

Data Validation Package

November 2013
Water Sampling at the
Ambrosia Lake, New Mexico,
Disposal Site

February 2014

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Contents

| | |
|--|----|
| Sampling Event Summary | 1 |
| Ambrosia Lake, New Mexico, Disposal Site Sample Location Map | 3 |
| Data Assessment Summary..... | 5 |
| Water Sampling Field Activities Verification Checklist | 7 |
| Laboratory Performance Assessment | 9 |
| Sampling Quality Control Assessment | 16 |
| Certification | 18 |

Attachment 1—Assessment of Anomalous Data

Potential Outliers Report

Attachment 2—Data Presentation

Groundwater Quality Data
Static Water Level Data
Time-Concentration Graphs

Attachment 3—Sampling and Analysis Work Order

Attachment 4—Trip Report

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Sampling Event Summary

Site: Ambrosia Lake, New Mexico, Disposal Site

Sampling Period: November 20, 2013

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. There were no significant changes in analyte concentrations observed in the wells.

Table 1. 2013 Groundwater Monitoring Analytical Results at the Ambrosia Lake, New Mexico, Site

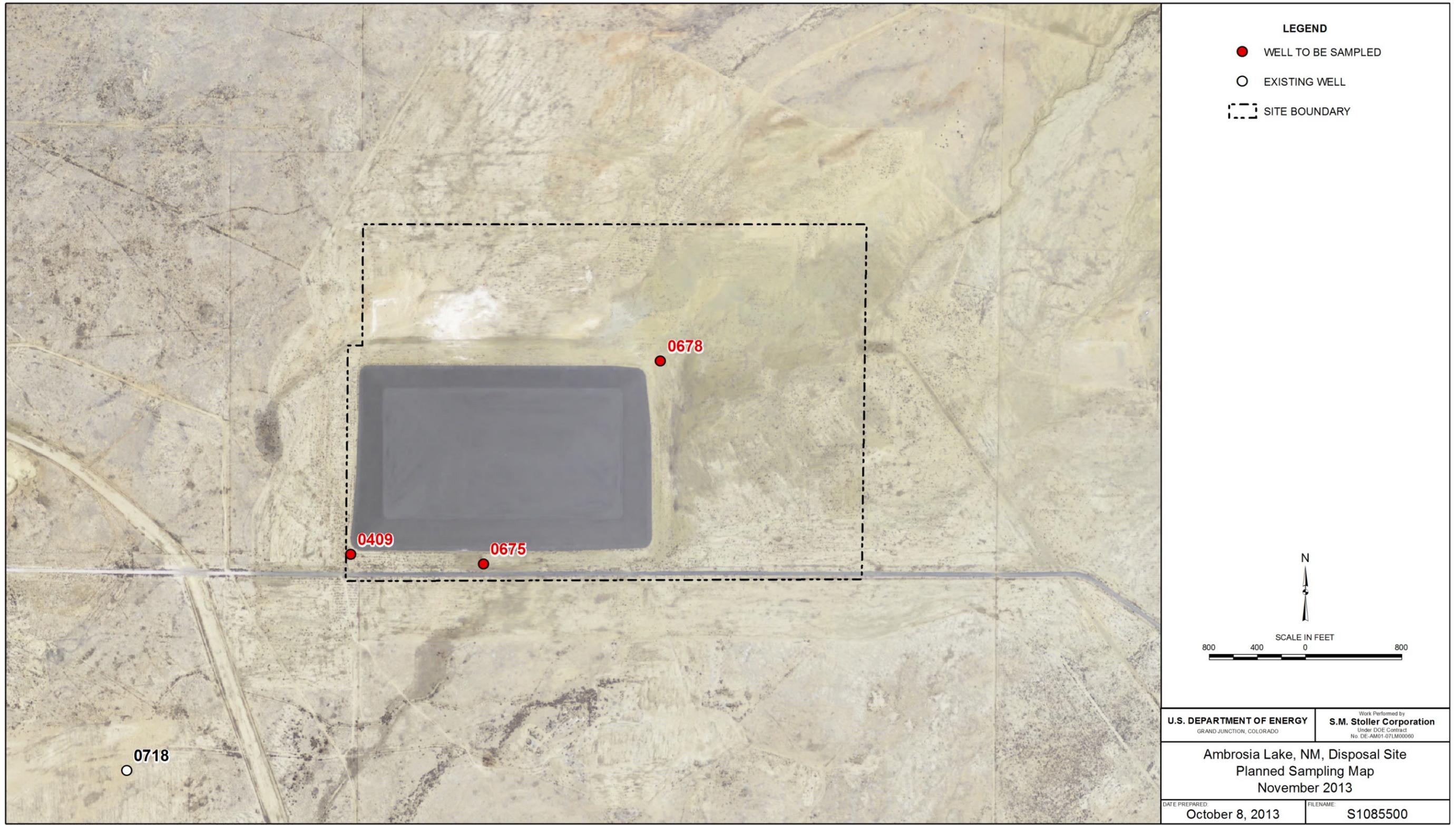
| Analyte | Well 0675 mg/L | Well 0678 mg/L |
|-------------------------------|-------------------|-------------------|
| Arsenic | ND | ND |
| Calcium | 435 | 374 |
| Chloride | 263 | 314 |
| Magnesium | 239 | 475 |
| Molybdenum | 0.649 | 0.00534 |
| Nitrate + Nitrite as Nitrogen | 36.8 | 212 |
| Potassium | 8.37 | 31.2 |
| Selenium | 0.706 | 0.00557 |
| Sodium | 918 | 2940 |
| Sulfate | 3570 | 7600 |
| Total Dissolved Solids | 6090 | 14200 |
| Uranium | 1.3 | 0.059 |

Key: mg/L = milligrams per liter; ND = not detected


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

2/10/14
 Date

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M:\LTS\11110001\16\000\S10855\S1085500.mxd coatesc 10/08/2013 6:56:40 AM

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 | <u>Ambrosia Lake, NM, Disposal Site</u> | Date(s) of Water Sampling | <u>November 20, 2013</u> |
| Date(s) of Verification | <u>January 29, 2014</u> | Name of Verifier | <u>Gretchen Baer</u> |

| | Response (Yes, No, NA) | Comments |
|--|--|--|
| 1. Is the SAP the primary document directing field procedures? List any Program Directives or other documents, SOPs, instructions. | <u>Yes</u> | <u>Work Order letter dated October 11, 2013.</u> |
| 2. Were the sampling locations specified in the planning documents sampled? | <u>No</u> | <u>Location 0409 was dry and not sampled.</u> |
| 3. Were calibrations conducted as specified in the above-named documents? | <u>Yes</u> | |
| 4. Was an operational check of the field equipment conducted daily? Did the operational checks meet criteria? | <u>Yes</u> <u>Yes</u> | |
| 5. Were the number and types (alkalinity, temperature, specific conductance, pH, turbidity, DO, ORP) of field measurements taken as specified? | <u>Yes</u> | |
| 6. Were wells categorized correctly? | <u>Yes</u> | |
| 7. Were the following conditions met when purging a Category I well: Was one pump/tubing volume purged prior to sampling? Did the water level stabilize prior to sampling? Did pH, specific conductance, and turbidity measurements meet criteria prior to sampling? Was the flow rate less than 500 mL/min? | <u>Yes</u> <u>Yes</u> <u>Yes</u> <u>Yes</u> | |

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 | |
| 10. Were equipment blanks taken at a frequency of one per 20 samples that were collected with non-dedicated equipment? | NA | |
| 11. Were trip blanks prepared and included with each shipment of VOC samples? | NA | |
| 12. Were the true identities of the QC samples documented? | Yes | |
| 13. Were samples collected in the containers specified? | Yes | |
| 14. Were samples filtered and preserved as specified? | Yes | |
| 15. Were the number and types of samples collected as specified? | Yes | |
| 16. Were chain of custody records completed and was sample custody maintained? | Yes | |
| 17. Was all pertinent information documented on the field data sheets? | Yes | |
| 18. Was the presence or absence of ice in the cooler documented at every sample location? | Yes | |
| 19. Were water levels measured at the locations specified in the planning documents? | Yes | |

Laboratory Performance Assessment

General Information

Report Number (RIN): 13115745
Sample Event: November 20, 2013
Site(s): Ambrosia Lake, New Mexico
Laboratory: GEL Laboratories, Charleston, South Carolina
Work Order No.: 338118
Analysis: Metals and Wet Chemistry
Validator: Gretchen Baer
Review Date: January 29, 2014

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 | EPA 300.0 | EPA 300.0 |
| Nitrate + Nitrite as N | WCH-A-022 | EPA 353.2 | EPA 353.2 |
| Total Dissolved Solids | WCH-A-033 | SM 2540C | SM 2540C |

Data Qualifier Summary

None of the sample results required additional qualification.

Sample Shipping/Receiving

GEL Laboratories in Charleston, South Carolina, received three water samples on November 22, 2013, 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. The laboratory noted that a bottle collected at location 0675 was mislabeled as 0409; the laboratory corrected the error and proceeded with analysis.

Preservation and Holding Times

The sample shipment was received intact with the temperature inside the iced cooler at 2 °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 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. Some samples were diluted prior to analysis of arsenic to reduce interferences, resulting in elevated detection limits.

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 August 19, 2013. 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 EPA 353.2

Calibrations for nitrate + nitrite as N were performed using five calibration standards on December 17, 2013. 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 SM 2540C

There are no initial or continuing calibration requirements associated with the total dissolved solids method. The laboratory noted that some total dissolved solids samples failed the weight check criterion of 0.0005 grams. These weights were within 4 percent, however, so no further qualification is necessary

Method SW-846 6010B

Calibrations for calcium, magnesium, potassium, and sodium were performed on December 16, 2013, 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, with the following exception. Some potassium check results were outside the acceptance range. All affected results were greater than 5 times the PQL, so no qualification is necessary.

Method SW-846 6020A

Calibrations were performed for arsenic, molybdenum, selenium, and uranium on December 11, 12, and 18, 2013, 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. 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. Mass calibration and resolution verifications were performed at the beginning of each analytical run in accordance with the analytical procedure. Internal standard recoveries associated with requested analytes were stable and within acceptable ranges.

Method and Calibration Blanks

Method blanks are analyzed to assess any contamination that may have occurred during sample preparation. Calibration blanks are analyzed to assess instrument contamination prior to and during sample analysis. All method blank and calibration blank results associated with the samples were below the 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 samples are used to measure method performance in the sample matrix. The matrix spike 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.

(A spike recovery of sulfate exceeded the laboratory's acceptance criteria, but was within the ± 25 percent requirement.)

Laboratory Replicate Analysis

Laboratory replicate analyses are used to determine laboratory precision for each sample matrix. The relative percent difference for replicate results that are greater than 5 times the PQL should be less than 20 percent. For results that are less than 5 times the PQL, the range should be no greater than the PQL. The replicate results met these criteria, demonstrating acceptable laboratory 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 chromatography data. All peak integrations were satisfactory.

Electronic Data Deliverable (EDD) File

The EDD file arrived on December 20, 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 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: 13115745 Lab Code: GEN Validator: Gretchen Baer Validation Date: 1/29/2014

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.

There are 0 detection limit failures.

There was 1 duplicate evaluated.

**SAMPLE MANAGEMENT SYSTEM
Metals Data Validation Worksheet**

RIN: 13115745 Lab Code: GEN Date Due: 12/20/2013
 Matrix: Water Site Code: AMB01 Date Completed: 12/30/2013

| 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 | 12/16/2013 | 0.0000 | 1.0000 | OK | OK | OK | 99.5 | | | 3.0 | 97.0 | 5.0 | 108.0 |
| Magnesium | ICP/ES | 12/16/2013 | 0.0000 | 1.0000 | OK | OK | OK | 104.0 | | | 3.0 | 100.0 | 4.0 | 103.0 |
| Potassium | ICP/ES | 12/16/2013 | 0.0000 | 1.0000 | OK | OK | OK | 99.6 | 84.5 | | 9.0 | 118.0 | | 150.0 |
| Sodium | ICP/ES | 12/16/2013 | 0.0000 | 1.0000 | OK | OK | OK | 101.0 | | | 2.0 | 114.0 | 3.0 | 127.0 |
| Arsenic | ICP/MS | 12/18/2013 | 0.0000 | 1.0000 | OK | OK | OK | 117.0 | 119.0 | | | 102.0 | | 100.0 |
| Molybdenum | ICP/MS | 12/11/2013 | 0.0000 | 1.0000 | OK | OK | OK | 104.0 | | | 1.0 | 105.0 | 4.0 | 102.0 |
| Selenium | ICP/MS | 12/11/2013 | 0.0000 | 1.0000 | OK | OK | OK | 107.0 | | | 7.0 | 93.0 | 0.5 | 100.0 |
| Uranium | ICP/MS | 12/11/2013 | 0.0000 | 1.0000 | OK | OK | OK | 102.0 | | | 2.0 | 99.0 | 4.0 | 100.0 |

SAMPLE MANAGEMENT SYSTEM

Wet Chemistry Data Validation Worksheet

RIN: 13115745

Lab Code: GENDate Due: 12/20/2013Matrix: WaterSite Code: AMB01Date Completed: 12/30/2013

| Analyte | Date Analyzed | CALIBRATION | | | | Method Blank | LCS %R | MS %R | MSD %R | DUP RPD | Serial Dil. %R |
|---------------------------------------|---------------|-------------|----------------|-----|-----|-----------------|-----------|----------|-----------|------------|-------------------|
| | | Int. | R ² | CCV | CCB | | | | | | |
| Chloride | 08/19/2013 | 0.048 | 0.9995 | | | | | | | | |
| Chloride | 12/10/2013 | | | OK | OK | OK | 96.40 | | | | |
| Chloride | 12/11/2013 | | | | | | 96.6 | | 2.00 | | |
| Chloride | 12/12/2013 | | | | | | 98.7 | | 0 | | |
| NO ₂ +NO ₃ as N | 12/17/2013 | -0.011 | 0.9991 | OK | OK | OK | 101.00 | 99.8 | 1.00 | | |
| NO ₂ +NO ₃ as N | 12/17/2013 | | | | | | | 93.1 | 0 | | |
| Sulfate | 08/19/2013 | 0.042 | 0.9998 | | | | | | | | |
| Sulfate | 12/10/2013 | | | OK | OK | OK | 104.00 | | | | |
| Sulfate | 12/11/2013 | | | | | | | 104.0 | 6.00 | | |
| Sulfate | 12/12/2013 | | | | | | | 111.0 | 0 | | |
| Total Dissolved Solids | 11/25/2013 | | | | | OK | 102.00 | | 2.00 | | |
| Total Dissolved Solids | 11/25/2013 | | | | | OK | 98.10 | | 0 | | |
| Total Dissolved Solids | 11/25/2013 | | | | | | | | 2.00 | | |
| Total Dissolved Solids | 11/25/2013 | | | | | | | | 3.00 | | |
| Total Dissolved Solids | 11/25/2013 | | | | | | | | 0 | | |

Sampling Quality Control Assessment

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

Sampling Protocol

Sample results for monitoring wells were qualified with an “F” flag in the database, indicating the wells were purged and sampled using the low-flow sampling method and 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. Duplicate samples were collected from location 0675. 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 5 times the PQL, the range should be no greater than the PQL. The duplicate results met the criteria, demonstrating acceptable overall precision.

SAMPLE MANAGEMENT SYSTEM
Validation Report: Field Duplicates

RIN: 13115745 Lab Code: GEN Project: Ambrosia Lake Disposal Site Validation Date: 1/29/2014

Duplicate: 2073

Sample: 0675

| Analyte | Sample | | | | Duplicate | | | | RPD | RER | Units |
|------------------------|--------|------|-------|----------|-----------|------|-------|----------|-------|-----|-------|
| | Result | Flag | Error | Dilution | Result | Flag | Error | Dilution | | | |
| Arsenic | 17.0 | U | | 10.00 | 20.7 | | | 1.00 | | | ug/L |
| Calcium | 435000 | | | 1.00 | 437000 | | | 1.00 | 0.46 | | ug/L |
| Chloride | 263 | | | 250.00 | 273 | | | 50.00 | 3.73 | | mg/L |
| Magnesium | 239000 | | | 1.00 | 234000 | | | 1.00 | 2.11 | | ug/L |
| Molybdenum | 649 | | | 100.00 | 576 | | | 100.00 | 11.92 | | ug/L |
| NO2+NO3 as N | 36.8 | | | 50.00 | 39.8 | | | 50.00 | 7.83 | | mg/L |
| Potassium | 8370 | | | 10.00 | 8150 | | | 10.00 | 2.66 | | ug/L |
| Selenium | 706 | | | 20.00 | 707 | | | 20.00 | 0.14 | | ug/L |
| Sodium | 918000 | | | 10.00 | 899000 | | | 10.00 | 2.09 | | ug/L |
| Sulfate | 3570 | | | 250.00 | 3380 | | | 500.00 | 5.47 | | mg/L |
| Total Dissolved Solids | 6090 | | | 1.00 | 6060 | | | 1.00 | 0.49 | | mg/L |
| Uranium | 1300 | | | 100.00 | 1300 | | | 100.00 | 0 | | 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 Donovan
Stephen Donovan

2-10-2014
Date

Data Validation Lead:

Gretchen Baer GRB
Gretchen Baer

2-10-2014
Date

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. The review should include an evaluation of any notable trends in the data that may indicate the outliers represent true extreme values.

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

Data Validation Outliers Report - No Field Parameters

Comparison: All Historical Data

Laboratory: GEL Laboratories

RIN: 13115745

Report Date: 1/29/2014

| 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 | 0678 | N001 | 11/20/2013 | Selenium | 0.00557 | | F | 0.7 | | F | 0.011 | | F | 15 | 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.

Attachment 2

Data Presentation

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Groundwater Quality Data

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General Water Quality Data by Location (USEE105) FOR SITE AMB01, Ambrosia Lake Disposal Site

REPORT DATE: 1/29/2014

Location: 0675 WELL

| Parameter | Units | Sample Date | Sample ID | Depth Range (Ft BLS) | | | Result | Qualifiers | | | Detection Limit | Uncertainty |
|-------------------------------|-------|-------------|-----------|----------------------|---|------|--------|------------|------|----|-----------------|-------------|
| | | | | | | | | Lab | Data | QA | | |
| Arsenic | mg/L | 11/20/2013 | 0001 | 22.5 | - | 32.5 | 0.017 | U | F | # | 0.017 | |
| Arsenic | mg/L | 11/20/2013 | 0002 | 22.5 | - | 32.5 | 0.0207 | | F | # | 0.0017 | |
| Calcium | mg/L | 11/20/2013 | 0001 | 22.5 | - | 32.5 | 435 | | F | # | 0.05 | |
| Calcium | mg/L | 11/20/2013 | 0002 | 22.5 | - | 32.5 | 437 | | F | # | 0.05 | |
| Chloride | mg/L | 11/20/2013 | 0001 | 22.5 | - | 32.5 | 263 | | F | # | 16.8 | |
| Chloride | mg/L | 11/20/2013 | 0002 | 22.5 | - | 32.5 | 273 | | F | # | 3.35 | |
| Dissolved Oxygen | mg/L | 11/20/2013 | N001 | 22.5 | - | 32.5 | 0.69 | | F | # | | |
| Magnesium | mg/L | 11/20/2013 | 0001 | 22.5 | - | 32.5 | 239 | | F | # | 0.11 | |
| Magnesium | mg/L | 11/20/2013 | 0002 | 22.5 | - | 32.5 | 234 | | F | # | 0.11 | |
| Molybdenum | mg/L | 11/20/2013 | 0001 | 22.5 | - | 32.5 | 0.649 | | F | # | 0.0165 | |
| Molybdenum | mg/L | 11/20/2013 | 0002 | 22.5 | - | 32.5 | 0.576 | | F | # | 0.0165 | |
| Nitrate + Nitrite as Nitrogen | mg/L | 11/20/2013 | 0001 | 22.5 | - | 32.5 | 36.8 | | F | # | 0.85 | |
| Nitrate + Nitrite as Nitrogen | mg/L | 11/20/2013 | 0002 | 22.5 | - | 32.5 | 39.8 | | F | # | 0.85 | |
| Oxidation Reduction Potential | mV | 11/20/2013 | N001 | 22.5 | - | 32.5 | 60.8 | | F | # | | |
| pH | s.u. | 11/20/2013 | N001 | 22.5 | - | 32.5 | 6.87 | | F | # | | |
| Potassium | mg/L | 11/20/2013 | 0001 | 22.5 | - | 32.5 | 8.37 | | F | # | 0.5 | |
| Potassium | mg/L | 11/20/2013 | 0002 | 22.5 | - | 32.5 | 8.15 | | F | # | 0.5 | |
| Selenium | mg/L | 11/20/2013 | 0001 | 22.5 | - | 32.5 | 0.706 | | F | # | 0.03 | |

General Water Quality Data by Location (USEE105) FOR SITE AMB01, Ambrosia Lake Disposal Site

REPORT DATE: 1/29/2014

Location: 0675 WELL

| Parameter | Units | Sample Date | Sample ID | Depth Range (Ft BLS) | Result | Qualifiers | | | Detection Limit | Uncertainty |
|------------------------|-----------|-------------|-----------|----------------------|--------|------------|------|----|-----------------|-------------|
| | | | | | | Lab | Data | QA | | |
| Selenium | mg/L | 11/20/2013 | 0002 | 22.5 - 32.5 | 0.707 | | F | # | 0.03 | |
| Sodium | mg/L | 11/20/2013 | 0001 | 22.5 - 32.5 | 918 | | F | # | 1 | |
| Sodium | mg/L | 11/20/2013 | 0002 | 22.5 - 32.5 | 899 | | F | # | 1 | |
| Specific Conductance | umhos /cm | 11/20/2013 | N001 | 22.5 - 32.5 | 6312 | | F | # | | |
| Sulfate | mg/L | 11/20/2013 | 0001 | 22.5 - 32.5 | 3570 | | F | # | 33.3 | |
| Sulfate | mg/L | 11/20/2013 | 0002 | 22.5 - 32.5 | 3380 | | F | # | 66.5 | |
| Temperature | C | 11/20/2013 | N001 | 22.5 - 32.5 | 10.17 | | F | # | | |
| Total Dissolved Solids | mg/L | 11/20/2013 | 0001 | 22.5 - 32.5 | 6090 | | F | # | 3.4 | |
| Total Dissolved Solids | mg/L | 11/20/2013 | 0002 | 22.5 - 32.5 | 6060 | | F | # | 3.4 | |
| Turbidity | NTU | 11/20/2013 | N001 | 22.5 - 32.5 | 31 | | F | # | | |
| Uranium | mg/L | 11/20/2013 | 0001 | 22.5 - 32.5 | 1.3 | | F | # | 0.0067 | |
| Uranium | mg/L | 11/20/2013 | 0002 | 22.5 - 32.5 | 1.3 | | F | # | 0.0067 | |

General Water Quality Data by Location (USEE105) FOR SITE AMB01, Ambrosia Lake Disposal Site

REPORT DATE: 1/29/2014

Location: 0678 WELL

| Parameter | Units | Sample Date | Sample ID | Depth Range (Ft BLS) | Result | Qualifiers | | | Detection Limit | Uncertainty |
|-------------------------------|----------|-------------|-----------|----------------------|---------|------------|------|----|-----------------|-------------|
| | | | | | | Lab | Data | QA | | |
| Arsenic | mg/L | 11/20/2013 | N001 | 261.85 - 281.85 | 0.0017 | U | F | # | 0.0017 | |
| Calcium | mg/L | 11/20/2013 | N001 | 261.85 - 281.85 | 374 | | F | # | 0.05 | |
| Chloride | mg/L | 11/20/2013 | N001 | 261.85 - 281.85 | 314 | | F | # | 67 | |
| Dissolved Oxygen | mg/L | 11/20/2013 | N001 | 261.85 - 281.85 | 5.53 | | F | # | | |
| Magnesium | mg/L | 11/20/2013 | N001 | 261.85 - 281.85 | 475 | | F | # | 0.11 | |
| Molybdenum | mg/L | 11/20/2013 | N001 | 261.85 - 281.85 | 0.00534 | | F | # | 0.000165 | |
| Nitrate + Nitrite as Nitrogen | mg/L | 11/20/2013 | N001 | 261.85 - 281.85 | 212 | | F | # | 8.5 | |
| Oxidation Reduction Potential | mV | 11/20/2013 | N001 | 261.85 - 281.85 | 36.6 | | F | # | | |
| pH | s.u. | 11/20/2013 | N001 | 261.85 - 281.85 | 7.1 | | F | # | | |
| Potassium | mg/L | 11/20/2013 | N001 | 261.85 - 281.85 | 31.2 | | F | # | 0.5 | |
| Selenium | mg/L | 11/20/2013 | N001 | 261.85 - 281.85 | 0.00557 | | F | # | 0.0015 | |
| Sodium | mg/L | 11/20/2013 | N001 | 261.85 - 281.85 | 2940 | | F | # | 1 | |
| Specific Conductance | umhos/cm | 11/20/2013 | N001 | 261.85 - 281.85 | 14193 | | F | # | | |
| Sulfate | mg/L | 11/20/2013 | N001 | 261.85 - 281.85 | 7600 | | F | # | 133 | |
| Temperature | C | 11/20/2013 | N001 | 261.85 - 281.85 | 10.81 | | F | # | | |
| Total Dissolved Solids | mg/L | 11/20/2013 | N001 | 261.85 - 281.85 | 14200 | | F | # | 3.4 | |
| Turbidity | NTU | 11/20/2013 | N001 | 261.85 - 281.85 | 2.83 | | F | # | | |
| Uranium | mg/L | 11/20/2013 | N001 | 261.85 - 281.85 | 0.059 | | 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: 1/29/2014

| 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 |
|---------------|-----------|------------------------------|------------------|------------------|-------------------------------|----------------------|------------------|
| 0675 | D | 6966.65 | 11/20/2013 | 16:05:25 | 20.21 | 6946.44 | |
| 0678 | C | 6987.94 | 11/20/2013 | 14:55:40 | 225.92 | 6762.02 | |

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

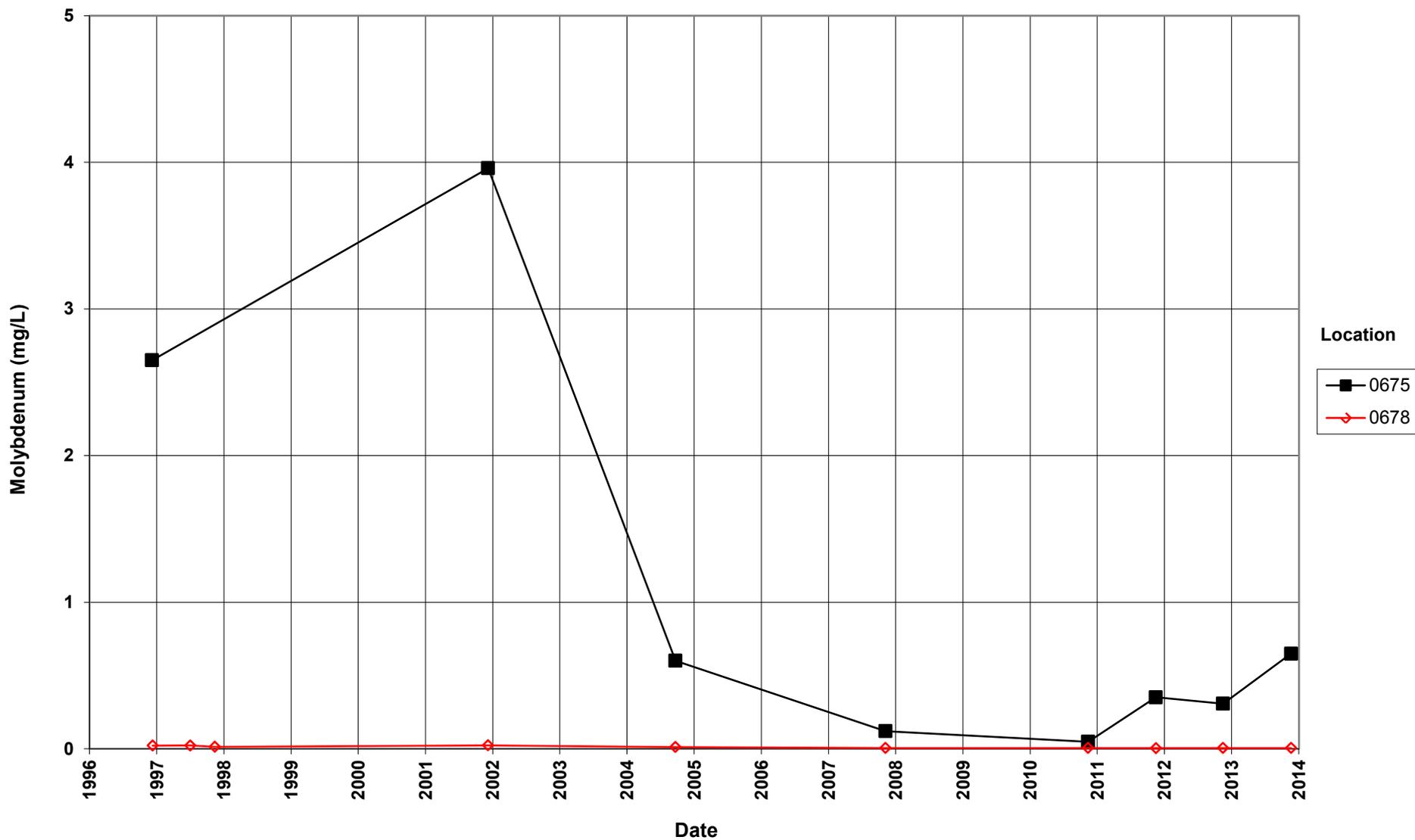
WATER LEVEL FLAGS: D Dry F Flowing B Below top of pump

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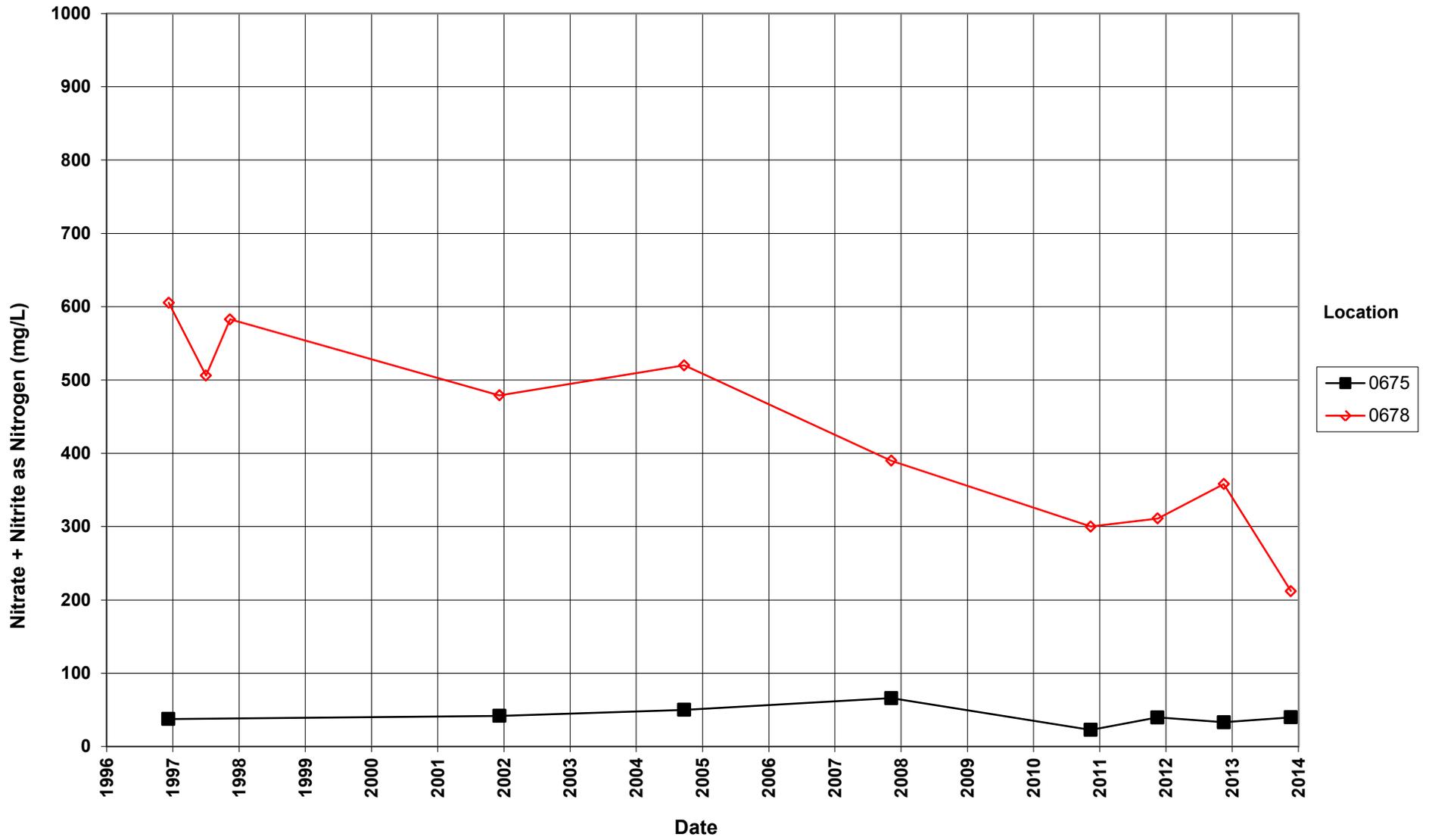
Time-Concentration Graphs

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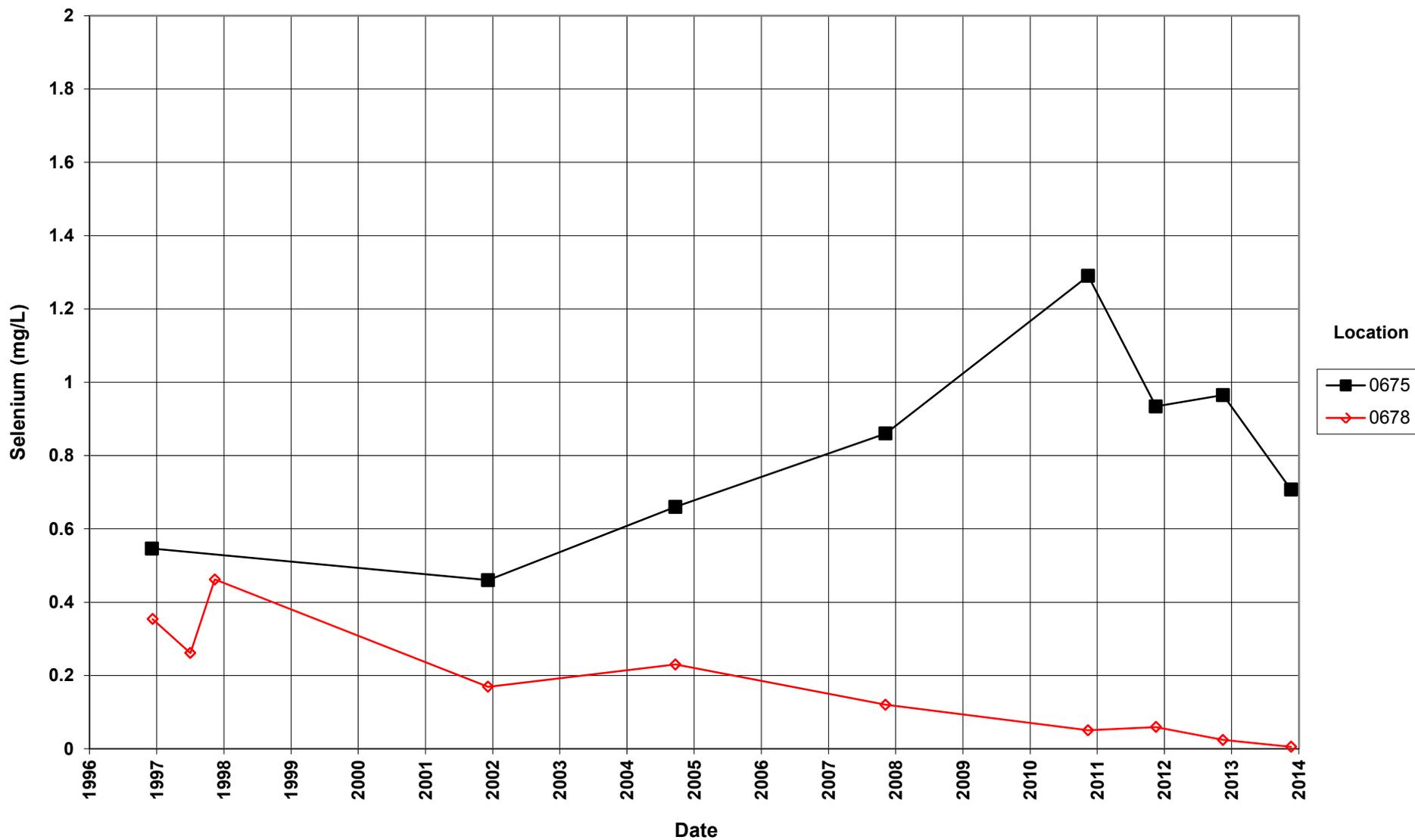
Ambrosia Lake Disposal Site Molybdenum Concentration



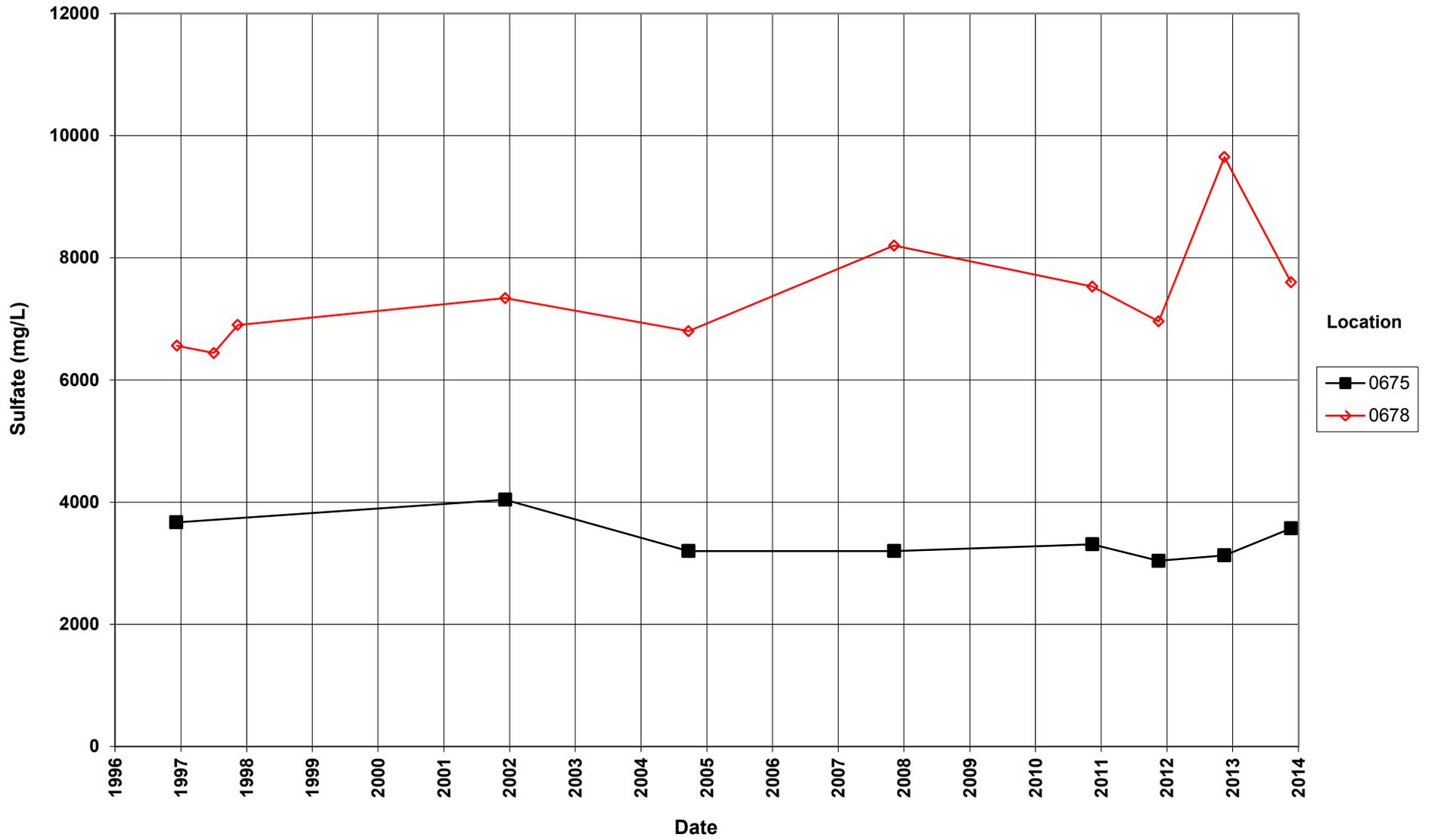
Ambrosia Lake Disposal Site Nitrate + Nitrite as Nitrogen Concentration



Ambrosia Lake Disposal Site Selenium Concentration



Ambrosia Lake Disposal Site Sulfate Concentration



Ambrosia Lake Disposal Site Uranium Concentration



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Attachment 3
Sampling and Analysis Work Order

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established 1959

Task Order LM-501
Control Number 14-0036

October 11, 2013

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-AM01-07LM00060, S.M. Stoller Corporation (Stoller)
November 2013 Environmental Sampling at the Ambrosia Lake, New Mexico,
Disposal Site

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

Dear Ms. Barr:

The purpose of this letter is to inform you of the upcoming sampling event at Ambrosia Lake, New Mexico. 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 11, 2013.

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.

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

Sincerely,

Richard K. Johnson
Site Lead

Deborah Barr
Control Number 14-0036
Page 2

RKJ/lcg/lb

Enclosures (3)

cc: (electronic)

Christina Pennal, DOE
Steve Donovan, Stoller
Bev Gallagher, Stoller
Lauren Goodknight, Stoller
Richard Johnson, Stoller
EDD Delivery
rc-grand,junction
File: AMB 410.02(A)

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 | X | | | | |
| Redox Potential | X | | | | |
| pH | X | | | | |
| Specific | 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 (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 | X | | 10 | SM2540 C | WCH-A-033 |
| Total Organic | | | | | |
| 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 3, 2013

TO: Dick Johnson

FROM: David Atkinson

SUBJECT: Trip Report

Site: Ambrosia Lakes, NM Site

Dates of Sampling Event: 11/20/2013

Team Members: Dan Sellers, David Atkinson

Number of Locations Sampled: Samples were collected at 2 monitoring well locations, and 1 QC duplicate sample was collected.

Locations Not Sampled/Reason: Location 0409 was dry and could not be sampled.

Location Specific Information: Samples collected at monitoring well 0675 were filtered due to persistently high turbidity.

Quality Control Sample Cross Reference:

| Sample Date/Time | Sample Type | False ID | True ID | Ticket # |
|------------------|-------------|----------|---------|----------|
| 11-20-13/1525 | Duplicate | 2073 | 0675 | LMS 313 |

RIN Number Assigned: All samples were assigned to RIN 13115745

Sample Shipment: Samples were shipped overnight via FedEx to GEL Laboratories in Charleston, SC, from Cortez, CO, on 11/21//2013.

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

Well Inspection Summary: All wells appeared to be in good condition.

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

Field Variance: None.

Equipment: Wells were sampled with a peristaltic pump and dedicated tubing or a dedicated bladder pump. All equipment functioned properly.

Institutional Controls:

Fences, Gates, Locks: No issues identified.

Signs: Nothing to note.

Trespassing/Site Disturbances: None observed.

Site Issues:

Disposal Cell/Drainage Structure Integrity: N/A

Vegetation/Noxious Weed Concerns: None.

Maintenance Requirements: None

Access Issues: None

Corrective Action Required: None.

cc: (electronic)
Deborah Barr, DOE
Steve Donovan, Stoller
Dick Johnson, Stoller
EDD Delivery