November 6, 2013

Mr. Brian Wootton
North Carolina Department of Environment and Natural Resources
Division of Waste Management, Solid Waste Section
1646 Mail Service Center
Raleigh, North Carolina 27699

**Reference: September 2013 Annual Groundwater Sampling Event**
Owen Farm Borrow Pit - Solid Waste Demonstration Project
Plymouth, North Carolina
S&ME Project No. 1040-01-537

Dear Mr. Wootton:

S&ME, Inc., on behalf of Geo-Specialty Chemicals is pleased to provide you with the September 2013 sampling report as required under the conditions of the Solid Waste Demonstration Project which GSC is performing with the North Carolina Department of Environment and Natural Resources - Division of Waste Management.

The enclosed report presents analytical results of groundwater samples collected from the four monitor wells located at the Owen Farm Borrow Pit in Plymouth, North Carolina. In accordance with your letter dated January 3, 2011 groundwater was sampled for the following constituents: sulfate, aluminum, specific conductivity, temperature and pH.

If you have any questions or require additional information, please contact our office at (919) 872-2660.

Sincerely,
**S&ME, INC.**

James Waters 11/6/2013
James Waters
Environmental Technician

Samuel P. Watts, P.G.
Senior Project Manager

Attachment: *September 2013 Annual Groundwater Sampling Event*, dated November 6, 2013

cc: Ms. Charita Redding (GSC)
Mr. Perry White (GSC)

FORTY YEARS OF ENGINEERING INTEGRITY

# SEPTEMBER 2013 ANNUAL GROUNDWATER SAMPLING EVENT
# Owen Farm Borrow Pit
# Solid Waste Demonstration Project
# Plymouth, North Carolina
# S&ME Project No. 1040-01-537

**Prepared for:**

Geo-Specialty Chemicals
P.O. Box 68
Plymouth, NC 27962

**Prepared by:**

S&ME, Inc.
3201 Spring Forest Road
Raleigh, North Carolina 27616

November 6, 2013

November 6, 2013

Geo-Specialty Chemicals
P.O. Box 68
Plymouth, NC 27962

Attention: Mr. Perry White via email: perry.white@GEOSC.com

**Reference: September 2013 Annual Groundwater Sampling Event**
Owen Farm Borrow Pit - Solid Waste Demonstration Project
Plymouth, North Carolina
S&ME Project No. 1040-01-537

Dear Mr. White:

S&ME, Inc. (S&ME) is pleased to provide you with the September 2013 sampling report as required under the conditions of the Solid Waste Demonstration Project which Geo-Specialty Chemicals (GSC) is performing with the North Carolina Department of Environment and Natural Resources - Division of Waste Management (NCDENR-DWM). This report presents analytical results of groundwater samples collected from selected monitor wells located at the Owen Farm Borrow Pit in Plymouth, North Carolina (**Figure 1**).

## PROJECT BACKGROUND

In September 1994, GSC (as CYTEC Industries, Inc.) received approval from the DWM to use processed silica to assist in the restoration of selected tracts of farm land to productive use. Specifically, approximately 48,000 cubic yards of processed silica were used, over a period of two years, to fill a soil borrow pit to a compatible elevation with adjacent fields. Operational conditions of the Solid Waste Demonstration Project included groundwater monitoring at the site.

Since 1994, GSC has conducted groundwater monitoring at the site and submitted the sampling results to the DWM on a semi-annual basis. After reviewing the recent and historical data from the groundwater monitoring, S&ME concluded in its reports for the September 2007 and March 2008 sampling events that "… GSC has demonstrated that restoration of land resources has been performed without an adverse release of constituents to the environment that may pose a threat to public health and safety." Accordingly, S&ME requested, on behalf of GSC, that DWM consider termination of the Solid Waste Demonstration Project and semi-annual groundwater monitoring at the site.

FORTY YEARS OF ENGINEERING INTEGRITY

In a letter dated April 17, 2008, Mr. Brian Wootton of the DWM responded, in part, that based on the historical detections of aluminum and sulfate in the groundwater samples and periodic detections of sulfate in excess of the 250 mg/l North Carolina 2L groundwater standard, the Solid Waste Section will allow the groundwater sampling schedule to be reduced from semi-annual to annual (in September). At the end of three (3) years of this annual sampling, GSC may request a revaluation of the sampling schedule. In September 2010, S&ME conducted the third of the three annual September groundwater sampling events and submitted the results to DWM. In a letter dated January 3, 2011, Mr. Wootton responded that the DWM, Solid Waste Section reevaluated the groundwater data and "requires that groundwater sampling continue on an annual basis (September, for the following constituents; Sulfate, Aluminum, Specific Conductivity, Temperature, and pH) since detections of Sulfate and Aluminum have fluctuated and not leveled off…" A copy of Mr. Wooton's letter is attached for reference in **Appendix I**.

## GROUNDWATER MEASUREMENT AND SAMPLING ACTIVITIES

On September 30, 2013, S&ME personnel visited the referenced site to collect groundwater samples from the four selected monitor wells (MW-1, MW-2, MW-3, and MW-4). Depth to groundwater was measured in each well prior to sampling. Water level measurements were compared to the surveyed measuring points on the wells and converted to relative groundwater elevations. These elevations were used to construct the attached groundwater potentiometric map (see **Figure 2**). These results show that groundwater flow continues to flow toward the west, in accordance with previous data. Water levels, excluding MW-1, were consistently higher than recent sampling events, likely reflecting higher precipitation amounts.

Using bailers, the monitor wells were purged of three well volumes of water prior to collecting samples for analysis. While purging the wells, specific conductivity, pH, and temperature were measured in the groundwater collected from each well. These field data are summarized in **Table 1**. Groundwater samples designated for laboratory analysis were then collected by dedicated bailers and placed in laboratory-supplied containers, stored on ice, and transported under standard Chain-of-Custody protocol to ENCO Laboratories, located in Cary, North Carolina.

## LABORATORY ANALYTICAL RESULTS

The samples were analyzed for total aluminum and sulfate using EPA Method 6010C and EPA Method 300.0, respectively. **Table 2** summarizes the laboratory analytical results for the September 2013 groundwater sampling event. Sulfate concentrations reported for the samples collected ranged from 36.0 mg/L in MW-2 to 97.0 mg/L in MW-3. Total aluminum concentrations in the samples ranged from 1.43 mg/L in well MW-1 to 6.22 mg/L in well MW-2. A copy of the laboratory analytical results is included as an attachment in **Appendix I.**

## DISCUSSION OF RESULTS

Conditions of the Solid Waste Demonstration Project which GSC is performing with the DWM do not establish performance criteria, or water quality standards for the Owen Farm Borrow Pit project, and it is unclear what (if any) regulatory criteria should be applied to the project. Regulations pertaining to the classifications and water quality standards applicable to groundwaters of North Carolina are located in Title 15A of the North Carolina Administrative Code, Subchapter 2L (15A NCAC 2L). The 2L Standard for sulfate is 250 mg/L. There is no 2L Standard for aluminum promulgated in this Rule (last amended on April 1, 2013). However, Section .0200, Paragraph (d) of this Rule provides a method to calculate groundwater protection standards for a substance for which a 2L Standard has not been established under the rules. The calculated groundwater protection standard for aluminum is 3.5 mg/L. It should be noted this is a general calculation (not a site-specific) of the groundwater protection standard for aluminum, and 15A NCAC 02L .0202, Paragraph (d), section (3) allows alternative methodology for the derivation of the groundwater protection standards "*Where naturally occurring substances exceed the established standard, the standard shall be the naturally occurring concentration as determined by the Director [of the Division of Environmental Management]*." Because aluminum is a naturally occurring substance in groundwater, it may be possible to establish an alternative, site-specific groundwater protection standard for to aluminum concentrations in groundwater.

**Table 3** summarizes the historical analytical data from previous and current sampling events for comparison. In comparing the September 2013 sampling event data with the results of the previous sampling event of September 2012, the following trends can be seen:

- Aluminum concentrations in groundwater increased in two monitor wells (MW-2 and MW-3), but decreased in the other monitor wells (MW-1 and MW-4)
- Sulfate concentrations in groundwater decreased in three of the monitor wells (MW-1, MW-2, and MW-3). Sulfate concentrations only increased in one monitoring well (MW-4).

**Figures 3** and **4** are also presented for evaluation of historical trends in the laboratory analytical results for aluminum and sulfate concentrations, respectively. As shown on **Figure 3**, aluminum concentrations appear variable in all four wells from October 1994 through March 1998. After that date, aluminum levels remained consistently low, with most results being at or below 5 mg/L through March 2001. The aluminum results have shown some fluctuation in recent years but with peaks at or below 20 mg/L. During this most recent sampling event, aluminum concentrations in groundwater samples, MW-1 and MW-4, have concentrations less that 5mg/L, with MW-1 having less than 2 mg/L. MW-2 and MW-3 have a concentration of more than 5 mg/L.

As shown on **Figure 4**, the sulfate results have been somewhat more variable, with levels being initially above 75 mg/L or less for several years. After mid-1999, sulfate levels in samples from wells MW-1 and MW-2 remain approximately below 75 mg/L while the levels

in MW-3 and MW-4 become more elevated and variable. Sulfate levels in these two wells in March 2006 exceeded the sulfate 2L Groundwater Standard. Since that event, sulfate levels have continued to fluctuate but have consistently remained below the 2L Standard of 250 mg/L for sulfate.

**Figure 5** provides a historical record of the pH of groundwater from all four monitor wells. Groundwater pH measured during the September 2013 sampling event decreased slightly in all four monitor wells, relative to measurements recorded during the September 2012 event. Overall, since 1995 there has been little variability in pH levels recorded at the site, with a slightly higher pH in monitor well MW-2.

## CLOSING

S&ME appreciates the opportunity to be of service to GSC. If you have any questions or require additional information, please contact our office at (919) 872-2660.

Sincerely,
**S&ME, INC.**

James Waters 11/6/2013
James Waters
Environmental Technician

Samuel P. Watts, P.G.
Senior Project Manager

Attachments
cc: Ms. Charita Redding (GSC)

# TABLES

**TABLE 1**
**FIELD MEASUREMENT DATA**
**September 30, 2013**
**OWEN BORROW PIT**
**PLYMOUTH, NORTH CAROLINA**
**S&ME PROJECT NO. 1040-01-537**

| Monitor Well I.D. | TOC Elevation (feet) | Depth to Water From TOC (feet) | Depth to Bottom of Well (feet) | Groundwater Elevation (feet) | Temp (°C) | pH | Specific Conductance (µS/cm) |
|---|---|---|---|---|---|---|---|
| MW-1 | 39.41 | 8.14 | 20.05 | 31.27 | 21.5 | 4.08 | 0.28 |
| MW-2 | 35.62 | 20.51 | 30.05 | 15.11 | 17.2 | 4.32 | 0.20 |
| MW-3 | 24.61 | 11.37 | 19.20 | 13.24 | 18.6 | 3.92 | 0.28 |
| MW-4 | 32.31 | 17.12 | 26.43 | 15.19 | 17.3 | 3.79 | 0.36 |

°C - degrees Celsius
µS/cm – microSiemens per centimeter
pH – standard units

**TABLE 2**
**LABORATORY ANALYTICAL RESULTS**
**September 30, 2013**
**OWEN BORROW PIT**
**PLYMOUTH, NORTH CAROLINA**
**S&ME PROJECT NO. 1040-01-537**

| Analyte | MW-1 (mg/L) | MW-2 (mg/L) | MW-3 (mg/L) | MW-4 (mg/L) | Quantitation Limits (mg/L) |
|---|---|---|---|---|---|
| Aluminum (Total) | 1.43 | 6.22 | 5.69 | 4.6 | 0.100 |
| Sulfate | 40.0 | 36.0 | 97.0 | 90.0 | 1 - 10 |

mg/L - milligrams per Liter

**TABLE 3**
**HISTORICAL SUMMARY OF GROUNDWATER QUALITY DATA**
**OWEN FARM BORROW PIT**
**PLYMOUTH, NORTH CAROLINA**
**S&ME PROJECT NO. 1040-01-537**

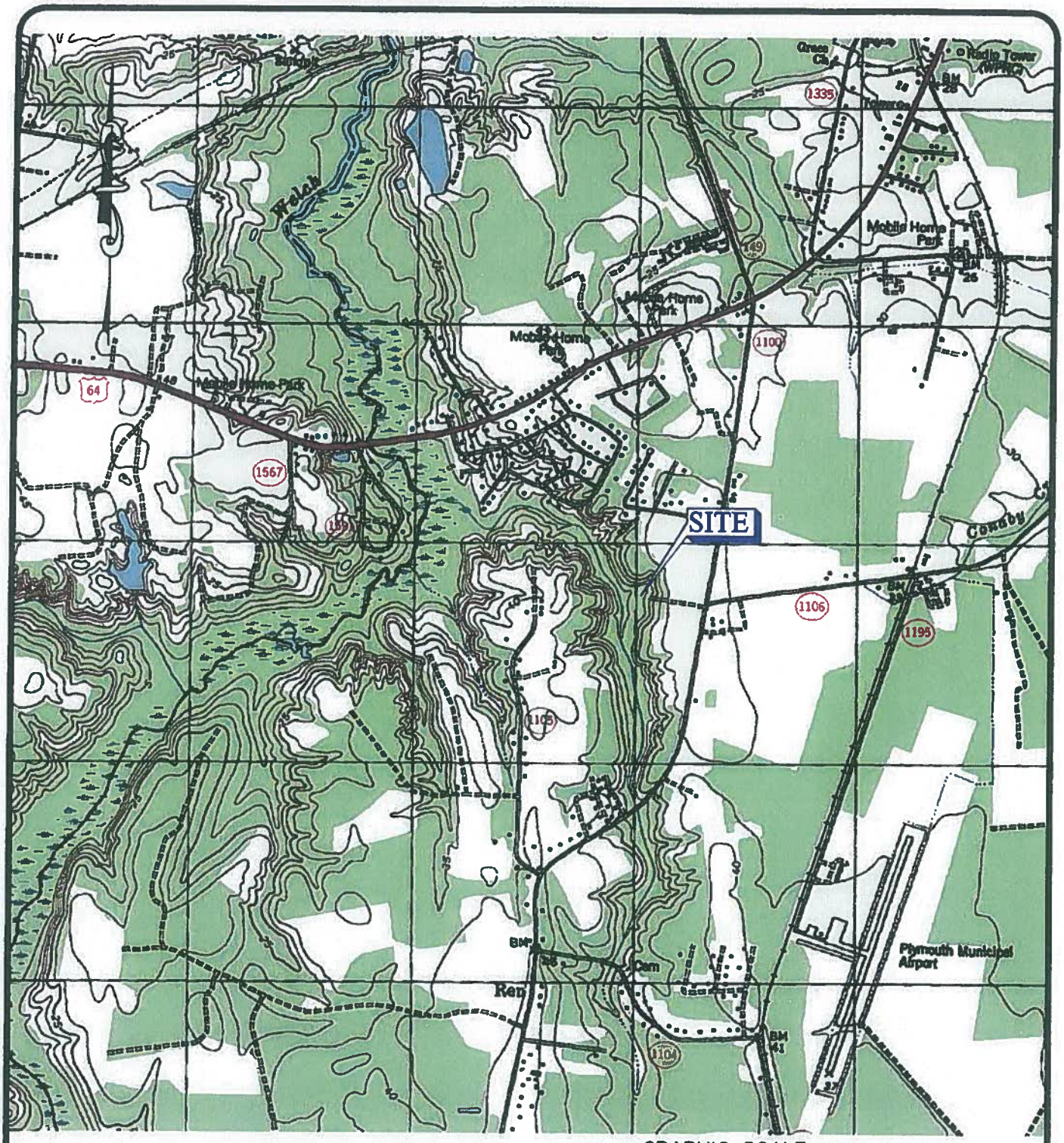
| Monitor Well ID | Analyte | Oct-94 | Mar-95 | Jun-95 | Sep-95 | Dec-95 | Apr-96 | Nov-96 | Mar-97 | Sep-97 | Mar-98 | Sep-98 | Apr-99 | Oct-99 | Mar-00 | Sep-00 | Jan-02 | Mar-02 | Sep-02 | Mar-03 | Sep-03 | Mar-04 | Sep-04 | Mar-05 | Oct-05 | Mar-06 | Sep-06 | Mar-07 | Sep-07 | Mar-08 | Sep-08 | Sep-09 | Sep-10 | Sep-11 | Sep-12 | Sep-13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MW-1 | Aluminum | 62 | 3.8 | 1.7 | 2 | 2 | 3.17 | 6.88 | 0.260 | 2.34 | 1.53 | 1.80 | 1.37 | 1.48 | 1.46 | 1.36 | 3.24 | 2.16 | 2.03 | 3.92 | 1.61 | 2.25 | 1.18 | 1.23 | 1.3 | 1.28 | 1.43 | 7.16 | 9.45 | 1.48 | 1.4 | 1.59 | 5.91 | 1.64 | 1.87 | 1.43 |
| | Sulfate | 76 | 77 | 88 | 56 | 81 | 63.3 | 56.2 | 46.8 | 45.9 | 53 | 49.7 | 47.7 | 46.7 | 55.4 | 41 | 75 | 59 | 53 | 69 | 52 | 59.2 | 52.6 | 51.7 | 62 | 112 | 52.0 | 47 | 47.2 | 56.4 | 70 | 56.6 | 54.5 | 54.2 | 49.1 | 40.0 |
| | pH | 3.9 | 4.4 | 4.4 | 4.1 | 4.0 | 4.5 | 4.4 | 4.8 | 4.2 | 3.9 | 4.4 | 4.7 | 4.0 | 4.3 | 3.8 | 4.2 | 5.3 | 5.6 | 6.4 | 4.8 | 5.8 | 4.8 | 4.4 | 4.9 | 4.8 | 4.2 | 4.43 | 3.9 | 3.8 | 3.72 | 4.20 | 3.98 | 4.04 | 4.40 | 4.08 |
| MW-2 | Aluminum | 18 | 4.6 | 2 | 11 | 15 | 4.14 | 4.85 | 0.113 | 4.35 | 0.450 | 0.352 | 0.270 | 0.794 | 0.329 | 0.399 | 0.147 | 0.402 | 0.595 | 6.28 | 4.07 | 1.51 | 2.39 | <0.20 | 1.50 | 2.41 | 3.56 | 2.53 | 2.32 | 0.74 | <0.10 | 3.6 | 0.441 | 1.05 | 4.77 | 6.22 |
| | Sulfate | 23 | 32 | 31 | 25 | 24 | 28.8 | 23.0 | 17.3 | 24.7 | 33 | 28.9 | 30.9 | 34.8 | 27.9 | 26.8 | 44 | 29 | 39.5 | 43 | 25 | 30.7 | 29.3 | 24.4 | 36.6 | 29.1 | 38 | 33 | 44.5 | 35.6 | 49 | 36.8 | 46.5 | 35.1 | 37 | 36 |
| | pH | 4.7 | 4.6 | 4.6 | 4.9 | 5.0 | 4.9 | 4.8 | 5.9 | 4.7 | 5.3 | 4.7 | 5.0 | 5.7 | 4.8 | 4.2 | 4.6 | 5.1 | 6.0 | 6.0 | 5.2 | 6.4 | 5.6 | 4.3 | 8.9 | 5.3 | 4.6 | 5.04 | 4.6 | 5.2 | 4.31 | 4.28 | 4.72 | 4.75 | 5.10 | 4.32 |
| MW-3 | Aluminum | 6.3 | 4.4 | 1.9 | 24 | 24 | 3.78 | 7.82 | 0.106 | 5.67 | 0.482 | 0.935 | 0.508 | 0.634 | 1.21 | 0.648 | 1.95 | 1.62 | 1.85 | 7.37 | 2.46 | 11.5 | 5.27 | 3.38 | 4.78 | 2.5 | 9.06 | 3.74 | 7.4 | 8.2 | 1.55 | 4.15 | 4.93 | 0.372 | 4.21 | 5.69 |
| | Sulfate | 25 | 26 | 21 | 21 | 27 | 26.7 | 23.4 | 34.3 | 48.8 | 36 | 61.5 | 63.3 | 25.4 | 137.5 | 35 | 150 | 110 | 145 | 25 | 12 | 235 | 134 | 242 | 63.5 | 332 | 83 | 200 | 105 | 75.7 | 185 | 97.7 | 182 | 5 | 97.8 | 97 |
| | pH | 4.3 | 5.5 | 5.5 | 4.2 | 5.0 | 5.1 | 4.6 | 5.3 | 4.5 | 4.7 | 4.6 | 4.7 | 4.6 | 4.3 | 4.1 | 4.6 | 3.3 | 5.0 | 6.7 | 4.6 | 7.0 | 4.4 | 3.9 | 7.5 | 4.6 | 4.2 | 4.47 | 4.0 | 4 | 3.68 | 3.07 | 4.09 | 4.42 | 4.54 | 3.92 |
| MW-4 | Aluminum | 24 | 9.2 | 3.3 | 17 | 60 | 6.33 | 2.93 | BQL | 14.7 | 0.746 | 1.19 | 0.501 | 0.889 | 1.46 | 0.607 | 1.03 | 2.25 | 2.19 | 8.17 | 4 | 3.56 | 1.38 | 2.6 | 2.33 | 2.79 | 3.36 | 3.69 | 18.2 | 1.73 | 1.56 | 2.77 | 2.20 | 2.83 | 5.90 | 4.56 |
| | Sulfate | 64 | 63 | 95 | 68 | 73 | 55.5 | 60.4 | 16.6 | 49.1 | 50 | 61.2 | 53.7 | 50.5 | 241 | 49 | 80 | 63 | 79 | 69 | 59 | 244 | 161 | 97.8 | 183 | 430 | 95.0 | 234 | 113 | 81.6 | 84 | 76 | 187 | 77 | 79 | 90 |
| | pH | 4.4 | 4.3 | 4.3 | 4.4 | 5.0 | 4.5 | 4.4 | 4.7 | 4.6 | 4.7 | 4.6 | 4.5 | 4.3 | 4.2 | 3.9 | 5.4 | 4.6 | 5.4 | 6.2 | 4.4 | 5.8 | 4.5 | 4.2 | 6.0 | 4.6 | 4.2 | 4.30 | 4.1 | 3.8 | 3.94 | 2.92 | 4.13 | 4.24 | 4.17 | 3.79 |

Aluminum and Sulfate concentration values are reported in mg/L units.

pH values are reported in standard units.

NA = Not Analyzed

# FIGURES




GRAPHIC SCALE

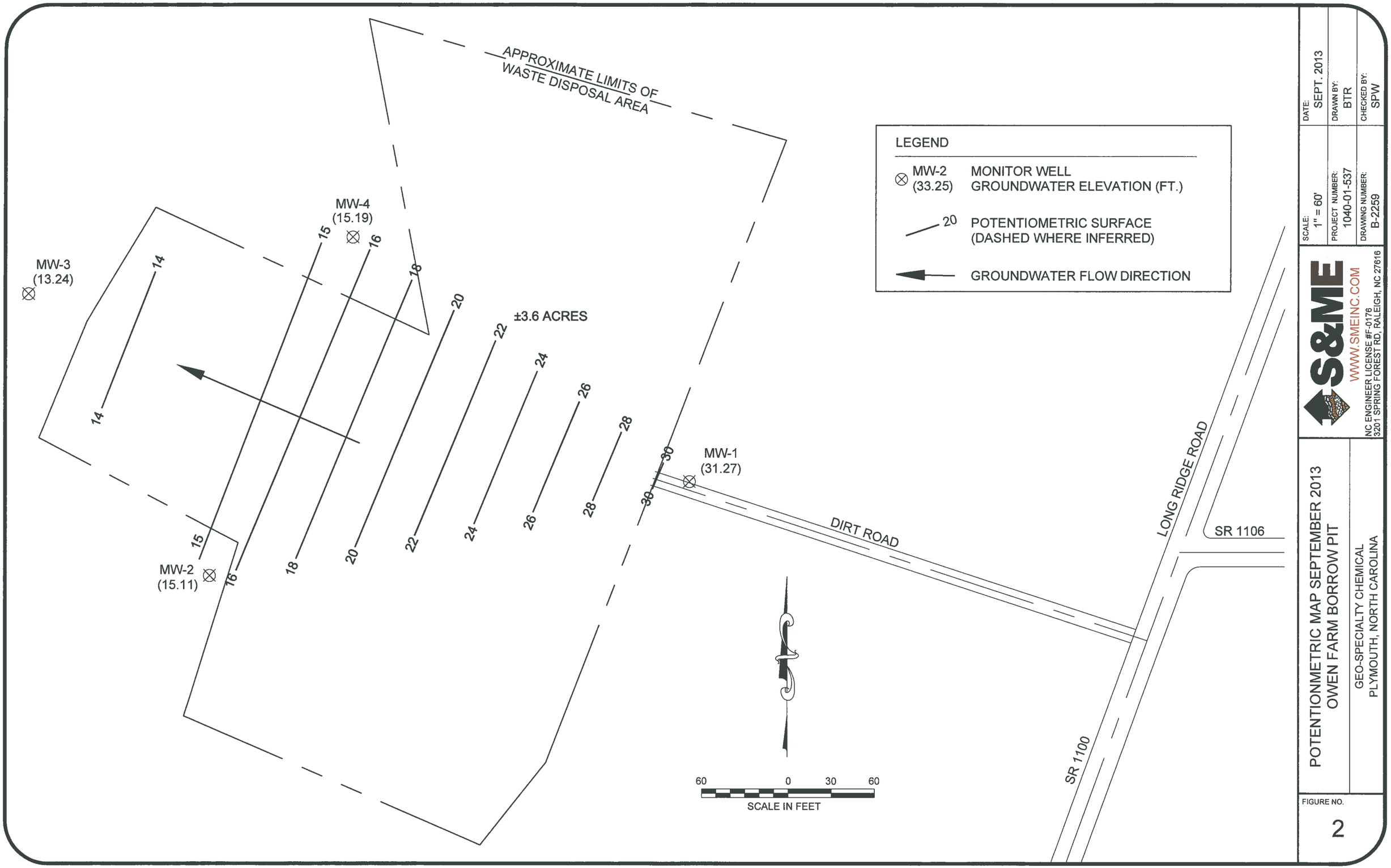
1000 0 500 1000 2000

( IN FEET )

SOURCE:
PLYMOUTH WEST, N.C. USGS QUADRANGLE DATED 1998

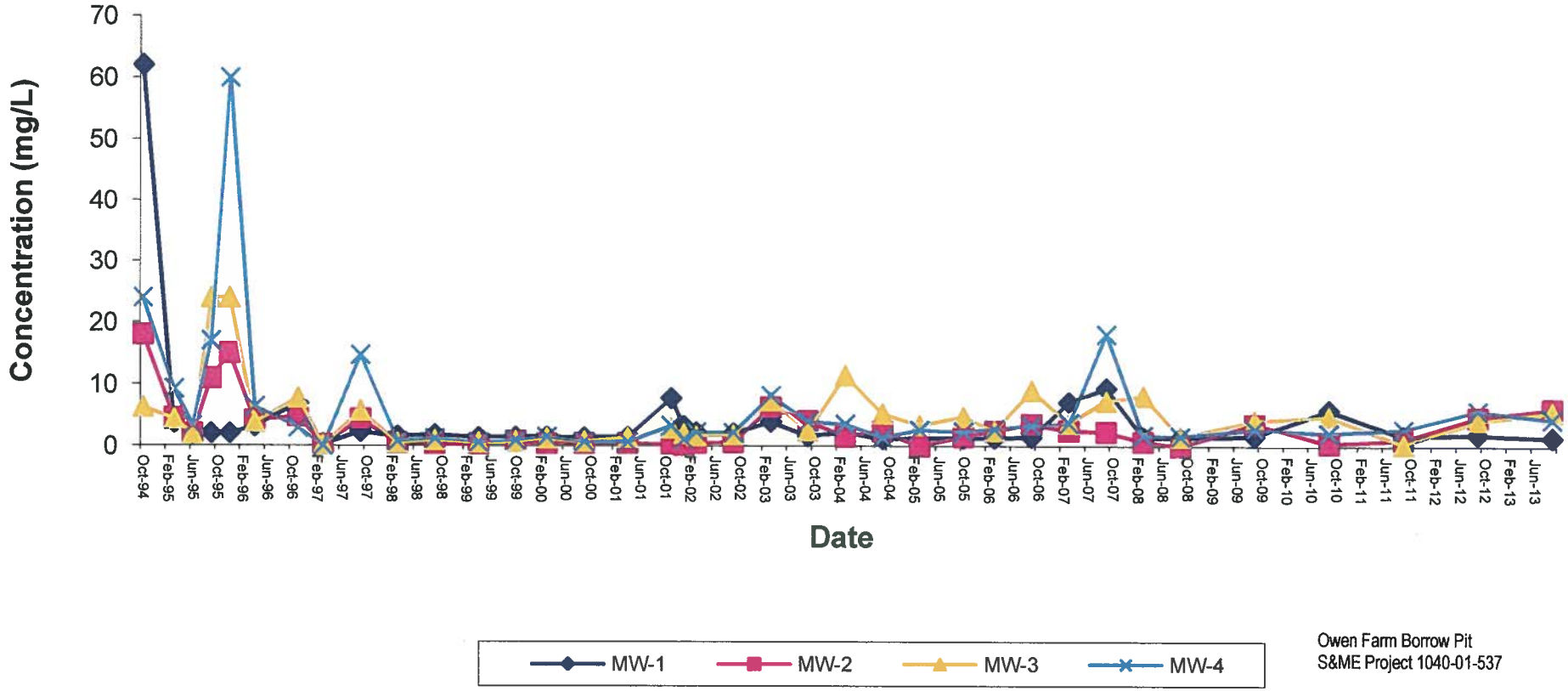
A-1073

| | | | |
|---|---|---|---|
| SCALE: 1" = 2000' | S&ME WWW.SMEINC.COM | VICINITY MAP<br>OWEN FARM BARROW PIT<br>GEO-SPECIALTY CHEMICAL<br>PLYMOUTH, NORTH CAROLINA | FIGURE NO. |
| DATE: APRIL 2008 | | | 1 |
| DRAWN BY: BTR | | | |
| PROJECT NO: 1040-01-537 | | | |



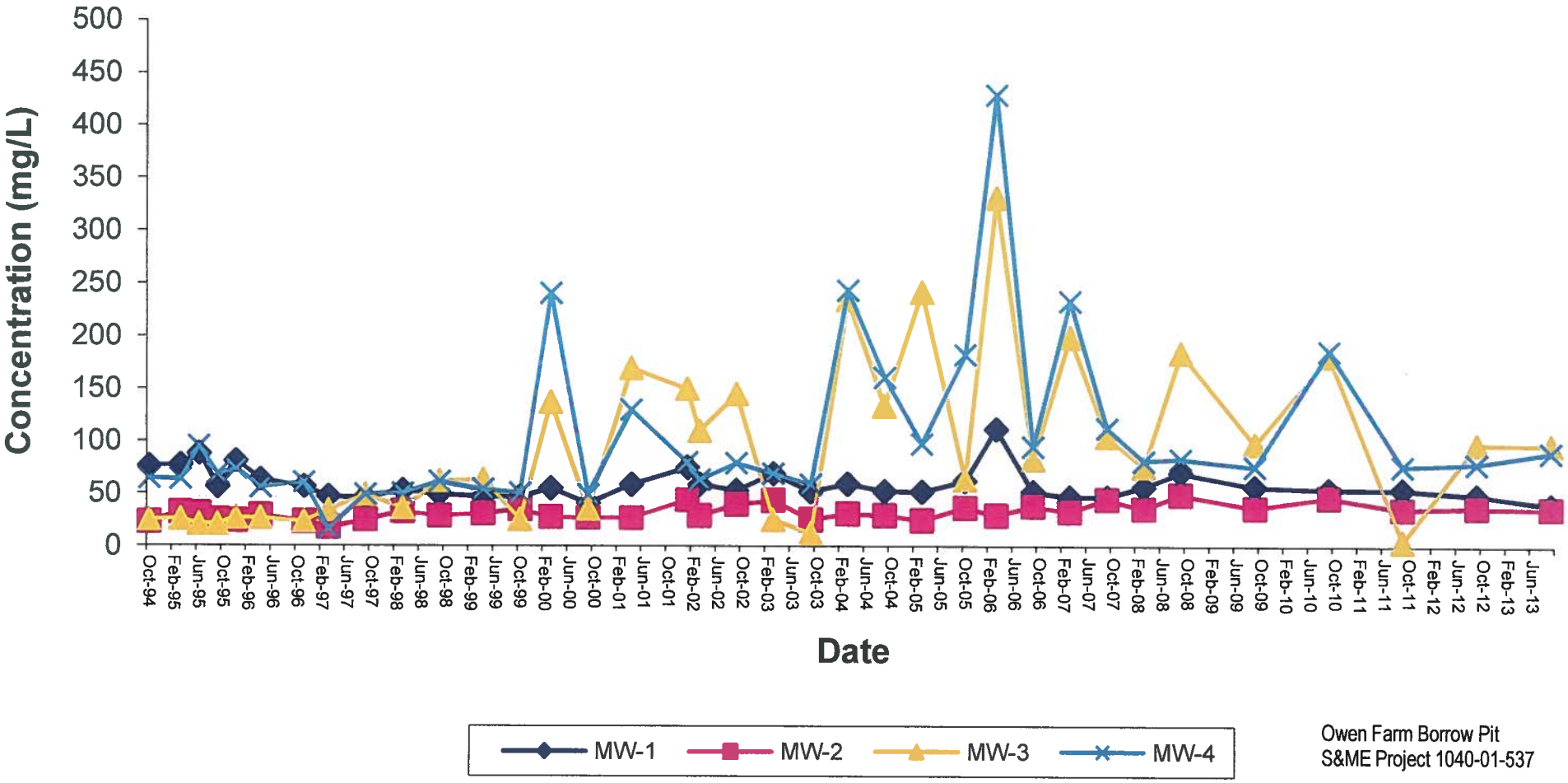

S:\PROJECTS\Pre-2005\Environ\2001 Jobs\01-537 Owen Farm Borrow Pit - Geospecialty Chemicals\CAD\B2259.dwg, FIG2, 10/18/2013 9:46:02 AM, 1:1

## Figure 3
## Total Aluminum Concentration in mg/L vs Time



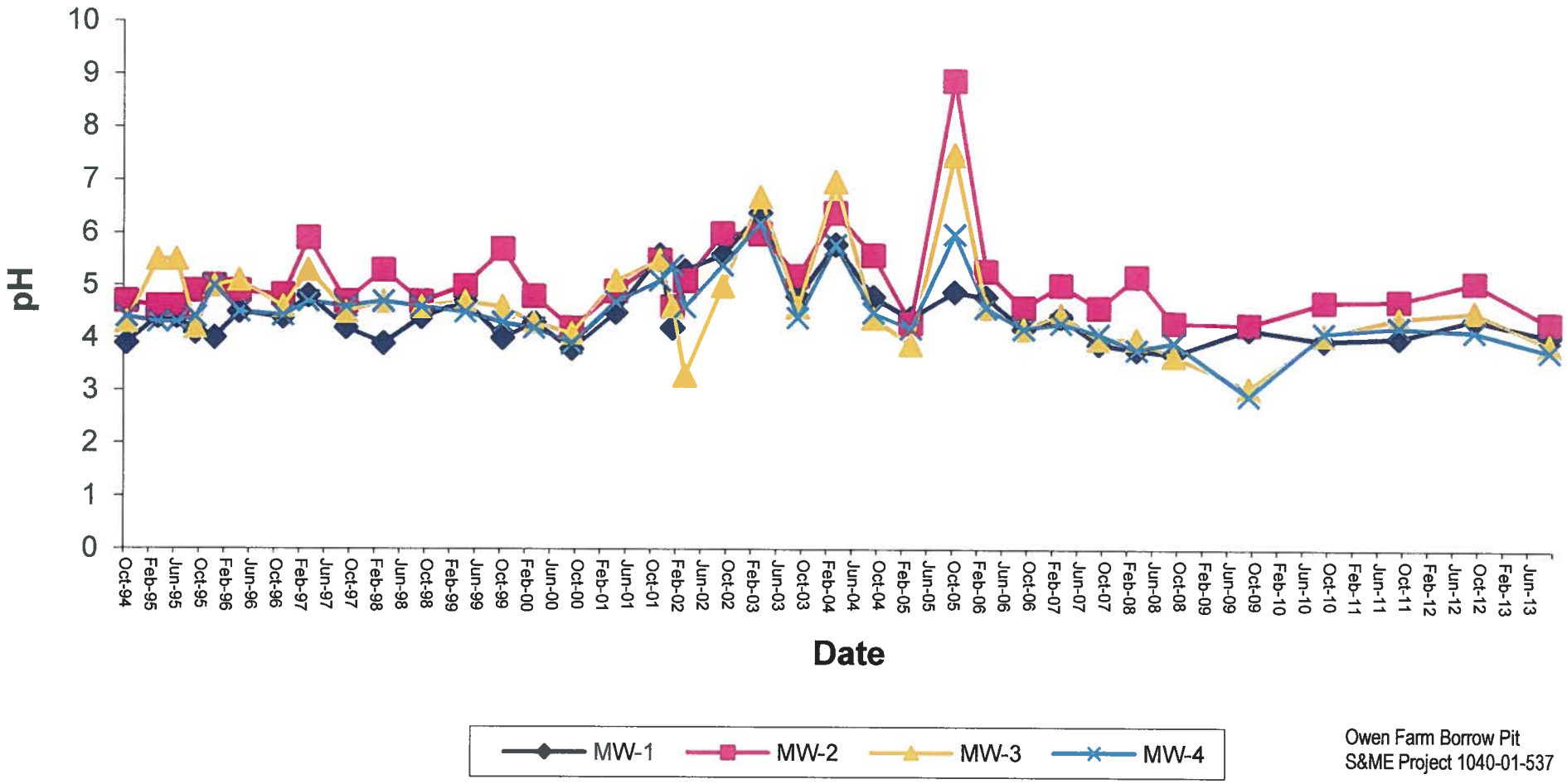

Owen Farm Borrow Pit
S&ME Project 1040-01-537

# Figure 4
## Sulfate Concentration in mg/L vs Time




Owen Farm Borrow Pit
S&ME Project 1040-01-537

# Figure 5
# pH vs Time




Owen Farm Borrow Pit
S&ME Project 1040-01-537

# APPENDIX I

**CORRESPONDENCE**

DWM letter, January 3, 2011

NCDENR
North Carolina Department of Environment and Natural Resources
Division of Waste Management
Dexter R. Matthews
Director

Beverly Eaves Perdue
Governor

Dee Freeman
Secretary

January 3, 2011

Ms. Claudia B. Irvin, Assistant Project Manager,
S&ME, Inc.
3201 Spring Forest Road
Raleigh, NC 27616

RE: Owen Borrow Pit – Solid Waste Demonstration Project
Water Quality Monitoring Requirements –
Plymouth, NC
Washington County

Dear Ms. Irvin:

The Solid Waste Section (SWS) received on November 8, 2010, the September 2010 Annual Groundwater Sampling Report by S&ME, Inc., on behalf of Geo-Specialty Chemicals (GSC), for the Owen Farm Borrow Pit – Solid Waste Demonstration Project located in Plymouth, North Carolina.

Pages 4 and 5 of this report, state in-part the following: *"Based on the results of groundwater monitoring and plant growth and development of organic matter and soil structure studies conducted at the site, it is our opinion that GSC has demonstrated that restoration of land resources has been performed without an adverse release of constituents to the environment that may pose a threat to public health and safety. As discussed in the background section of this report, GSC has previously requested termination of groundwater monitoring for this demonstration project. This sampling event has successfully demonstrated that sulfate levels have remained below 2L Groundwater Standards for this site. Accordingly, on behalf of GSC, we request that DWM approve termination of the Solid Waste Demonstration Project and annual groundwater monitoring at the Owen Farm Borrow Pit site."*

According to the letter by the SWS to Geo–Specialty Chemicals on April 17, 2008, it stated in-part the following: *"Based on the groundwater data submitted since 1994, there have been detections of the constituents, Aluminum and Sulfate in samples obtained from the four (4) groundwater monitor wells at the site. According to groundwater sampling data submitted, the constituent Sulfate was detected above the North Carolina 2L groundwater standard of 250 mg/l during the March 2006 sampling event. However, the trend for this constituent concentration has been mostly below 2L groundwater standards. The constituent, Aluminum has also been detected in the groundwater monitoring*

*wells. Based on these factors, the Solid Waste Section will allow the groundwater sampling schedule be reduced from semi-annually to once a year (annually – September) and the groundwater wells shall continued to be sampled for the same constituents; Sulfate, Aluminum, Specific Conductivity, Temperature, and pH for a time frame of three (3) years. At the end of three (3) years, you may submit a written request to the Solid Waste Section for a revaluation of the groundwater monitoring schedule. Please note, that if the frequency of groundwater quality standards exceedances increase during the next three (3) years, then semi-annual sampling, assessment monitoring, and possible corrective action may be implemented at the time of reevaluation".*

After a reevaluation of the groundwater data obtained from the four (4) monitoring wells, The Solid Waste Section requires that groundwater sampling continue on an annual basis (September, for the same constituents; Sulfate, Aluminum, Specific Conductivity, Temperature, and pH) since detections of Sulfate and Aluminum have fluctuated and not leveled off. In addition, the Groundwater Protection Standard for Aluminum is now 3.5 mg per liter. The concentration levels for Aluminum at this site have on occasion been above this protection standard. Toxicologists with the North Carolina Department of Health and Human Services calculate Groundwater Protection Standards. Questions regarding how the standards are calculated can be directed to the North Carolina Department of Health and Human Services.

Thank you for your cooperation. If you have any questions, please call me at (919) 508-8524.

Sincerely,

Brian Wootton

Brian Wootton
Hydrogeologist
Solid Waste Section

cc: Samuel P. Watts, P.G. – S&ME, Inc.
Charita Redding - Manager of Safety & Environmental Affairs, Geo-Specialty Chemicals (GCS)
Ed Mussler - Solid Waste Section
Mark Poindexter - Solid Waste Section
Ray Williams – Solid Waste Section
Hanna Assefa – Environmental Toxicologist - DWM

# LABORATORY ANAYLTICAL REPORT

# ENCO Laboratories

*Accurate. Timely. Responsive. Innovative.*

**102-A Woodwinds Industrial Court**
**Cary NC, 27511**
**Phone: 919.467.3090 FAX: 919.467.3515**

Monday, October 14, 2013
S&ME, Inc. (SM001)
Attn: Sam Watts
3201 Spring Forest Road
Raleigh, NC 27616

**RE: Laboratory Results for**
**Project Number: 1040-01-537, Project Name/Desc: Owen Farm Borrow Pit**
**ENCO Workorder(s): C312845**

Dear Sam Watts,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Tuesday, October 1, 2013.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Cary. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Chuck Smith

Chuck Smith
Project Manager
Enclosure(s)

www.encolabs.com

## SAMPLE SUMMARY/LABORATORY CHRONICLE

**Client ID: MW-1** **Lab ID: C312845-01** **Sampled: 09/30/13 15:10** **Received: 10/01/13 13:00**

| Parameter | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|
| EPA 300.0 | 10/28/13 | 10/03/13 12:57 | 10/03/13 19:46 |
| EPA 6010C | 03/29/14 | 10/07/13 09:54 | 10/08/13 12:41 |

**Client ID: MW-2** **Lab ID: C312845-02** **Sampled: 09/30/13 15:35** **Received: 10/01/13 13:00**

| Parameter | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|
| EPA 300.0 | 10/28/13 | 10/03/13 12:57 | 10/03/13 20:04 |
| EPA 6010C | 03/29/14 | 10/07/13 09:54 | 10/08/13 13:22 |

**Client ID: MW-3** **Lab ID: C312845-03** **Sampled: 09/30/13 16:00** **Received: 10/01/13 13:00**

| Parameter | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|
| EPA 300.0 | 10/28/13 | 10/03/13 12:57 | 10/03/13 20:21 |
| EPA 6010C | 03/29/14 | 10/07/13 09:54 | 10/08/13 13:25 |

**Client ID: MW-4** **Lab ID: C312845-04** **Sampled: 09/30/13 16:20** **Received: 10/01/13 13:00**

| Parameter | Hold Date/Time(s) | Prep Date/Time(s) | Analysis Date/Time(s) |
|---|---|---|---|
| EPA 300.0 | 10/28/13 | 10/03/13 12:57 | 10/03/13 20:39 |
| EPA 6010C | 03/29/14 | 10/07/13 09:54 | 10/08/13 13:27 |



This report relates only to the sample as received by the laboratory, and may only be reproduced in full.

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## SAMPLE DETECTION SUMMARY

**Client ID: MW-1** **Lab ID: C312845-01**

| Analyte | Results | Flag | MDL | PQL | Units | Method | Notes |
|---|---|---|---|---|---|---|---|
| Aluminum - Total | 1430 | | 29.0 | 100 | ug/L | EPA 6010C | |
| Sulfate as SO4 | 40 | | 2.9 | 5.0 | mg/L | EPA 300.0 | |

**Client ID: MW-2** **Lab ID: C312845-02**

| Analyte | Results | Flag | MDL | PQL | Units | Method | Notes |
|---|---|---|---|---|---|---|---|
| Aluminum - Total | 6220 | | 29.0 | 100 | ug/L | EPA 6010C | |
| Sulfate as SO4 | 36 | | 2.9 | 5.0 | mg/L | EPA 300.0 | |

**Client ID: MW-3** **Lab ID: C312845-03**

| Analyte | Results | Flag | MDL | PQL | Units | Method | Notes |
|---|---|---|---|---|---|---|---|
| Aluminum - Total | 5690 | | 29.0 | 100 | ug/L | EPA 6010C | |
| Sulfate as SO4 | 97 | | 2.9 | 5.0 | mg/L | EPA 300.0 | |

**Client ID: MW-4** **Lab ID: C312845-04**

| Analyte | Results | Flag | MDL | PQL | Units | Method | Notes |
|---|---|---|---|---|---|---|---|
| Aluminum - Total | 4560 | | 29.0 | 100 | ug/L | EPA 6010C | |
| Sulfate as SO4 | 90 | | 2.9 | 5.0 | mg/L | EPA 300.0 | |


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## ANALYTICAL RESULTS

**Description:** MW-1 **Lab Sample ID:** C312845-01 **Received:** 10/01/13 13:00
**Matrix:** Ground Water **Sampled:** 09/30/13 15:10 **Work Order:** C312845
**Project:** Owen Farm Borrow Pit **Sampled By:** James Waters

### Metals (total recoverable) by EPA 6000/7000 Series Methods

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | PQL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum [7429-90-5]^ | 1430 | | ug/L | 1 | 29.0 | 100 | 3J07015 | EPA 6010C | 10/08/13 12:41 | JDH | |

### Classical Chemistry Parameters

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | PQL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate as SO4 [14808-79-8]^ | 40 | | mg/L | 1 | 2.9 | 5.0 | 3J03020 | EPA 300.0 | 10/03/13 19:46 | AJB | |

**Description:** MW-2 **Lab Sample ID:** C312845-02 **Received:** 10/01/13 13:00
**Matrix:** Ground Water **Sampled:** 09/30/13 15:35 **Work Order:** C312845
**Project:** Owen Farm Borrow Pit **Sampled By:** James Waters

### Metals (total recoverable) by EPA 6000/7000 Series Methods

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | PQL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum [7429-90-5]^ | 6220 | | ug/L | 1 | 29.0 | 100 | 3J07015 | EPA 6010C | 10/08/13 13:22 | JDH | |

### Classical Chemistry Parameters

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | PQL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate as SO4 [14808-79-8]^ | 36 | | mg/L | 1 | 2.9 | 5.0 | 3J03020 | EPA 300.0 | 10/03/13 20:04 | AJB | |

**Description:** MW-3 **Lab Sample ID:** C312845-03 **Received:** 10/01/13 13:00
**Matrix:** Ground Water **Sampled:** 09/30/13 16:00 **Work Order:** C312845
**Project:** Owen Farm Borrow Pit **Sampled By:** James Waters

### Metals (total recoverable) by EPA 6000/7000 Series Methods

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | PQL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum [7429-90-5]^ | 5690 | | ug/L | 1 | 29.0 | 100 | 3J07015 | EPA 6010C | 10/08/13 13:25 | JDH | |

### Classical Chemistry Parameters

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | PQL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate as SO4 [14808-79-8]^ | 97 | | mg/L | 1 | 2.9 | 5.0 | 3J03020 | EPA 300.0 | 10/03/13 20:21 | AJB | |

**Description:** MW-4 **Lab Sample ID:** C312845-04 **Received:** 10/01/13 13:00
**Matrix:** Ground Water **Sampled:** 09/30/13 16:20 **Work Order:** C312845
**Project:** Owen Farm Borrow Pit **Sampled By:** James Waters

### Metals (total recoverable) by EPA 6000/7000 Series Methods

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | PQL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum [7429-90-5]^ | 4560 | | ug/L | 1 | 29.0 | 100 | 3J07015 | EPA 6010C | 10/08/13 13:27 | JDH | |

### Classical Chemistry Parameters

*^ - ENCO Cary certified analyte [NC 591]*

| Analyte [CAS Number] | Results | Flag | Units | DF | MDL | PQL | Batch | Method | Analyzed | By | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate as SO4 [14808-79-8]^ | 90 | | mg/L | 1 | 2.9 | 5.0 | 3J03020 | EPA 300.0 | 10/03/13 20:39 | AJB | |


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# QUALITY CONTROL DATA

## Metals (total recoverable) by EPA 6000/7000 Series Methods - Quality Control

### *Batch 3J07015 - EPA 3005A*

**Blank (3J0701S-BLK1)** Prepared: 10/07/2013 09:54 Analyzed: 10/08/2013 12:34

| Analyte | Result | Flag | POL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 29.0 | U | 100 | ug/L | | | | | | | |

**LCS (3J07015-BS1)** Prepared: 10/07/2013 09:54 Analyzed: 10/08/2013 12:38

| Analyte | Result | Flag | POL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 2060 | | 100 | ug/L | 2000 | | 103 | 80-120 | | | |

**Matrix Spike (3J07015-MS1)** Prepared: 10/07/2013 09:54 Analyzed: 10/08/2013 12:43

**Source: C312845-01**

| Analyte | Result | Flag | POL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 3640 | | 100 | ug/L | 2000 | 1430 | 110 | 75-125 | | | |

**Matrix Spike Dup (3J07015-MSD1)** Prepared: 10/07/2013 09:54 Analyzed: 10/08/2013 12:46

**Source: C312845-01**

| Analyte | Result | Flag | POL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 3680 | | 100 | ug/L | 2000 | 1430 | 112 | 75-125 | 1 | 20 | |

**Post Spike (3J07015-PS1)** Prepared: 10/07/2013 09:54 Analyzed: 10/08/2013 12:48

**Source: C31284S-01**

| Analyte | Result | Flag | POL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminum | 3.46 | | 0.100 | mg/L | 2.00 | 1.43 | 101 | 80-120 | | | |

## Classical Chemistry Parameters - Quality Control

### *Batch 3J03020 - NO PREP*

**Blank (3J03020-BLK1)** Prepared: 10/03/2013 12:57 Analyzed: 10/03/2013 14:48

| Analyte | Result | Flag | POL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate as SO4 | 2.9 | U | 5.0 | mg/L | | | | | | | |

**LCS (3J03020-BS1)** Prepared: 10/03/2013 12:57 Analyzed: 10/03/2013 15:23

| Analyte | Result | Flag | POL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate as SO4 | 48 | | 5.0 | mg/L | 50.0 | | 96 | 90-110 | | | |

**Matrix Spike (3J03020-MS1)** Prepared: 10/03/2013 12:57 Analyzed: 10/03/2013 23:52

**Source: C310141-01**

| Analyte | Result | Flag | POL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate as SO4 | 31 | | 5.0 | mg/L | 20.0 | 12 | 95 | 90-110 | | | |

**Matrix Spike Dup (3J03020-MSD1)** Prepared: 10/03/2013 12:57 Analyzed: 10/04/2013 00:09

**Source: C310141-01**

| Analyte | Result | Flag | POL | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sulfate as SO4 | 31 | | 5.0 | mg/L | 20.0 | 12 | 96 | 90-110 | 1 | 10 | |



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## FLAGS/NOTES AND DEFINITIONS

| | |
|---|---|
| **B** | The analyte was detected in the associated method blank. |
| **D** | The sample was analyzed at dilution. |
| **J** | The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable. |
| **U** | The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable. |
| **E** | The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate. |
| **MRL** | Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content. |



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# ENVIRONMENTAL CONSERVATION LABORATORIES CHAIN-OF-CUSTODY RECORD

10775 Central Port Dr
Orlando, FL 32824
(407) 826-5314 Fax (407) 850-6945

4810 Executive Park Court, Suite 111
Jacksonville, FL 32210-6060
(904) 296-3007 Fax (904) 296-6210

102-A Woodwinds Industrial Court
Cary, NC 27511
(919) 467-3090 Fax (919) 467-3515



| | |
|---|---|
| Client Name: S+ME Inc. | Project Number: 1040-01-537 |
| Address: 3201 Spring Forest Rd. | Project Name/Desc: Owen Farm Borrow Pit |
| City/ST/Zip: Raleigh NC 27616 | PO # / Billing Info: |
| Tel: (919) 872-2660 Fax: | Reporting Contact: Sam Watts swatts@sme.com |
| Sampler(s) Name, Affiliation (Print): James Waters Env. Technician | Billing Contact: |
| Sampler(s) Signature: James C. Waters | Facility # (if required): |

Requested Analyses: Aluminum, Sulfate, (SPW)

Requested Turnaround Times

Note: Rush requests subject to acceptance by the facility

✓ Standard

___ Expedited

Due __/__/__

Lab Workorder: C312845

Preservation (See Codes) (Combine as necessary)

| Item # | Sample ID (Field Identification) | Collection Date | Collection Time | Comp / Grab | Matrix (see codes) | Total # of Containers | N | None | | | | | | | | | Sample Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | MW-1 | 9/30/13 | 1510 | Grab | GW | 2 | ✓ | ✓ | | | | | | | | | |
| 2 | MW-2 | | 1535 | | | 2 | ✓ | ✓ | | | | | | | | | |
| 3 | MW-3 | | 1600 | | | 2 | ✓ | ✓ | | | | | | | | | |
| 4 | MW-4 | | 1620 | | | 2 | ✓ | ✓ | | | | | | | | | |
| ~~5~~ | ~~Trip Blank~~ SPW | | | | | (SW) | | | (SPW) | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
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| | | | | | | | | | | | | | | | | | |
| | | | | | | 8 | <-- Total # of Containers | | | | | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Sample Kit Prepared By: James C. Waters | Date/Time: 10/1/13 | | Date/Time: | Received By: [signature] | Date/Time: 10/1/13 1109 |
| Comments: | | | Date/Time: | Received By: | Date/Time: |
| | | | Date/Time: | Received By: [signature] | Date/Time: 10/1/13 100 |
| | | Cooler #'s & Temps on Receipt: 1.1°C | | | Condition Upon Receipt: ✓ Acceptable ___ Unacceptable |

Matrix: GW-Groundwater SO-Soil SE-Sediment SW-Surface Water WW-Wastewater A-Air D-Other (detail in comments)

Preservation: I-Ice H-HCl N-HNO3 S-H2SO4 NO-NaOH O-Other (detail in comments)

Note: All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist