

Data Validation Package

**December 2015
Groundwater Sampling at the
Ambrosia Lake, New Mexico,
Disposal Site**

March 2016



U.S. DEPARTMENT OF
ENERGY

Legacy
Management

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Sampling Event Summary

Site: Ambrosia Lake, New Mexico, Disposal Site

Sampling Period: December 3, 2015

The *Long-Term Surveillance Plan for the Ambrosia Lake, New Mexico, Disposal Site* does not require groundwater monitoring because groundwater in the uppermost aquifer is of limited use, and supplemental standards have been applied to the aquifer. However, at the request of the New Mexico Environment Department, the U.S. Department of Energy conducts annual monitoring at three locations: monitoring wells 0409, 0675, and 0678. Sampling and analyses were conducted as specified in the *Sampling and Analysis Plan for U.S. Department of Energy Office of Legacy Management Sites* (LMS/PRO/S04351, continually updated). Monitoring well 0409 was not sampled during this event because it was dry. Water levels were measured at each sampled well. One duplicate sample was collected from location 0675.

Groundwater samples from the two sampled wells were analyzed for the constituents listed in Table 1. Time-concentration graphs for selected analytes are included in this report. At well 0675, the duplicate results for total dissolved solids and for most metals (magnesium, molybdenum, potassium, selenium, sodium, and uranium) were outside acceptance criteria, which may indicate non-homogeneous conditions at this location. November 2014 results for molybdenum and uranium at well 0675 also were outside acceptance criteria. The well condition will be evaluated prior to the next sampling event.

Table 1. 2015 Groundwater Monitoring Analytical Results at the Ambrosia Lake, New Mexico, Site

Analyte	Well 0675 mg/L	Well 0675 (Field Duplicate) mg/L	Well 0678 mg/L
Arsenic	0.0013	0.0014	0.00091
Calcium	460	460	400
Chloride	230	240	380
Magnesium	240	320	510
Molybdenum	3.3	13	0.013
Nitrate + Nitrite as Nitrogen	19	17	230
Potassium	7.4	9.8	33
Selenium	0.63	0.40	0.0080
Sodium	890	1300	3100
Sulfate	3500	3700	8700
Total Dissolved Solids	5200	6400	16000
Uranium	2.1	6.1	0.052

Key: mg/L = milligrams per liter


 Richard K. Johnson, Site Lead
 Navarro Research and Engineering, Inc.

3/16/16
 Date

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LEGEND WELL TO BE SAMPLED SITE BOUNDARY	 SCALE IN FEET 0 500 1,000		U.S. DEPARTMENT OF ENERGY OFFICE OF LEGACY MANAGEMENT	Work Performed by Navarro Research & Engineering, Inc. <small>Under DOE Contract Number DE-LM0000421</small>
	Planned Sampling Map Ambrosia Lake, NM, Disposal Site November 2015			
	DATE PREPARED: October 22, 2015			FILE NAME: S1342100-11x17

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Ambrosia Lake, NM, Disposal Site Planned Sampling Map

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Data Assessment Summary

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Water Sampling Field Activities Verification Checklist

Project	Ambrosia Lake, New Mexico	Date(s) of Water Sampling	December 3, 2015
Date(s) of Verification	February 28, 2016	Name of Verifier	Gretchen Baer

	Response (Yes, No, NA)	Comments
1. Is the SAP the primary document directing field procedures? List any Program Directives or other documents, SOPs, instructions.	Yes	Work Order letter dated November 2, 2015.
2. Were the sampling locations specified in the planning documents sampled?	No	Location 0409 was dry and not sampled.
3. Were field equipment calibrations conducted as specified in the above-named documents?	Yes	
4. Was an operational check of the field equipment conducted daily? Did the operational checks meet criteria?	Yes	
5. Were the number and types (alkalinity, temperature, specific conductance, pH, turbidity, DO, ORP) of field measurements taken as specified?	Yes	
6. Were wells categorized correctly?	Yes	
7. Were the following conditions met when purging a Category I well: Was one pump/tubing volume purged prior to sampling?	Yes	
Did the water level stabilize prior to sampling?	Yes	
Did pH, specific conductance, and turbidity measurements meet criteria prior to sampling?	Yes	
Was the flow rate less than 500 mL/min?	Yes	

Water Sampling Field Activities Verification Checklist (continued)

	Response (Yes, No, NA)	Comments
8. Were the following conditions met when purging a Category II well:		
Was the flow rate less than 500 mL/min?	Yes	
Was one pump/tubing volume removed prior to sampling?	Yes	
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	One duplicate was collected at 0675.
10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with non-dedicated equipment?	NA	All samples were collected with dedicated equipment.
11. Were trip blanks prepared and included with each shipment of VOC samples?	NA	No VOC samples were collected.
12. Were the true identities of the QC samples documented?	Yes	
13. Were samples collected in the containers specified?	Yes	
14. Were samples filtered and preserved as specified?	Yes	
15. Were the number and types of samples collected as specified?	Yes	
16. Were chain of custody records completed and was sample custody maintained?	Yes	
17. Was all pertinent information documented on the field data sheets?	Yes	
18. Was the presence or absence of ice in the cooler documented at every sample location?	Yes	
19. Were water levels measured at the locations specified in the planning documents?	Yes	Water levels were measured in all sampled wells.

Laboratory Performance Assessment

General Information

Report Number (RIN): 15117494
 Sample Event: December 3, 2015
 Site(s): Ambrosia Lake, New Mexico
 Laboratory: ALS Laboratory Group, Fort Collins, Colorado
 Work Order No.: 1512092
 Analysis: Metals and Wet Chemistry
 Validator: Gretchen Baer
 Review Date: February 28, 2016

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 2.

Table 2. Analytes and Methods

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

Data Qualifier Summary

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

Table 3. Data Qualifier Summary

Sample Number	Location	Analyte(s)	Flag	Reason
1512092-1	0675	Magnesium	J	Field duplicate RPD > 20%
1512092-1	0675	Molybdenum	J	Field duplicate RPD > 20%
1512092-1	0675	Potassium	J	Field duplicate RPD > 20%
1512092-1	0675	Selenium	J	Field duplicate RPD > 20%
1512092-1	0675	Sodium	J	Field duplicate RPD > 20%
1512092-1	0675	Total dissolved solids	J	Field duplicate RPD > 20%
1512092-1	0675	Uranium	J	Field duplicate RPD > 20%

Table 3 (continued). Data Qualifier Summary

Sample Number	Location	Analyte(s)	Flag	Reason
1512092-3	0675 Duplicate	Magnesium	J	Field duplicate RPD > 20%
1512092-3	0675 Duplicate	Molybdenum	J	Field duplicate RPD > 20%
1512092-3	0675 Duplicate	Potassium	J	Field duplicate RPD > 20%
1512092-3	0675 Duplicate	Selenium	J	Field duplicate RPD > 20%
1512092-3	0675 Duplicate	Sodium	J	Field duplicate RPD > 20%
1512092-3	0675 Duplicate	Total dissolved solids	J	Field duplicate RPD > 20%
1512092-3	0675 Duplicate	Uranium	J	Field duplicate RPD > 20%

Sample Shipping/Receiving

ALS Laboratory Group in Fort Collins, Colorado, received three water samples on December 4, 2015, accompanied by a Chain of Custody form. A copy of the air bill was included in the receiving documentation. The Chain of Custody form was checked to confirm that all of the samples were listed with sample collection dates and times, and that signatures and dates were present indicating sample relinquishment and receipt. The Chain of Custody form was complete with no errors or omissions.

Preservation and Holding Times

The sample shipment was received intact with the temperature inside the iced cooler at -0.2 °C, which is acceptable. All samples were received in the correct container types and had been preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all 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. The reported MDLs for all 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 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 MCAWW 160.1

There are no initial or continuing calibration requirements associated with the total dissolved solids method.

Method EPA 353.2

Calibrations for nitrate + nitrite as N were performed using seven calibration standards on December 9, 2015. 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. All calibration check results were within the acceptance criteria.

Method SW-846 6010B

Calibrations for calcium, magnesium, potassium, and sodium were performed on December 10, 2015, using three calibration standards. The correlation coefficient values were greater than 0.995. 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. All calibration checks met the acceptance criteria. Reporting limit verification checks were made at the required frequency to verify the linearity of the calibration curve near the PQL and all results were within the acceptance range.

Method SW-846 6020A

Calibrations were performed for arsenic, molybdenum, selenium, and uranium on December 10, 2015, using three calibration standards. The calibration curve correlation coefficient values were greater than 0.995. The absolute values of the calibration curve intercepts were less than 3 times the MDL. Initial and continuing calibration verification checks were made at the required frequency. All calibration checks associated with reported results 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, with the following exception. The selenium check results were above the acceptance range. All associated results were greater than 5 times the PQL, so no qualification is necessary. Mass calibration and resolution verifications were performed at the beginning of each analytical run in accordance with the analytical procedure. Internal standard recoveries associated with requested analytes were stable and within acceptable ranges.

Method SW-846 9056

Calibrations for chloride and sulfate were performed using seven calibration standards on November 20, 2015. 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. All calibration checks met the acceptance criteria.

Method and Calibration Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. Calibration blanks are analyzed to assess instrument contamination prior to and during sample analysis. All method blank and calibration blank results associated with the samples were below the PQL for all analytes. 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.

Inductively Coupled Plasma Interference Check Sample Analysis

Interference check samples were analyzed at the required frequency to verify the instrumental interelement 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. 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 results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. All replicate results met these criteria, demonstrating acceptable precision.

Laboratory Control 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. All evaluated serial dilution data were acceptable.

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 December, 31, 2015. 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 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: 15117494 Lab Code: PAR Validator: Gretchen Baer Validation Date: 2/28/2016
Project: Ambrosia Lake Disposal Site Analysis Type: Metals General Chem Rad Organics
of Samples: 3 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
- Detection Limits
- Field/Trip Blanks
- Field Duplicates

All analyses were completed within the applicable holding times.

The reported detection limits are equal to or below contract requirements.

There was 1 duplicate evaluated.

SAMPLE MANAGEMENT SYSTEM
Metals Data Validation Worksheet

RIN: 15117494 Lab Code: PAR Date Due: 1/1/2016
 Matrix: Water Site Code: AMB01 Date Completed: 1/4/2016

Analyte	Method Type	Date Analyzed	CALIBRATION				Method Blank	LCS %R	MS %R	MSD %R	Dup. RPD	ICSAB %R	Serial Dil. %R	CRI %R
			Int.	R^2	CCV	CCB								
Calcium	ICP/ES	12/10/2015	-0.0150	1.0000	OK	OK	OK	103.0			0.0	99.0	0.0	106.0
Magnesium	ICP/ES	12/10/2015	-0.0230	1.0000	OK	OK	OK	101.0			0.0	102.0	1.0	99.0
Potassium	ICP/ES	12/10/2015	-0.1150	0.9998	OK	OK	OK	102.0	104.0	105.0	2.0			92.0
Sodium	ICP/ES	12/10/2015	-0.0410	0.9999	OK	OK	OK	105.0			1.0		4.0	97.0
Arsenic	ICP/MS	12/10/2015	-0.0080	1.0000	OK	OK	OK	100.0	103.0	101.0	1.0	106.0		103.0
Molybdenum	ICP/MS	12/10/2015	-0.0300	1.0000	OK	OK	OK	99.0			2.0	105.0	10.0	121.0
Selenium	ICP/MS	12/10/2015	-0.0300	1.0000	OK	OK	OK	101.0			2.0	106.0	2.0	145.0
Uranium	ICP/MS	12/10/2015	-0.0030	1.0000	OK	OK	OK	99.0			2.0	103.0	8.0	100.0

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 15117494 **Lab Code:** PAR **Date Due:** 1/1/2016
Matrix: Water **Site Code:** AMB01 **Date Completed:** 1/4/2016

Analyte	Date Analyzed	CALIBRATION				Method Blank	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	CCV	CCB						
CHLORIDE	11/20/2015	0.004	0.9999								
CHLORIDE	12/29/2015			OK	OK	OK	101.00	98.0	98.0	0	
Nitrate+Nitrite as N	12/09/2015	0.000	1.0000	OK	OK	OK	98.00	99.0	97.0	2.00	
Sulfate	11/20/2015	0.349	0.9998								
SULFATE	12/29/2015			OK	OK	OK	102.00	102.0	107.0	1.00	
TOTAL DISSOLVED SOLIDS	12/09/2015			OK	OK	OK	102.00			0	

Sampling Quality Control Assessment

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

Sampling Protocol

Sample results for all monitoring wells were qualified with an “F” flag, indicating the wells were purged and sampled using the low-flow method. At monitoring well location 0675, purging and sampling met the Category I criteria. Monitoring well 0678 was classified as Category II because this well produced water at a rate less than the minimum low-flow purging rate. The sample results for 0678 were qualified with a “Q” flag (qualitative), indicating the samples were not collected under the optimal conditions of the Category I stability criteria.

Equipment Blank Assessment

No equipment blanks were taken. All samples were collected using dedicated equipment that did not require equipment blanks.

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. Duplicate samples were collected from location 0675 (field duplicate ID 2073). The relative percent difference (RPD) for duplicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. The duplicate results for total dissolved solids and for most metals (magnesium, molybdenum, potassium, selenium, sodium, and uranium) were above the criteria; associated results are qualified with a “J” flag as estimated values. The raw data for all metals results were examined and no errors were identified. The laboratory reanalysis of the metals samples confirmed the original results. The field duplicate results may indicate non-homogeneous conditions at location 0675.

SAMPLE MANAGEMENT SYSTEM
Validation Report: Field Duplicates

Page 1 of 1

RIN: 15117494 Lab Code: PAR Project: Ambrosia Lake Disposal Site Validation Date: 2/28/2016

Duplicate: 2073

Sample: 0675

Analyte	Sample				Duplicate				RPD	RER	Units
	Result	Flag	Error	Dilution	Result	Flag	Error	Dilution			
Arsenic	1.3			10	1.4			10	7.41		UG/L
Calcium	460000			5	460000			5	0		UG/L
CHLORIDE	230			50	240			50	4.26		MG/L
Magnesium	240000			5	320000			5	28.57		UG/L
Molybdenum	3300			10	13000			100	119.02		UG/L
Nitrate+Nitrite as N	19			50	17			50	11.11		MG/L
Potassium	7400			5	9800			5	27.91		UG/L
Selenium	630			10	400			10	44.66		UG/L
Sodium	890000			5	1300000			5	37.44		UG/L
SULFATE	3500			50	3700			50	5.56		MG/L
TOTAL DISSOLVED SOLIDS	5200			1	6400			1	20.69		MG/L
Uranium	2100			100	6100			100	97.56		UG/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 3-14-2016
Stephen Donivan Date

Data Validation Lead: Gretchen Baer 3/14/16
Gretchen Baer 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 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 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.** 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 also made 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 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.** The review should include an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values.

The total dissolved solids (TDS) result in well 0678 was identified as a potential outlier (see the Data Validation Outliers Reports, below). The data associated with this result were further reviewed and there were no errors noted. The outlier is due to the narrow historical range for TDS results at this location. 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. The data for this RIN are acceptable as qualified.

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Data Validation Outliers Report - No Field Parameters

Comparison: All historical Data Beginning 1/1/2004

Laboratory: ALS Laboratory Group

RIN: 15117494

Report Date: 2/28/2016

Site Code	Location Code	Sample ID	Sample Date	Analyte	Current	Qualifiers		Historical Maximum			Historical Minimum			Number of Data Points		Statistical Outlier
					Result	Lab	Data	Result	Lab	Data	Result	Lab	Data	N	N Below Detect	
AMB01	0675	N001	12/03/2015	Arsenic	0.00130		F	0.0472	N	FJ	0.00665		F	8	1	No
AMB01	0675	N002	12/03/2015	Arsenic	0.00140		F	0.0472	N	FJ	0.00665		F	8	1	No
AMB01	0675	N001	12/03/2015	Total Dissolved Solids	5200		JF	9370		F	5240		F	8	0	NA
AMB01	0678	N001	12/03/2015	Arsenic	0.00091	J	FQ	0.00470	B	F	0.00160	UN	F	7	3	No
AMB01	0678	N001	12/03/2015	Molybdenum	0.0130		FQ	0.0120		JFQ	0.00432		F	9	0	NA
AMB01	0678	N001	12/03/2015	Sodium	3100		FQ	3040		F	2800		F	7	0	No
AMB01	0678	N001	12/03/2015	Total Dissolved Solids	16000		FQ	14400		F	13900		F	7	0	Yes
AMB01	0678	N001	12/03/2015	Uranium	0.0520		FQ	0.0590		F	0.0527		F	9	0	No

STATISTICAL TESTS:

The distribution of the data is tested for normality or lognormality using the Shapiro-Wilk Test

Outliers are identified using Dixon's Test when there are 25 or fewer data points.

Outliers are identified using Rosner's Test when there are 26 or more data points.

See Data Quality Assessment: Statistical Methods for Practitioners, EPA QC/G-9S, February 2006.

NA: Data are not normally or lognormally distributed.

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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 AMB01, Ambrosia Lake Disposal Site

REPORT DATE: 2/28/2016

Location: 0675 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
								Lab	Data	QA		
Alkalinity, Total (as CaCO ₃)	mg/L	12/03/2015	N001	22.5	-	32.5	898		F	#		
Arsenic	mg/L	12/03/2015	N001	22.5	-	32.5	0.0013		F	#	0.00015	
Arsenic	mg/L	12/03/2015	N002	22.5	-	32.5	0.0014		F	#	0.00015	
Calcium	mg/L	12/03/2015	N001	22.5	-	32.5	460		F	#	0.12	
Calcium	mg/L	12/03/2015	N002	22.5	-	32.5	460		F	#	0.12	
Chloride	mg/L	12/03/2015	N001	22.5	-	32.5	230		F	#	10	
Chloride	mg/L	12/03/2015	N002	22.5	-	32.5	240		F	#	10	
Dissolved Oxygen	mg/L	12/03/2015	N001	22.5	-	32.5	2.72		F	#		
Magnesium	mg/L	12/03/2015	N001	22.5	-	32.5	240		JF	#	0.15	
Magnesium	mg/L	12/03/2015	N002	22.5	-	32.5	320		JF	#	0.15	
Molybdenum	mg/L	12/03/2015	N001	22.5	-	32.5	3.3		JF	#	0.00032	
Molybdenum	mg/L	12/03/2015	N002	22.5	-	32.5	13		JF	#	0.0032	
Nitrate + Nitrite as Nitrogen	mg/L	12/03/2015	N001	22.5	-	32.5	19		F	#	0.5	
Nitrate + Nitrite as Nitrogen	mg/L	12/03/2015	N002	22.5	-	32.5	17		F	#	0.5	
Oxidation Reduction Potential	mV	12/03/2015	N001	22.5	-	32.5	145.7		F	#		
pH	s.u.	12/03/2015	N001	22.5	-	32.5	6.79		F	#		
Potassium	mg/L	12/03/2015	N001	22.5	-	32.5	7.4		JF	#	0.26	
Potassium	mg/L	12/03/2015	N002	22.5	-	32.5	9.8		JF	#	0.26	

Groundwater Quality Data by Location (USEE100) FOR SITE AMB01, Ambrosia Lake Disposal Site

REPORT DATE: 2/28/2016

Location: 0675 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers			Detection Limit	Uncertainty
								Lab	Data	QA		
Selenium	mg/L	12/03/2015	N001	22.5	-	32.5	0.63	JF	#	0.00032		
Selenium	mg/L	12/03/2015	N002	22.5	-	32.5	0.4	JF	#	0.00032		
Sodium	mg/L	12/03/2015	N001	22.5	-	32.5	890	JF	#	0.23		
Sodium	mg/L	12/03/2015	N002	22.5	-	32.5	1300	JF	#	0.23		
Specific Conductance	umhos/cm	12/03/2015	N001	22.5	-	32.5	9504	F	#			
Sulfate	mg/L	12/03/2015	N001	22.5	-	32.5	3500	F	#	25		
Sulfate	mg/L	12/03/2015	N002	22.5	-	32.5	3700	F	#	25		
Temperature	C	12/03/2015	N001	22.5	-	32.5	11.39	F	#			
Total Dissolved Solids	mg/L	12/03/2015	N001	22.5	-	32.5	5200	JF	#	200		
Total Dissolved Solids	mg/L	12/03/2015	N002	22.5	-	32.5	6400	JF	#	200		
Turbidity	NTU	12/03/2015	N001	22.5	-	32.5	1.89	F	#			
Uranium	mg/L	12/03/2015	N001	22.5	-	32.5	2.1	JF	#	0.00029		
Uranium	mg/L	12/03/2015	N002	22.5	-	32.5	6.1	JF	#	0.00029		

Groundwater Quality Data by Location (USEE100) FOR SITE AMB01, Ambrosia Lake Disposal Site

REPORT DATE: 2/28/2016

Location: 0678 WELL

Parameter	Units	Sample		Depth Range (Ft BLS)	Result	Qualifiers			Detection Limit	Uncertainty
		Date	ID			Lab	Data	QA		
Arsenic	mg/L	12/03/2015	N001	261.85 - 281.85	0.00091	J	FQ	#	0.00015	
Calcium	mg/L	12/03/2015	N001	261.85 - 281.85	400		FQ	#	0.24	
Chloride	mg/L	12/03/2015	N001	261.85 - 281.85	380		FQ	#	20	
Dissolved Oxygen	mg/L	12/03/2015	N001	261.85 - 281.85	2.58		FQ	#		
Magnesium	mg/L	12/03/2015	N001	261.85 - 281.85	510		FQ	#	0.3	
Molybdenum	mg/L	12/03/2015	N001	261.85 - 281.85	0.013		FQ	#	0.00032	
Nitrate + Nitrite as Nitrogen	mg/L	12/03/2015	N001	261.85 - 281.85	230		FQ	#	2	
Oxidation Reduction Potential	mV	12/03/2015	N001	261.85 - 281.85	125		FQ	#		
pH	s.u.	12/03/2015	N001	261.85 - 281.85	7.14		FQ	#		
Potassium	mg/L	12/03/2015	N001	261.85 - 281.85	33		FQ	#	0.52	
Selenium	mg/L	12/03/2015	N001	261.85 - 281.85	0.008		FQ	#	0.00032	
Sodium	mg/L	12/03/2015	N001	261.85 - 281.85	3100		FQ	#	0.47	
Specific Conductance	umhos/cm	12/03/2015	N001	261.85 - 281.85	15250		FQ	#		
Sulfate	mg/L	12/03/2015	N001	261.85 - 281.85	8700		FQ	#	50	
Temperature	C	12/03/2015	N001	261.85 - 281.85	12.43		FQ	#		
Total Dissolved Solids	mg/L	12/03/2015	N001	261.85 - 281.85	16000		FQ	#	2000	
Turbidity	NTU	12/03/2015	N001	261.85 - 281.85	3.13		FQ	#		
Uranium	mg/L	12/03/2015	N001	261.85 - 281.85	0.052		FQ	#	0.000029	

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.

Static Water Level Data

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STATIC WATER LEVELS (USEE700) FOR SITE AMB01, Ambrosia Lake Disposal Site
REPORT DATE: 2/28/2016

Location Code	Flow Code	Top of Casing Elevation (Ft)	Measurement Date	Measurement Time	Depth From Top of Casing (Ft)	Water Elevation (Ft)	Water Level Flag
0409		6966.98	12/03/2015	09:57:00			D
0675	D	6966.65	12/03/2015	08:55:31	19.15	6947.50	
0678	C	6987.94	12/03/2015	09:45:33	226.43	6761.51	

FLOW CODES: B BACKGROUND C CROSS GRADIENT D DOWNGRADIENT F OFFSITE
 N UNKNOWN O ONSITE U UPGRADIENT

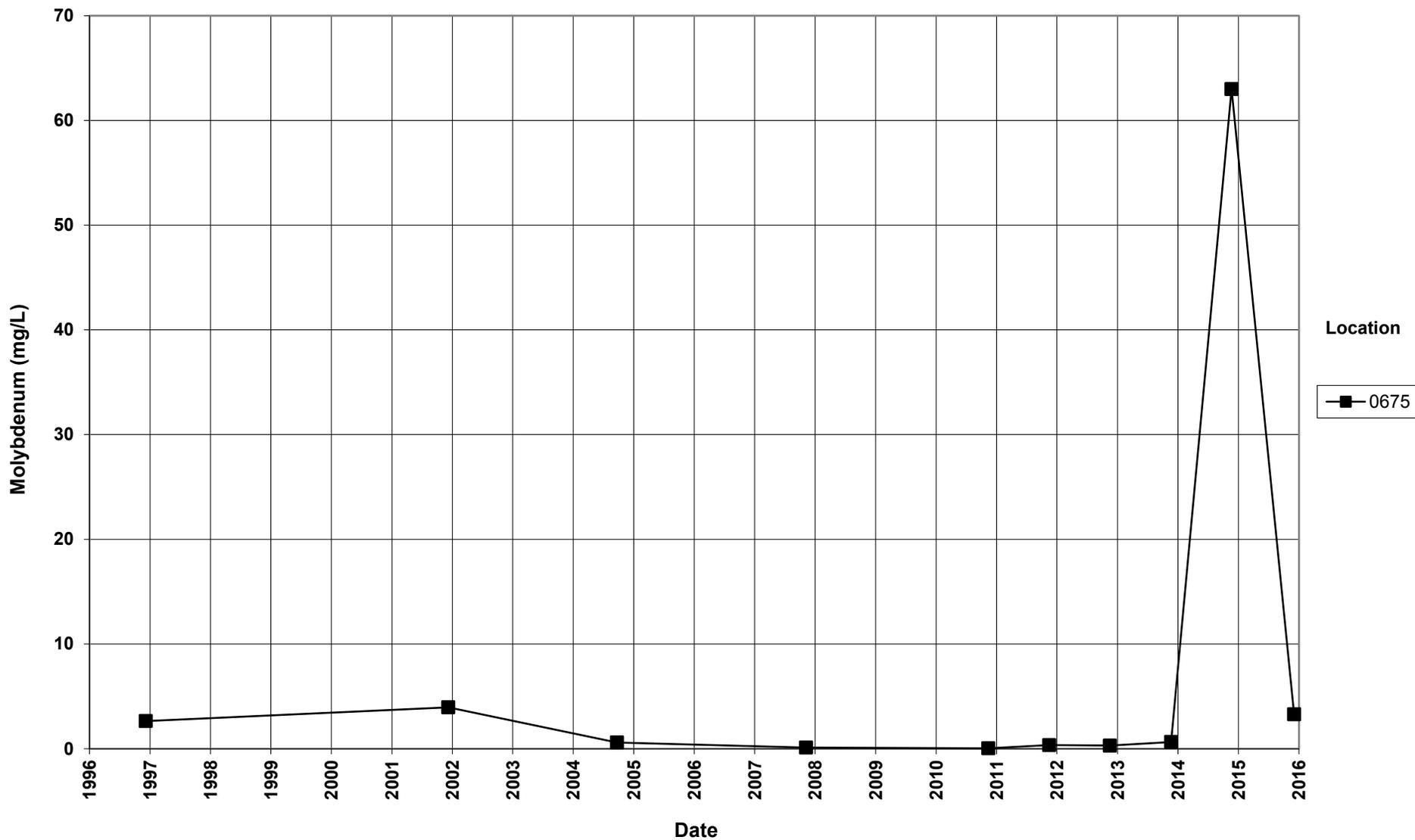
WATER LEVEL FLAGS: D Dry F Flowing B Below top of pump

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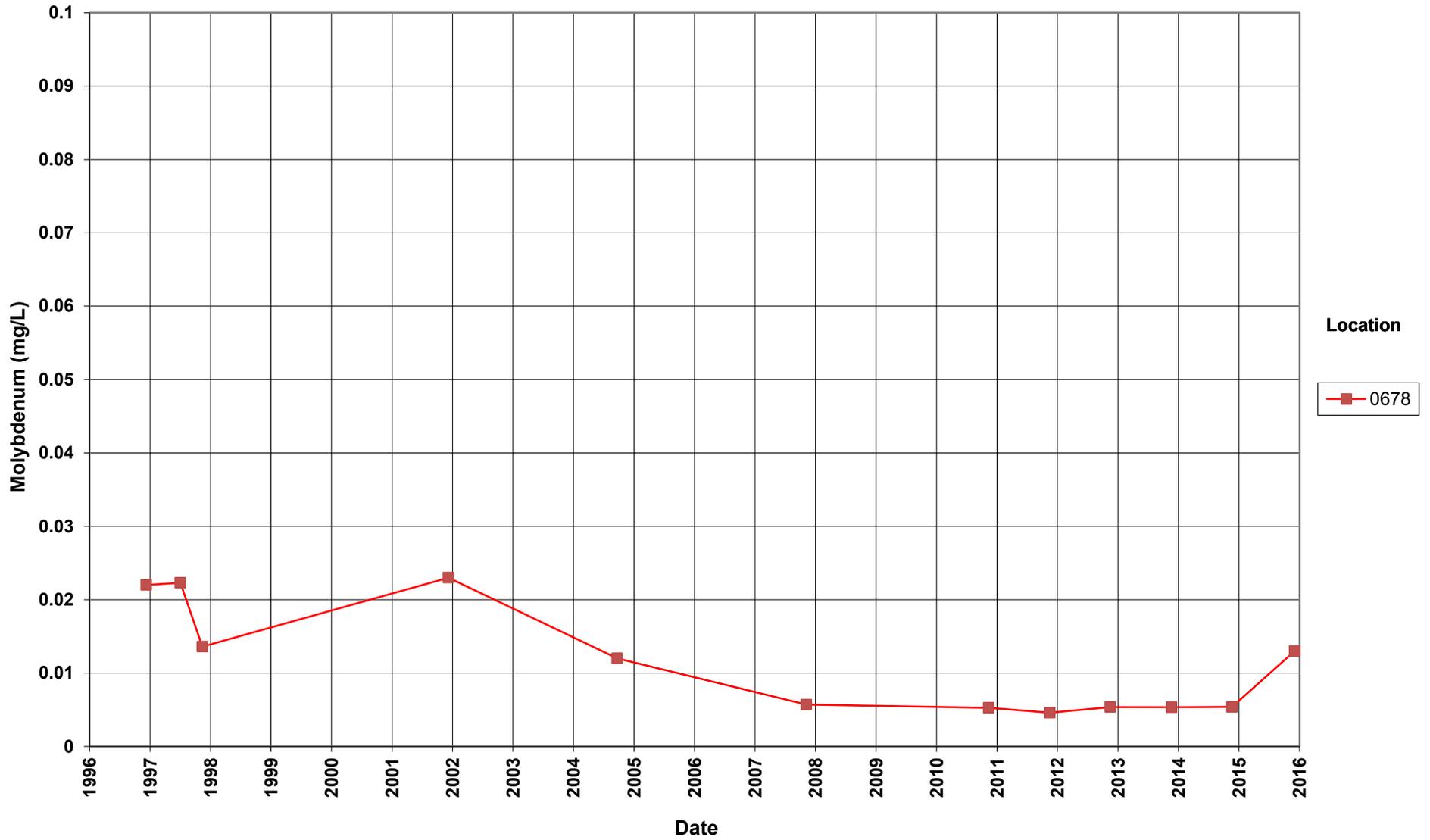
Time-Concentration Graphs

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Ambrosia Lake Disposal Site Molybdenum Concentration



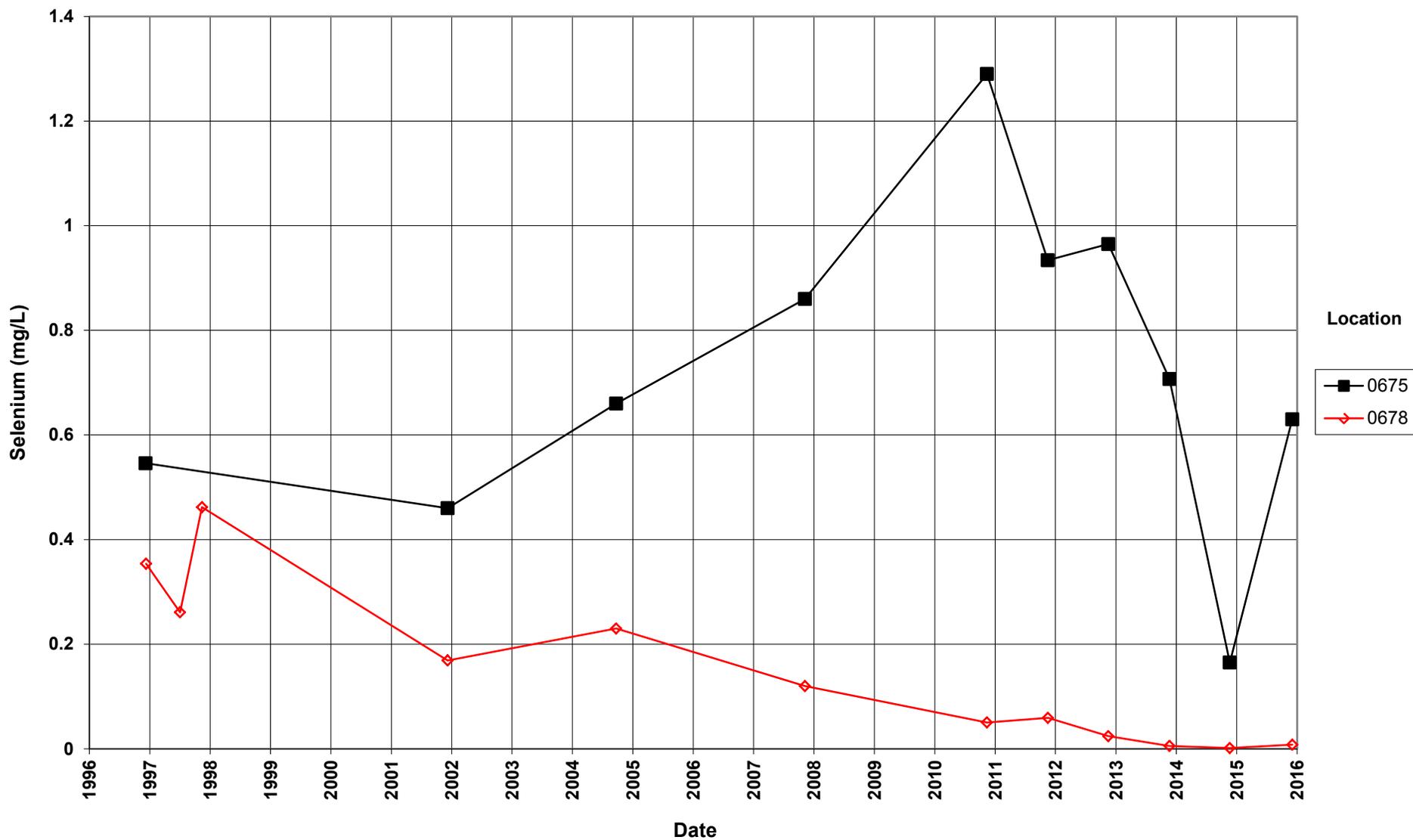
Ambrosia Lake Disposal Site Molybdenum Concentration



Ambrosia Lake Disposal Site Nitrate + Nitrite as Nitrogen Concentration



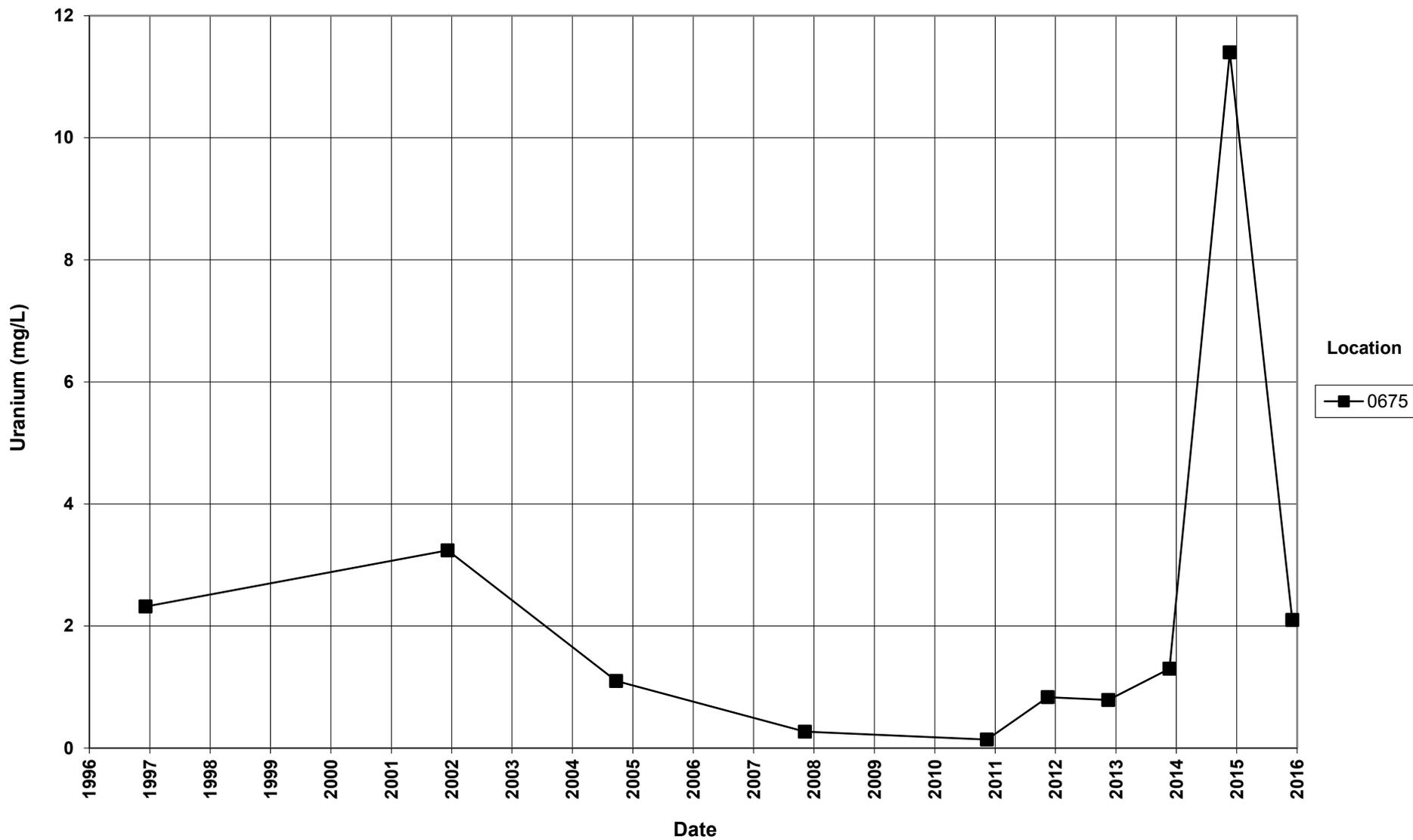
Ambrosia Lake Disposal Site Selenium Concentration



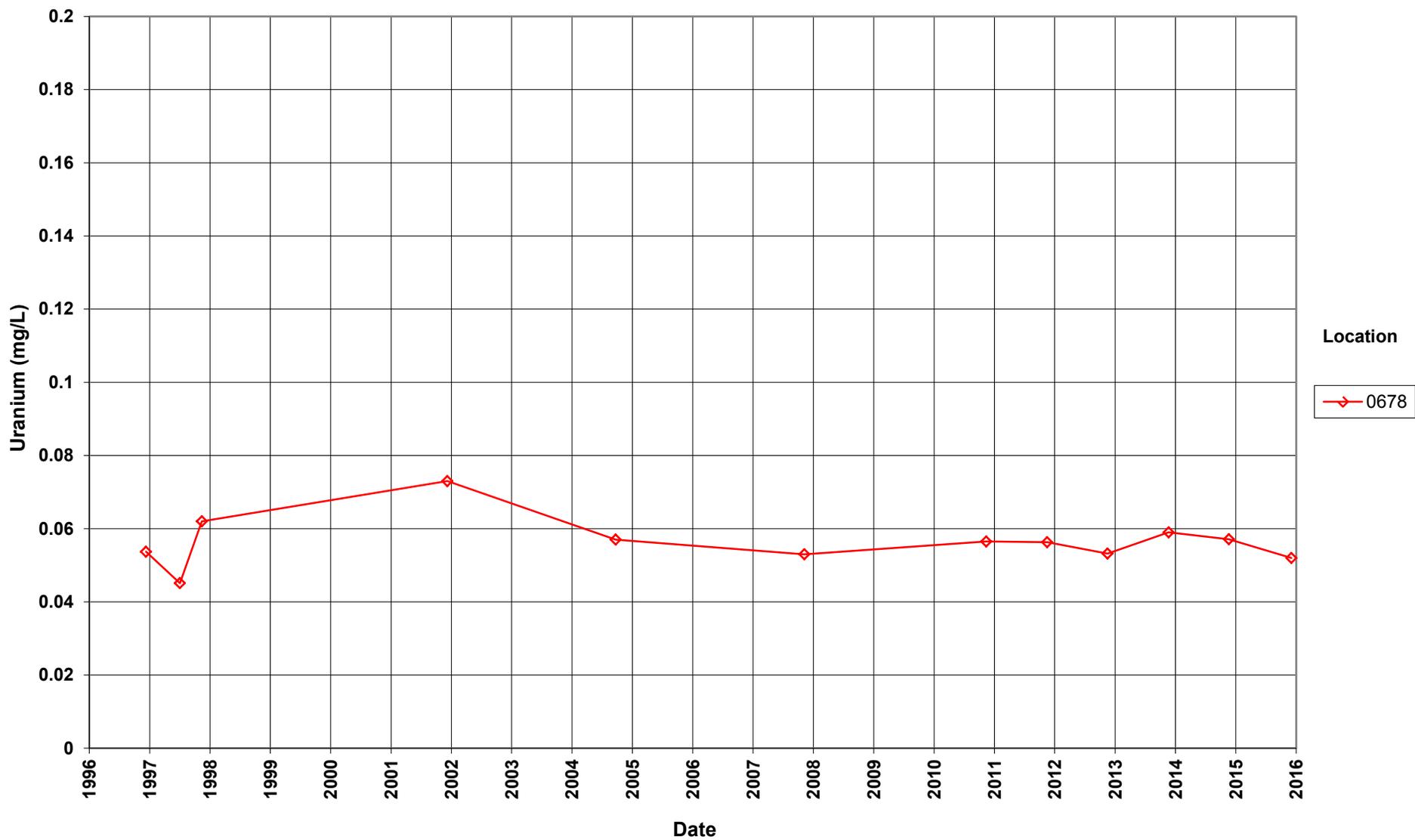
Ambrosia Lake Disposal Site Sulfate Concentration



Ambrosia Lake Disposal Site Uranium Concentration



Ambrosia Lake Disposal Site Uranium Concentration



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Attachment 3

Sampling and Analysis Work Order

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November 2, 2015

Task Assignment 103
Control Number 16-0072

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

SUBJECT: Contract No. DE-LM0000421, Navarro Research & Engineering, Inc. (Navarro)
Task Assignment 103 LTS&M-UMTRCA TI & TII Sites, D&D Sites, Other
Sites, & Other
November 2015 Environmental Sampling at the Ambrosia Lake, New Mexico,
Disposal Site

REFERENCE: Task Assignment 103, 1-103-1-02-101, Ambrosia Lake, New Mexico, Disposal
Site

Dear Ms. Barr:

The purpose of this letter is to inform you of the upcoming sampling event at the Ambrosia Lake, New Mexico, disposal site. Enclosed are the map and tables specifying sample locations and analytes for monitoring at the Ambrosia Lake site. Water quality data will be collected from this site as part of the routine environmental sampling currently scheduled to begin the week of November 16, 2015.

The following list shows the monitoring wells (with zone of completion) scheduled to be sampled during this event.

Monitoring Wells*

409 Al 675 Km 678 Tb

*NOTE: Al = alluvium; Km = Mancos shale; Tb = Tres Hermanos-B sandstone

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

Deborah Barr
Control Number 16-0072
Page 2

Please contact me at (970) 248-6022 if you have any questions.

Sincerely,



Richard K. Johnson
Site Lead

RJ/lcg/bkb

Enclosures (3)

cc: (electronic)

Christina Pennal, DOE
Jeff Carman, Navarro
Beverly Cook, Navarro
Steve Donovan, Navarro
Lauren Goodknight, Navarro
Richard Johnson, Navarro
Diana Osborne, Navarro
EDD Delivery
rc-grand.junction
File: AMB 400.02

Constituent Sampling Breakdown

Site	Ambrosia Lake		Required Detection Limit (mg/L)	Analytical Method	Line Item Code
	Analyte	Groundwater			
Approx. No. Samples/yr	2	0			
Field Measurements					
Alkalinity					
Dissolved Oxygen	X				
Redox Potential	X				
pH	X				
Specific Conductance	X				
Turbidity	X				
Temperature	X				
Laboratory Measurements					
Aluminum					
Arsenic	X		0.0001	SW-846 6020	LMM-02
Calcium	X		5	SW-846 6010	LMM-01
Chloride	X		0.5	SW-846 9056	WCH-A-039
Iron					
Lead					
Magnesium	X		5	SW-846 6010	LMM-01
Manganese					
Molybdenum	X		0.003	SW-846 6020	LMM-02
Nickel					
Nickel-63					
Nitrate + Nitrite as N (NO3+NO2)-N	X		0.05	EPA 353.1	WCH-A-022
Potassium	X		1	SW-846 6010	LMM-01
Radium-226					
Radium-228					
Selenium	X		0.0001	SW-846 6020	LMM-02
Silica					
Sodium	X		1	SW-846 6010	LMM-01
Strontium					
Sulfate	X		0.5	SW-846 9056	MIS-A-044
Sulfide					
Total Dissolved Solids	X		10	SM2540 C	WCH-A-033
Total Organic Carbon					
Tritium					
Uranium	X		0.0001	SW-846 6020	LMM-02
U-234, -238					
Vanadium					
Zinc					
Total No. of Analytes	12	0			

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

**Sampling Frequencies for Locations at
Ambrosia Lake, New Mexico**

Location ID	Quarterly	Semiannually	Annually	Triennially	Not Sampled	Notes
Monitoring Wells						
409			X			Usually dry; sample if water is present
675			X			
678			X			

Sampling conducted in November

Attachment 4

Trip Report

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Memorandum

DATE: December 10, 2015
TO: Dick Johnson
FROM: Jeff Price
SUBJECT: Sampling Trip Report

Site: Ambrosia Lake, New Mexico, Disposal Site

Dates of Sampling Event: December 3, 2015

Team Members: Rob Rice and Jeff Price

Number of Locations Sampled: Samples were collected from two of the three locations identified.

Locations Not Sampled/Reason: Location 0409 was dry.

Location Specific Information: None.

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	Associated Samples
2073	NMZ 084	0675	Duplicate	Groundwater	N/A

Requisition Index Number (RIN) Assigned: Samples were assigned to RIN15117494; field data sheets can be found in \\crow\SMS\15117494\FieldData.

Sample Shipment: Samples were shipped overnight via FedEx from Durango to ALS Laboratory Group, Fort Collins, Colorado on December 3, 2015.

Water Level Measurements: Water levels were measured at all wells prior to sampling.

Well Inspection Summary: No issues were identified.

Sampling Method: Samples were collected according to the *Sampling and Analysis Plan (SAP) for the U. S. Department of Energy Office of Legacy Management Sites (LMS/PRO/S04351, continually updated)*.

Field Variance: None.

Equipment: All equipment functioned properly.

Stakeholder/Regulatory/DOE: None.

Institutional Controls:

Fences, Gates, and Locks: See note below.

Signs: No issues were observed.

Trespassing/Site Disturbances: None observed.

Disposal Cell/Drainage Structure Integrity: None observed.

Safety Issues: None.

Access Issues: Homestake Mining, in an effort to restrict access to all of their properties, had removed our lock from the access gate to the Ambrosia Lake disposal cell. Access was gained after contacting the Homestake security office. Also, we informed Homestake security that we periodically visit the site and that we would like to have our lock placed back into the gate chain.

General Information: None.

Immediate Actions Taken: None.

(JP/lcg)

cc: (electronic)
Deborah Barr, DOE
Steve Donivan, Navarro
Dick Johnson, Navarro
EDD Delivery