Data Validation Package

June 2012
Groundwater Sampling at the
Central Nevada Test Area

March 2013

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Sampling Event Summary

Site: Central Nevada Test Area

Sampling Period: June 26–27, 2012

The U.S. Department of Energy Office of Legacy Management conducted annual sampling at the Central Nevada Test Area (CNTA) on June 26–27, 2012, in accordance with the 2004 *Corrective Action Decision Document/Corrective Action Plan for Corrective Action Unit 443: Central Nevada Test Area (CNTA)—Subsurface* and the addendum to the “Corrective Action Decision Document/Corrective Action Plan” completed in 2008. Sampling and analysis were conducted as specified in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PLN/S04351, continually updated). Samples were submitted for analysis as follows:

- Requisition 12064645 was submitted to ALS Laboratory Group in Fort Collins, Colorado, for the determination of bicarbonate alkalinity, bromide, calcium, chloride, gamma spectrometry, gross alpha/beta, magnesium, nitrite + nitrate as nitrogen (N), potassium, silica, sodium, sulfate, and tritium. A sample from location UC-1-P-2SR-2192 was also submitted for carbon-14 analysis for screening purposes only. A duplicate sample from location UC-1-P-2SR-1590 was included with this submittal.
- Requisition 12064646 was submitted to the NSF-Arizona AMS Facility in Tucson, Arizona, for the determination of carbon-14 at location UC-1-P-2SR-1590. This carbon-14 result has not been loaded into the SEEPro database.
- Requisition 12064647 was submitted to Reston Stable Isotope Laboratory in Reston, Virginia, for the determination of stable hydrogen and oxygen isotope ratios.

This monitoring event included sampling and hydrologic logging of well UC-1-P-2SR at multiple levels and sampling piezometers MV-4PZ and MV-5PZ. Tritium was detected in well UC-1-P-2SR, but was not detected in either of the piezometers.

Rick Findlay
Site Lead, S.M. Stoller Corporation

3-11-2013
Date

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CNTA Sample Location Map

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Data Assessment Summary

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Water Sampling Field Activities Verification Checklist

Project	Central Nevada Test Area	Date(s) of Water Sampling	June 26–27, 2012
Date(s) of Verification	October 26, 2012	Name of Verifier	Gretchen Baer

	Response (Yes, No, NA)	Comments
1. Is the SAP the primary document directing field procedures? List other documents, SOPs, instructions.	Yes	Work Order letter dated June 8, 2012.
2. Were the sampling locations specified in the planning documents sampled?	Yes	
3. Was a pre-trip calibration conducted as specified in the above-named documents?	Yes	Calibration was performed on June 25, 2012.
4. Was an operational check of the field equipment conducted daily? Did the operational checks meet criteria?	Yes No	One turbidity check failed slightly low. Because all associated turbidity results were either well below the 10 NTU limit or were higher than the 10 NTU limit, data were not further qualified.
5. Were the number and types (alkalinity, temperature, specific conductance, pH, turbidity, DO, ORP) of field measurements taken as specified?	Yes	Well UC-1-P-1SRC has a dedicated electric submersible pump and one casing volume was purged at high flow rate prior to sample collection per Directive # CNT-2012-01. Wells UC-1-P-2SR, MV-4PZ, and MV-5PZ were sampled with a bailer per Directive # CNT-2012-02.
6. Was the category of the well documented?	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 Cat I wells.
Did the water level stabilize prior to sampling?	NA	
Did pH, specific conductance, and turbidity measurements stabilize prior to sampling?	NA	
Was the flow rate less than 500 mL/min?	NA	
If a portable pump was used, was there a 4-hour delay between pump installation and sampling?	NA	

Water Sampling Field Activities Verification Checklist (continued)

	Response (Yes, No, NA)	Comments
8. Were the following conditions met when purging a Category II well:		
Was the flow rate less than 500 mL/min?	Yes	
Was one pump/tubing volume removed prior to sampling?	Yes	
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	
10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with nondedicated equipment?	Yes	
11. Were trip blanks prepared and included with each shipment of VOC samples?	NA	
12. Were QC samples assigned a fictitious site identification number?	Yes	
Was the true identity of the samples recorded on the Quality Assurance Sample Log or in the Field Data Collection System (FDCS) report?	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. Are field data sheets signed and dated by both team members (hardcopies) or are dates present for the "Date Signed" fields (FDCS)?	Yes	
18. Was all other pertinent information documented on the field data sheets?	Yes	
19. Was the presence or absence of ice in the cooler documented at every sample location?	Yes	
20. Were water levels measured at the locations specified in the planning documents?	Yes	

Laboratory Performance Assessment

General Information

Report No. (RIN): 12064645
Sample Event: June 26–27, 2012
Site(s): Central Nevada Test Area
Laboratory: ALS Laboratory Group, Fort Collins, Colorado
Work Order No.: 1207018
Analysis: Metals, Radiochemistry, and Wet Chemistry
Validator: Gretchen Baer
Review Date: October 26, 2012

This validation was performed according to the *Environmental Procedures Catalog*, (LMS/PRO/S04325, continually updated) “Standard Practice for Validation of Laboratory Data.” The procedure was applied at Level 3, Data 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
Bicarbonate Alkalinity	WCH-A-003	EPA 310.1	EPA 310.1
Bromide, Chloride, Sulfate	MIS-A-045	SW-856 9056	SW-856 9056
Calcium, Magnesium, Potassium, Silica, Sodium	LMM-01	SW-846 3005A	SW-846 6010B
Gross Alpha/Beta	GPC-A-001	SOP 702	SOP 724
Nitrite + Nitrate as Nitrogen (N)	WCH-A-022	EPA 353.2	EPA 353.2
Tritium	LSC-A-001	SOP 700	SOP 704
Carbon-14 (for screening)	LSC-A-012	SOP 772	SOP 704
Gamma Spectrometry	GAM-A-001	SOP 739	SOP 713

Data Qualifier Summary

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
1207018-1	Equipment Blank	Magnesium	U	Less than 5 times the calibration blank
		Potassium	U	Less than 5 times the calibration blank
1207018-2	UC-1-P-2SR-1590 Dup	Magnesium	U	Less than 5 times the calibration blank
		Potassium	U	Less than 5 times the calibration blank
1207018-3	HTH-1RC	Magnesium	U	Less than 5 times the calibration blank
1207018-4	MV-1	Magnesium	U	Less than 5 times the calibration blank
1207018-5	MV-2	Magnesium	U	Less than 5 times the calibration blank
1207018-8	MV-5PZ	Potassium	U	Less than 5 times the calibration blank

Table 2 (continued). Data Qualifier Summary

Sample Number	Location	Analyte	Flag	Reason
1207018-9	UC-1-P-1SRC	Potassium	U	Less than 5 times the calibration blank
1207018-10	UC-1-P-2SR-1590	Magnesium	U	Less than 5 times the calibration blank
		Potassium	U	Less than 5 times the calibration blank
1207018-11	UC-1-P-2SR-2192	Gross Alpha	J	Less than the Determination Limit
		Gross Beta	J	Less than the Determination Limit
		Magnesium	U	Less than 5 times the calibration blank
		Potassium	U	Less than 5 times the calibration blank
1207018-12	UC-1-P-2SR-780	Magnesium	U	Less than 5 times the calibration blank
1207018-12	UC-1-P-2SR-780	Potassium	U	Less than 5 times the calibration blank
All	All	Alkalinity	J	Shipment temperature not compliant
All	All	Nitrite + Nitrate as N	J	Shipment temperature not compliant
All	All	Sulfate	J	Shipment temperature not compliant

Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received 12 water samples on July 3, 2012, accompanied by a Chain of Custody form. Copies of the air bills were included in the receiving documentation. The Chain of Custody 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 was complete with no errors or omissions, with the exception that the wrong bottle size for some samples was listed. Sufficient volumes were received for all analyses and no corrective action was required.

Preservation and Holding Times

The sample shipment was received intact with the temperature inside the iced cooler at 7.4 °C, which does not comply with requirements. The alkalinity, sulfate, and nitrate + nitrite as N methods require cold preservation; all associated results are qualified with a “J” flag as estimated values. All other samples were preserved correctly. All samples were received in the correct container types and all samples were analyzed within the applicable holding times.

Detection and Quantitation Limits

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

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

The reported MDLs for all metal and wet chemical analytes, and MDCs for radiochemical analytes demonstrate compliance with contractual requirements. Some detection limits were above the Line Item Code required detection limits (RDLs) for tritium and bicarbonate alkalinity. With one exception, results are well above the RDLs and no corrective action is necessary. The result for bicarbonate alkalinity in the sample from MV-2, however, was reported as a non-detect at an elevated detection limit. This is acceptable because the pH of the native sample was >10.5 and bicarbonate alkalinity is negligible.

Laboratory Instrument Calibration

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

Method EPA 310.1, Alkalinity

There are no calibration requirements associated with the determination of alkalinity.

Method EPA 353.2, Nitrite + Nitrate as Nitrogen

Calibrations were performed using seven calibration standards on July 9, 2012. The calibration curve correlation coefficient values were greater than 0.995 and the absolute values of the intercepts were less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency resulting in seven verification checks. All calibration checks met the acceptance criteria.

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

Calibrations were performed on July 18 and 20, 2012, using three standards. The correlation coefficient values were greater than 0.995. The absolute values of the intercepts were not less than 3 times the MDL; however, these intercepts were less than the Line Item Code RDLs and all results were above the absolute values of the intercepts. Initial and continuing calibration verification checks were made at the required frequency resulting in 26 verification checks. 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 9056, Bromide, Chloride, Sulfate

Calibrations were performed using five calibration standards on June 12, 2012. The calibration curve correlation coefficient values were greater than 0.995 and the absolute values of the intercepts were less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency resulting in ten verification checks. All calibration checks met the acceptance criteria.

Radiochemical Analysis

Carbon-14 (Submitted for screening purposes. The results will not be loaded into SEEPro.)

The quench calibration curve was generated on February 7, 2012, for quench indicator values ranging from 503 to 776. Nitromethane was added to the samples to adjust the sample quench values within the calibration range for the analysis. A high-energy window (Window 2) was established to monitor for any potential interferences that might be present due to higher energy beta emitters that would bias the results high. All samples had Window 2 count rates that were within the control limits. Daily instrument performance checks were acceptable.

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.

Gross Alpha/Beta

Plateau calibrations were performed in June 2012. Alpha and beta attenuation calibrations were performed in June 2012, covering a range of 21 to 166 milligrams (mg). All standards were counted to a minimum of 10,000 counts. All calibration and background checks met acceptance criteria. The residual mass was less than 100 mg for all samples.

Tritium

The tritium quench calibration curve was generated on August 1, 2011, for quench indicator values ranging from 147 to 262. Nitromethane was added to the samples to adjust the sample quench values within the calibration range for the analysis. A high-energy window (Window 2) was established to monitor for any potential interferences that might be present due to higher energy beta emitters that would bias the results high. All samples had Window 2 count rates that were within the control limits. Daily instrument performance checks were acceptable.

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 were below the PQLs with the exception of a blank for nitrate + nitrite as N; all associated results were non-detects so no further qualification is necessary. In cases where a blank concentration exceeds the MDL, the associated sample results are qualified with a “U” flag (not detected) when the sample result is greater than the MDL but less than 5 times the blank concentration. For some metals, the blanks were negative and the absolute values were greater than the MDL but less than the PQL. All associated results for field samples were greater than 5 times the MDL, so no results are qualified. The radiochemistry method blank results were less than the DLC.

Inductively Coupled Plasma Interference Check Sample Analysis

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

Matrix Spike Analysis

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

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for non-radiochemical replicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. For radiochemical measurements, the relative error ratio (the ratio of the absolute difference between the sample and duplicate results and the sum of the 1-sigma uncertainties) is used to evaluate duplicate results and should be less than 3. All replicate results met these criteria, demonstrating acceptable precision.

Laboratory Control Sample

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

Metals Serial Dilution

Serial dilutions were prepared and analyzed for the metals analyses to monitor chemical or physical interferences in the sample matrix. Serial dilution data are evaluated when the concentration of the undiluted sample is greater than 50 times the MDL. No serial dilution data required evaluation.

Completeness

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

Chromatography Peak Integration

The integration of analyte peaks was reviewed for all ion chromatography data. All peak integrations were satisfactory.

Electronic Data Deliverable (EDD) File

The EDD file arrived on July 31, 2012, and the data were loaded into SEEPro on January 8, 2013. The Sample Management System EDD validation module was used to verify that the EDD file was complete and in compliance with requirements. The module compares the contents of the file to the requested analyses to ensure that all and only the requested data are delivered. The contents of the EDD were manually examined to verify that the sample results accurately reflect the data contained in the sample data package.

Anion/Cation Balance

The anion/cation balance is used to determine if major ion concentrations have been quantified correctly. The total anions should balance with (be equal to) the total cations when expressed in milliequivalents per liter (meq/L). Table 3 shows the total anion and cation results from this event and the charge balance, which is a relative percent difference calculation. Typically, a charge balance difference of 10 percent is considered acceptable. The charge balance differences for all wells were below 10 percent.

Table 3. Comparison of Major Anions and Cations

Location	Cations (meq/L)	Anions (meq/L)	Charge Balance (%)
UC-1-P-2SR-1590 Dup	2.77	2.99	3.9
HTH-1RC	5.86	5.76	0.9
MV-1	6.71	5.63	8.8
MV-2	13.00	14.14	4.2
MV-3	10.69	10.14	2.6
MV-4PZ	1.78	1.87	2.4
MV-5PZ	1.97	2.07	2.3
UC-1-P-1SRC	3.54	3.41	1.9
UC-1-P-2SR-1590	2.81	2.95	2.4
UC-1-P-2SR-2192	3.39	3.45	0.9
UC-1-P-2SR-780	2.72	2.83	2.0

SAMPLE MANAGEMENT SYSTEM

General Data Validation Report

RIN: 12064645 Lab Code: PAR Validator: Gretchen Baer Validation Date: 10/25/2012

Project: Central Nevada Test Area Analysis Type: ☒ Metals ☒ General Chem ☒ Rad ☐ Organics

of Samples: 12 Matrix: WATER Requested Analysis Completed: Yes

Chain of Custody

Present: OK Signed: OK Dated: OK

Sample

Integrity: OK Preservation: OK Temperature: NO

Select Quality Parameters

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

All analyses were completed within the applicable holding times.

There are 6 detection limit failures.

There was 1 trip/equipment blank evaluated.

There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM

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Non-Compliance Report: Detection Limits

RIN: 12064645 Lab Code: PAR

Project: Central Nevada Test Area

Validation Date: 10/25/2012

Ticket	Location	Lab Sample ID	Method Code	Lab Method	Analyte Name	Result	Qualifier	Reported Detection Limit	Required Detection Limit	Units
KHY 966	2360	1207018-2	WCH-A-003	EPA310.1	Bicarbonate	74		20	10	MG/L
KHY 960	HTH-1RC	1207018-3	WCH-A-003	EPA310.1	Bicarbonate	220		20	10	MG/L
KHY 957	MV-1	1207018-4	WCH-A-003	EPA310.1	Bicarbonate	97		20	10	MG/L
KHY 958	MV-2	1207018-5	WCH-A-003	EPA310.1	Bicarbonate	50	U	50	10	MG/L
KHY 959	MV-3	1207018-6	WCH-A-003	EPA310.1	Bicarbonate	480		50	10	MG/L
KHY 954	UC-1-P-2SR-2192	1207018-11	LSC-A-001	704R10	H-3	234000		840	400	pCi/L

Date Completed: 7/31/2012

[illegible]

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 12064645 **Lab Code:** PAR **Date Due:** 7/31/2012
Matrix: Water **Site Code:** CNT01 **Date Completed:** 7/31/2012

Analyte	Date Analyzed	CALIBRATION						Method	LCS	MS	MSD	DUP	Serial Dil.
		Int.	R^2	ICV	CCV	ICB	CCB	Blank	%R	%R	%R	RPD	%R
ALKALINITY, Total as CaCO3	07/05/2012							OK	99				
Bicarbonate	07/05/2012												
BROMIDE	06/12/2012	0.012	1.0000	OK		OK							
BROMIDE	07/05/2012				OK		OK	OK	98	104	106	2	
CHLORIDE	06/12/2012	-0.082	1.0000	OK		OK							
CHLORIDE	07/05/2012				OK		OK	OK	95	102	104	1	
Nitrate+Nitrite as N	07/09/2012	0.000	0.9999	OK	OK	OK	OK	OK	102	104	100	3	
SULFATE	06/12/2012	0.355	0.9999	OK		OK							
SULFATE	07/05/2012				OK		OK	OK	98	103	104	1	

SAMPLE MANAGEMENT SYSTEM

Radiochemistry Data Validation Worksheet

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RIN: 12064645 Lab Code: PAR Date Due: 7/31/2012
 Matrix: Water Site Code: CNT01 Date Completed: 7/31/2012

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate
UC-1-P-2SR-219	Actinium-228	07/07/2012						2.11
UC-1-P-2SR-219	Americium-241	07/07/2012						1.44
Blank_Spike	Americium-241	07/07/2012				90.10		
UC-1-P-2SR-219	Antimony-125	07/07/2012						1.15
UC-1-P-2SR-219	Carbon-14	07/10/2012						2.25
Blank_Spike	Carbon-14	07/10/2012				89.70		
UC-1-P-2SR-219	Carbon-14	07/10/2012					80.9	
Blank	Carbon-14	07/10/2012	-90.2000	U				
UC-1-P-2SR-219	Cerium-144	07/07/2012						0.73
UC-1-P-2SR-219	Cesium-134	07/07/2012						0.68
UC-1-P-2SR-219	Cesium-137	07/07/2012						0.44
Blank_Spike	Cesium-137	07/07/2012				95.40		
UC-1-P-2SR-219	Cobalt-60	07/07/2012						1.27
Blank_Spike	Cobalt-60	07/07/2012				95.20		
UC-1-P-2SR-219	Europium-152	07/07/2012						1.91
UC-1-P-2SR-219	Europium-154	07/07/2012						0.82
UC-1-P-2SR-219	Europium-155	07/07/2012						0.70
UC-1-P-2SR-219	GROSS ALPHA	07/05/2012						0.17
Blank	GROSS ALPHA	07/05/2012	-0.0916	U				
UC-1-P-2SR-219	GROSS ALPHA	07/05/2012					99.9	
Blank_Spike	GROSS ALPHA	07/05/2012				83.60		
UC-1-P-2SR-219	GROSS BETA	07/05/2012						0.79
Blank	GROSS BETA	07/05/2012	0.1800	U				
UC-1-P-2SR-219	GROSS BETA	07/05/2012					92.2	
Blank_Spike	GROSS BETA	07/05/2012				103.00		
HTH-1RC	H-3	07/12/2012					99.0	
MV-3	H-3	07/13/2012						0.17
MV-5PZ	H-3	07/13/2012						0.11
Blank	H-3	07/14/2012	-61.3000	U				
Blank_Spike	H-3	07/14/2012				97.50		
UC-1-P-2SR-219	Lead-212	07/07/2012						0.13
UC-1-P-2SR-219	Potassium-40	07/07/2012						1.21

SAMPLE MANAGEMENT SYSTEM

Radiochemistry Data Validation Worksheet

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RIN: 12064645 **Lab Code:** PAR **Date Due:** 7/31/2012
Matrix: Water **Site Code:** CNT01 **Date Completed:** 7/31/2012

Sample	Analyte	Date Analyzed	Result	Flag	Tracer %R	LCS %R	MS %R	Duplicate
UC-1-P-2SR-219	Promethium-144	07/07/2012						0.59
UC-1-P-2SR-219	Promethium-146	07/07/2012						1.40
UC-1-P-2SR-219	Ruthenium-106	07/07/2012						0.15
UC-1-P-2SR-219	Thorium-234	07/07/2012						0.23
UC-1-P-2SR-219	Uranium-235	07/07/2012						1.11
UC-1-P-2SR-219	Yttrium-88	07/07/2012						0.58

General Information

Report Numbers (RIN): 12064646
Sample Event: June 27, 2012
Site(s): Central Nevada Test Area
Laboratory: NSF-Arizona AMS Facility, Tucson, AZ
Analysis: Carbon-14 (Dissolved Inorganic Carbon Only)
Validator: Steve Donovan
Review Date: October 22, 2012

This validation was performed according to the *Environmental Procedures Catalog*, (LMS/PRO/S04325, continually updated) "Standard Practice for Validation of Laboratory Data." The procedure was applied at Level 1, Data Deliverables Examination. All analyses were successfully completed. The sample was prepared and analyzed using accepted procedures based on methods specified by line item code, which are listed in Table 4.

Table 4. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
Carbon-14 (DIC*)	LMR-18	AMS Facility SOP	Accelerator Mass Spectrometry (AMS)

*DIC = Dissolved Inorganic Carbon

Data Qualifier Summary

None of the analytical results required qualification.

Sample Shipping/Receiving

The NSF-Arizona AMS Facility in Tucson, Arizona, received one water sample on August 8, 2012, submitted for the determination of carbon-14 associated with the dissolved inorganic carbon. The analytical report was checked to confirm that all of the samples scheduled were received and analyzed. All analyses were successfully completed.

Preservation and Holding Times

The sample shipment was received intact with the sample in the correct container type preserved correctly for the requested analyses. The sample was analyzed within the applicable holding times.

Laboratory Instrument Calibration

Data for this RIN were reported at Analysis Service Level B (results only) and do not include calibration data.

Completeness

Carbon-14 associated with the dissolved inorganic carbon and results were reported as requested for the sample submitted.

General Information

Report Numbers (RINs): 12064647
Sample Event: June 26–27, 2012
Site(s): Central Nevada Test Area
Laboratory: Reston Stable Isotope Laboratory, Reston, Virginia
Analysis: Stable Isotopes
Validator: Steve Donovan
Review Date: October 22, 2012

This validation was performed according to the *Environmental Procedures Catalog*, (LMS/PRO/S04325, continually updated) “Standard Practice for Validation of Laboratory Data.” The procedure was applied at Level 1, Data Deliverables Examination. 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 5.

Table 5. Analytes and Methods

Analyte	Line Item Code	Prep Method	Analytical Method
H-2/H-1 and O-18/O-16–Isotope Ratios	LMW-08	NA	Mass Spectrometry

Data Qualifier Summary

None of the analytical results required qualification.

Sample Shipping/Receiving

The Reston Stable Isotope Laboratory in Reston, Virginia, received 10 water samples on August 1, 2012, submitted for the determination of stable hydrogen and oxygen isotope ratios. The analytical report was checked to confirm that all of the samples scheduled were received and analyzed.

Preservation and Holding Times

The sample shipment was received intact with all samples in the correct container types preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times.

Laboratory Analysis

Hydrogen-isotope-ratio analyses were performed using a hydrogen equilibration technique (Coplen and others, 1991; Revesz and Coplen, 2008a), rather than the zinc technique. The hydrogen equilibration technique measures deuterium activity, whereas the zinc technique measures deuterium concentration. For the majority of samples—with the exception of brines—the difference in reported isotopic compositions between the two techniques is not significant.

Water samples are measured for delta O-18 using the CO₂ equilibration technique of Epstein and Mayeda (1953), which has been automated (Revesz and Coplen, 2008b). Therefore, both oxygen and hydrogen isotopic ratio measurements are reported as activities.

Reporting of Stable Hydrogen and Oxygen Isotope Ratios Oxygen and hydrogen isotopic results are reported in per mill relative to VSMOW (Vienna Standard Mean Ocean Water) and normalized (Coplen, 1994) on scales such that the oxygen and hydrogen isotopic values of SLAP (Standard Light Antarctic Precipitation) are -55.5 per mill and -428 per mill, respectively. Oxygen isotopic results of a sample Z can be expressed relative to VPDB (Vienna Peedee belemnite) using the equation:

$$\text{Delta O-18 of Z relative to VPDB} = (0.97001 \times \text{delta O-18 of Z relative to VSMOW}) - 29.99$$

The 2-sigma uncertainties of oxygen and hydrogen isotopic results are 0.2 per mill and 2 per mill, respectively, unless otherwise indicated. This means that if the same sample were resubmitted for isotopic analysis, the newly measured value would lie within the uncertainty bounds 95 percent of the time.

Completeness

The EDD was the only deliverable received for this RIN.

EDD File

The EDD file arrived on September 6, 2012.

Sampling Quality Control Assessment

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

Sampling Protocol

Sample results for wells HTH-1RC, MV-1, MV-2, and MV-3 met the low-flow sampling criteria and were qualified with an “F” flag, indicating the wells were purged and sampled using the low-flow sampling method and with a “Q” flag, indicating the data are considered qualitative because these are Category II wells.

As per Program Directives CNT-2012-01 and CNT-2012-02, some wells were *not* sampled using low-flow criteria. Well UC-1-P-1SRC was sampled using a dedicated high-flow submersible pump and wells UC-1-P-2SR, MV-4PZ, and MV-5PZ were sampled with a bailer. At the high-flow well, the field parameters specified in the directive met the required stability criteria over the final three readings.

Equipment Blank Assessment

Equipment blanks are prepared and analyzed to document contamination attributable to the sample collection process. An equipment blank (field ID 2359) was collected by pouring deionized water through the bailer used to collect some samples. This rinsate was then filtered before being containerized and preserved according to analytical requirements. Silicon and sodium were detected in the equipment blank. All associated sample results are greater than 10 times the equipment blank, so no data qualification is necessary. Magnesium and potassium were detected in the blank by the laboratory, but these analytes were qualified during data validation with a “U” flag as not detected. The equipment blank results indicate adequate decontamination of the sampling equipment.

Field Duplicate Assessment

Field duplicate samples are collected and analyzed as an indication of overall precision of the measurement process. The precision observed includes both field and laboratory precision and has more variability than laboratory duplicates, which measure only laboratory performance. Duplicate samples were collected from location UC-1-P-2SR-1590. For non-radiochemical measurements, the relative percent difference for duplicate results that are greater than 5 times the PQL should be less than 20 percent. For results less than 5 times the PQL, the range should be no greater than the PQL. For radiochemical measurements, the relative error ratio (the ratio of the absolute difference between the sample and duplicate results and the sum of the 1-sigma uncertainties) is used to evaluate duplicate results and should be less than 3. All duplicate results met these criteria, demonstrating acceptable precision.

SAMPLE MANAGEMENT SYSTEM
Validation Report: Equipment/Trip Blanks

Page 1 of 1

RIN: 12064645 **Lab Code:** PAR **Project:** Central Nevada Test Area **Validation Date:** 10/25/2012

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Equipment Blank	1207018-1	SW6010	Silica	44	B	9.5	UG/L

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
1207018-10	KHY 955	UC-1-P-2SR-1590	19000	1		
1207018-11	KHY 954	UC-1-P-2SR-2192	30000	1		
1207018-12	KHY 956	UC-1-P-2SR-780	12000	1		
1207018-7	KHY 963	MV-4PZ	11000	1		
1207018-8	KHY 964	MV-5PZ	19000	1		

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Equipment Blank	1207018-1	SW6010	Silicon	21	B	4.4	UG/L

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
1207018-10	KHY 955	UC-1-P-2SR-1590	8700	1		
1207018-11	KHY 954	UC-1-P-2SR-2192	14000	1		
1207018-12	KHY 956	UC-1-P-2SR-780	5400	1		
1207018-7	KHY 963	MV-4PZ	4900	1		
1207018-8	KHY 964	MV-5PZ	8800	1		

Blank Data

Blank Type	Lab Sample ID	Lab Method	Analyte Name	Result	Qualifier	MDL	Units
Equipment Blank	1207018-1	SW6010	Sodium	180	B	6.6	UG/L

Sample ID	Sample Ticket	Location	Result	Dilution Factor	Lab Qualifier	Validation Qualifier
1207018-10	KHY 955	UC-1-P-2SR-1590	62000	1		
1207018-11	KHY 954	UC-1-P-2SR-2192	74000	1		
1207018-12	KHY 956	UC-1-P-2SR-780	60000	1		
1207018-7	KHY 963	MV-4PZ	24000	1		
1207018-8	KHY 964	MV-5PZ	20000	1		

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

Page 1 of 1

RIN: 12064645 **Lab Code:** PAR **Project:** Central Nevada Test Area **Validation Date:** 10/25/2012

Duplicate: 2360

Sample: UC-1-P-2SR-1590

Analyte	Sample				Duplicate				RPD	RER	Units
	Result	Flag	Error	Dilution	Result	Flag	Error	Dilution			
Bicarbonate	67			1	74			1			MG/L
Calcium	1600			1	1600			1	0		UG/L
CHLORIDE	4.8			1	4.8			1	0		MG/L
H-3	3070		544	1	2740		497	1	11.36	0.9	pCi/L
Magnesium	60	B		1	62	B		1			UG/L
Nitrate+Nitrite as N	0.011			1	0.01	U		1			MG/L
Potassium	1200			1	1200			1	0		UG/L
Silica	19000			1	18000			1	5.41		UG/L
Silicon	8700			1	8300			1	4.71		UG/L
Sodium	62000			1	61000			1	1.63		UG/L
SULFATE	23			1	23			1	0		MG/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:

Steve Donovan
Steve Donovan

3-8-2013
Date

Data Validation Lead:

Gretchen Baer
Gretchen Baer

3/7/13
Date

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Attachment 1

Assessment of Anomalous Data

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Potential Outliers Report

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Potential Outliers Report

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

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

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

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

No laboratory results from this sampling event were identified as potential outliers. The data for this RIN are acceptable as qualified.

Potential anomalies in the field parameters were also examined for patterns of repeated high or low bias, which suggest a systematic error due to instrument malfunction. No such patterns were found. All field data from this event are acceptable.

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Attachment 2

Data Presentation

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Groundwater Quality Data

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General Water Quality Data by Location (USEE105) FOR SITE CNT01, Central Nevada Test Area Site

REPORT DATE: 2/22/2013

Location: HTH-1RC WELL Previously in database as HTH-1, until reconditioned on 5/6/2009

Parameter	Units	Sample		Depth Range		Result	Qualifiers			Detection Limit	Uncertainty
		Date	ID	(Ft BLS)			Lab	Data	QA		
Bicarbonate	mg/L	06/27/2012	N001	2357.7 5	- 5	220		JFQ	#	20	
Calcium	mg/L	06/27/2012	N001	2357.7 5	- 5	3.2		FQ	#	0.012	
Chloride	mg/L	06/27/2012	N001	2357.7 5	- 5	21		FQ	#	1	
Dissolved Oxygen	mg/L	06/27/2012	N002	2357.7 5	- 5	1.49			0		
Magnesium	mg/L	06/27/2012	N001	2357.7 5	- 5	0.055	B	UFQ	#	0.013	
Nitrate + Nitrite as Nitrogen	mg/L	06/27/2012	N001	2357.7 5	- 5	0.01	U	JFQ	#	0.01	
Oxidation Reduction Potential	mV	06/27/2012	N002	2357.7 5	- 5	-136.2			0		
pH	s.u.	06/27/2012	N002	2357.7 5	- 5	8.16			0		
Potassium	mg/L	06/27/2012	N001	2357.7 5	- 5	1.8		FQ	#	0.11	
Silica	mg/L	06/27/2012	N001	2357.7 5	- 5	67		FQ	#	0.0095	
Silicon	mg/L	06/27/2012	N001	2357.7 5	- 5	31		FQ	#	0.0044	
Sodium	mg/L	06/27/2012	N001	2357.7 5	- 5	130		FQ	#	0.0066	
Specific Conductance	umhos/cm	06/27/2012	N002	2357.7 5	- 5	607			0		
Stable isotope ratio H2/H1 in Water	parts per thousand	06/27/2012	0002	2357.7 5	- 5	-118.33			0		
Stable isotope ratio O18/O16 in Water	parts per thousand	06/27/2012	0002	2357.7 5	- 5	-15.39			0		
Sulfate	mg/L	06/27/2012	N001	2357.7 5	- 5	37		JFQ	#	0.5	
Temperature	C	06/27/2012	N002	2357.7 5	- 5	16.14			0		
Tritium	pCi/L	06/27/2012	N001	2357.7 5	- 5	-30.1	U	FQ	#	340	201
Turbidity	NTU	06/27/2012	N002	2357.7 5	- 5	5.98			0		

General Water Quality Data by Location (USEE105) FOR SITE CNT01, Central Nevada Test Area Site
REPORT DATE: 2/22/2013
Location: MV-1 WELL

Parameter	Units	Sample		Depth Range		Result	Qualifiers			Detection Limit	Uncertainty
		Date	ID	(Ft BLS)			Lab	Data	QA		
Bicarbonate	mg/L	06/26/2012	0001	3750	- 3909.5 6	97		JFQ	#	20	
Calcium	mg/L	06/26/2012	0001	3750	- 3909.5 6	2.6		FQ	#	0.012	
Chloride	mg/L	06/26/2012	0001	3750	- 3909.5 6	46		FQ	#	1	
Dissolved Oxygen	mg/L	06/26/2012	N002	3750	- 3909.5 6	0.7			0		
Magnesium	mg/L	06/26/2012	0001	3750	- 3909.5 6	0.066	B	UFQ	#	0.013	
Nitrate + Nitrite as Nitrogen	mg/L	06/26/2012	0001	3750	- 3909.5 6	0.01	U	JFQ	#	0.01	
Oxidation Reduction Potential	mV	06/26/2012	N002	3750	- 3909.5 6	-173.5			0		
pH	s.u.	06/26/2012	N002	3750	- 3909.5 6	9.26			0		
Potassium	mg/L	06/26/2012	0001	3750	- 3909.5 6	2.1		FQ	#	0.11	
Silica	mg/L	06/26/2012	0001	3750	- 3909.5 6	100		FQ	#	0.095	
Silicon	mg/L	06/26/2012	0001	3750	- 3909.5 6	48		FQ	#	0.044	
Sodium	mg/L	06/26/2012	0001	3750	- 3909.5 6	150		FQ	#	0.0066	
Specific Conductance	umhos/cm	06/26/2012	N002	3750	- 3909.5 6	685			0		
Stable isotope ratio H2/H1 in Water	parts per thousand	06/26/2012	0002	3750	- 3909.5 6	-117.28			0		
Stable isotope ratio O18/O16 in Water	parts per thousand	06/26/2012	0002	3750	- 3909.5 6	-15.21			0		
Sulfate	mg/L	06/26/2012	0001	3750	- 3909.5 6	6.5		JFQ	#	0.5	
Temperature	C	06/26/2012	N002	3750	- 3909.5 6	15.99			0		
Tritium	pCi/L	06/26/2012	0001	3750	- 3909.5 6	-10.5	U	FQ	#	340	202
Turbidity	NTU	06/26/2012	N002	3750	- 3909.5 6	49.3			0		

General Water Quality Data by Location (USEE105) FOR SITE CNT01, Central Nevada Test Area Site
REPORT DATE: 2/22/2013
Location: MV-2 WELL

Parameter	Units	Sample		Depth Range		Result	Qualifiers			Detection Limit	Uncertainty
		Date	ID	(Ft BLS)			Lab	Data	QA		
Bicarbonate	mg/L	06/27/2012	N001	3039.4 9	- 4	50	U	JFQ	#	50	
Calcium	mg/L	06/27/2012	N001	3039.4 9	- 4	1.5		FQ	#	0.012	
Chloride	mg/L	06/27/2012	N001	3039.4 9	- 4	220		FQ	#	4	
Dissolved Oxygen	mg/L	06/27/2012	N002	3039.4 9	- 4	1.2			0		
Magnesium	mg/L	06/27/2012	N001	3039.4 9	- 4	0.016	B	UFQ	#	0.013	
Nitrate + Nitrite as Nitrogen	mg/L	06/27/2012	N001	3039.4 9	- 4	0.01	U	JFQ	#	0.01	
Oxidation Reduction Potential	mV	06/27/2012	N002	3039.4 9	- 4	-235.3			0		
pH	s.u.	06/27/2012	N002	3039.4 9	- 4	10.88			0		
Potassium	mg/L	06/27/2012	N001	3039.4 9	- 4	46		FQ	#	0.11	
Silica	mg/L	06/27/2012	N001	3039.4 9	- 4	120		FQ	#	0.095	
Silicon	mg/L	06/27/2012	N001	3039.4 9	- 4	55		FQ	#	0.044	
Sodium	mg/L	06/27/2012	N001	3039.4 9	- 4	270		FQ	#	0.066	
Specific Conductance	umhos/cm	06/27/2012	N002	3039.4 9	- 4	1617			0		
Stable isotope ratio H2/H1 in Water	parts per thousand	06/27/2012	0002	3039.4 9	- 4	-115.91			0		
Stable isotope ratio O18/O16 in Water	parts per thousand	06/27/2012	0002	3039.4 9	- 4	-14.94			0		
Sulfate	mg/L	06/27/2012	N001	3039.4 9	- 4	100		JFQ	#	10	
Temperature	C	06/27/2012	N002	3039.4 9	- 4	17.62			0		
Tritium	pCi/L	06/27/2012	N001	3039.4 9	- 4	-159	U	FQ	#	340	200
Turbidity	NTU	06/27/2012	N002	3039.4 9	- 4	3.42			0		

General Water Quality Data by Location (USEE105) FOR SITE CNT01, Central Nevada Test Area Site
REPORT DATE: 2/22/2013
Location: MV-3 WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Data	QA	Detection Limit	Uncertainty
Bicarbonate	mg/L	06/26/2012	0001	4046 - 4207.75	480		JFQ	#	50	
Calcium	mg/L	06/26/2012	0001	4046 - 4207.75	20		FQ	#	0.012	
Chloride	mg/L	06/26/2012	0001	4046 - 4207.75	19		FQ	#	2	
Dissolved Oxygen	mg/L	06/26/2012	N002	4046 - 4207.75	0.89			0		
Magnesium	mg/L	06/26/2012	0001	4046 - 4207.75	0.33	B	FQ	#	0.013	
Nitrate + Nitrite as Nitrogen	mg/L	06/26/2012	0001	4046 - 4207.75	0.01	U	JFQ	#	0.01	
Oxidation Reduction Potential	mV	06/26/2012	N002	4046 - 4207.75	-79.4			0		
pH	s.u.	06/26/2012	N002	4046 - 4207.75	7.23			0		
Potassium	mg/L	06/26/2012	0001	4046 - 4207.75	3.7		FQ	#	0.11	
Silica	mg/L	06/26/2012	0001	4046 - 4207.75	67		FQ	#	0.0095	
Silicon	mg/L	06/26/2012	0001	4046 - 4207.75	31		FQ	#	0.0044	
Sodium	mg/L	06/26/2012	0001	4046 - 4207.75	220		FQ	#	0.066	
Specific Conductance	umhos/cm	06/26/2012	N002	4046 - 4207.75	946			0		
Stable isotope ratio H2/H1 in Water	parts per thousand	06/26/2012	0002	4046 - 4207.75	-113.82			0		
Stable isotope ratio O18/O16 in Water	parts per thousand	06/26/2012	0002	4046 - 4207.75	-15.37			0		
Sulfate	mg/L	06/26/2012	0001	4046 - 4207.75	0.61		JFQ	#	0.5	
Temperature	C	06/26/2012	N002	4046 - 4207.75	16.4			0		
Tritium	pCi/L	06/26/2012	0001	4046 - 4207.75	-38.2	U	FQ	#	340	200
Turbidity	NTU	06/26/2012	N002	4046 - 4207.75	15.3			0		

General Water Quality Data by Location (USEE105) FOR SITE CNT01, Central Nevada Test Area Site
REPORT DATE: 2/22/2013
Location: MV-4PZ WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Bicarbonate	mg/L	06/26/2012	0001	918.25 - 978.25	83		J	#	10	
Bromide	mg/L	06/26/2012	0001	918.25 - 978.25	0.2	U		#	0.2	
Calcium	mg/L	06/26/2012	0001	918.25 - 978.25	13			#	0.012	
Chloride	mg/L	06/26/2012	0001	918.25 - 978.25	2.9			#	0.2	
Magnesium	mg/L	06/26/2012	0001	918.25 - 978.25	0.55	B		#	0.013	
Nitrate + Nitrite as Nitrogen	mg/L	06/26/2012	0001	918.25 - 978.25	0.26		J	#	0.01	
Oxidation Reduction Potential	mV	06/26/2012	N002	918.25 - 978.25	-1.6			0		
pH	s.u.	06/26/2012	N002	918.25 - 978.25	8.36			0		
Potassium	mg/L	06/26/2012	0001	918.25 - 978.25	1.7			#	0.11	
Silica	mg/L	06/26/2012	0001	918.25 - 978.25	11			#	0.0095	
Silicon	mg/L	06/26/2012	0001	918.25 - 978.25	4.9			#	0.0044	
Sodium	mg/L	06/26/2012	0001	918.25 - 978.25	24			#	0.0066	
Specific Conductance	umhos/cm	06/26/2012	N002	918.25 - 978.25	201			0		
Stable isotope ratio H2/H1 in Water	parts per thousand	06/26/2012	0002	918.25 - 978.25	-105.77			0		
Stable isotope ratio O18/O16 in Water	parts per thousand	06/26/2012	0002	918.25 - 978.25	-13.95			0		
Sulfate	mg/L	06/26/2012	0001	918.25 - 978.25	5.2		J	#	0.5	
Tritium	pCi/L	06/26/2012	0001	918.25 - 978.25	-1.13	U		#	340	201
Turbidity	NTU	06/26/2012	N002	918.25 - 978.25	811			0		

General Water Quality Data by Location (USEE105) FOR SITE CNT01, Central Nevada Test Area Site
REPORT DATE: 2/22/2013
Location: MV-5PZ WELL

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
						Lab	Data	QA		
Bicarbonate	mg/L	06/26/2012	0001	1017.7 - 1077.7	91		J	#	10	
Bromide	mg/L	06/26/2012	0001	1017.7 - 1077.7	0.2	U		#	0.2	
Calcium	mg/L	06/26/2012	0001	1017.7 - 1077.7	20			#	0.012	
Chloride	mg/L	06/26/2012	0001	1017.7 - 1077.7	3.9			#	0.2	
Magnesium	mg/L	06/26/2012	0001	1017.7 - 1077.7	0.84	B		#	0.013	
Nitrate + Nitrite as Nitrogen	mg/L	06/26/2012	0001	1017.7 - 1077.7	0.26		J	#	0.01	
Oxidation Reduction Potential	mV	06/26/2012	N002	1017.7 - 1077.7	64.3			0		
pH	s.u.	06/26/2012	N002	1017.7 - 1077.7	8.13			0		
Potassium	mg/L	06/26/2012	0001	1017.7 - 1077.7	1.4		U	#	0.11	
Silica	mg/L	06/26/2012	0001	1017.7 - 1077.7	19			#	0.0095	
Silicon	mg/L	06/26/2012	0001	1017.7 - 1077.7	8.8			#	0.0044	
Sodium	mg/L	06/26/2012	0001	1017.7 - 1077.7	20			#	0.0066	
Specific Conductance	umhos/cm	06/26/2012	N002	1017.7 - 1077.7	197			0		
Stable isotope ratio H2/H1 in Water	parts per thousand	06/26/2012	0002	1017.7 - 1077.7	-105.54			0		
Stable isotope ratio O18/O16 in Water	parts per thousand	06/26/2012	0002	1017.7 - 1077.7	-13.91			0		
Sulfate	mg/L	06/26/2012	0001	1017.7 - 1077.7	5.7		J	#	0.5	
Temperature	C	06/26/2012	N002	1017.7 - 1077.7	28.21			0		
Tritium	pCi/L	06/26/2012	0001	1017.7 - 1077.7	-104	U		#	340	196
Turbidity	NTU	06/26/2012	N002	1017.7 - 1077.7	1000	>		0		

General Water Quality Data by Location (USEE105) FOR SITE CNT01, Central Nevada Test Area Site
REPORT DATE: 2/22/2013
Location: UC-1-P-1SRC WELL Previously in database as UC-1-P-1S, until reconditioned on 6/2/2009

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Bicarbonate	mg/L	06/27/2012	N001	512.04 - 573.02	160		J	#	10	
Calcium	mg/L	06/27/2012	N001	512.04 - 573.02	48			#	0.012	
Chloride	mg/L	06/27/2012	N001	512.04 - 573.02	2.3			#	0.2	
Dissolved Oxygen	mg/L	06/27/2012	N001	512.04 - 573.02	6.78			#		
Magnesium	mg/L	06/27/2012	N001	512.04 - 573.02	5.5			#	0.013	
Nitrate + Nitrite as Nitrogen	mg/L	06/27/2012	N001	512.04 - 573.02	0.29		J	#	0.01	
Oxidation Reduction Potential	mV	06/27/2012	N001	512.04 - 573.02	25.3			#		
pH	s.u.	06/27/2012	N001	512.04 - 573.02	7.28			#		
Potassium	mg/L	06/27/2012	N001	512.04 - 573.02	1.5		U	#	0.11	
Silica	mg/L	06/27/2012	N001	512.04 - 573.02	31			#	0.0095	
Silicon	mg/L	06/27/2012	N001	512.04 - 573.02	14			#	0.0044	
Sodium	mg/L	06/27/2012	N001	512.04 - 573.02	15			#	0.0066	
Specific Conductance	umhos/cm	06/27/2012	N001	512.04 - 573.02	326			#		
Stable isotope ratio H2/H1 in Water	parts per thousand	06/27/2012	0002	512.04 - 573.02	-108.12			0		
Stable isotope ratio O18/O16 in Water	parts per thousand	06/27/2012	0002	512.04 - 573.02	-14.21			0		
Sulfate	mg/L	06/27/2012	N001	512.04 - 573.02	6		J	#	0.5	
Temperature	C	06/27/2012	N001	512.04 - 573.02	18.02			#		
Tritium	pCi/L	06/27/2012	N001	512.04 - 573.02	-78	U		#	340	200
Turbidity	NTU	06/27/2012	N001	512.04 - 573.02	5.31			#		

General Water Quality Data by Location (USEE105) FOR SITE CNT01, Central Nevada Test Area Site

REPORT DATE: 2/22/2013

Location: UC-1-P-2SR WELL Previously in database as UC-1-P-2S, UC-1-P-2R & UC-1-P-2. Per Rex Hodges combining into 1 location.

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)	Result	Qualifiers Lab	Data	QA	Detection Limit	Uncertainty
Actinium-228	pCi/L	06/27/2012	0003	2192 - 2192	9.63	U		#	15	9.1
Americium-241	pCi/L	06/27/2012	0003	2192 - 2192	-2.9	U		#	24	14.3
Antimony-125	pCi/L	06/27/2012	0003	2192 - 2192	3.23	U		#	11	6.33
Bicarbonate	mg/L	06/26/2012	0001	780 - 780	61		J	#	10	
Bicarbonate	mg/L	06/27/2012	0001	1590 - 1590	67		J	#	10	
Bicarbonate	mg/L	06/27/2012	0002	1590 - 1590	74		J	#	20	
Bicarbonate	mg/L	06/27/2012	0003	2192 - 2192	110		J	#	10	
Calcium	mg/L	06/26/2012	0001	780 - 780	1.5			#	0.012	
Calcium	mg/L	06/27/2012	0001	1590 - 1590	1.6			#	0.012	
Calcium	mg/L	06/27/2012	0002	1590 - 1590	1.6			#	0.012	
Calcium	mg/L	06/27/2012	0003	2192 - 2192	2.8			#	0.012	
Cerium-144	pCi/L	06/27/2012	0003	2192 - 2192	6.26	U		#	21	12.4
Cesium-134	pCi/L	06/27/2012	0003	2192 - 2192	0.905	U		#	5.2	3.12
Cesium-137	pCi/L	06/27/2012	0003	2192 - 2192	-.916	U		#	5.1	2.93
Chloride	mg/L	06/26/2012	0001	780 - 780	4.9			#	0.2	
Chloride	mg/L	06/27/2012	0001	1590 - 1590	4.8			#	0.2	
Chloride	mg/L	06/27/2012	0002	1590 - 1590	4.8			#	0.2	
Chloride	mg/L	06/27/2012	0003	2192 - 2192	6.1			#	0.2	
Cobalt-60	pCi/L	06/27/2012	0003	2192 - 2192	1.2	U		#	5.8	3.41
Europium-152	pCi/L	06/27/2012	0003	2192 - 2192	-10.5	U		#	32	17.8
Europium-154	pCi/L	06/27/2012	0003	2192 - 2192	0.446	U		#	28	16.6

General Water Quality Data by Location (USEE105) FOR SITE CNT01, Central Nevada Test Area Site

REPORT DATE: 2/22/2013

Location: UC-1-P-2SR WELL Previously in database as UC-1-P-2S, UC-1-P-2R & UC-1-P-2. Per Rex Hodges combining into 1 location.

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)			Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Europium-155	pCi/L	06/27/2012	0003	2192	-	2192	-.555	U		#	12	7.03
Gross Alpha	pCi/L	06/27/2012	0003	2192	-	2192	1.47		J	#	1	0.767
Gross Beta	pCi/L	06/27/2012	0003	2192	-	2192	1.97		J	#	1.6	1.05
Lead-212	pCi/L	06/27/2012	0003	2192	-	2192	0.055	U		#	13	7.55
Magnesium	mg/L	06/26/2012	0001	780	-	780	0.093	B	U	#	0.013	
Magnesium	mg/L	06/27/2012	0001	1590	-	1590	0.06	B	U	#	0.013	
Magnesium	mg/L	06/27/2012	0002	1590	-	1590	0.062	B	U	#	0.013	
Magnesium	mg/L	06/27/2012	0003	2192	-	2192	0.072	B	U	#	0.013	
Nitrate + Nitrite as Nitrogen	mg/L	06/26/2012	0001	780	-	780	0.01	U	J	#	0.01	
Nitrate + Nitrite as Nitrogen	mg/L	06/27/2012	0001	1590	-	1590	0.011		J	#	0.01	
Nitrate + Nitrite as Nitrogen	mg/L	06/27/2012	0002	1590	-	1590	0.01	U	J	#	0.01	
Nitrate + Nitrite as Nitrogen	mg/L	06/27/2012	0003	2192	-	2192	0.01	U	J	#	0.01	
Oxidation Reduction Potential	mV	06/26/2012	N002	780	-	780	-81.3			0		
Oxidation Reduction Potential	mV	06/27/2012	N001	1590	-	1590	-90.3			#		
Oxidation Reduction Potential	mV	06/27/2012	N004	2192	-	2192	-32.1			0		
pH	s.u.	06/26/2012	N002	780	-	780	9.53			0		
pH	s.u.	06/27/2012	N001	1590	-	1590	9.36			#		
pH	s.u.	06/27/2012	N004	2192	-	2192	9.02			0		
Potassium	mg/L	06/26/2012	0001	780	-	780	1.2		U	#	0.11	
Potassium	mg/L	06/27/2012	0001	1590	-	1590	1.2		U	#	0.11	

General Water Quality Data by Location (USEE105) FOR SITE CNT01, Central Nevada Test Area Site

REPORT DATE: 2/22/2013

Location: UC-1-P-2SR WELL Previously in database as UC-1-P-2S, UC-1-P-2R & UC-1-P-2. Per Rex Hodges combining into 1 location.

Parameter	Units	Sample		Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
		Date	ID					Lab	Data	QA		
Potassium	mg/L	06/27/2012	0002	1590	-	1590	1.2		U	#	0.11	
Potassium	mg/L	06/27/2012	0003	2192	-	2192	0.99	B	U	#	0.11	
Potassium-40	pCi/L	06/27/2012	0003	2192	-	2192	-66.9	U		#	150	85.9
Promethium-144	pCi/L	06/27/2012	0003	2192	-	2192	3.29	U		#	5	3.09
Promethium-146	pCi/L	06/27/2012	0003	2192	-	2192	2.52	U		#	5.8	3.54
Ruthenium-106	pCi/L	06/27/2012	0003	2192	-	2192	-4.38	U		#	62	36.8
Silica	mg/L	06/26/2012	0001	780	-	780	12			#	0.0095	
Silica	mg/L	06/27/2012	0001	1590	-	1590	19			#	0.0095	
Silica	mg/L	06/27/2012	0002	1590	-	1590	18			#	0.0095	
Silica	mg/L	06/27/2012	0003	2192	-	2192	30			#	0.0095	
Silicon	mg/L	06/26/2012	0001	780	-	780	5.4			#	0.0044	
Silicon	mg/L	06/27/2012	0001	1590	-	1590	8.7			#	0.0044	
Silicon	mg/L	06/27/2012	0002	1590	-	1590	8.3			#	0.0044	
Silicon	mg/L	06/27/2012	0003	2192	-	2192	14			#	0.0044	
Sodium	mg/L	06/26/2012	0001	780	-	780	60			#	0.0066	
Sodium	mg/L	06/27/2012	0001	1590	-	1590	62			#	0.0066	
Sodium	mg/L	06/27/2012	0002	1590	-	1590	61			#	0.0066	
Sodium	mg/L	06/27/2012	0003	2192	-	2192	74			#	0.0066	
Specific Conductance	umhos/cm	06/26/2012	N002	780	-	780	309			0		
Specific Conductance	umhos/cm	06/27/2012	N001	1590	-	1590	313			#		
Specific Conductance	umhos/cm	06/27/2012	N004	2192	-	2192	368			0		

General Water Quality Data by Location (USEE105) FOR SITE CNT01, Central Nevada Test Area Site

REPORT DATE: 2/22/2013

Location: UC-1-P-2SR WELL Previously in database as UC-1-P-2S, UC-1-P-2R & UC-1-P-2. Per Rex Hodges combining into 1 location.

Parameter	Units	Sample Date	ID	Depth Range (Ft BLS)			Result	Lab	Qualifiers Data	QA	Detection Limit	Uncertainty
Stable isotope ratio H2/H1 in Water	parts per thousand	06/26/2012	0002	780	-	780	-115.41			0		
Stable isotope ratio H2/H1 in Water	parts per thousand	06/27/2012	0004	2192	-	2192	-116.37			0		
Stable isotope ratio H2/H1 in Water	parts per thousand	06/27/2012	0004	1590	-	1590	-114.67			0		
Stable isotope ratio O18/O16 in Water	parts per thousand	06/26/2012	0002	780	-	780	-15.1			0		
Stable isotope ratio O18/O16 in Water	parts per thousand	06/27/2012	0004	2192	-	2192	-15.2			0		
Stable isotope ratio O18/O16 in Water	parts per thousand	06/27/2012	0004	1590	-	1590	-15.12			0		
Sulfate	mg/L	06/26/2012	0001	780	-	780	20		J	#	0.5	
Sulfate	mg/L	06/27/2012	0001	1590	-	1590	23		J	#	0.5	
Sulfate	mg/L	06/27/2012	0002	1590	-	1590	23		J	#	0.5	
Sulfate	mg/L	06/27/2012	0003	2192	-	2192	30		J	#	0.5	
Thorium-234	pCi/L	06/27/2012	0003	2192	-	2192	11.9	U		#	140	83
Tritium	pCi/L	06/26/2012	0001	780	-	780	2650			#	340	485
Tritium	pCi/L	06/27/2012	0001	1590	-	1590	3070			#	340	544
Tritium	pCi/L	06/27/2012	0002	1590	-	1590	2740			#	340	497
Tritium	pCi/L	06/27/2012	0003	2192	-	2192	234000			#	840	35700
Turbidity	NTU	06/26/2012	N002	780	-	780	28.9			0		
Turbidity	NTU	06/27/2012	N001	1590	-	1590	12.2			#		
Turbidity	NTU	06/27/2012	N004	2192	-	2192	35.2			0		
Uranium-235	pCi/L	06/27/2012	0003	2192	-	2192	2.55	U		#	21	12.3
Yttrium-88	pCi/L	06/27/2012	0003	2192	-	2192	-3.79	U		#	12	7.22

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

LAB QUALIFIERS:

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

DATA QUALIFIERS:

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

QA QUALIFIER:

Validated according to quality assurance guidelines.

Equipment Blank Data

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BLANKS REPORT

LAB: PARAGON/ALS LABORATORY GROUP (Fort Collins, CO)

RIN: 12064645

Report Date: 2/22/2013

Parameter	Site Code	Location ID	Sample Date	Sample ID	Units	Result	Qualifiers Lab	Data	Detection Limit	Uncertainty	Sample Type
Bicarbonate	CNT01	0999	06/27/2012	0001	mg/L	5	U	J	5		E
Calcium	CNT01	0999	06/27/2012	0001	mg/L	0.012	U		0.012		E
Chloride	CNT01	0999	06/27/2012	0001	mg/L	0.2	U		0.2		E
Magnesium	CNT01	0999	06/27/2012	0001	mg/L	0.019	B	U	0.013		E
Nitrate + Nitrite as Nitrogen	CNT01	0999	06/27/2012	0001	mg/L	0.01	U	J	0.01		E
Potassium	CNT01	0999	06/27/2012	0001	mg/L	0.29	B	U	0.11		E
Silica	CNT01	0999	06/27/2012	0001	mg/L	0.044	B		0.0095		E
Silicon	CNT01	0999	06/27/2012	0001	mg/L	0.021	B		0.0044		E
Sodium	CNT01	0999	06/27/2012	0001	mg/L	0.18	B		0.0066		E
Sulfate	CNT01	0999	06/27/2012	0001	mg/L	0.5	U	J	0.5		E
Tritium	CNT01	0999	06/27/2012	0001	pCi/L	1.97	U		340	200	E

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

LAB QUALIFIERS:

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

DATA QUALIFIERS:

- F Low flow sampling method used.
- 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.

SAMPLE TYPES:

- E Equipment Blank.

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Static Water Level Data

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STATIC WATER LEVELS (USEE700) FOR SITE CNT01, Central Nevada Test Area Site
REPORT DATE: 2/22/2013

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
HTH-1RC		6011.65	06/27/2012	17:15:25	489.45	5522.2	
MV-1		6070.54	06/26/2012	13:30:17	507.07	5563.47	
MV-2		6190.61	06/27/2012	13:40:44	358.25	5832.36	
MV-3		6168.28	06/26/2012	18:10:02	600.51	5567.77	
MV-5PZ		6040.87	06/26/2012	12:45:20	288.75	5752.12	
UC-1-P-1SRC		6031.59	06/27/2012	18:40:48	281.55	5750.04	

FLOW CODES: B BACKGROUND
 N UNKNOWN

C CROSS GRADIENT
 O ON SITE

D DOWN GRADIENT
 U UPGRADIENT

F OFF SITE

WATER LEVEL FLAGS: D Dry

F Flowing

B Below top of pump

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Attachment 3

Sampling and Analysis Work Order

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established 1959

Task Order LM00-502
Control Number 12-0679

June 8, 2012

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

SUBJECT: Contract No. DE-AM01-07LM00060, S.M. Stoller Corporation (Stoller)
June 2012 Environmental Sampling at Subsurface CAU 443,
Central Nevada Test Area, Nevada

REFERENCE: Task Order LM00-502-07-613, Central Nevada Test Area, Nevada, Site

Dear Mr. Kautsky:

The purpose of this letter is to inform you of the upcoming monitoring event at the Central Nevada Test Area (CNTA). It provides details on the typical sampling activities, the hydraulic head monitoring, and the supplemental activities that are not part of our typical annual monitoring. Typical sampling activities for this annual monitoring event will include the analyses of samples from the site monitoring wells for tritium as specified in the Addendum to the Corrective Action Decision Document/Corrective Action Plan. Supplemental activities for this monitoring event will include sampling and hydrologic logging of well UC-1-P-2SR, sampling piezometers MV-4PZ and MV-5PZ, an enhanced analytical suite for the wells, and removing telemetry equipment from the wells/piezometers at the site.

Well UC-1-P-2SR will be included in this years annual monitoring. Well UC-1-P-2SR penetrates the upper portion of the collapse chimney formed by the underground nuclear test and was logged and sampled by Desert Research Institute (DRI) during the 1990s (1992, 1993, 1995, and 1997; see DRI Report No. 45165, September 1999). Monitoring of this well will assess (1) the current status of groundwater flow in the well using hydrologic logging techniques and (2) the current chemical and radiochemical conditions. The results will be compared to historic data to identify any hydrologic and/or chemical and radiochemical changes within the well. Samples collected from the wells and piezometers MV-4PZ and MV-5PZ will be analyzed to provide information on the geochemical properties of the water and determine the presence or absence of tritium. Hydraulic head levels will be monitored at the site, but the telemetry equipment for the wells and piezometers will be removed to reduce the visual exposure of equipment at the surface and reduce the potential for vandalism at the site. Attached are a map and tables that specify the sampling locations and analytes for the annual monitoring event. This monitoring event is scheduled to begin the week of June 25, 2012.

The S.M. Stoller Corporation 2597 Legacy Way Grand Junction, CO 81503 (970) 248-6000 Fax (970) 248-6040

The following locations are scheduled for sampling during this event:

- **Wells**
 - MV-1, MV-2, MV-3, HTH-1RC, HTH-2, UC-1-P-1SRC, and UC-1-P-2SR
- **Piezometers**
 - MV-4PZ and MV-5PZ

Samples will be collected from the well UC-1-P-2SR and from piezometers MV-4PZ and MV-5PZ using a depth-specific bailer because the well and piezometers are not completed with dedicated submersible pumps. The samples from well UC-1-P-2SR will be collected from multiple intervals within the well and as specified in the supplemental activities discussion below. The samples from the piezometers will be collected from the approximate middle of the screened interval. Monitoring wells UC-1-P-1SRC, and HTH-2* will be sampled using the dedicated submersible electric pumps. At least one well volume will be removed, and field parameters (temperature, pH, and specific conductance) will be allowed to stabilize before samples are collected. Monitoring wells MV-1, MV-2, MV-3, and HTH-1RC will be sampled using the dedicated submersible bladder pumps. These wells will be sampled using the low-flow sampling methodology. Before samples are collected from the wells and piezometers, the transducer will be downloaded, and a water level will be determined. All samples will be collected as directed in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (http://www.lm.doe.gov/Long-Term_Surveillance_and_Maintenance.aspx#) and will meet the requirements of the *Addendum to the Corrective Action Decision Document/Corrective Action Plan (CADD/CAP) for Corrective Action Unit (CAU) 443: Central Nevada Test Area (CNTA) - Subsurface*. Refer to Table 2 for the required analyses.

Supplemental Activities

The following supplemental activities are associated with this monitoring event:

- **UC-1-P-2SR:** The supplemental activities for this well include hydrologic logging and collection of discrete samples from the depths sampled in 1993 (depths are below land surface as feet/meters): 780/238, 1590/485, 2192/668. Samples will not be collected from near the total depth of the well at 2579/786 because of the extensive radiological contamination that has been documented in the upper part of the chimney. Hydrologic logging will be conducted to determine temperature, pH, and electrical conductivity from the water surface to near the total depth of the well. Groundwater flow logging will also be conducted to focus on previous flow meter measurement depths, as well as any new zones of interest identified in the hydrologic logs. Additional samples may be collected at locations identified by the hydrologic logging results. All samples will be analyzed for major cations and anions, stable isotopes of hydrogen and oxygen, and tritium. Samples collected from selected depths will also be analyzed for gamma-emitting radionuclides (using high-resolution gamma spectrometry), gross alpha, gross beta, and carbon-14. A transducer will be installed in the well upon completion of the

* The pump in well HTH-2 failed during a previous monitoring event. The well will not be sampled if the pump is inoperable.

well logging and sampling activities. Refer to Table 2 for the complete analytical suite for this well.

- **Piezometers MV-4PZ and MV-5PZ:** Supplemental activities include the collection of samples from piezometers MV-4PZ and MV-5PZ. These piezometers have been added to the network for this monitoring event because the associated wells MV-4 and MV-5 will not be sampled this year. The Nevada Division of Environmental Protection (NDEP) agreed that sampling the piezometers this year could replace the sampling of wells MV-4 and MV-5 to reduce the impact that operating the submersible electric pumps in these wells has on the water levels at these locations. It is planned that the electric pumps in wells MV-4 and MV-5 will be replaced with low-flow bladder pumps prior to the 2013 sampling event. Adding these piezometers to the sampling network for this monitoring event will provide information on the geochemical properties of the water and the presence or absence of tritium in the upper alluvial aquifer within the graben. Refer to Table 2 for the analytical suite for the piezometers.
- **Enhanced analytical suite:** Supplemental activities include using an enhanced analytical suite for the wells. This will require collecting additional samples from the wells to be analyzed for major anions and cations and for stable isotopes of oxygen and hydrogen. It should be noted that the enhanced analytical suite is in addition to the tritium analysis that is specified in the Addendum to the Corrective Action Decision Document/Corrective Action Plan. The analytical data will provide information on the geochemical properties of the water and will contribute to the evaluation of results with respect to sample location and depth. Refer to Table 2 for the complete analytical suite for the wells.
- **Site telemetry stations:** Supplemental activities include removing the telemetry stations and associated equipment from the wells and piezometers at the site. NDEP agreed that the telemetry equipment, used to transmit head data on a daily basis, could be removed or phased out as part of future monitoring activities at the site. Removing the telemetry stations will reduce the visual exposure of equipment near the monitoring well locations, but it will not change the frequency for monitoring head levels at the site. Hydraulic head data will continue to be measured using transducers that are installed in the wells and piezometers, and the data will be downloaded during the semiannual visits and included in the annual monitoring reports for the site. It should be noted that the main telemetry station at well MV-3 will remain at the site to transmit soil moisture data associated with the UC-1 Central Mud Pit.

Please contact me at (970) 248-6419 if you have any questions or concerns.

Sincerely,

Rick Hutton

Digitally signed by Rick Hutton
DN: c=us, o=u.s. government,
ou=department of energy,
ou=headquarters, ou=people, cn=Rick
Hutton
Date: 2012.06.07 15:00:19 -06'00'

Rick Findlay
Site Lead

RF/lcg/dc
Enclosures (3)

Mark Kautsky
Control Number 12-0679
Page 4

Attachments: Table 1 – Sampling Frequencies for Locations at Central Nevada Test Area
Table 2 – Constituent Sampling Breakdown for Central Nevada Test Area
Figure 1 – Planned Sampling Map, Central Nevada Test Area

cc: (electronic)
Karl Stoeckle, DOE
Steve Donovan, Stoller
Rick Findlay, Stoller
Bev Gallagher, Stoller
Lauren Goodknight, Stoller
Rex Hodges, Stoller
Rick Hutton, Stoller
EDD Delivery
rc-grand.junction
File: CNT 410.02(A)

Table 1 – Sampling Frequencies for Locations at Central Nevada Test Area

Location ID	Quarterly	Semiannually	Annually	Biennially	Not Sampled	Notes
Monitoring Wells						
MV-1			X			
MV-2			X			
MV-3			X			
HTH-1RC			X			
HTH-2			X			Pump in this well may not be operable
UC-1-P-1SRC			X			
UC-1-P-2SR			X*			
MV-4					X	Allowing additional time for water levels to stabilize from previous sampling event.
MV-5					X	Allowing additional time for water levels to stabilize from previous sampling event.
Piezometers						
MV-1UPZ						
MV-1LPZ						
MV-2UPZ						
MV-2LPZ						
MV-3UPZ						
MV-3LPZ						
MV-4PZ			X*			
MV-5PZ			X*			
HTH-1UPZ						
HTH-1LPZ						

* = This location is part of the 2012 sampling and is not planned for future sampling events.

Table 2 – Constituent Sampling Breakdown for Central Nevada Test Area

	Measurements by Location Type		Laboratory Requirements				
	Wells	Piezometers	Required Detection Limit (mg/L)	Analytical Method	Line Item Code	ALS	University of Arizona
Sample Locations	7	2					
Field Measurements							
Alkalinity							
Dissolved Oxygen	X	X					
Redox Potential	X	X					
pH	X	X					
Specific Conductance	X	X					
Turbidity	X	X					
Temperature	X	X					
Laboratory Measurements							
Aluminum							
Bromide		All Piezometers	0.5	SW-846 9056	MIS-A-045	X	
Calcium	All wells & all sample intervals	All Piezometers	5	SW-846 6010	LMM-01	X	
Carbon-14	UC-1-P-2SR 1591 ft sample interval only		NA	AMS	LMR-18		X
Chloride	All wells & all sample intervals	All Piezometers	0.5	SW-846 9056	MIS-A-045	X	
Chromium							
Gamma Spec	UC-1-P-2SR 2192 ft sample interval only		10 pCi/L	Gamma Spectrometry	GAM-A-001	X	
Gross Alpha	UC-1-P-2SR 2192 ft sample interval only		2 pCi/L	EPA 900.0	GPC-A-001	X	
Gross Beta	UC-1-P-2SR 2192 ft sample interval only		4 pCi/L	EPA 900.0	GPC-A-001	X	
Hydrogen Carbonate (Bicarbonates)	All wells & all sample intervals	All Piezometers	10	SM2320 B	WCH-A-003	X	
Iron							
Lead							
Magnesium	All wells & all sample intervals	All Piezometers	5	SW-846 6010	LMM-01	X	
Nickel							
Nitrate + Nitrite as N (NO3+NO2)-N	All wells & all sample intervals	All Piezometers	0.05	EPA 353.1	WCH-A-022	X	
Potassium	All wells & all sample intervals	All Piezometers	5	SW-846 6010	LMM-01	X	
Selenium							
Silica	All wells & all sample intervals	All Piezometers	0.2	SW-846 6010	LMM-01	X	
Sodium	All wells & all sample intervals	All Piezometers	1	SW-846 6010	LMM-01	X	
Stable Isotopes (Oxygen and Hydrogen)	All wells & all sample intervals	All Piezometers	NA	Mass Spectrometry	LMW-08	X	
Strontium							
Sulfate	All wells & all sample intervals	All Piezometers	0.5	SW-846 9056	MIS-A-045	X	
Sulfide							
Tritium	All wells & all sample intervals	All Piezometers	400 pCi/L	Liquid Scintillation	LSC-A-001	X	
Tritium, enriched							
Uranium							
Vanadium							
Zinc							
Total No. of Analytes	15	12					

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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Memorandum

Control Number N/A

DATE: July 9, 2012
TO: Rick Findlay
FROM: Jeff Price
SUBJECT: Trip Report (LTHMP Sampling)

Site: Central Nevada Test Area (CNTA)

Dates of Sampling Event: June 25-28, 2012

Team Members: Rick Findlay, Rex Hodges, Sam Campbell, and Jeff Price (Stoller); Brad Lyles and Jenny Chapman (DRI).

Number of Locations Sampled: Eight onsite monitoring wells. One of the eight, UC-1-P-2SR, was sampled at three separate depths, 780, 1590, and 2192 feet below surface.

Locations Not Sampled/Reason: HTH-2 was determined during the sampling event last year that the pump motor is probably bad.

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

False Id	True Id	Sample Type	Associated Matrix	Ticket Number
2360	UC-1-P-2SR-1590	Duplicate	Groundwater	KHY 966
2359	N/A	Equipment Blank	DRI Bailer	KHY 965

RIN Number Assigned: Samples were assigned to RIN 12064645, 12064646, and 12064647.

Sample Shipment: Samples for RIN 12064645 were shipped on July 2 to ALS Laboratory Group in Ft. Collins, CO. Analytes associated with the other two RINs are being held for shipment (as directed by project lead).

Water Level Measurements: Water levels for sampled wells (including HTH-2) are presented in the following table.

Well ID	Date/Time	DTW (ft)	Comments
MV-1	6/26/12 10:20	507.07	Water access tube; purge vol = 9.2 gal
MV-1-UPZ	6/26/12 10:05	317.55	Piezometer tube
MV-1-LPZ	6/26/12 10:00	41.21	Piezometer tube
MV-2	6/26/12 18:15	358.25	Water access tube; purge vol = 7.6 gal
MV-2-UPZ	6/26/12 18:20	406.10	Piezometer tube
MV-2-LPZ	6/26/12 18:25	407.67	Piezometer tube

Rick Findlay
 July 9, 2012
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Well ID	Date/Time	DTW (ft)	Comments
MV-3	6/26/12 13:45	600.51	Water access tube; purge vol = 10 gal
MV-3-UPZ	6/26/12 13:35	372.82	Piezometer tube
MV-3-LPZ	6/26/12 13:30	192.81	Piezometer tube
MV-4	6/27/12 16:40	504.85	Water access tube; purge vol = 1,900 gal
MV-4-PZ	6/27/12 16:45	275.32	Piezometer tube
MV-5			Transducers obstructing access tube
MV-5-PZ	6/26/12 12:45	288.75	
HTH-1RC	6/27/12 12:55	489.45	Water access tube; purge vol = 6.2 gal
HTH-1RC-UPZ	6/27/12 13:25	542.71	Piezometer tube
HTH-1RC-LPZ	6/27/12 13:15	541.10	Piezometer tube
HTH-2	6/27/12 16:15	556.15	Water access tube; no purge; pump not working
UC-1-P-1SRC	6/27/12 14:10	281.55	Water access tube; purge vol = 370 gal

DTW = Depth to Water (all measurements obtained from north top of casing)
 Ft = Feet
 ID = Identification

Trip Summary:

The 2012 LTHMP sampling was conducted from June 25-28 by Sam Campbell and Jeff Price (Stoller), and Brad Lyles and Jenny Chapman (DRI). Rick Findlay and Rex Hodges were also on site to perform management oversight and to measure water levels/download transducers. Mark Kautsky and Bill Dam, both DOE, and Mark McLane and Chris Andres (NDEP) were present for site visits.

Samples will be analyzed for metals (Ca, K Mg, Na, SiO₂), alkalinity, anions (Cl, SO₄), nitrate plus nitrite as N, tritium, and stable isotopes of O and H. Gamma spec and gross alpha/beta analyses will be done at UC-1-P-2SR-2192, and carbon-14 analysis will be done on UC-1-P-2SR-1590. The following table lists the bladder pump specifics. Monitoring well UC-1-P-1SRC has a dedicated electric submersible pump, in which one casing volume is purged prior to sample collection.

Well ID	Date Installed	Pump Depth (ft)	DTW (ft)	Drop Tube Length (ft)	Sample Intake Depth (ft)	Tubing Purge Volume Prior to Sampling (Gal)
MV-1	5/30/09	700	510	3100	3800	9.0
MV-2	6/26/09	500	340	2600	3100	7.5
MV-3	6/25/09	800	600	3300	4100	9.6
HTH-1RC	6/24/09	700	540	1900	2600	5.9

(JP/lcg)

cc: (electronic)
 Mark Kautsky, DOE
 Sam Campbell, Stoller
 Paul Darr, Stoller
 Steve Donovan, Stoller
 Jack Duray, Stoller
 Bev Gallagher, Stoller
 Rex Hodges, Stoller
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