LMS/AMB/S01111

Data Validation Package

November 2011
Groundwater Sampling at the Ambrosia Lake, New Mexico, Disposal Site

February 2012

U.S. DEPARTMENT OF ENERGY | Legacy Management

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Sampling Event Summary

Site: Ambrosia Lake, New Mexico, Disposal Site

Sampling Period: November 15–16, 2011

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 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). 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 0678.

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. When compared to 2010 data, increases in molybdenum and uranium concentrations, and a decrease in selenium concentration were observed in well 0675, which is completed in the alluvium. There were no significant changes in analyte concentrations observed in well 0678 which is completed in the Tres Hermanos B Sandstone Unit of the Mancos Shale.

Table 1. 2011 Groundwater Monitoring Analytical Results at the Ambrosia Lake, New Mexico, Site

Analyte	0675, mg/L	0678, mg/L
Arsenic	0.020	0.003
Bicarbonate alkalinity ($CaCO_3$)	277	753
Calcium	485	413
Carbonate alkalinity ($CaCO_3$)	ND	ND
Chloride	252	419
Magnesium	252	515
Molybdenum	0.351	0.004
Nitrate + Nitrite as Nitrogen	39.7	307
Potassium	12	46.5
Selenium	0.932	0.059
Sodium	913	2980
Sulfate	3040	6880
Total Dissolved Solids	5590	14300
Uranium	835	52.7

ND = not detected
mg/L = milligrams per liter

Richard K. Johnson
Site Lead, S.M. Stoller Corporation

2/9/12
Date

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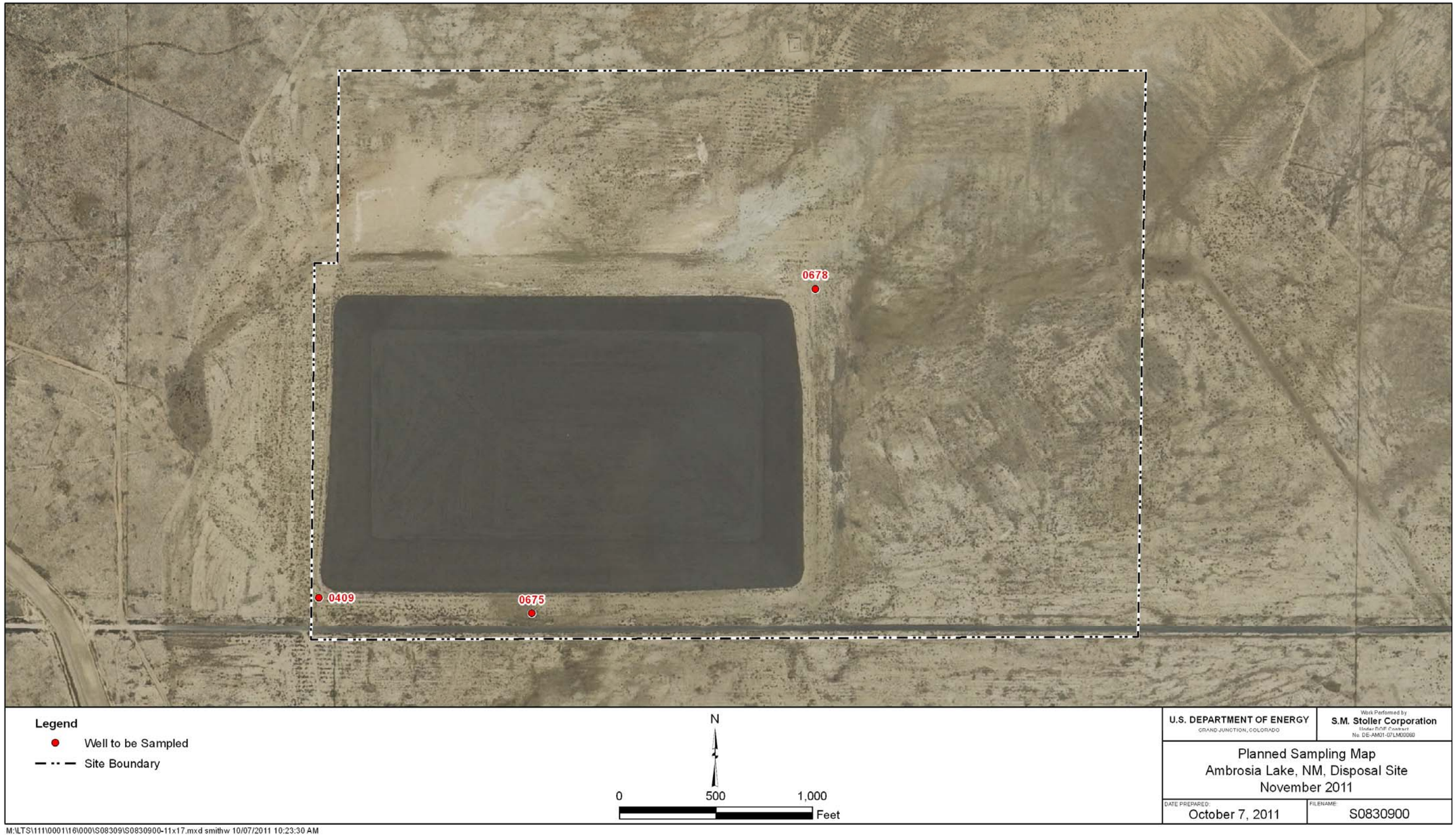

Ambrosia Lake, New Mexico, Disposal Site Sample Location Map

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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**	November 15–16, 2011
Date(s) of Verification	January 18, 2012	**Name of Verifier**	Steve Donivan

	Response (Yes, No, NA)	Comments
1. Is the SAP the primary document directing field procedures?	Yes	
List other documents, SOPs, instructions.		Work Order letter dated October 12, 2011.
2. Were the sampling locations specified in the planning documents sampled?	No	Location 0409 was dry and not sampled.
3. Was a pre-trip calibration conducted as specified in the above-named documents?	Yes	Pre-trip calibration was performed November 11, 2011.
4. Was an operational check of the field equipment conducted daily?	Yes	
Did the operational checks meet criteria?	Yes	
5. Were the number and types (alkalinity, temperature, specific conductance, pH, turbidity, DO, ORP) of field measurements taken as specified?	Yes	
6. Was the category of the well documented?	Yes	Both sampled wells were Category I.
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 stabilize prior to sampling?	Yes	
Was the flow rate less than 500 mL/min?	Yes	
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?	NA	
Was one pump/tubing volume removed prior to sampling?	NA	
9. Were duplicates taken at a frequency of one per 20 samples?	Yes	A duplicate sample was collected from location 0678.
10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with nondedicated equipment?	NA	All samples were collected using dedicated equipment.
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	Location ID 2073 was used for the duplicate sample.
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 Number (RIN):	11114180
Sample Event:	November 15–16, 2011
Site(s):	Ambrosia Lake, New Mexico
Laboratory:	GEL Laboratories, Charleston, South Carolina
Work Order No.:	290656
Analysis:	Metals, Radiochemistry, and Wet Chemistry
Validator:	Steve Donivan
Review Date:	January 19, 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. 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
Alkalinity, Bicarbonate	WCH-A-003	SM2320B	SM2320B
Alkalinity, Carbonate	WCH-A-004	SM2320B	SM2320B
Chloride	MIS-A-039	EPA 300.0	EPA 300.0
Calcium, Magnesium, Potassium, Sodium	LMM-01	SW-846 3005	SW-846 6010B
Arsenic, Molybdenum, Selenium, Uranium	LMM-02	SW-846 3005	SW-846 6020
Nitrate + Nitrite as N	WCH-A-022	EPA 353.2	EPA 353.2
Sulfate	MIS-A-044	EPA 300.0	EPA 300.0
Total Dissolved Solids	WCH-A-033	SM2540C	SM2540C

Data Qualifier Summary

None of the analytical results required qualification.

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received three water samples on November 18, 2011, accompanied by a Chain of Custody form. The air bill numbers were listed 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 with the exception that the filtration status was not included. The filtration status was documented in the field notes.

Preservation and Holding Times

The sample shipment was received intact with the temperature inside the iced cooler at 3 °C, which complies with requirements. All samples were received in the correct container types and had been preserved correctly for the requested analyses. All samples were analyzed within the applicable holding times.

Detection and Quantitation Limits

The method detection limit (MDL) was reported for all metal, organic, 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. 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 EPA 300.0
Calibrations for chloride and sulfate were performed using seven calibration standards on November 23 and 28, 2011. 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.

Methods SM2320B and SM2540C
There are no initial or continuing calibration requirements associated with the alkalinity or total dissolved solids methods.

Method EPA 353.2
Calibrations for nitrate + nitrite as N were performed using five calibration standards on December 6, 2011. 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 check results were within the acceptance criteria.

Method SW-846 6010B
Calibrations for calcium, magnesium, potassium, and sodium were performed on December 12, 2011, using four 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 resulting in 14 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 6020
Calibrations were performed for arsenic, molybdenum, selenium, and uranium between December 7 and 16, 2011, using two calibration standards. Initial and continuing calibration verification checks were made at the required frequency resulting in eight 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. Mass calibration and resolution verifications were performed at the beginning of each analytical run in accordance with the analytical procedure. Internal standard recoveries associated with requested analytes were stable and within acceptable ranges.

Method and Calibration Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. Methods without sample preparation do not require the analysis of a method blank. Calibration blanks are analyzed to assess instrument contamination prior to and during sample analysis.

Metals and Wet Chemistry
All method blank and calibration blank results associated with the samples were below the PQLs with the following exceptions. Some blank results for molybdenum and uranium were above the PQL. The samples associated with these blanks had concentrations greater than 10 times the blank. Some other metals blanks exceeded the MDL but all associated sample results were greater than 5 times the blank concentrations. For potassium, some calibration blanks were negative and the absolute values were greater than the MDL but less than the PQL. All potassium results were greater than 5 times the MDL, not requiring qualification.

Inductively Coupled Plasma (ICP) Interference Check Sample (ICS) Analysis

ICP interference check samples ICSA and ICSAB 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 concentration. The spikes met the recovery and precision 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 the PQL, the range should be no greater than the PQL. The replicate results met these criteria, demonstrating acceptable laboratory precision. The relative error ratio for radiochemical replicate results (calculated using the one-sigma total propagated uncertainty) was less than three, indicating acceptable precision.

Laboratory Control Sample

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

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 PQL for method 6010 or greater than 100 times the PQL for method 6020. 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.

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 presents the total anion and cation results in groundwater samples from this event and the charge balance, which is a relative percent difference calculation. Typically, a charge balance difference of 10 percent or less is considered acceptable.

Table 3. Comparison of Major Anions and Cations in Groundwater Samples

Site Code	Location	Cations (meq/L)	Anions (meq/L)	Charge Balance (%)
AMB01	0675	84.95	78.76	3.78
AMB01	0678	193.37	192.01	0.36

The charge balance values met the acceptance criteria, indicating acceptable analytical performance.

Electronic Data Deliverable (EDD) File

The EDD file arrived on December 20, 2011. 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: 11114180 **Lab Code:** GEN **Validator:** Steve Donivan **Validation Date:** 1/18/2012

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

SAMPLE MANAGEMENT SYSTEM

Metals Data Validation Worksheet

RIN: 11114180 **Lab Code:** GEN **Date Due:** 12/16/2011

Matrix: Water **Site Code:** AMB01 **Date Completed:** 12/20/2011

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	ICV	CCV	ICB	CCB								
Arsenic	ICP/MS	12/14/2011			OK	OK	OK	OK	OK	106.0	110.0			104.0		113.0
Arsenic	ICP/MS	12/16/2011			OK	OK	OK	OK	OK					101.0		104.0
Calcium	ICP/ES	12/12/2011	0.0000	1.0000	OK	OK	OK	OK	OK	104.0	119.0		0.0	99.0	0.7	102.0
Magnesium	ICP/ES	12/12/2011	0.0000	1.0000	OK	OK	OK	OK	OK	103.0	108.0		1.0	100.0	0.7	104.0
Magnesium	ICP/ES	12/15/2011	0.0000	1.0000	OK	OK	OK	OK	OK					100.0		101.0
Molybdenum	ICP/MS	12/13/2011			OK	OK	OK	OK	OK	103.0	100.0		3.0	87.0		115.0
Potassium	ICP/ES	12/12/2011	0.0000	1.0000	OK	OK	OK	OK	OK	101.0	103.0		1.0	119.0		123.0
Selenium	ICP/MS	12/14/2011			OK	OK	OK	OK	OK	103.0	109.0		5.0	99.0		105.0
Selenium	ICP/MS	12/16/2011			OK	OK	OK	OK	OK					101.0		109.0
Sodium	ICP/ES	12/12/2011	0.0000	1.0000	OK	OK	OK	OK	OK	99.2			0.0	111.0	1.0	102.0
Uranium	ICP/MS	12/07/2011			OK	OK	OK	OK	OK	105.0			3.0	107.0	0.7	106.0
Uranium	ICP/MS	12/08/2011			OK	OK	OK	OK	OK					99.0		108.0
Uranium	ICP/MS	12/13/2011			OK	OK	OK	OK	OK					106.0		108.0

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 11114180 **Lab Code:** GEN **Date Due:** 12/16/2011

Matrix: Water **Site Code:** AMB01 **Date Completed:** 12/20/2011

Analyte	Date Analyzed	CALIBRATION						Method Blank	LCS %R	MS %R	MSD %R	DUP RPD	Serial Dil. %R
		Int.	R^2	ICV	CCV	ICB	CCB						
ALKALINITY, Total as CaCO3	11/29/2011							OK	102	97.6			
ALKALINITY, Total as CaCO3	11/30/2011							OK	102	105			
ALKALINITY, Total as CaCO3	11/30/2011								107				
Bicarbonate alkalinity (CaCO3	11/29/2011											0	
Bicarbonate alkalinity (CaCO3	11/30/2011											0	
Chloride	11/23/2011	0.000	0.9988	OK	OK	OK	OK	OK	92.6				
Chloride	11/24/2011									101		0	
Chloride	11/28/2011			OK	OK	OK	OK			102		0	
NO2+NO3 as N	12/06/2011	0.000	1.0000	OK	OK	OK	OK	OK	103			1	
NO2+NO3 as N	12/06/2011									101		1	
Sulfate	11/23/2011	0.000	0.9994	OK	OK	OK	OK	OK	94.9				
Sulfate	11/24/2011											0	
Sulfate	11/28/2011			OK	OK	OK	OK			96.2		2	
Total Dissolved Solids	11/21/2011							OK	95.2			2	
Total Dissolved Solids	11/21/2011											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 in the database, indicating the wells were purged and sampled using the low-flow sampling method. All wells met the Category I 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. The relative percent difference for duplicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than the PQL, the range should be no greater than the PQL. A duplicate sample was collected from location 0678 (field duplicate ID 2073). The duplicate results met the criteria, demonstrating acceptable overall precision.

SAMPLE MANAGEMENT SYSTEM

Validation Report: Field Duplicates

RIN: 11114180 **Lab Code:** GEN **Project:** Ambrosia Lake Disposal Site **Validation Date:** 1/18/2012

Duplicate: 2073 **Sample:** 0678

Analyte	Sample Result	Sample Flag	Sample Error	Sample Dilution	Duplicate Result	Duplicate Flag	Duplicate Error	Duplicate Dilution	RPD	RER	Units
Arsenic	2.99	B		1.00	2.5	B		1.00			ug/L
Bicarbonate alkalinity (CaCO3)	753			1.00	746			1.00	0.93		mg/L
Calcium	405000			1.00	413000			1.00	1.96		ug/L
Carbonate alkalinity (CaCO3)	0.725	U		1.00	0.725	U		1.00			mg/L
Chloride	419			50.00	418			50.00	0.24		mg/L
Magnesium	515000			10.00	497000			10.00	3.56		ug/L
Molybdenum	4.32			1.00	4.6			1.00	6.28		ug/L
NO2+NO3 as N	307			500.00	311			500.00	1.29		mg/L
Potassium	46500			10.00	44600			10.00	4.17		ug/L
Selenium	59.3			1.00	57.6			1.00	2.91		ug/L
Sodium	2980000			10.00	2920000			10.00	2.03		ug/L
Sulfate	6880			1000.00	6960			1000.00	1.16		mg/L
Total Dissolved Solids	14300			1.00	14200			1.00	0.70		mg/L
Uranium	52.7			1.00	56.3			1.00	6.61		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: Steve Donivan — Date: 2-3-12

Data Validation Lead: Steve Donivan — Date: 2-3-12

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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 SEEPro database. The application compares the new data set 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.

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

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Attachment 2
Data Presentation

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Groundwater Quality Data

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Groundwater Quality Data by Location (USEE100) FOR SITE AMB01, Ambrosia Lake Disposal Site
REPORT DATE: 1/18/2012
Location: 0675 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	11/15/2011	N001	22.5	-	32.5	277		F	#	0.725	
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	11/15/2011	N001	22.5	-	32.5	0.725	U	F	#	0.725	
Arsenic	mg/L	11/15/2011	N001	22.5	-	32.5	0.0196		F	#	0.0017	
Calcium	mg/L	11/15/2011	N001	22.5	-	32.5	485		F	#	0.05	
Chloride	mg/L	11/15/2011	N001	22.5	-	32.5	252		F	#	3.3	
Dissolved Oxygen	mg/L	11/15/2011	N001	22.5	-	32.5	0.81		F	#		
Magnesium	mg/L	11/15/2011	N001	22.5	-	32.5	252		F	#	0.11	
Molybdenum	mg/L	11/15/2011	N001	22.5	-	32.5	0.351		F	#	0.000165	
Nitrate + Nitrite as Nitrogen	mg/L	11/15/2011	N001	22.5	-	32.5	39.7		F	#	0.5	
Oxidation Reduction Potential	mV	11/15/2011	N001	22.5	-	32.5	141.7		F	#		
pH	s.u.	11/15/2011	N001	22.5	-	32.5	7.02		F	#		
Potassium	mg/L	11/15/2011	N001	22.5	-	32.5	12		F	#	0.05	
Selenium	mg/L	11/15/2011	N001	22.5	-	32.5	0.934		F	#	0.0075	
Sodium	mg/L	11/15/2011	N001	22.5	-	32.5	913		F	#	1	
Specific Conductance	umhos /cm	11/15/2011	N001	22.5	-	32.5	6380		F	#		
Sulfate	mg/L	11/15/2011	N001	22.5	-	32.5	3040		F	#	100	
Temperature	C	11/15/2011	N001	22.5	-	32.5	11.88		F	#		
Total Dissolved Solids	mg/L	11/15/2011	N001	22.5	-	32.5	5590		F	#	3.4	
Turbidity	NTU	11/15/2011	N001	22.5	-	32.5	1.71		F	#		
Uranium	mg/L	11/15/2011	N001	22.5	-	32.5	0.835		F	#	0.00067	

Groundwater Quality Data by Location (USEE100) FOR SITE AMB01, Ambrosia Lake Disposal Site
REPORT DATE: 1/18/2012
Location: 0678 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	11/16/2011	N001	261.85	-	281.85	753		F	#	0.725	
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	11/16/2011	N002	261.85	-	281.85	746		F	#	0.725	
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	11/16/2011	N001	261.85	-	281.85	0.725	U	F	#	0.725	
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	11/16/2011	N002	261.85	-	281.85	0.725	U	F	#	0.725	
Arsenic	mg/L	11/16/2011	N001	261.85	-	281.85	0.00299	B	F	#	0.0017	
Arsenic	mg/L	11/16/2011	N002	261.85	-	281.85	0.0025	B	F	#	0.0017	
Calcium	mg/L	11/16/2011	N001	261.85	-	281.85	405		F	#	0.05	
Calcium	mg/L	11/16/2011	N002	261.85	-	281.85	413		F	#	0.05	
Chloride	mg/L	11/16/2011	N001	261.85	-	281.85	419		F	#	3.3	
Chloride	mg/L	11/16/2011	N002	261.85	-	281.85	418		F	#	3.3	
Dissolved Oxygen	mg/L	11/16/2011	N001	261.85	-	281.85	10.64		F	#		
Magnesium	mg/L	11/16/2011	N001	261.85	-	281.85	515		F	#	1.1	
Magnesium	mg/L	11/16/2011	N002	261.85	-	281.85	497		F	#	1.1	
Molybdenum	mg/L	11/16/2011	N001	261.85	-	281.85	0.00432		F	#	0.000165	
Molybdenum	mg/L	11/16/2011	N002	261.85	-	281.85	0.0046		F	#	0.000165	
Nitrate + Nitrite as Nitrogen	mg/L	11/16/2011	N001	261.85	-	281.85	307		F	#	5	
Nitrate + Nitrite as Nitrogen	mg/L	11/16/2011	N002	261.85	-	281.85	311		F	#	5	
Oxidation Reduction Potential	mV	11/16/2011	N001	261.85	-	281.85	144.7		F	#		

Groundwater Quality Data by Location (USEE100) FOR SITE AMB01, Ambrosia Lake Disposal Site
REPORT DATE: 1/18/2012
Location: 0678 WELL

Parameter	Units	Sample Date	Sample ID	Depth Range (Ft BLS)			Result	Qualifiers Lab	Qualifiers Data	Qualifiers QA	Detection Limit	Uncertainty
pH	s.u.	11/16/2011	N001	261.85	-	281.85	7.14		F	#		
Potassium	mg/L	11/16/2011	N001	261.85	-	281.85	46.5		F	#	0.5	
Potassium	mg/L	11/16/2011	N002	261.85	-	281.85	44.6		F	#	0.5	
Selenium	mg/L	11/16/2011	N001	261.85	-	281.85	0.0593		F	#	0.0015	
Selenium	mg/L	11/16/2011	N002	261.85	-	281.85	0.0576		F	#	0.0015	
Sodium	mg/L	11/16/2011	N001	261.85	-	281.85	2980		F	#	1	
Sodium	mg/L	11/16/2011	N002	261.85	-	281.85	2920		F	#	1	
Specific Conductance	umhos /cm	11/16/2011	N001	261.85	-	281.85	14925		F	#		
Sulfate	mg/L	11/16/2011	N001	261.85	-	281.85	6880		F	#	100	
Sulfate	mg/L	11/16/2011	N002	261.85	-	281.85	6960		F	#	100	
Temperature	C	11/16/2011	N001	261.85	-	281.85	11.81		F	#		
Total Dissolved Solids	mg/L	11/16/2011	N001	261.85	-	281.85	14300		F	#	3.4	
Total Dissolved Solids	mg/L	11/16/2011	N002	261.85	-	281.85	14200		F	#	3.4	
Turbidity	NTU	11/16/2011	N001	261.85	-	281.85	3.95		F	#		
Uranium	mg/L	11/16/2011	N001	261.85	-	281.85	0.0527		F	#	0.000067	
Uranium	mg/L	11/16/2011	N002	261.85	-	281.85	0.0563		F	#	0.000067	

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: 1/18/2012

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	11/15/2011	08:51:00			D
0675	D	6966.65	11/15/2011	10:00:31	19.85	6946.8	
0678	C	6987.94	11/16/2011	10:20:51	226.04	6761.9	

FLOW CODES: B BACKGROUND C CROSS GRADIENT D DOWN GRADIENT F OFF SITE
N UNKNOWN O ON SITE U UPGRADIENT

WATER LEVEL FLAGS: D Dry F FLOWING

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Time-Concentration Graphs

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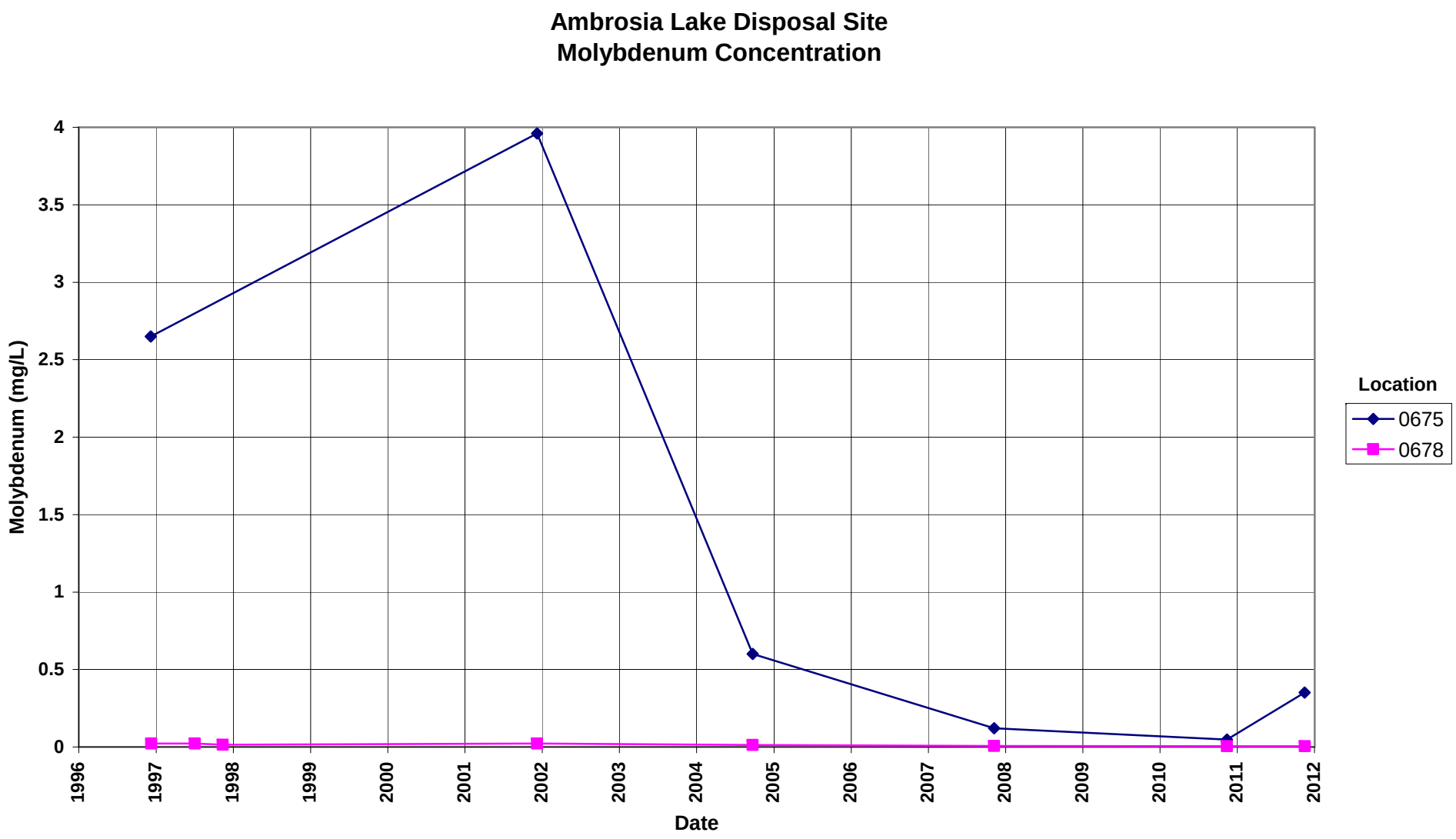
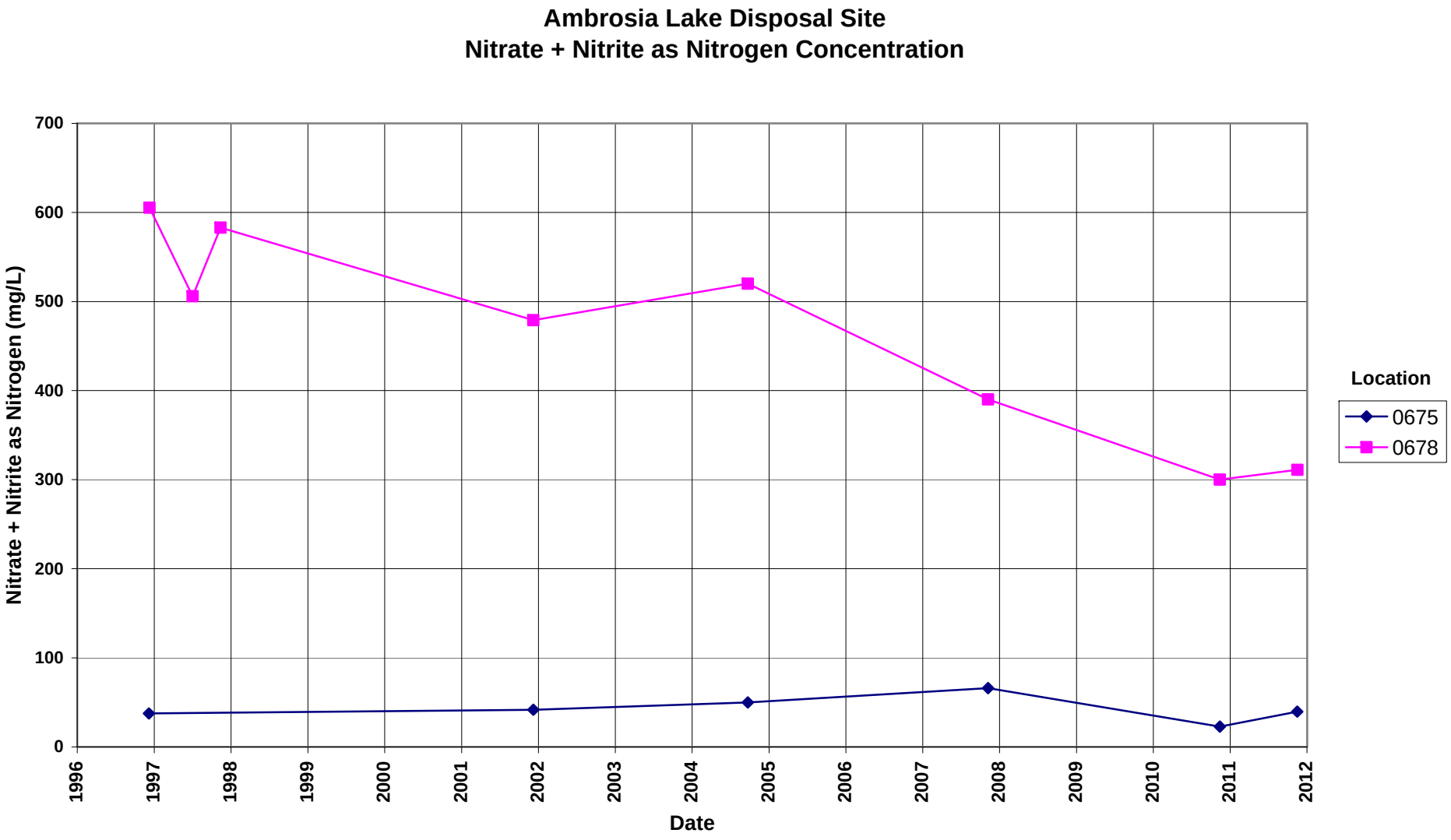
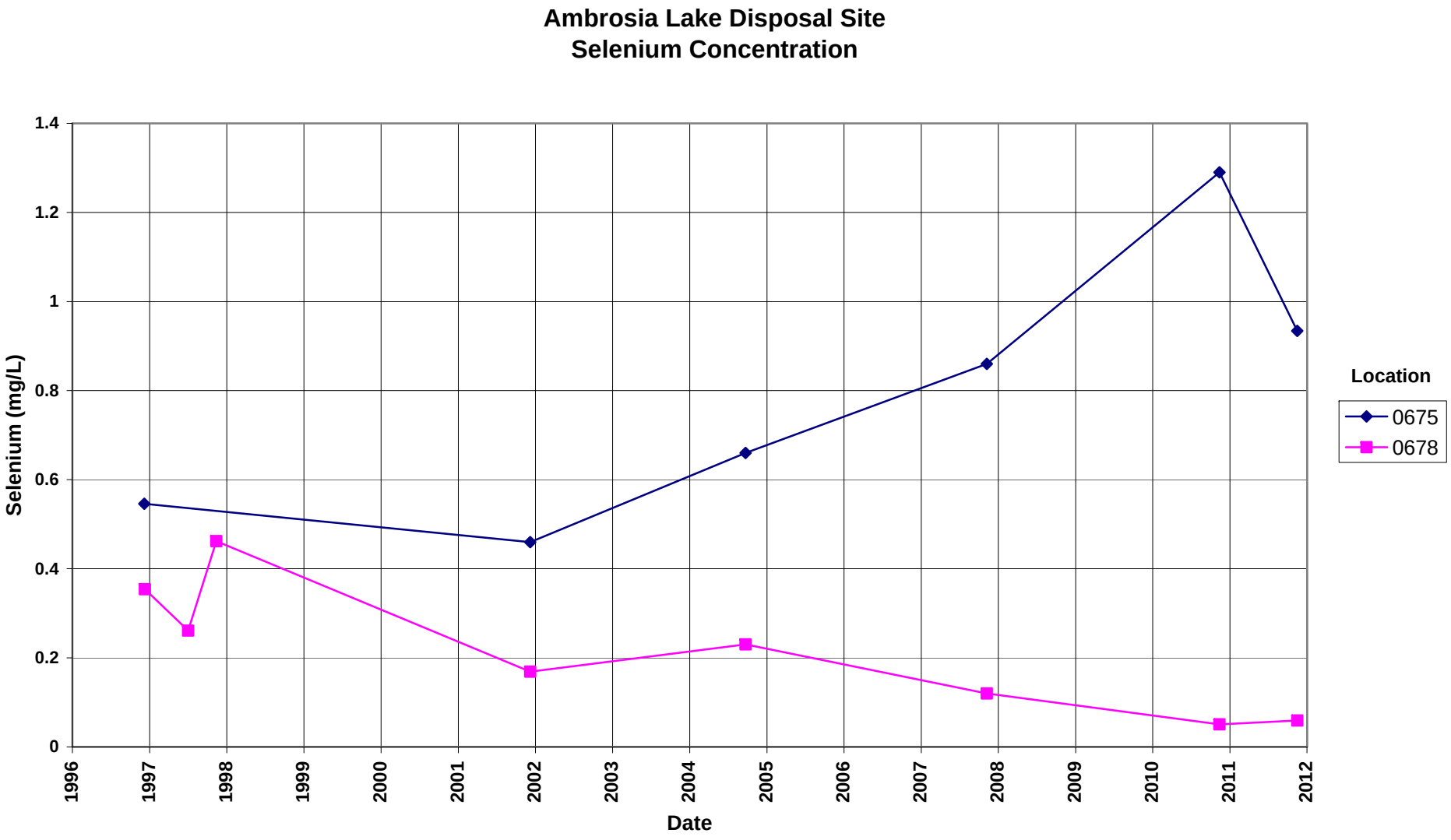
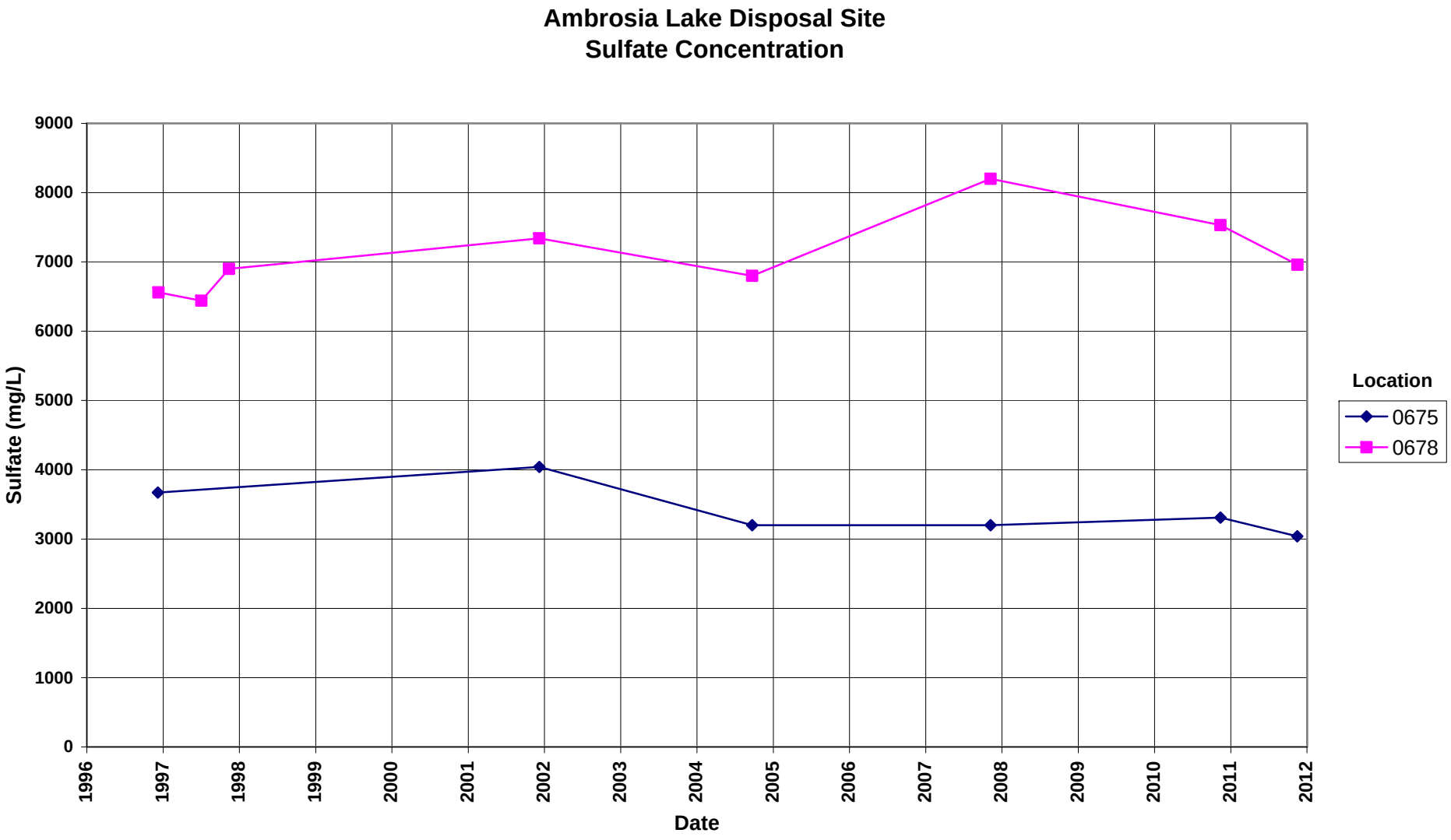
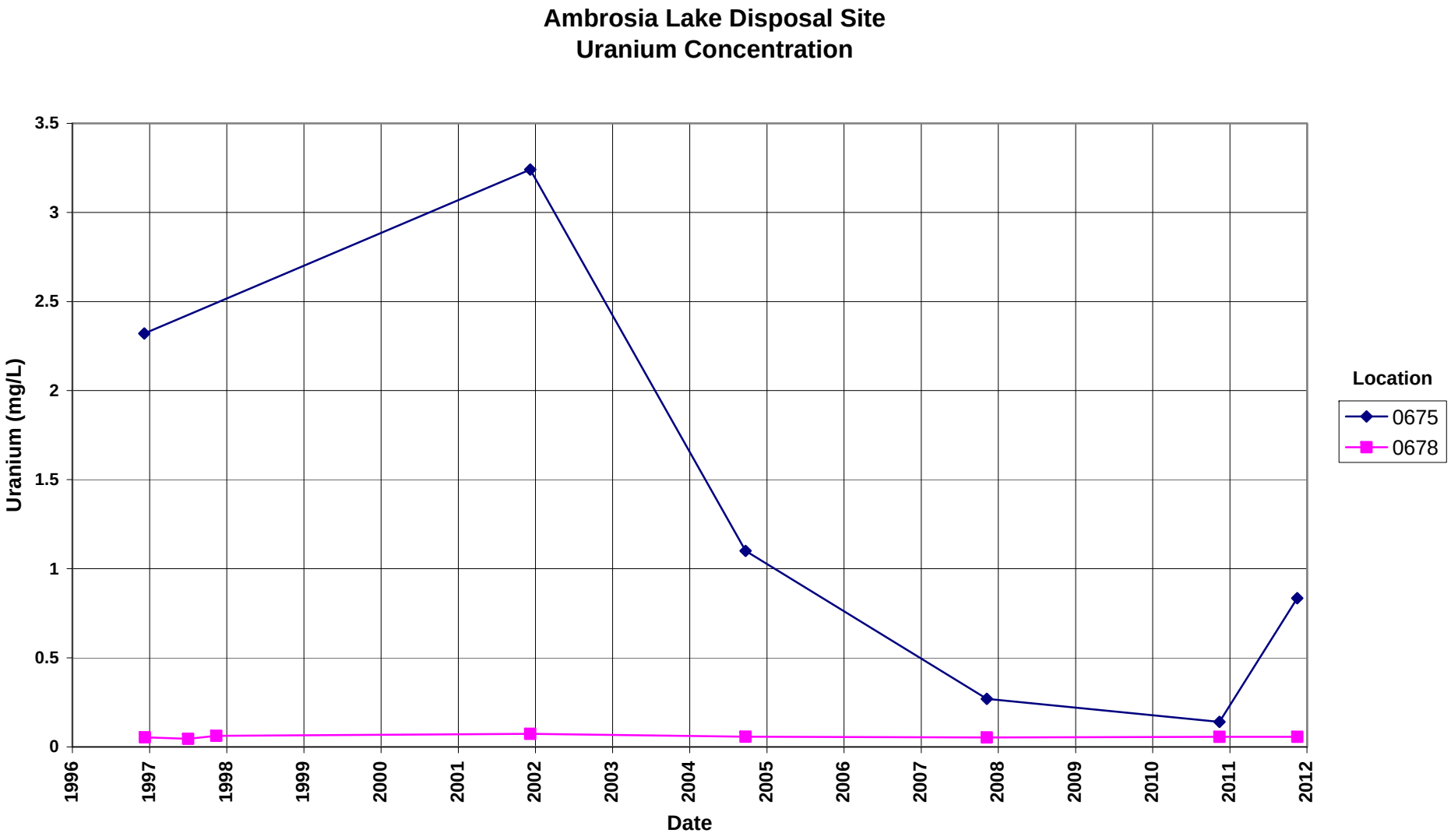

Ambrosia Lake Disposal Site
Molybdenum Concentration
Molybdenum (mg/L)
4
3.5
3
2.5
2
1.5
1
0.5
0
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Date
Location
0675
0678


Ambrosia Lake Disposal Site
Nitrate + Nitrite as Nitrogen Concentration
Nitrate + Nitrite as Nitrogen (mg/L)
700
600
500
400
300
200
100
0
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Date
Location
0675
0678


Ambrosia Lake Disposal Site
Selenium Concentration
Selenium (mg/L)
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Date
Location
0675
0678


Ambrosia Lake Disposal Site
Sulfate Concentration
Sulfate (mg/L)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Date
Location
0675
0678


Ambrosia Lake Disposal Site
Uranium Concentration
Uranium (mg/L)
3.5
3
2.5
2
1.5
1
0.5
0
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Date
Location
0675
0678

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Attachment 3
Sampling and Analysis Work Order

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Stoller

established 1959

Task Order LM00-501
Control Number 12-0024

October 12, 2011

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

SUBJECT: Contract No. DE-AM01-07LM00060, S.M. Stoller Corporation (Stoller) November 2011 Environmental Sampling at Ambrosia Lake, New Mexico

REFERENCE: Task Order LM-501-02-101-402, Ambrosia Lake, NM, Disposal Site

Dear Dr. Gil:

The purpose of this letter is to inform you of the upcoming sampling event at Ambrosia Lake, NM. Enclosed are the map and tables specifying sample locations and analytes for monitoring at the Ambrosia Lake Disposal 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 14, 2011.

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.

A draft of this letter is also being provided to DOE Support for distribution to stakeholders.

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

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

Sincerely,

Richard K. Johnson
Site Lead

RKJ/lcg/lb

Enclosures (3)

cc: (electronic)
Karl Stoeckle, DOE
Steve Donivan, Stoller
Bev Gallagher, Stoller
Lauren Goodknight, Stoller
Dick Johnson, Stoller
EDD Delivery
rc-grand.junction
File: AMB 410.02(A)

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

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

Constituent Sampling Breakdown

Site	Ambrosia Lake				
Analyte	**Groundwater**	**Surface Water**	**Required Detection Limit (mg/L)**	**Analytical Method**	**Line Item Code**
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
Bicarbonate	X		10	SM2320 B	WCH-A-003
Calcium	X		5	SW-846 6010	LMM-01
Carbonate	X		10	SM2320 B	WCH-A-004
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 (NO_3+NO_2)-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	14	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.

Attachment 4
Trip Report

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Stoller
Grand Junction Office
established 1959

Memorandum

Control Number N/A

DATE: November 22, 2011

TO: Dick Johnson

FROM: Jeff Walters

SUBJECT: Trip Report

Site: Ambrosia Lake, NM

Date of Sampling Event: November 14-16, 2011

Team Members: Joe Trevino and Jeff Walters

Number of Locations Sampled: Two wells were sampled for Ca, K, Mg, Na, As, Mo, Se, U, CL, Alk-Carb, Alk-Bicarb, SO4, TDS, (NO_3+NO_2)-N. One duplicate sample was collected for QC purposes.

Locations Not Sampled/Reason: Monitoring well 0409 was dry.

Location Specific Information:

TICKET NUMBER	SAMPLE DATE	LOCATION	Description
JMV 483	11/15/2011	0675	CAT I
JMV 484	11/16/2011	0678	CAT I

Field Variance: None.

Quality Control Sample Cross Reference:

FALSE ID	TRUE ID	SAMPLE TYPE	ASSOCIATED MATRIX	TICKET NUMBER
2073	0678	Duplicate	Groundwater	JMV 485

Requisition Numbers Assigned: All samples were assigned to RIN 11114180.

Water Level Measurements: Water levels were collected in all sampled wells. See *Water Sampling Field Data* logs for measurements.

Well Inspection Summary: Well inspections were conducted on all three wells. They were in good condition.

Equipment: Monitoring well 0675 was sampled using a peristaltic pump and the low flow procedure. Well 0678 was sampled using a high pressure dedicated bladder pump and the low flow procedure; 0678 needs the MP10UH control box to purge and sample. (The pump in 0678 was changed to a new high pressure pump on 11/15/2011 and then sampled on 11/16/2011. It worked very well).

Sample Shipment: All samples were shipped via Fed-Ex to GEL Labs in Charleston, South Carolina, from Grants, New Mexico on 11/17/2011.

Institutional Controls

Fences, Gates, Locks: All were ok
Signs: No problems observed
Trespassing/Site Disturbances: No problems observed

Site Issues

Disposal Cell/Drainage Structure Integrity: No problems observed
Vegetation/Noxious Weed Concerns: N/A
Maintenance Requirements: None

Corrective Action: None Taken

cc: (electronic)
April Gil, DOE
Steve Donivan, Stoller
Dick Johnson, Stoller `
EDD Delivery