/L). These results are consistent with background levels for tritium and are well below the U.S. Environmental Protection Agency (EPA) drinking-water standard for tritium of 20,000 pCi/L. All high-resolution gamma spectrometry results were below detectable concentrations. The results from this sampling event indicate that groundwater and surface water supplies in the area have not been impacted by detonation-related contaminants.

Rick Hutton, Site Lead
Navarro Research and Engineering, Inc.

10-15-2015
Date

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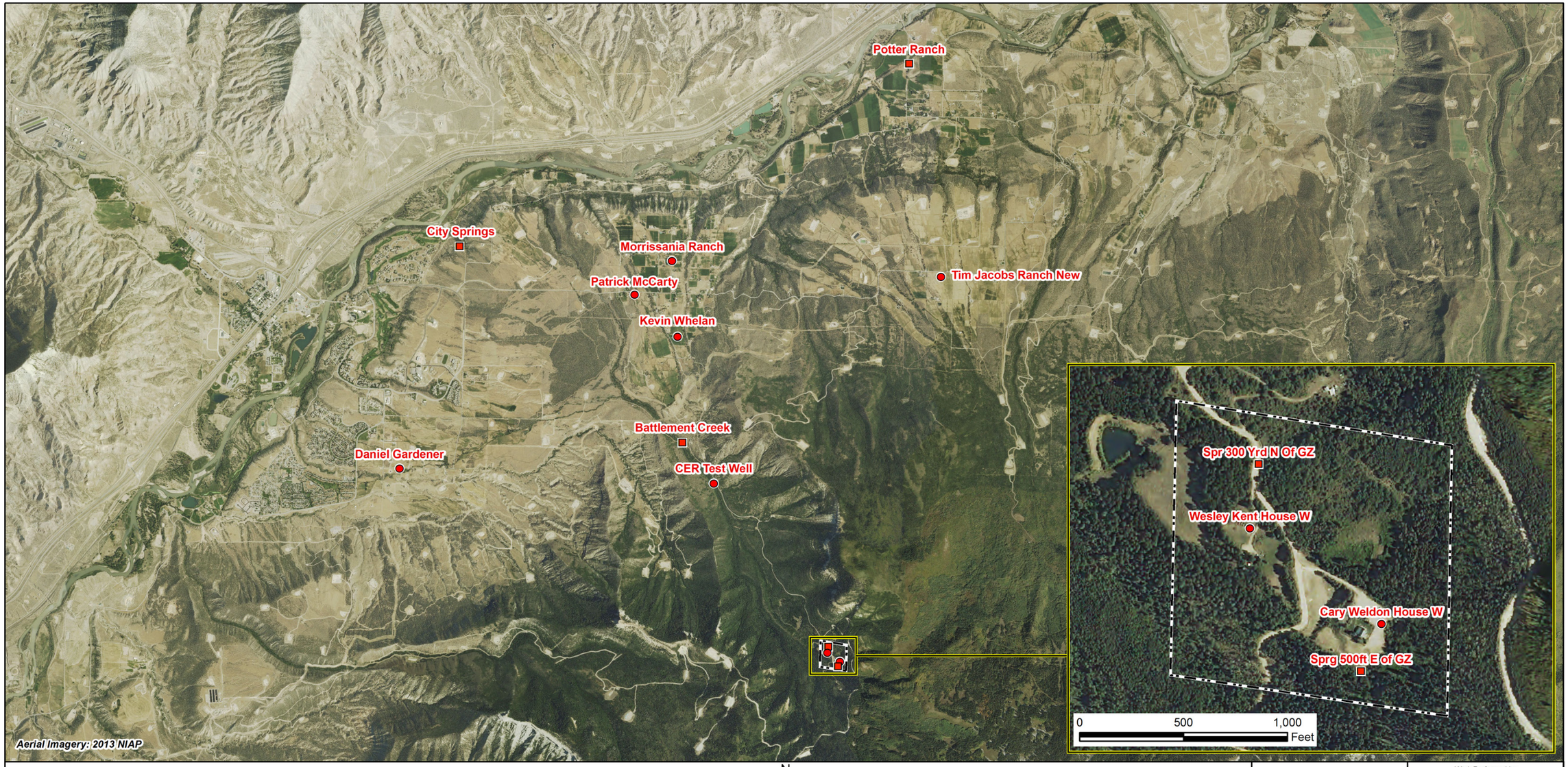

LEGEND

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

N

0 1 2 Miles

U.S. DEPARTMENT OF ENERGY OFFICE OF LEGACY MANAGEMENT	Work Performed by **Stoller Newport News Nuclear, Inc.** Under DOE Contract Number DE-LM0000415
Planned Sampling Map Rulison, CO, Site May 2015	
DATE PREPARED: April 22, 2015	FILE NAME: S1288400

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Rulison, Colorado, Site, Sample Location Map

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Data Assessment Summary

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Water Sampling Field Activities Verification Checklist

Project	Rulison, Colorado	**Date(s) of Water Sampling**	May 20-22 and 27, 2015
Date(s) of Verification	September 8, 2015	**Name of Verifier**	Stephen Donivan

	Response (Yes, No, NA)	Comments
1. Is the SAP the primary document directing field procedures?	Yes	
List any Program Directives or other documents, SOPs, instructions.		Work Order letter dated April 24, 2015.
2. Were the sampling locations specified in the planning documents sampled?	Yes	
3. Were calibrations conducted as specified in the above-named documents?	Yes	Calibrations were performed on May 15, 2015.
4. Was an operational check of the field equipment conducted daily?	Yes	
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?	NA	There were no Category I wells.
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?		

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 Cary Weldon House W.
10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	NA	An equipment blank was not required.
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	

Laboratory Performance Assessment

General Information

Report Number (RIN):	15057039
Sample Event:	May 20-22 and 27, 2015
Site(s):	Rulison, Colorado, Site
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	374039
Analysis:	Radiochemistry
Validator:	Stephen Donivan
Review Date:	September 1, 2015

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

Table 1. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Gamma Spectrometry	GAM-A-001	EPA 901.1	EPA 901.1
Tritium, Enrichment Method	LMR-17	DOE HASL 300	DOE HASL 300
Tritium	LSC-A-001	EPA 906.0m	EPA 906.0m

Data Qualifier Summary

None of the analytical results required qualification.

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received 14 water samples on May 29, 2015, 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 to confirm signatures and dates were present indicating sample relinquishment and receipt. The Chain of Custody was complete and had no errors or omissions.

Preservation and Holding Times

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

Detection and Quantitation Limits

Radiochemical results are evaluated using the minimum detectable concentration (MDC), Decision Level Concentration (DLC), and Determination Limit (DL). The MDC is a measure of radiochemical method performance and was calculated and reported as specified in *Quality Systems for Analytical Services*. The DLC is the minimum concentration of an analyte that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero, while estimated at 3 times the 1-sigma total propagated uncertainty. Results which are greater than the MDC, but less than the DLC, are qualified with a "U" flag (not detected). The DL for radiochemical results is the lowest concentration that reliably can be measured and is defined as 3 times the MDC. Results not previously "U" qualified that are less than the DL are qualified with a "J" flag as estimated values.

The reported MDCs for radiochemical analytes demonstrate compliance with contractual requirements.

Laboratory Instrument Calibration

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing acceptable qualitative and quantitative data for all analytes. Initial calibration demonstrated that the instrument was capable of acceptable performance in the beginning of the analytical run. Compliance requirements for continuing calibration checks are established to ensure that the instrument continues to be capable of producing acceptable qualitative and quantitative data. All laboratory instrument calibrations were performed correctly in accordance with the cited methods. All calibration and laboratory-spike standards were prepared from independent sources.

Radiochemical Analysis

Tritium
Instrument quench-calibration curves were generated on August 1, 2015. The daily instrument checks performed on July 9 and August 14, 2015, met the acceptance criteria.

Gamma Spectrometry
The gamma-spectrometry efficiency calibrations were performed within a year prior to sample analysis. All daily calibration and background-check results met the acceptance criteria.

Method Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. All methodology blank results associated with the samples were below the DLC for all analytes.

Matrix Spike Analysis

Matrix spike and matrix-spike duplicate samples were analyzed for tritium as a measure of method performance in the sample matrix. All spike results were within the acceptance range.

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative error ratio for radiochemical replicate results (calculated using the 1-sigma total propagated uncertainty) was less than three, indicating acceptable precision.

Laboratory Control Sample

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

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 August 27, 2015. The Sample Management System EDD validation module was used to verify that the EDD files were complete and in compliance with requirements. The module compares the contents of the file 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.

SAMPLE MANAGEMENT SYSTEM

General Data Validation Report

RIN: 15057039 **Lab Code:** GEN **Validator:** Stephen Donivan **Validation Date:** 09/01/2015

Project: Rulison Site **Analysis Type:** ☐ Metals ☐ General Chem ☑ Rad ☐ Organics

# of Samples: 14 **Matrix:** Water **Requested Analysis Completed:** Yes

Chain of Custody

Present: OK **Signed:** OK **Dated:** OK

Sample

Integrity: OK **Preservation:** OK **Temperature:** OK

Select Quality Parameters

☑ Holding Times	All analyses were completed within the applicable holding times.
☑ Detection Limits	There are 0 detection limit failures.
☐ Field/Trip Blanks	
☑ Field Duplicates	There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM
Radiochemistry Data Validation Worksheet

RIN: 15057039 **Lab Code:** GEN **Date Due:** 08/27/2015

Matrix: Water **Site Code:** RUL01 **Date Completed:** 08/27/2015

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate RER
2487	Actinium-228	06/26/2015						2.00
2487	Americium-241	06/26/2015						0.76
Blank_Spike	Americium-241	06/26/2015				106.00		
2487	Antimony-125	06/26/2015						0.67
2487	Cerium-144	06/26/2015						0.42
Blank_Spike	Cerium-144	06/26/2015						
2487	Cesium-134	06/26/2015						2.17
2487	Cesium-137	06/26/2015						1.37
Blank_Spike	Cesium-137	06/26/2015				104.00		
2487	Cobalt-60	06/26/2015						0.75
Blank_Spike	Cobalt-60	06/26/2015				99.40		
2487	Europium-152	06/26/2015						0.12
2487	Europium-154	06/26/2015						0.66
Blank_Spike	Europium-154	06/26/2015						
2487	Europium-155	06/26/2015						0.29
2487	Lead-212	06/26/2015						0.58
Blank_Spike	Lead-212	06/26/2015						
2487	Potassium-40	06/26/2015						0.75
2487	Promethium-144	06/26/2015						0.35
Blank_Spike	Promethium-144	06/26/2015						
2487	Promethium-146	06/26/2015						1.53
2487	Ruthenium-106	06/26/2015						1.37
Blank_Spike	Ruthenium-106	06/26/2015						
2487	Thorium-234	06/26/2015						0.97
2487	Tritium	07/09/2015						0.60
Blank	Tritium	07/09/2015	233.0000	U				
Blank_Spike	Tritium	07/09/2015				108.00		
2487	Tritium	07/09/2015					108.0	
Morrissania Ran	Tritium	08/14/2015			65.0			
Patrick McCarty	Tritium	08/14/2015			65.0			
Wesley Kent Hou	Tritium	08/14/2015			65.0			
Blank_Spike	Tritium	08/15/2015			65.0	124.00		

SAMPLE MANAGEMENT SYSTEM
Radiochemistry Data Validation Worksheet

RIN: 15057039 **Lab Code:** GEN **Date Due:** 08/27/2015

Matrix: Water **Site Code:** RUL01 **Date Completed:** 08/27/2015

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate RER
Blank	Tritium	08/15/2015	0.4400	U	65.0			
2487	Uranium-235	06/26/2015						0.84
Blank_Spike	Uranium-235	06/26/2015						
2487	Uranium-238	06/26/2015						0.97
2487	Yttrium-88	06/26/2015						0.77
Blank_Spike	Yttrium-88	06/26/2015						

Sampling Quality Control Assessment

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

Sampling Protocol

Location CER Test Well was sampled using a dedicated bladder pump as a Category II well. Data from this well are qualified with the "FQ" flags in the database, which indicate the well was Category II, purged and sampled using the low-flow sampling method. All other sample locations were domestic wells or surface water locations.

Equipment Blank

Equipment blanks are prepared and analyzed to document contamination attributable to the sample collection process. An equipment blank was not required.

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. A duplicate sample was collected from location Cary Weldon House W. For radiochemical measurements, the relative-error ratio (the ratio of the absolute difference between the sample and duplicate results and the sum of the 1-sigma uncertainties) was used to evaluate duplicate results and should be less than 3. All duplicate results met this criteria thereby demonstrating acceptable precision.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 15057039 **Lab Code:** GEN **Project:** Rulison Site **Validation Date:** 09/01/2015

Duplicate: 2487 **Sample:** Cary Weldon House W

Analyte	Sample Result	Flag	Error	Dilution	Duplicate Result	Flag	Error	Dilution	RPD	RER	Units
Actinium-228	12.4	U	11.5	1.00	-8.02	U	13.2	1.00		2.3	pCi/L
Americium-241	7.51	U	14.5	1.00	-6.23	U	24.4	1.00		0.9	pCi/L
Antimony-125	0.114	U	4.48	1.00	8.05	U	9.11	1.00		1.5	pCi/L
Cerium-144	11.3	U	12.6	1.00	7.10	U	20.2	1.00		0.3	pCi/L
Cesium-134	1.44	U	1.77	1.00	2.66	U	3.54	1.00		0.6	pCi/L
Cesium-137	-0.596	U	1.63	1.00	2.88	U	3.62	1.00		1.7	pCi/L
Cobalt-60	1.41	U	1.78	1.00	-0.156	U	2.67	1.00		1.0	pCi/L
Europium-152	-1.14	U	5.04	1.00	3.46	U	9.79	1.00		0.8	pCi/L
Europium-154	-0.355	U	4.30	1.00	2.22	U	9.32	1.00		0.5	pCi/L
Europium-155	4.24	U	6.11	1.00	-0.774	U	10.4	1.00		0.8	pCi/L
Lead-212	2.27	U	5.20	1.00	1.24	U	6.63	1.00		0.2	pCi/L
Potassium-40	4.97	U	29.0	1.00	-27.4	U	48.3	1.00		1.1	pCi/L
Promethium-144	-1.02	U	1.91	1.00	-0.299	U	3.31	1.00		0.4	pCi/L
Promethium-146	-0.73	U	2.02	1.00	2.31	U	3.92	1.00		1.4	pCi/L
Ruthenium-106	0.949	U	15.0	1.00	0.343	U	25.6	1.00		0	pCi/L
Thorium-234	-63.9	U	155	1.00	77.4	U	224	1.00		1.0	pCi/L
Tritium	115	U	177	1.00	37.1	U	168	1.00		0.6	pCi/L
Uranium-235	11.8	U	20.0	1.00	-9.37	U	21.5	1.00		1.4	pCi/L
Uranium-238	-63.9	U	155	1.00	77.4	U	224	1.00		1.0	pCi/L
Yttrium-88	-0.204	U	2.44	1.00	2.73	U	5.36	1.00		1.0	pCi/L

Certification

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

Laboratory Coordinator: Stephen Donivan — Stephen Donivan — 10-15-2015 — Date

Data Validation Lead: Stephen Donivan — Stephen Donivan — 10-15-2015 — Date

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Attachment 1
Assessment of Anomalous Data

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Potential Outliers Report

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Potential Outliers Report

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

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

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

1. **Identify extreme values that may be potential outliers.** Do this by generating the Outliers Report using the Sample Management System from data in the environmental database. The application compares the new data set (in standard environmental database units) with historical data and lists the new data that fall outside the historical data range. A determination is made also as to whether the data are normally distributed using the Shapiro-Wilk Test.
2. **Apply the appropriate statistical test.** Dixon's Test for extreme values is used to test for statistical outliers when the sample size is less than or equal to 25. This test considers both extreme values that are much smaller than the rest of the data (case 1) and extreme values that are much larger than the rest of the data (case 2). This test is valid only if the data outside the suspected outlier are normally distributed. Rosner's Test is a parametric test that is used to detect outliers for sample sizes of 25 or more. This test also assumes that the data outside the suspected outliers are normally distributed.
3. **Scientifically review statistical outliers and decide on their disposition.** The review should include an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values.

There were no potential outliers identified, and the data for this event are acceptable as qualified.

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Attachment 2
Data Presentation

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Groundwater Quality Data

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Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: CER Test Well WELL CER Test Well

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data		Lab QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	05/22/2015	0001	0	-	0	0.213	U	FQ	#	14.7	9.22
Americium-241	pCi/L	05/22/2015	0001	0	-	0	-6.39	U	FQ	#	33.5	23.3
Antimony-125	pCi/L	05/22/2015	0001	0	-	0	1.22	U	FQ	#	9.97	5.52
Cerium-144	pCi/L	05/22/2015	0001	0	-	0	2.94	U	FQ	#	27.7	15.9
Cesium-134	pCi/L	05/22/2015	0001	0	-	0	-.615	U	FQ	#	3.72	2.15
Cesium-137	pCi/L	05/22/2015	0001	0	-	0	-2.49	U	FQ	#	3.44	2.47
Cobalt-60	pCi/L	05/22/2015	0001	0	-	0	0.666	U	FQ	#	4.52	2.36
Europium-152	pCi/L	05/22/2015	0001	0	-	0	3.14	U	FQ	#	11.5	6.44
Europium-154	pCi/L	05/22/2015	0001	0	-	0	-4.53	U	FQ	#	9.51	6
Europium-155	pCi/L	05/22/2015	0001	0	-	0	-5.65	U	FQ	#	15.4	9.29
Lead-212	pCi/L	05/22/2015	0001	0	-	0	1.21	U	FQ	#	7.67	5.3
Oxidation Reduction Potential	mV	05/22/2015	N001	0	-	0	-135		FQ	#		
pH	s.u.	05/22/2015	N001	0	-	0	8.5		FQ	#		
Potassium-40	pCi/L	05/22/2015	0001	0	-	0	9.88	U	FQ	#	50.6	29.5
Promethium-144	pCi/L	05/22/2015	0001	0	-	0	1.47	U	FQ	#	4.55	2.91
Promethium-146	pCi/L	05/22/2015	0001	0	-	0	0.294	U	FQ	#	4.92	2.75
Ruthenium-106	pCi/L	05/22/2015	0001	0	-	0	4.03	U	FQ	#	37.6	20.9
Specific Conductance	umhos /cm	05/22/2015	N001	0	-	0	423		FQ	#		

Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: CER Test Well WELL CER Test Well

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Qualifiers QA	Lab #	Detection Limit	Uncertainty
Temperature	C	05/22/2015	N001	0	-	0	7.92		FQ	#		
Thorium-234	pCi/L	05/22/2015	0001	0	-	0	133	U	FQ	#	334	255
Tritium	pCi/L	05/22/2015	0001	0	-	0	163	U	FQ	#	297	180
Turbidity	NTU	05/22/2015	N001	0	-	0	22.9		FQ	#		
Uranium-235	pCi/L	05/22/2015	0001	0	-	0	-9	U	FQ	#	27.6	21.1
Uranium-238	pCi/L	05/22/2015	0001	0	-	0	133	U	FQ	#	334	255
Yttrium-88	pCi/L	05/22/2015	0001	0	-	0	-1.32	U	FQ	#	4.5	2.63

Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Cary Weldon House W WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	05/21/2015	N001	0	-	0	12.4	U	#	14.2	11.5
Actinium-228	pCi/L	05/21/2015	N002	0	-	0	-8.02	U	#	24.6	13.2
Americium-241	pCi/L	05/21/2015	N001	0	-	0	7.51	U	#	24.7	14.5
Americium-241	pCi/L	05/21/2015	N002	0	-	0	-6.23	U	#	44	24.4
Antimony-125	pCi/L	05/21/2015	N001	0	-	0	0.114	U	#	8.22	4.48
Antimony-125	pCi/L	05/21/2015	N002	0	-	0	8.05	U	#	16.8	9.11
Cerium-144	pCi/L	05/21/2015	N001	0	-	0	11.3	U	#	21.7	12.6
Cerium-144	pCi/L	05/21/2015	N002	0	-	0	7.1	U	#	36.3	20.2
Cesium-134	pCi/L	05/21/2015	N001	0	-	0	1.44	U	#	3.18	1.77
Cesium-134	pCi/L	05/21/2015	N002	0	-	0	2.66	U	#	6.67	3.54
Cesium-137	pCi/L	05/21/2015	N001	0	-	0	-.596	U	#	2.77	1.63
Cesium-137	pCi/L	05/21/2015	N002	0	-	0	2.88	U	#	6.58	3.62
Cobalt-60	pCi/L	05/21/2015	N001	0	-	0	1.41	U	#	3.62	1.78
Cobalt-60	pCi/L	05/21/2015	N002	0	-	0	-.156	U	#	5.51	2.67
Europium-152	pCi/L	05/21/2015	N001	0	-	0	-1.14	U	#	9.08	5.04
Europium-152	pCi/L	05/21/2015	N002	0	-	0	3.46	U	#	18	9.79
Europium-154	pCi/L	05/21/2015	N001	0	-	0	-.355	U	#	8.38	4.3
Europium-154	pCi/L	05/21/2015	N002	0	-	0	2.22	U	#	19.4	9.32

Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Cary Weldon House W WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Europium-155	pCi/L	05/21/2015	N001	0	-	0	4.24	U	#	11	6.11
Europium-155	pCi/L	05/21/2015	N002	0	-	0	-.774	U	#	18.6	10.4
Lead-212	pCi/L	05/21/2015	N001	0	-	0	2.27	U	#	6.25	5.2
Lead-212	pCi/L	05/21/2015	N002	0	-	0	1.24	U	#	11.2	6.63
Oxidation Reduction Potential	mV	05/21/2015	N001	0	-	0	110		#		
pH	s.u.	05/21/2015	N001	0	-	0	7.07		#		
Potassium-40	pCi/L	05/21/2015	N001	0	-	0	4.97	U	#	35.1	29
Potassium-40	pCi/L	05/21/2015	N002	0	-	0	-27.4	U	#	79.1	48.3
Promethium-144	pCi/L	05/21/2015	N001	0	-	0	-1.02	U	#	3.08	1.91
Promethium-144	pCi/L	05/21/2015	N002	0	-	0	-.299	U	#	5.27	3.31
Promethium-146	pCi/L	05/21/2015	N001	0	-	0	-.73	U	#	3.53	2.02
Promethium-146	pCi/L	05/21/2015	N002	0	-	0	2.31	U	#	7.62	3.92
Ruthenium-106	pCi/L	05/21/2015	N001	0	-	0	0.949	U	#	27.3	15
Ruthenium-106	pCi/L	05/21/2015	N002	0	-	0	0.343	U	#	48.9	25.6
Specific Conductance	umhos /cm	05/21/2015	N001	0	-	0	680		#		
Temperature	C	05/21/2015	N001	0	-	0	7.9		#		
Thorium-234	pCi/L	05/21/2015	N001	0	-	0	-63.9	U	#	228	155
Thorium-234	pCi/L	05/21/2015	N002	0	-	0	77.4	U	#	387	224

Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Cary Weldon House W WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Tritium	pCi/L	05/21/2015	N001	0	-	0	115	U	#	299	177
Tritium	pCi/L	05/21/2015	N002	0	-	0	37.1	U	#	293	168
Turbidity	NTU	05/21/2015	N001	0	-	0	2.22		#		
Uranium-235	pCi/L	05/21/2015	N001	0	-	0	11.8	U	#	21.2	20
Uranium-235	pCi/L	05/21/2015	N002	0	-	0	-9.37	U	#	34	21.5
Uranium-238	pCi/L	05/21/2015	N001	0	-	0	-63.9	U	#	228	155
Uranium-238	pCi/L	05/21/2015	N002	0	-	0	77.4	U	#	387	224
Yttrium-88	pCi/L	05/21/2015	N001	0	-	0	-.204	U	#	4.62	2.44
Yttrium-88	pCi/L	05/21/2015	N002	0	-	0	2.73	U	#	11.2	5.36

Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Daniel Gardener WELL A Gardner Ranch loc 40 ft to South

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	05/22/2015	N001	0	-	0	-.871	U	#	11.9	7.31
Americium-241	pCi/L	05/22/2015	N001	0	-	0	0.726	U	#	11.1	6.33
Antimony-125	pCi/L	05/22/2015	N001	0	-	0	-.5	U	#	8.22	4.76
Cerium-144	pCi/L	05/22/2015	N001	0	-	0	7.29	U	#	21.2	12.6
Cesium-134	pCi/L	05/22/2015	N001	0	-	0	0.602	U	#	3.49	1.9
Cesium-137	pCi/L	05/22/2015	N001	0	-	0	-.103	U	#	3.01	1.66
Cobalt-60	pCi/L	05/22/2015	N001	0	-	0	-.315	U	#	3.08	1.7
Europium-152	pCi/L	05/22/2015	N001	0	-	0	0.174	U	#	8.67	4.92
Europium-154	pCi/L	05/22/2015	N001	0	-	0	-.762	U	#	9.32	5.12
Europium-155	pCi/L	05/22/2015	N001	0	-	0	-5.63	U	#	10.1	6.69
Lead-212	pCi/L	05/22/2015	N001	0	-	0	6.66	U	#	6.83	6.08
Oxidation Reduction Potential	mV	05/22/2015	N001	0	-	0	-40		#		
pH	s.u.	05/22/2015	N001	0	-	0	7.63		#		
Potassium-40	pCi/L	05/22/2015	N001	0	-	0	18.7	U	#	27.6	24.4
Promethium-144	pCi/L	05/22/2015	N001	0	-	0	0.826	U	#	3.21	1.99
Promethium-146	pCi/L	05/22/2015	N001	0	-	0	-1.27	U	#	3.73	2.32
Ruthenium-106	pCi/L	05/22/2015	N001	0	-	0	1.34	U	#	27.9	15.2
Specific Conductance	umhos /cm	05/22/2015	N001	0	-	0	835		#		

Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Daniel Gardener WELL A Gardner Ranch loc 40 ft to South

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Temperature	C	05/22/2015	N001	0	-	0	11.1		#		
Thorium-234	pCi/L	05/22/2015	N001	0	-	0	-36.1	U	#	124	77.6
Tritium	pCi/L	05/22/2015	N001	0	-	0	222	U	#	296	185
Turbidity	NTU	05/22/2015	N001	0	-	0	2.77		#		
Uranium-235	pCi/L	05/22/2015	N001	0	-	0	2.68	U	#	20.7	14.7
Uranium-238	pCi/L	05/22/2015	N001	0	-	0	-36.1	U	#	124	77.6
Yttrium-88	pCi/L	05/22/2015	N001	0	-	0	-1.05	U	#	3.53	2.04

Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Kevin Whelan WELL Whelan Ranch Loc

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	05/21/2015	N001	0	-	0	10.8	U	#	18.4	14.1
Americium-241	pCi/L	05/21/2015	N001	0	-	0	12.5	U	#	30.8	18.7
Antimony-125	pCi/L	05/21/2015	N001	0	-	0	-.853	U	#	10.2	5.86
Cerium-144	pCi/L	05/21/2015	N001	0	-	0	-1.61	U	#	26.1	15.2
Cesium-134	pCi/L	05/21/2015	N001	0	-	0	0.186	U	#	4.04	2.19
Cesium-137	pCi/L	05/21/2015	N001	0	-	0	0.896	U	#	4.13	2.2
Cobalt-60	pCi/L	05/21/2015	N001	0	-	0	0.7	U	#	4.82	2.43
Europium-152	pCi/L	05/21/2015	N001	0	-	0	2.23	U	#	12	7.56
Europium-154	pCi/L	05/21/2015	N001	0	-	0	3.76	U	#	13.5	7.52
Europium-155	pCi/L	05/21/2015	N001	0	-	0	9.85	U	#	14	10.2
Lead-212	pCi/L	05/21/2015	N001	0	-	0	2.08	U	#	6.98	6.57
Oxidation Reduction Potential	mV	05/21/2015	N001	0	-	0	120		#		
pH	s.u.	05/21/2015	N001	0	-	0	7.83		#		
Potassium-40	pCi/L	05/21/2015	N001	0	-	0	0	U	#	46.3	29.1
Promethium-144	pCi/L	05/21/2015	N001	0	-	0	0.64	U	#	3.93	2.17
Promethium-146	pCi/L	05/21/2015	N001	0	-	0	-1.75	U	#	4.27	2.58
Ruthenium-106	pCi/L	05/21/2015	N001	0	-	0	-.907	U	#	37.2	20.5
Specific Conductance	umhos /cm	05/21/2015	N001	0	-	0	860		#		

Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Kevin Whelan WELL Whelan Ranch Loc

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Temperature	C	05/21/2015	N001	0	-	0	13.12		#		
Thorium-234	pCi/L	05/21/2015	N001	0	-	0	196	U	#	255	221
Tritium	pCi/L	05/21/2015	N001	0	-	0	192	U	#	291	179
Turbidity	NTU	05/21/2015	N001	0	-	0	1.74		#		
Uranium-235	pCi/L	05/21/2015	N001	0	-	0	-2.28	U	#	25	18
Uranium-238	pCi/L	05/21/2015	N001	0	-	0	196	U	#	255	221
Yttrium-88	pCi/L	05/21/2015	N001	0	-	0	0.628	U	#	6.68	3.43

Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site

REPORT DATE: 09/08/2015

Location: Morrissania Ranch WELL Formerly Glen Schwab Ranch/Robert Searcy Ranch; Sauter Douglas; Rothgery, Wayne and Debra; Douglas K. Sauter AP

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	05/21/2015	N001	0	-	0	7.48	U	#	13.1	7.96
Americium-241	pCi/L	05/21/2015	N001	0	-	0	5.34	U	#	30.3	19.1
Antimony-125	pCi/L	05/21/2015	N001	0	-	0	-1.82	U	#	8.46	4.96
Cerium-144	pCi/L	05/21/2015	N001	0	-	0	-1.67	U	#	25.3	15
Cesium-134	pCi/L	05/21/2015	N001	0	-	0	-.0268	U	#	3.55	1.9
Cesium-137	pCi/L	05/21/2015	N001	0	-	0	0.532	U	#	3.53	1.86
Cobalt-60	pCi/L	05/21/2015	N001	0	-	0	0.444	U	#	3.43	1.76
Europium-152	pCi/L	05/21/2015	N001	0	-	0	3.64	U	#	10.2	6.32
Europium-154	pCi/L	05/21/2015	N001	0	-	0	-1.24	U	#	10	5.62
Europium-155	pCi/L	05/21/2015	N001	0	-	0	-3.65	U	#	12.7	7.78
Lead-212	pCi/L	05/21/2015	N001	0	-	0	3.14	U	#	7.21	4.8
Oxidation Reduction Potential	mV	05/21/2015	N001	0	-	0	125		#		
pH	s.u.	05/21/2015	N001	0	-	0	7.96		#		
Potassium-40	pCi/L	05/21/2015	N001	0	-	0	3.13	U	#	45.3	23.8
Promethium-144	pCi/L	05/21/2015	N001	0	-	0	1.19	U	#	3.17	1.67
Promethium-146	pCi/L	05/21/2015	N001	0	-	0	0.976	U	#	4.4	2.44
Ruthenium-106	pCi/L	05/21/2015	N001	0	-	0	12.7	U	#	32.1	17.9
Specific Conductance	umhos /cm	05/21/2015	N001	0	-	0	560		#		

Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site

REPORT DATE: 09/08/2015

Location: Morrissania Ranch WELL Formerly Glen Schwab Ranch/Robert Searcy Ranch; Sauter Douglas; Rothgery, Wayne and Debra; Douglas K. Sauter AP

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Temperature	C	05/21/2015	N001	0	-	0	10.63		#		
Thorium-234	pCi/L	05/21/2015	N001	0	-	0	112	U	#	232	212
Tritium	pCi/L	05/21/2015	N001	0	-	0	21.7		#	4	4.73
Turbidity	NTU	05/21/2015	N001	0	-	0	1.88		#		
Uranium-235	pCi/L	05/21/2015	N001	0	-	0	1.14	U	#	24.7	17.5
Uranium-238	pCi/L	05/21/2015	N001	0	-	0	112	U	#	232	212
Yttrium-88	pCi/L	05/21/2015	N001	0	-	0	-.328	U	#	3.9	2.02

Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Patrick McCarty WELL McCartey Genetics 100 ft South (

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	05/21/2015	N001	0	-	0	0.736	U	#	15.6	10.6
Americium-241	pCi/L	05/21/2015	N001	0	-	0	5.05	U	#	24	14.6
Antimony-125	pCi/L	05/21/2015	N001	0	-	0	-.904	U	#	8.65	4.9
Cerium-144	pCi/L	05/21/2015	N001	0	-	0	1.4	U	#	22.3	12.7
Cesium-134	pCi/L	05/21/2015	N001	0	-	0	-1.7	U	#	3.28	2.1
Cesium-137	pCi/L	05/21/2015	N001	0	-	0	0.269	U	#	3.65	2.27
Cobalt-60	pCi/L	05/21/2015	N001	0	-	0	0.369	U	#	3.03	1.69
Europium-152	pCi/L	05/21/2015	N001	0	-	0	-.0913	U	#	9.04	4.98
Europium-154	pCi/L	05/21/2015	N001	0	-	0	1.24	U	#	9.49	4.91
Europium-155	pCi/L	05/21/2015	N001	0	-	0	3.66	U	#	12.5	7.15
Lead-212	pCi/L	05/21/2015	N001	0	-	0	4.83	U	#	5.8	5.56
Oxidation Reduction Potential	mV	05/21/2015	N001	0	-	0	130		#		
pH	s.u.	05/21/2015	N001	0	-	0	7.79		#		
Potassium-40	pCi/L	05/21/2015	N001	0	-	0	-8.5	U	#	46.5	23.9
Promethium-144	pCi/L	05/21/2015	N001	0	-	0	0.19	U	#	3.18	1.93
Promethium-146	pCi/L	05/21/2015	N001	0	-	0	0.875	U	#	3.89	2.11
Ruthenium-106	pCi/L	05/21/2015	N001	0	-	0	8.07	U	#	34.6	19.2
Specific Conductance	umhos /cm	05/21/2015	N001	0	-	0	670		#		

Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Patrick McCarty WELL McCartey Genetics 100 ft South (

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Temperature	C	05/21/2015	N001	0	-	0	11.53		#		
Thorium-234	pCi/L	05/21/2015	N001	0	-	0	164	U	#	254	208
Tritium	pCi/L	05/21/2015	N001	0	-	0	19		#	4.1	4.98
Turbidity	NTU	05/21/2015	N001	0	-	0	1.19		#		
Uranium-235	pCi/L	05/21/2015	N001	0	-	0	16.8	U	#	19.5	20.6
Uranium-238	pCi/L	05/21/2015	N001	0	-	0	164	U	#	254	208
Yttrium-88	pCi/L	05/21/2015	N001	0	-	0	1.28	U	#	5.6	2.82

Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Tim Jacobs Ranch New WELL Jacobs Residence loc is 100 ft S

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	05/21/2015	N001	0	-	0	-10	U	#	23.8	14.8
Americium-241	pCi/L	05/21/2015	N001	0	-	0	23.1	U	#	48.3	30.6
Antimony-125	pCi/L	05/21/2015	N001	0	-	0	-1.38	U	#	13.7	7.46
Cerium-144	pCi/L	05/21/2015	N001	0	-	0	-13.1	U	#	35.2	21.1
Cesium-134	pCi/L	05/21/2015	N001	0	-	0	0.0952	U	#	5.62	2.86
Cesium-137	pCi/L	05/21/2015	N001	0	-	0	1.06	U	#	4.25	2.77
Cobalt-60	pCi/L	05/21/2015	N001	0	-	0	1.06	U	#	7.56	3.76
Europium-152	pCi/L	05/21/2015	N001	0	-	0	-.838	U	#	15.4	8.75
Europium-154	pCi/L	05/21/2015	N001	0	-	0	4.81	U	#	19	9.33
Europium-155	pCi/L	05/21/2015	N001	0	-	0	3.85	U	#	19.8	10.7
Lead-212	pCi/L	05/21/2015	N001	0	-	0	-.554	U	#	12.1	6.99
Oxidation Reduction Potential	mV	05/21/2015	N001	0	-	0	115		#		
pH	s.u.	05/21/2015	N001	0	-	0	7.76		#		
Potassium-40	pCi/L	05/21/2015	N001	0	-	0	16.1	U	#	79.7	37.8
Promethium-144	pCi/L	05/21/2015	N001	0	-	0	0.741	U	#	5.16	2.69
Promethium-146	pCi/L	05/21/2015	N001	0	-	0	2.47	U	#	7.92	4.2
Ruthenium-106	pCi/L	05/21/2015	N001	0	-	0	4.2	U	#	47.8	25
Specific Conductance	umhos /cm	05/21/2015	N001	0	-	0	380		#		

Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site

REPORT DATE: 09/08/2015

Location: Tim Jacobs Ranch New WELL Jacobs Residence loc is 100 ft S

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Temperature	C	05/21/2015	N001	0	-	0	10.79		#		
Thorium-234	pCi/L	05/21/2015	N001	0	-	0	55.5	U	#	386	321
Tritium	pCi/L	05/21/2015	N001	0	-	0	5.68	U	#	290	164
Turbidity	NTU	05/21/2015	N001	0	-	0	0.54		#		
Uranium-235	pCi/L	05/21/2015	N001	0	-	0	21.6	U	#	40.7	26.1
Uranium-238	pCi/L	05/21/2015	N001	0	-	0	55.5	U	#	386	321
Yttrium-88	pCi/L	05/21/2015	N001	0	-	0	-2.81	U	#	6.9	4.28

Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Wesley Kent House W WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	05/21/2015	N001	0	-	0	2.36	U	#	19.2	9.68
Americium-241	pCi/L	05/21/2015	N001	0	-	0	-9.85	U	#	27.7	19.2
Antimony-125	pCi/L	05/21/2015	N001	0	-	0	1.03	U	#	13	6.85
Cerium-144	pCi/L	05/21/2015	N001	0	-	0	-.477	U	#	30	16.4
Cesium-134	pCi/L	05/21/2015	N001	0	-	0	2.21	U	#	5.17	2.35
Cesium-137	pCi/L	05/21/2015	N001	0	-	0	0.677	U	#	4.43	2.26
Cobalt-60	pCi/L	05/21/2015	N001	0	-	0	-.426	U	#	4.47	2.65
Europium-152	pCi/L	05/21/2015	N001	0	-	0	1.88	U	#	14.1	8.29
Europium-154	pCi/L	05/21/2015	N001	0	-	0	0.458	U	#	12.6	5.9
Europium-155	pCi/L	05/21/2015	N001	0	-	0	8.08	U	#	17	9.34
Lead-212	pCi/L	05/21/2015	N001	0	-	0	1.23	U	#	8.35	5.94
Oxidation Reduction Potential	mV	05/21/2015	N001	0	-	0	155		#		
pH	s.u.	05/21/2015	N001	0	-	0	7.92		#		
Potassium-40	pCi/L	05/21/2015	N001	0	-	0	-31.7	U	#	64.4	38.3
Promethium-144	pCi/L	05/21/2015	N001	0	-	0	0.251	U	#	4.26	2.24
Promethium-146	pCi/L	05/21/2015	N001	0	-	0	1.75	U	#	6.43	3.36
Ruthenium-106	pCi/L	05/21/2015	N001	0	-	0	-5.16	U	#	41	22.9
Specific Conductance	umhos /cm	05/21/2015	N001	0	-	0	655		#		

Groundwater Quality Data by Location (USEE100) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Wesley Kent House W WELL

Parameter	Units	Sample ID	Date	Depth Range (Ft BLS)			Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Temperature	C	05/21/2015	N001	0	-	0	12.51		#		
Thorium-234	pCi/L	05/21/2015	N001	0	-	0	165	U	#	330	230
Tritium	pCi/L	05/21/2015	N001	0	-	0	16.9		#	3.75	3.98
Turbidity	NTU	05/21/2015	N001	0	-	0	2.21		#		
Uranium-235	pCi/L	05/21/2015	N001	0	-	0	-2.03	U	#	28.2	17.8
Uranium-238	pCi/L	05/21/2015	N001	0	-	0	165	U	#	330	230
Yttrium-88	pCi/L	05/21/2015	N001	0	-	0	-1.29	U	#	6.09	3.35

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

LAB QUALIFIERS:
- * Replicate analysis not within control limits.
- > Result above upper detection limit.
- B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
- D Analyte determined in diluted sample.
- E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
- H Holding time expired, value suspect.
- IIncreased detection limit due to required dilution.
- J Estimated
- N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
- P > 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
- U Analytical result below detection limit.
- W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
- X,Y,Z Laboratory defined qualifier, see case narrative.

DATA QUALIFIERS:
- F Low flow sampling method used.
- L Less than 3 bore volumes purged prior to sampling.
- U Parameter analyzed for but was not detected.
- G Possible grout contamination, pH > 9.
- Q Qualitative result due to sampling technique.
- X Location is undefined.
- J Estimated value.
- R Unusable result.

QA QUALIFIER:
- # Validated according to quality assurance guidelines.

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Surface Water Quality Data

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Surface Water Quality Data by Location (USEE102) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Battlement Creek SURFACE LOCATION Battlement Creek Loc.

Parameter	Units	Sample ID	Date	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	05/22/2015	0001	5.18	U	#	19.3	19.5
Americium-241	pCi/L	05/22/2015	0001	2.4	U	#	13.5	7.7
Antimony-125	pCi/L	05/22/2015	0001	2.15	U	#	10.8	5.88
Cerium-144	pCi/L	05/22/2015	0001	-8.42	U	#	24.7	15.7
Cesium-134	pCi/L	05/22/2015	0001	0.334	U	#	4.57	2.44
Cesium-137	pCi/L	05/22/2015	0001	1.46	U	#	3.93	2.71
Cobalt-60	pCi/L	05/22/2015	0001	1.61	U	#	4.32	2.44
Europium-152	pCi/L	05/22/2015	0001	-5.49	U	#	9.95	6.88
Europium-154	pCi/L	05/22/2015	0001	-11.1	U	#	10.9	9.72
Europium-155	pCi/L	05/22/2015	0001	4.86	U	#	12.6	7.51
Lead-212	pCi/L	05/22/2015	0001	4.22	U	#	7.99	5.32
Oxidation Reduction Potential	mV	05/22/2015	N001	-42.7		#		
pH	s.u.	05/22/2015	N001	8.26		#		
Potassium-40	pCi/L	05/22/2015	0001	2.31	U	#	63.3	41.2
Promethium-144	pCi/L	05/22/2015	0001	-.784	U	#	4.27	4.46
Promethium-146	pCi/L	05/22/2015	0001	-1.49	U	#	4.73	2.8
Ruthenium-106	pCi/L	05/22/2015	0001	13.8	U	#	39.6	21.9
Specific Conductance	umhos/cm	05/22/2015	N001	180		#		

Surface Water Quality Data by Location (USEE102) FOR SITE RUL01, Rulison Site

REPORT DATE: 09/08/2015

Location: Battlement Creek SURFACE LOCATION Battlement Creek Loc.

Parameter	Units	Sample ID	Date	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Temperature	C	05/22/2015	N001	5.83		#		
Thorium-234	pCi/L	05/22/2015	0001	-68.8	U	#	130	96.4
Tritium	pCi/L	05/22/2015	0001	124	U	#	296	176
Turbidity	NTU	05/22/2015	N001	18.2		#		
Uranium-235	pCi/L	05/22/2015	0001	1.86	U	#	25.2	17
Uranium-238	pCi/L	05/22/2015	0001	-68.8	U	#	130	96.4
Yttrium-88	pCi/L	05/22/2015	0001	0.108	U	#	5.58	2.83

Surface Water Quality Data by Location (USEE102) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: City Springs SURFACE LOCATION Parachute Springs Loc in Bldg

Parameter	Units	Sample ID	Date	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	05/20/2015	N001	-3.88	U	#	13.1	8.67
Americium-241	pCi/L	05/20/2015	N001	4.56	U	#	18.8	11.6
Antimony-125	pCi/L	05/20/2015	N001	-.94	U	#	7.8	5.08
Cerium-144	pCi/L	05/20/2015	N001	-7.05	U	#	23.2	14.2
Cesium-134	pCi/L	05/20/2015	N001	-.512	U	#	3.77	2.11
Cesium-137	pCi/L	05/20/2015	N001	-1.95	U	#	2.88	2.29
Cobalt-60	pCi/L	05/20/2015	N001	-.0835	U	#	3.31	1.72
Europium-152	pCi/L	05/20/2015	N001	0.932	U	#	9.4	5.17
Europium-154	pCi/L	05/20/2015	N001	0.82	U	#	10.1	5.11
Europium-155	pCi/L	05/20/2015	N001	-.507	U	#	11	6.36
Lead-212	pCi/L	05/20/2015	N001	7.2	U	#	7.37	6.28
Oxidation Reduction Potential	mV	05/20/2015	N001	610		#		
pH	s.u.	05/20/2015	N001	7.52		#		
Potassium-40	pCi/L	05/20/2015	N001	9.44	U	#	48.3	24.4
Promethium-144	pCi/L	05/20/2015	N001	2.08	U	#	3.82	2.12
Promethium-146	pCi/L	05/20/2015	N001	0.0684	U	#	3.91	2.18
Ruthenium-106	pCi/L	05/20/2015	N001	1.73	U	#	30.8	16.3
Specific Conductance	umhos/cm	05/20/2015	N001	526		#		

Surface Water Quality Data by Location (USEE102) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: City Springs SURFACE LOCATION Parachute Springs Loc in Bldg

Parameter	Units	Sample ID	Date	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Temperature	C	05/20/2015	N001	13.27		#		
Thorium-234	pCi/L	05/20/2015	N001	-51	U	#	169	101
Tritium	pCi/L	05/20/2015	N001	144	U	#	296	178
Turbidity	NTU	05/20/2015	N001	3.58		#		
Uranium-235	pCi/L	05/20/2015	N001	3.94	U	#	20	16.7
Uranium-238	pCi/L	05/20/2015	N001	-51	U	#	169	101
Yttrium-88	pCi/L	05/20/2015	N001	1.02	U	#	5.77	2.94

Surface Water Quality Data by Location (USEE102) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Potter Ranch SURFACE LOCATION Potter Ranch loc is 100 ft E

Parameter	Units	Sample ID	Date	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	05/27/2015	N001	6.56	U	#	15.3	11.1
Americium-241	pCi/L	05/27/2015	N001	-6.77	U	#	32.9	21
Antimony-125	pCi/L	05/27/2015	N001	5.48	U	#	9.96	5.65
Cerium-144	pCi/L	05/27/2015	N001	9.09	U	#	26.3	15.4
Cesium-134	pCi/L	05/27/2015	N001	-.736	U	#	3.88	2.2
Cesium-137	pCi/L	05/27/2015	N001	2.01	U	#	3.76	2.2
Cobalt-60	pCi/L	05/27/2015	N001	0.114	U	#	4.06	2.09
Europium-152	pCi/L	05/27/2015	N001	-2.51	U	#	10.4	6.12
Europium-154	pCi/L	05/27/2015	N001	2.05	U	#	11.1	5.47
Europium-155	pCi/L	05/27/2015	N001	3.53	U	#	14.1	8.12
Lead-212	pCi/L	05/27/2015	N001	-2.29	U	#	6.87	4.49
Oxidation Reduction Potential	mV	05/27/2015	N001	-37.6		#		
pH	s.u.	05/27/2015	N001	7.44		#		
Potassium-40	pCi/L	05/27/2015	N001	18.6	U	#	37.6	34.6
Promethium-144	pCi/L	05/27/2015	N001	0.37	U	#	3.36	2.29
Promethium-146	pCi/L	05/27/2015	N001	0.245	U	#	4.73	2.64
Ruthenium-106	pCi/L	05/27/2015	N001	19.7	U	#	36.4	19.9
Specific Conductance	umhos/cm	05/27/2015	N001	534		#		

Surface Water Quality Data by Location (USEE102) FOR SITE RUL01, Rulison Site

REPORT DATE: 09/08/2015

Location: Potter Ranch SURFACE LOCATION Potter Ranch loc is 100 ft E

Parameter	Units	Sample ID	Date	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Temperature	C	05/27/2015	N001	12.51		#		
Thorium-234	pCi/L	05/27/2015	N001	-38	U	#	277	175
Tritium	pCi/L	05/27/2015	N001	207	U	#	298	184
Turbidity	NTU	05/27/2015	N001	0.87		#		
Uranium-235	pCi/L	05/27/2015	N001	10.4	U	#	24	17.4
Uranium-238	pCi/L	05/27/2015	N001	-38	U	#	277	175
Yttrium-88	pCi/L	05/27/2015	N001	0.446	U	#	4.61	2.25

Surface Water Quality Data by Location (USEE102) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Spr 300 Yrd N Of GZ SURFACE LOCATION 500 Ft. East Spring loc (ERROR)

Parameter	Units	Sample ID	Date	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	05/21/2015	N001	4.21	U	#	21.1	13.1
Americium-241	pCi/L	05/21/2015	N001	-.604	U	#	7.29	7.19
Antimony-125	pCi/L	05/21/2015	N001	-2.65	U	#	11.4	6.65
Cerium-144	pCi/L	05/21/2015	N001	1.4	U	#	27.7	15.9
Cesium-134	pCi/L	05/21/2015	N001	-1.6	U	#	5.23	3.06
Cesium-137	pCi/L	05/21/2015	N001	0.566	U	#	5.26	2.91
Cobalt-60	pCi/L	05/21/2015	N001	-1.2	U	#	4.39	2.57
Europium-152	pCi/L	05/21/2015	N001	7.05	U	#	14.5	8.36
Europium-154	pCi/L	05/21/2015	N001	-9.11	U	#	14.3	11.5
Europium-155	pCi/L	05/21/2015	N001	-4.5	U	#	12.6	7.7
Lead-212	pCi/L	05/21/2015	N001	6.29	U	#	7.31	8.28
Oxidation Reduction Potential	mV	05/21/2015	N001	125		#		
pH	s.u.	05/21/2015	N001	7.61		#		
Potassium-40	pCi/L	05/21/2015	N001	7.49	U	#	44.6	29.9
Promethium-144	pCi/L	05/21/2015	N001	0.659	U	#	5.13	3.31
Promethium-146	pCi/L	05/21/2015	N001	-2.7	U	#	5.64	3.57
Ruthenium-106	pCi/L	05/21/2015	N001	-11.6	U	#	43.4	30.4
Specific Conductance	umhos/cm	05/21/2015	N001	720		#		

Surface Water Quality Data by Location (USEE102) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Spr 300 Yrd N Of GZ SURFACE LOCATION 500 Ft. East Spring loc (ERROR)

Parameter	Units	Sample ID	Date	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Temperature	C	05/21/2015	N001	6.97		#		
Thorium-234	pCi/L	05/21/2015	N001	23.7	U	#	103	84.1
Tritium	pCi/L	05/21/2015	N001	124	U	#	296	176
Turbidity	NTU	05/21/2015	N001	3.63		#		
Uranium-235	pCi/L	05/21/2015	N001	0	U	#	25.8	26
Uranium-238	pCi/L	05/21/2015	N001	23.7	U	#	103	84.1
Yttrium-88	pCi/L	05/21/2015	N001	1.65	U	#	5.82	2.95

Surface Water Quality Data by Location (USEE102) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Sprg 500ft E of GZ SURFACE LOCATION Weldon Creek Loc 15 ft to South

Parameter	Units	Sample ID	Date	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	05/21/2015	0001	9.68	U	#	22.7	18.7
Americium-241	pCi/L	05/21/2015	0001	7.78	U	#	28.5	17.5
Antimony-125	pCi/L	05/21/2015	0001	-3.44	U	#	11.7	6.87
Cerium-144	pCi/L	05/21/2015	0001	4.32	U	#	34.2	19.4
Cesium-134	pCi/L	05/21/2015	0001	-.438	U	#	5	2.66
Cesium-137	pCi/L	05/21/2015	0001	0.369	U	#	4.62	2.59
Cobalt-60	pCi/L	05/21/2015	0001	0.131	U	#	4.14	2.04
Europium-152	pCi/L	05/21/2015	0001	-.0591	U	#	14.1	7.65
Europium-154	pCi/L	05/21/2015	0001	4.84	U	#	14	6.62
Europium-155	pCi/L	05/21/2015	0001	-.46	U	#	17	9.68
Lead-212	pCi/L	05/21/2015	0001	3.26	U	#	10.1	6.57
Oxidation Reduction Potential	mV	05/21/2015	N001	135		#		
pH	s.u.	05/21/2015	N001	8.18		#		
Potassium-40	pCi/L	05/21/2015	0001	10.7	U	#	50.9	40.3
Promethium-144	pCi/L	05/21/2015	0001	0.307	U	#	4.88	2.67
Promethium-146	pCi/L	05/21/2015	0001	0.425	U	#	5.52	3.35
Ruthenium-106	pCi/L	05/21/2015	0001	18.3	U	#	46.7	27.4
Specific Conductance	umhos/cm	05/21/2015	N001	350		#		

Surface Water Quality Data by Location (USEE102) FOR SITE RUL01, Rulison Site
REPORT DATE: 09/08/2015
Location: Sprg 500ft E of GZ SURFACE LOCATION Weldon Creek Loc 15 ft to South

Parameter	Units	Sample ID	Date	Result	Qualifiers Data	Lab QA	Detection Limit	Uncertainty
Temperature	C	05/21/2015	N001	7.3		#		
Thorium-234	pCi/L	05/21/2015	0001	127	U	#	217	157
Tritium	pCi/L	05/21/2015	0001	235	U	#	292	184
Turbidity	NTU	05/21/2015	N001	12.3		#		
Uranium-235	pCi/L	05/21/2015	0001	-11.3	U	#	32.2	20.8
Uranium-238	pCi/L	05/21/2015	0001	127	U	#	217	157
Yttrium-88	pCi/L	05/21/2015	0001	-.422	U	#	6.75	3.43

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

LAB QUALIFIERS:
* Replicate analysis not within control limits.
> Result above upper detection limit.
B Inorganic: Result is between the IDL and CRDL. Organic: Analyte also found in method blank.
D Analyte determined in diluted sample.
E Inorganic: Estimate value because of interference, see case narrative. Organic: Analyte exceeded calibration range of the GC-MS.
H Holding time expired, value suspect.
IIncreased detection limit due to required dilution.
J Estimated.
N Inorganic or radiochemical: Spike sample recovery not within control limits. Organic: Tentatively identified compound (TIC).
P > 25% difference in detected pesticide or Aroclor concentrations between 2 columns.
U Analytical result below detection limit.
W Post-digestion spike outside control limits while sample absorbance < 50% of analytical spike absorbance.
X,Y,Z Laboratory defined qualifier, see case narrative.

DATA QUALIFIERS:
F Low flow sampling method used.
L Less than 3 bore volumes purged prior to sampling.
U Parameter analyzed for but was not detected.
G Possible grout contamination, pH > 9.
Q Qualitative result due to sampling technique.
X Location is undefined.
J Estimated value.
R Unusable result.

QA QUALIFIER:
Validated according to quality assurance guidelines.

Attachment 3
Sampling and Analysis Work Order

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Stoller Newport News Nuclear

April 24, 2015

Task Assignment 104
Control Number 15-0501

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

SUBJECT: Contract No. DE-LM0000415, Stoller Newport News Nuclear, Inc. (SN3), a wholly owned subsidiary of Huntington Ingalls Industries, Inc.
Task Assignment 104 LTS&M - Nevada Offsites and Monticello
May 2015 Environmental Sampling at the Rulison, Colorado, Site

REFERENCE: Task Assignment 104, 3-104-1-07-619, Rulison, Colorado, Site

Dear Mr. Kleinrath:

The purpose of this letter is to inform you of the upcoming sampling event at the Rulison 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 May 25, 2015.

The following lists show the locations scheduled for sampling during this event.

MONITORING WELLS

Off-Site

CER Test Well	Daniel Gardener	Kevin Whelan	Morrissania Ranch
Patrick McCarty	Tim Jacobs Ranch New		

On-Site

Cary Weldon House W — Wesley Kent House W

Municipal Water Supply

City Springs

SURFACE WATER

On-Site

Spr 300 Yrd N of GZ — Sprg 500ft E of GZ

Off-Site

Battlement Creek — Potter Ranch

All samples will be collected as directed in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites*. Notification for access to locations on private property will be conducted prior to the beginning of fieldwork.

If you have any questions, please call me at (970) 248-6477 or Rick Findlay at (970) 248-6419.

Sincerely,

Richard D. Hutton
Site Lead

RH/lcg/bkb

Enclosures (3)

cc: (electronic)
Christina Pennal, DOE
Steve Donivan, SN3
Lauren Goodknight, SN3
Diana Osborne, SN3
EDD Delivery
rc-grand.junction
File: RUL 400.02

A SUBSIDIARY OF HUNTINGTON INGALLS INDUSTRIES
2597 Legacy Way • Grand Junction, CO 81503-1789 • Telephone (970) 248-6000 • Fax (970) 248-6040

Sampling Frequencies for Locations at Rulison, Colorado

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
Off-Site						
CER Test Well			X			
Daniel Gardener			X			
Kevin Whelan			X			
Morrissania Ranch			X			
Patrick McCarty			X			
Tim Jacobs Ranch New			X			
On-Site						
Cary Weldon House W			X			
Wesley Kent House W			X			
Municipal Water Supply						
City Springs			X			
Surface Locations						
On-Site						
Spr 300 Yrd N Of GZ			X			
Sprg 500ft E of GZ			X			
Off-Site						
Battlement Creek			X			
Potter Ranch			X			

Sampling conducted in May

Constituent Sampling Breakdown

Site	Rulison				
Analyte	Groundwater	Surface Water	Required Detection Limit (mg/L)	Analytical Method	Line Item Code
Approx. No. Samples/yr	9	4			
Field Measurements					
Alkalinity					
Dissolved Oxygen					
Redox Potential					
pH	X	X			
Specific Conductance	X	X			
Turbidity	X				
Temperature	X	X			
Laboratory Measurements					
Aluminum					
Ammonia as N (NH3-N)					
Calcium					
Chloride					
Chromium					
Gamma Spec	X	X	10 pCi/L	Gamma Spectrometry	GAM-A-001
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					
Total Organic Carbon					
Tritium	X	X	400 pCi/L	Liquid Scintillation	LSC-A-001
Tritium, enriched	25% of the samples	25% of the samples	10 pCi/L	Liquid Scintillation	LMR-15
Uranium					
Vanadium					
Zinc					
Total No. of Analytes	3	3			

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

Attachment 4
Trip Report

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Stoller Newport News Nuclear

Memorandum

DATE: June 8, 2015

TO: Rick Hutton

FROM: Jennifer Graham

SUBJECT: Trip Report (LTHMP Sampling)

Site: Rulison, CO

Dates of Sampling Event: May 20 - 22 and 27, 2015

Team Members: Lauren Goodknight, Jeff Price, and Jennifer Graham

Number of Locations Sampled: Samples were collected from 13 of the 13 locations identified on the sampling notification letter, dated April 24, 2015, as follows:

	Locations That Were Sampled	Planned Locations
Monitoring wells	8	8
Surface water locations	4	4
Municipal water supply	1	1

All samples will be analyzed for tritium and gamma spec; a select set of samples will also be analyzed for enriched tritium (Morrissania Ranch, Patrick McCarty, Wesley Kent House W).

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

Location Specific Information:

Location IDs	Comments
Sprg 500ft E of GZ, CER Test Well, Battlement Creek	Turbidity not met. Samples were filtered
Wesley Kent House	Water sampled is from a surface water source.

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

False ID	Ticket Number	True ID	Sample Type	Associated Matrix
2487	NGQ 002	Cary Weldon House W	Duplicate	Groundwater

Requisition Index Number (RIN) Assigned: Samples were assigned to RIN 15057039. Field data sheets can be found in \\crow\RAApps\SMS\15057039\FieldData

Sample Shipment: The samples were shipped overnight FedEx from Grand Junction, Colorado, to GEL Laboratories in Charleston, SC., on May 27, 2015.

Locations Not Sampled/Reason: None.

Water Level Measurements: Water levels were measured in all sampled wells. The water level measurements were recorded in FDCS and uploaded to SEEPro database.

Well Inspection Summary: All wells sampled were in good condition.

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.

Equipment: All equipment functioned properly.

Stakeholder/Regulatory: SN3 site lead Rick Hutton observed sampling operations on May 21, 2015.

Institutional Controls:

Fences, Gates, Locks: None.
Signs: None.
Trespassing/Site Disturbances: N/A

Site Issues:

Disposal Cell/Drainage Structure Integrity: N/A
Vegetation/Noxious Weed Concerns: N/A
Maintenance Requirements: None.
Access Issues: None.
Safety Issues: None.

Corrective Action Required/Taken: None

cc: (electronic)
Art Kleinrath, DOE
Steve Donivan, SN3
Rick Findlay, SN3
Rex Hodges, SN3
Rick Hutton, SN3
EDD Delivery