
July 31, 2013

Mr. David Brownlee
Georgia Department of Natural Resources
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Atlanta, GA 30334-9000

Subject: **Transmittal of Semi-annual Groundwater Monitoring Report #10
July 2012 through June 2013
General Chemical Corporation Site, HSI#10498,
East Point, GA**

Dear Mr. Brownlee:

On behalf of General Chemical LLC (GCC), we are pleased to provide you with two paper copies and an electronic copy of the Semi-annual Groundwater Monitoring Report #10, July 2012 through June 2013 for the above referenced site.

If you have any questions regarding this report, please feel free to give me a call at (678) 202-9500.

Sincerely,
Geosyntec Consultants, Inc.



Brian D. Jacobson, P.E.
Senior Engineer



Prepared for

General Chemical LLC
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**SEMI-ANNUAL GROUNDWATER
MONITORING REPORT NO. 10
JANUARY THROUGH JUNE 2013
GENERAL CHEMICAL SITE
EAST POINT, GEORGIA
HSI#10498**

Prepared by

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engineers | scientists | innovators
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Project Number GR5060

July 2013

PROFESSIONAL ENGINEER CERTIFICATION

I certify that I am a qualified engineer who has received a baccalaureate or post-graduate degree in the natural science or engineering, and have sufficient training and experience in environmental assessment and corrective measures, as demonstrated by state registration and completion of accredited university courses, that enable me to make sound professional judgments. I further certify that this report was prepared by myself or by a subordinate working under my direction.

Brian D. Jacobson, P.E.
Registered Professional Engineer
Georgia Registration #23332

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1. INTRODUCTION

1.1 Background

1.1.1 Site Location and Description

The General Chemical LCC (GCL) facility (Site) is located on Central Avenue in the City of East Point, Fulton County, Georgia (**Figure 1-1**). The approximate Site location corresponds to latitude of 33.67 and longitude of 84.44. The Site property is bounded by North Martin Street and the Charles A. Green Recreational Facilities on the north side, Randall and Bayard Streets on the east side, Central Avenue and an industrial (metal recycling) facility on the south side, and Central Avenue on the west side. The general area surrounding the GCL facility consists of industrial land uses bordered by some residential properties toward the north and northeast directions. Another industrial site is located on the adjacent property to the northwest of the GCL facility.

The Site, as shown in an aerial view on **Figure 1-1**, consists of a process building, a warehouse structure, and an office building. During operation, there were four Hi-Clay Alumina (HCA) storage cells (herein referred to as HCA cells) located on the Site. These cells were removed during the period of 2003 to 2005, and the area was returned to beneficial use in 2006.

1.1.2 Summary of Recent Regulatory Activities

Subsequent to the issue of the 2002 Corrective Action Plan (CAP), GCL voluntarily elected to remove the HCA material from the on-site cells.

Following excavation and removal of the HCA, a revised CAP was issued by GCL on 2 October 2006. A Georgia Environmental Protection Division (GaEPD) letter dated 16 January 2007 provided comments and a request for additional work followed by resubmission of the revised CAP.

GCL submitted a revised CAP incorporating GaEPD comments on 30 March 2007.

GaEPD completed review and issued a conditional approval of the revised CAP on 4 September 2007. Pursuant to the revised CAP, groundwater and surface water samples were collected for aluminum and sulfate analysis.

GCL submitted a voluntary remediation plan application (VRPA) in January 2013. The VRPA proposed: (i) delineation of the horizontal extent of sulfate contamination in groundwater; (ii) continued semi-annual sampling of monitoring wells screened in the partially weathered rock (PWR) and surface water sampling locations; (iii) conduct a storm water drain assessment and implement any necessary repairs to prevent groundwater from entering the storm drain system; and (iv) institutional controls on affected properties through the placement of unified environmental covenants.

In a letter dated 10 April 2013, GaEPD approved the VRPA. GaEPD issued comments on the VRPA on 12 April 2013.

1.2 Objectives and Scope

The objective of this report is to present the results for the semi-annual groundwater monitoring activities conducted at the GCL site in April 2013. This is the first semi-annual report submitted to GaEPD following approval of the VRPA in April 2013. However, this report is issued as Semi-annual Groundwater Monitoring Report No.10” to avoid confusion with previous reports issued under the CAP. This report provides a summary of the activities performed and the results of the field and laboratory measurements that were obtained during this monitoring period.

This report presents the results of the following activities:

- Sampling of 6 on-site wells (**Figure 1-2**);
- Sampling of 3 off-site wells (**Figure 1-2**); and
- Sampling of surface water at one on-site and three off-site locations (**Figure 1-3**).

1.3 Overview

This semi-annual groundwater monitoring report presents the results of field sampling activities performed by Geosyntec in April 2013. The report is organized as follows:

- Section 2 presents a summary of site characterization information including site geology and hydrogeology, field investigations, nature and extent of environmental impact, and site-specific groundwater and contaminant transport conceptual modeling.
- Section 3 presents the results from sampling of monitoring wells and surface water from the Site.
- Section 4 discusses the sampling procedures used to obtain groundwater and stormwater samples from the Site
- Section 5 summarizes the results of quality assurance/quality control (QA/QC) evaluation of the data obtained during this monitoring period.
- Section 6 presents conclusions that are based on the data and provide recommendations for future activities.
- Data from this monitoring period are presented in the Appendices. Analytical laboratory reports for water samples are presented in **Appendix A**. Field Forms used during well sampling are presented in **Appendix B**.

2 SITE CHARACTERIZATION

2.1 Site Geology and Hydrogeology

This section presents an overview of the Site hydrogeologic conditions. Information on the Site hydrogeology was obtained during the Site investigation activities, conducted in May 1998 in support of the Compliance Status Report CSR [Geosyntec, 1999].

The occurrence and movement of groundwater in the Piedmont formation is generally within two hydrogeologic units. A shallow hydrogeologic unit typically occurs within the soils and saprolite (weathered residuum which mantles bedrock). A layer of partially weathered rock (PWR) typically forms a transition between the saprolite and the fractured bedrock. A deeper hydrogeologic unit generally occurs within the fractured bedrock.

Groundwater in the shallow hydrogeologic unit usually occurs under water Table (i.e., unconfined) conditions. Groundwater flow is controlled by local topographic features, where recharge occurs in upland areas and discharge occurs in drainage features such as streams, rivers, or lakes. Recharge to the shallow hydrogeologic unit is primarily the result of infiltrating precipitation. Groundwater in the deeper water-bearing zone is associated with secondary porosity (fractures or open spaces) within the crystalline bedrock and flow is controlled by the distribution and degree of interconnection of these openings in the rock. The deeper hydrogeologic unit is fully saturated.

Based on the results of the field investigation, the aquifer is conceptualized as an unconfined, homogeneous, and isotropic deposit of sandy clay with a hydraulic conductivity of approximately 4×10^{-5} to 2×10^{-4} cm/s, a hydraulic gradient of approximately 0.003 to 0.03, and an effective porosity of about 20 percent. Groundwater is believed to generally flow at about 16.4 ft per year from west to east across the Site and advection is believed to be the dominant contaminant transport mechanism.

The GCL Site is in an area of relatively steep topography adjacent to a small intermittent stream that discharges to the South River. As can be seen on the aerial photograph of the Site presented in **Figure 1.2**, industrial operations at the Site have resulted in regrading and leveling of a significant portion of the Site (i.e., vegetated areas east of the process buildings).

The lithology of the Site consists primarily of clayey fill material overlying saprolite as depicted on **Figures 2-1 through 2-3**, which illustrate hydrogeologic cross-sections that show the Site features and geology. The fill material, which varies in thickness, covers most of the Site and consists of sandy to gravelly red micaceous clay. The saprolite, as encountered in all fourteen of the monitoring wells drilled at the Site as part of this monitoring activity, consists of highly weathered schist consisting of orange to red clay with kaolinite and mica. Foliation and other relict rock texture are still well preserved and were visible in samples, but the material comprises mostly clay and mica which is formed by the deep weathering of the feldspar minerals. Competent bedrock, as defined by auger refusal, was generally between 20 to 60 feet below ground surface (bgs).

2.2 Summary of Previous Site Investigations

The aluminum concentrations observed in the Site soil during the course of the CSR investigation are within the range typically seen in Piedmont soils (i.e., 70,000 to 100,000 mg/kg). The samples, in which the aluminum concentrations were elevated, were limited to locations of accumulation of more strongly weathered material. Therefore, based on detected concentrations of aluminum in soil samples, industrial activities at the Site have not resulted in a significant increase in aluminum concentrations in the soil [Geosyntec, 1999].

The HCA was removed between 2003 and 2006. Sulfate concentrations vary according to the nature of the material analyzed and were related to the proximity to former HCA cells. In places where the undisturbed soils directly underlie former HCA cells, sulfate concentrations in these soils were typically higher than those of other undisturbed soils. Following removal of the HCA, underlying soils were sampled and analyzed for sulfate, and soils exhibiting sulfate concentrations over 10,300 mg/kg (95% Upper Confidence Limit for all samples was 3,143 mg/kg) were removed.

3. GROUNDWATER AND STORM DRAIN SAMPLING

This section presents the details of the sampling of six on-site wells, and three off-site groundwater wells and one on-site and three off-site stormwater storm drains.

3.1 Groundwater Potentiometric Conditions

Groundwater elevations were measured prior to sampling wells during the April sampling event. The measurements were performed on 17 April 2013. In addition to the groundwater wells, water levels at two piezometers installed as part of the January 2013 off-site soils sampling program were measured. The soils sampling results are attached as **Addendum 1** to this report. The results of the groundwater elevation measurements are provided in **Table 3-1**.

The potentiometric map for the April 2013 readings is shown in **Figure 3-1**. This map shows the typical Piedmont pattern of flow following topography towards surface water features, which act as collectors and discharge points for the groundwater. Since there are no streams at the Site, the groundwater is flowing towards the local topographic low which is aligned parallel with North Martin Street and the storm drain system. The general potentiometric pattern is consistent with the overall drainage flow pattern to the east-southeast towards the South River.

Water level measurements were recorded in wells screened in saprolite and shallow competent rock. In preparing the potentiometric map from water level measurements, generally no distinction was made as to whether the wells were shallow or deep, in saprolite or bedrock. Such distinctions were not appropriate for two reasons: (i) the Piedmont is characterized by a single saturated zone consisting of saprolite and bedrock that are hydraulically connected; and (ii) the vertical components of the head gradient are similar or small compared to the horizontal components.

3.2 Groundwater Sampling

3.2.1 Introduction

Groundwater samples were collected on 22-23 April 2013. Groundwater samples were submitted for analysis for sulfate using EPA Method 9056A and aluminum using EPA Method 6010C. The pH was measured in the field using EPA Method 150.1. The

groundwater sampling results are presented in **Table 3-2**. Laboratory results are presented in **Appendix A** and field forms are presented in **Appendix B**.

3.2.2 Groundwater Constituent Summary

Sulfate was detected at all monitoring wells during the April 2013 sampling event. The measured sulfate concentrations were lower in the off-site wells, 46 mg/l at EPW-01 at the northwestern boundary of the Site, and 57 mg/l at EPW-02 to the east of the Site. The sulfate concentration in off-site well EPW-03D was 28 mg/l. On-site well OW-1A at the western boundary was measured at 51 mg/l. The background monitoring well GCW-01D at the upgradient edge of the site had 280 mg/l of sulfate. The results indicate that groundwater entering the site contains background concentrations of sulfate between 46 to 51 mg/l as measured at EPW-01 and OW-1A. These values are also consistent with the upgradient storm drain sampling location SW-09 where sulfate has been measured between 2.5 to 170 mg/l. The sulfate concentration along the northern property boundary at GCW-04D was 5,000 mg/l. Sulfate at the eastern boundary at GCW-02D was 2,500 mg/l. The sulfate concentration measured at the source area monitoring well (GCW-05) was 1,500 mg/l.

Aluminum was detected at six of the nine monitoring wells during the April 2013 sampling event. The concentrations were low at the off-site wells: (i) 8.44 mg/l at EPW-01 at the northwestern boundary of the Site, and (ii) <0.1 at EPW-02 and EPW-03D, located to the east and northeast of the Site, respectively. On-site well OW-1A at the western boundary had 0.8 mg/l of aluminum. The background monitoring well GCW-01D at the upgradient edge of the site contained 6.1 mg/l. The results indicate that groundwater entering the site contains background concentrations of aluminum between 0.8 to 8.4 as measured at OW-1A and EPW-01. These values are also consistent with the upgradient storm drain location SW-09 where aluminum has been measured between <0.1 to 4.87 mg/l. The aluminum concentration along the northern property boundary at GCW-04D was 593 mg/l. Aluminum concentrations at the eastern boundary at GCW-02D and GCW-03D were 214 and 331 mg/l, respectively. The aluminum concentration at the source area monitoring well (GCW-05) was 0.4 mg/l.

The pH measurements were generally consistent across the site. The off-site wells EPW-01, -02, and -03 ranged from 5.3 to 6.5 standard units (s.u.). The upgradient wells GCW-01D and OW-1A ranged from 4 to 4.2 s.u. The northern and eastern wells were

similar and ranged from 3.3 to 3.5 s.u. The pH for source area monitoring well (GCW-05) was measured at 6.6 s.u.

3.2.3 Comparison to Previous Results for Groundwater

Table 3-3 summarizes the statistical trend analysis of both aluminum and sulfate data in groundwater. Mann-Kendall trend analysis was performed using available data for each monitoring well at a 95% confidence level. The procedure and methodologies employed in the analysis of the data are consistent with GaEPD and United States Environmental Protection Agency (EPA) recommended procedures. These methods meet the performance criteria specified in the rules of the GaEPD Chapter 391-3-4-.14(19) and the technical standards described in the EPA document "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance," dated March 2009.

Historical trend graphs for sulfate and pH are shown in **Figure 3-2**. Sulfate concentrations generally decreased or were stable in groundwater. The sulfate concentrations in monitoring wells GCW-01D, GCW-03D, GCW-04D, EPW-03D and OW-1A showed a statistically significant decreasing trend. Neither decreasing nor increasing trends were calculated for sulfate concentrations in monitoring wells GCW-02D, GCW-05, EPW-01 and EPW-02. Similarly, aluminum concentrations also decreased or were stable in groundwater. A statistically significant decreasing trend was calculated for aluminum in monitoring wells EPW-02 and OW-01A. Neither decreasing nor increasing trends were calculated for aluminum in the remainder of the wells. The pH measurements were generally stable. The pH measured at on-site wells was generally lower than the pH measured at the off-site wells except for the source area well which had a pH similar to background.

Several conditions not related to the site may slow the return of the site to background concentrations (e.g. the pH of offsite well EPW-02 was measured at 6.5 s.u.) of site constituents, following removal of source materials. These include the following:

- The pH of the groundwater in upgradient on site wells (OW-1A and GCW-01D) is low. Measured pH values ranged from 4.0 to 4.2 s.u. The low pH condition of groundwater entering the site will slow a return to background conditions for pH and aluminum.

- The pH of rainwater at the site was measured at less than 5 during the HCA removal, therefore infiltrating rainfall will not have a significant effect in terms of raising the groundwater pH in the short-term.
- The area surrounding the site has a number of other sources of sulfate in groundwater resulting from previous operations. Potential sulfate sources include a former battery cracking plant, a former fertilizer manufacturer, two off-site HCA disposal areas operated by others, and a former agricultural chemical manufacturer.

It is encouraging that no significant impacts have been detected at downgradient wells EPW-02 and EPW-03D. The sulfate concentration at EPW-02 appears stable and is similar to regional background conditions of 46 to 51 mg/l as observed at well EPW-01. EPW-03D is located approximately 200 feet from the site boundary. The sulfate concentration at EPW-03D is less than the regional background, and the trend is declining. The pH trend at the EPW-03D is stable and typical for the Piedmont with measurements generally around 5.5. The decreasing sulfate concentrations and stable pH indicate impacts from the site, if they ever existed, are minimal and decreasing with time. The concentration of constituents of concern from both on-site and off-site sources appear to have attenuated to background levels prior to reaching EPW-02 or EPW-03D.

The removal of the HCA source material appears to be resulting in the site returning to background conditions over time. The sulfate concentrations are in decline at downgradient wells. However, it will take time for residuals to mix with infiltration and incoming groundwater and for geochemical conditions to stabilize.

3.3 Storm Drain Sampling

3.3.1 Introduction

Storm drain water samples were collected from one on-site and three off-site storm drains in April 2013. Surface water flows in the storm drain system in the following sequence: SW-09, SW-06, SW-02, and SW-07 from upstream to downstream. The purpose of the storm drain sampling program was to evaluate potential impacts to the storm drain system as requested by GaEPD. Stormwater samples were submitted for analysis for sulfate using EPA Method 9056A and aluminum using EPA Method

6010C. The pH was measured in the field using EPA Method 150.1. The stormwater sampling locations are shown on **Figure 1-3**. The stormwater sampling results are presented in **Table 3-4**. Laboratory results are presented in **Appendix A** and field forms are presented in **Appendix B**.

3.3.2 Storm Drain Constituent Summary

Sulfate was detected at each storm drain monitoring location, including the location upgradient from the site, during the April 2013 sampling event. The upgradient (SW-09) sulfate concentration was measured at 17 mg/L which is consistent with background levels measured in groundwater wells at the site. A sample was collected cross gradient to the site (SW-06) at a location in the Charles A. Green Recreational Facilities. Sulfate was measured at 1,700 mg/l. At the downstream on-site location (SW-02), sulfate was measured at 900 mg/l. The discharge of the storm drain to surface water was sampled at SW-07. The sulfate concentration was measured at 510 mg/l.

Aluminum was detected at the four storm drain water monitoring locations during the April 2013 sampling event. The upgradient (SW-09) aluminum concentration was found to be 4.9 mg/l. The sample for aluminum collected cross gradient to the site (SW-06) was measured at 158 mg/l. At the downstream on-site location (SW-02) aluminum was measured at 99.4 mg/l. The discharge of the storm drain to surface water was sampled at SW-07. The aluminum concentrations was measured at 39 mg/l.

3.3.3 Comparison to Previous Results for Storm Drains

Table 3-5 summarizes the statistical trend analysis of both aluminum and sulfate data in storm drains. Mann-Kendall trend analysis was performed using available data for each monitoring well at a 95% confidence level. The procedure and methodologies employed in the analysis of the data are consistent with GaEPD and EPA recommended procedures. These methods meet the performance criteria specified in the rules of the GaEPD, Chapter 391-3-4-.14(19) and the technical standards described in the EPA document "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Unified Guidance," dated March 2009.

Historical trend graphs for sulfate, aluminum and pH are shown in **Figure 3-3**. Sulfate concentrations were generally stable. Aluminum concentrations did not vary in a consistent direction, showing both minor increases and decreases between sampling

events. The pH measurements were relatively stable showing minor changes between sampling events at the each location.

Several conditions not related to the site may slow the return of the site to background concentrations of site constituents, following removal of source materials. These include the following:

- The pH of rainwater at the site was measured at less than 5 during the HCA removal, therefore infiltrating rainfall will not have a significant effect in terms of raising the stormwater pH.
- The area surrounding the site has a number of other sources of sulfate in groundwater resulting from previous operations. Potential sulfate sources include a former battery cracking plant, a former fertilizer manufacturer, two off-site HCA disposal areas operated by others, and a former agricultural chemical manufacturer.

4. SAMPLE COLLECTION PROCEDURES

4.1 Summary

In April 2013, samples were collected from 9 monitoring wells. Samples from monitoring wells were collected using dedicated tubing and low-flow purging techniques. Samples were placed in 250 ml polyethylene containers. The containers for aluminum were acidified with approximately 2 ml of nitric acid. Sulfate samples were preserved by refrigeration. The sampling containers and preservatives were provided by Analytical Services, Inc. located in Norcross, Georgia. The containers were labeled and stored on ice in a cooler until time for shipment to the laboratory. The samples were packed in ice in a cooler and shipped by overnight courier or hand delivered to the laboratory. Chain-of-custody documents were completed and included with each shipment.

4.2 Monitoring Well Sampling Procedure

Monitoring wells were sampled using peristaltic pumps. Peristaltic pumps were used since the depth to water was less than 29 ft bgs, which is the maximum practical lift a peristaltic pump can achieve. The advantages of peristaltic pumps are that they produce low rates of flow with minimal surging and can be decontaminated more thoroughly when compared to bailers or other types of pumps by simply replacing the tubing in the pump head. The pump-head tubing is silicone, while the down-hole tubing is polyethylene.

Low flow purging is conducted by purging groundwater from the well at a low, constant rate for an extended period of time with the pump intake set directly opposite the well screen. This method creates a localized flow system in the well directly between the screen and pump intake, eliminating the need to remove large volumes of casing storage while ensuring that the sample collected is representative of the surrounding ground water. For this project, a purge rate of approximately 500 mL/min was extracted until the turbidity was stable at less than 20 NTUs or until other field parameters were stable. Additionally, a purge volume of at least five gallons was removed, when possible, to represent at least three pore volumes of the screened zone of the well.

To ensure that the samples collected are representative of the ground water in the formation, field parameters are measured throughout the purging process. Temperature (°C), conductivity (mS/cm), pH (s.u.), redox potential (mV), and turbidity (NTU) are measured using a Horiba U-52 or equivalent water quality meter. Measurements were taken in an enclosed flow-through cell to minimize the effects of contact with air.

After the field parameters have stabilized, the flow-through cell was disconnected and the sample is collected directly from the pump discharge tubing without adjusting the flow rate. This method ensures that the sample is representative of the ground water surrounding the respective location.

4.3 Groundwater Sampling Decontamination Procedure

Down well tubing was dedicated to each monitoring well by securing to the well cap and placing the tubing completely in the well when not in use. Pump-head tubing for the peristaltic pump was discarded after each use.

4.4 Storm Drain Sampling Procedure

Storm drains water was sampled using peristaltic pumps or by hand. The pump-head tubing is silicone, while the down-hole tubing is polyethylene.

Storm drain water sampling was performed at the upgradient (SW-09), on-site (SW-02) and cross-gradient (SW-06) locations by lowering tubing into storm drain manholes and placing the end of the tube near the outlet for the manhole. This ensured water from multiple inlets was mixed prior to sample collection. The downgradient (SW-07) sample was collected by hand at the outlet to the storm drain at the discharge to the stream.

For peristaltic pump samples a purge rate of approximately 500 mL/min was maintained until the turbidity was stable at less than 20 NTUs or until other field parameters were stable. To ensure that the samples collected are representative of the storm drain water, field parameters are measured throughout the purging process. Temperature (°C), conductivity (mS/cm), pH (s.u.), redox potential (mV), and turbidity (NTU) are measured using a Horiba U-52 or equivalent water quality meter. Measurements were taken in an enclosed flow-through cell to minimize the effects of contact with air.

After the field parameters have stabilized, the flow-through cell was disconnected and the sample is collected directly from the pump discharge tubing without adjusting the flow rate. This method ensures that the sample is representative of the storm drain water surrounding the respective location.

For hand samples a location near the center of the flow and free of surface debris was selected. The sample was collected from beneath the surface by inserting the container opening down into the water then inverting underwater. The field parameters were measured by inserting the water quality instrument in the flow at the sampling location.

4.5 Storm Drain Sampling Decontamination Procedure

Drop tubing and pump-head tubing for the peristaltic pump were discarded after each use.

5. QUALITY ASSURANCE/QUALITY CONTROL

The field and analytical data from this reported semi-annual groundwater monitoring period was reviewed by Mr. Brian Jacobson with Geosyntec. The data review included evaluation of the field and laboratory quality assurance/quality control (QA/QC) parameters in order to assess the integrity of the data obtained for this project including: documentation, holding times, laboratory control samples; and laboratory matrix spike analyses. The documentation and results of the QA/QC analyses are found in the laboratory reports provided in **Appendix A**. Evaluation of these parameters was used to assess the precision, accuracy, representativeness, comparability, and completeness of the data.

Based on the review of the field and laboratory data, the data obtained from this field investigation are considered to be of acceptable quality and are fully usable with the qualifications as designated by the data validation process. Details of the QA/QC review of the data are presented in the following sections.

5.1 Documentation

Field sampling forms and chain-of-custody forms were evaluated for completeness. Field records were considered to be usable and to provide a reasonable record of field activities and samples collected. This review indicated that field sampling and custody transfer procedures were adequately documented and the integrity of the samples was not compromised.

5.2 Holding Times

All samples were processed and analyzed by the laboratory using the correct analytical methods and within the prescribed holding times.

5.3 Reporting Limits

The laboratory reporting limits for sulfate by Method 9056A varied from 5 to 1000 mg/l depending on the required dilution to measure a result. The laboratory reporting limits for aluminum by Method 6010C varied between 0.1 mg/l and 2 mg/l. The required quantitation limits for this project were met for all data, except in cases where sample dilution was required because of high concentrations of target analytes or matrix interference.

5.4 Accuracy

The accuracy of the data was evaluated by examining the percent recovery (%R) of matrix spikes and matrix spike duplicate (MS and MSD), and laboratory control samples (LCS). A post digestion spike was also performed for aluminum analysis to evaluate possible matrix effects of the digestate. The %Rs met the laboratory-specific QC limits for the laboratory QC LCS samples. The MS samples for sulfate and aluminum were outside the %R limits for MS and MSD samples as well as for the post digestion spike. The low recoveries were due to the low spike concentration in relation to the actual sample concentration of aluminum and sulfate (sample concentration much greater than the spiked amount). The data were judged acceptable for use based on the acceptable %R for the LCS samples.

5.5 Representativeness

Representativeness was evaluated to assess the degree to which sample results represent the actual concentrations of constituents in groundwater. Representativeness was evaluated qualitatively by reviewing sampling procedures and laboratory analytical procedures. Based on this review, the samples yielded results that provided a good qualitative representation of constituent concentrations in groundwater.

A qualitative evaluation of representativeness was also performed by examining the analysis of laboratory method blanks. Constituents were not detected above the reporting limit in any of the method blanks. This evaluation further demonstrates that the analytical data are representative of actual conditions.

5.6 Comparability

The current field and laboratory methods were compared to methods used during past monitoring periods in order to evaluate the comparability of data obtained during the current monitoring period to data previously obtained. The recommended reporting limits were used for all constituents. The data presented in this report are consistent with the data presented in previous reports.

5.7 Completeness

Completeness was measured by determining the percentage of usable data obtained from samples for this project. The project sample results were found to be 100 percent complete and usable without qualification.

6. CONCLUSIONS

6.1 Groundwater

The results of the five years of data collection indicate that concentrations of constituents of concern are generally showing significant decreasing trends for on-site monitoring wells. The HCA source material has been removed for over eight years. While many factors can influence concentrations at any given point in time, (e.g., time since removal of the source, hydrogeologic conditions, and precipitation patterns) it is encouraging to see that concentrations of monitored constituents in the latest round of sampling indicate a decrease and that the general trend is decreasing. Groundwater levels (elevations) have been generally stable since 2008.

Sulfate concentrations show a statistically significant decreasing trend in five of seven on-site groundwater wells. The decreasing trends are consistent with source removal followed by natural attenuation of the remaining pore water.

Aluminum concentrations did not vary in a consistent direction between sampling events. Total aluminum concentration is pH dependent and since Piedmont soils contain high levels of naturally occurring aluminum, this phenomenon is not unexpected. Additionally, aluminum hydroxide can migrate as a colloid in groundwater. As shown in **Figure 6-1**, on-site wells consistently had aluminum concentrations above solubility limits indicating solid colloidal aluminum was likely being measured in the groundwater samples. Elimination of the colloidal aluminum would result in at least an order of magnitude reduction in total aluminum measured. For example, as shown in the example on **Figure 6-1**, the measured total aluminum concentration was 29 mg/l, whereas the maximum soluble concentration at pH 4.0 is 0.6 mg/l, a 98 percent decrease from the reported value. The natural filtering of the aluminum floc particles by the soil as the water migrates off-site may explain the rapid reduction in observed aluminum concentrations with increasing distance from the former source area.

The pH measurements were generally stable or increasing between the sampling events. While this is encouraging, we believe that local precipitation is a significant factor, and the fact that rainfall in the area has been measured with a pH less than 5 standard units will limit recovery of groundwater pH. The depressed pH will continue to allow

naturally occurring aluminum to be mobilized from site soils. However, the aluminum does not appear to migrate off site.

6.2 Storm Drains

Twelve sampling events have been performed for storm drains. Storm drain water and groundwater may be connected due to leaks in the storm drains that allow the infiltration/exfiltration of stormwater and groundwater depending on the relative water levels. The stormwater constituent concentrations and pH will vary slowly due to the low groundwater flow velocity across the site (previously estimated at 16.4 ft. per year). The potential presence of off-site sources may slow the return of the stormwater to background conditions. Factors that may slow a return to background include the following:

- The pH of the groundwater in upgradient wells (OW-1A and GCW-01D) is low. Measured pH values ranged from 4.0 to 4.2 s.u. The low pH values of groundwater entering the site will slow a return to background conditions (e.g. the pH of upstream point SW-09 was measured at 6.3 s.u.) of stormwater mixed with groundwater exiting the site. The pH of stormwater in the cross-gradient sampling location was measured at 4.3 s.u. This water mixes with on-site stormwater lowering the pH.
- The pH of rainwater at the site was measured at less than 5 during the HCA removal, therefore infiltrated rainfall and stormwater will not have a significant effect in terms of raising the stormwater pH in the short-term.
- The area surrounding the site has a number of other sources of sulfate in groundwater resulting from previous operations. These sites may be contributing the elevated sulfate concentrations noted at SW-06 that were measured at 1,700 mg/l. Potential sulfate sources include a former battery cracking plant, a former fertilizer manufacturer, two off-site HCA disposal areas operated by others, and a former agricultural chemical manufacturer.

The sulfate concentrations at the upgradient monitoring point (SW-09) were lower than on-site (SW-02) or cross-gradient (SW-06) monitoring points. Downgradient sulfate concentration at the exit to the storm drain and the start of open channel flow was

measured at 510 mg/l which is above the site background concentration of 46 to 51 mg/l.

The on-site concentrations were lower than the upstream cross-gradient location indicating limited impact, if any, from on-site contributions. Since the on-site source has been removed and potential off-site sources likely remain, the contribution from the site would be expected to continue to decrease with time. As presented in **Figure 3-3**, the time trend analysis shows a continued impact from the upstream SW-06 which is consistent with source removal on site and active potential impacts by a residual plume.

7. REFERENCES

Geosyntec (1999), “*Compliance Status Report*”, General Chemical Corporation, East Point, Georgia”, prepared by Geosyntec Consultants, February 1999

Geosyntec (2002), “*Revised Corrective Action Plan, General Chemical Corporation, East Point, Georgia*”, prepared by Geosyntec Consultants, February 2002

Geosyntec (2006), “*Site restoration Report, General Chemical Corporation, East Point, Georgia*”, prepared by Geosyntec Consultants, February 2006

Geosyntec (2007), “*Revised Corrective Action Plan, General Chemical Corporation, East Point, Georgia*”, prepared by Geosyntec Consultants, February 2007

Geosyntec (2013), “*Voluntary Remediation Plan Application, General Chemical Corporation, East Point, Georgia*”, prepared by Geosyntec Consultants, January 2013

TABLES

FIGURES

APPENDIX A

GROUNDWATER AND STORM DRAIN LABORATORY RESULTS

APPENDIX B

GROUNDWATER AND STORM DRAIN SAMPLING FORMS



**General
Chemical
LLC**

**SEMI-ANNUAL GROUNDWATER MONITORING REPORT NO. 10;
JANUARY THROUGH JUNE 2013
GENERAL CHEMICAL SITE, EAST POINT GEORGIA HSI#10498**

Geosyntec 
consultants

engineers | scientists | innovators

July 2013

Table 3-1
Well Construction Data and Groundwater Elevations
April 2013
General Chemical Site
East Point, Georgia

Location	Well Casing Elevation	Adjacent Soil Elevation	Screen Interval (ft bgs)	Depth to Water (ft)	Groundwater Elevation (ft msl)
				Apr-13	Apr-13
GCW-01S	1023.6	1024.0	15-25	10.6	1013.0
GCW-01M	1023.8	1024.1	34-44	10.6	1013.2
GCW-01D	1023.9	1024.2	58-68	9.9	1014.0
GCW-02S	983.6	983.9	16-26	4.2	979.4
GCW-02D	983.4	983.8	34-44	3.7	979.8
GCW-02V	984.7	985.0	85.5-95.5	3.6	981.1
GCW-03S	981.3	981.6	11-21	4.5	976.7
GCW-03D	981.2	981.6	28-38	4.1	977.1
GCW-04S	996.6	997.0	13-23	8.3	988.3
GCW-04M	997.0	997.4	30-40	8.6	988.4
GCW-04D	996.8	997.1	50-60	8.3	988.4
GCW-04V	996.7	997.0	114-124	10.2	986.5
GCW-05	995.1	994.9	80-90	4.1	991.0
EPW-01	1017.5	1017.7	24.51 ⁽¹⁾	14.9	1002.6
EPW-02	980.0	980.3	19.41 ⁽¹⁾	10.1	969.8
EPW-03S	984.5	984.8	12-22	9.5	975.0
EPW-03M	984.3	984.6	29-39	9.3	975.0
EPW-03D	984.6	984.9	46-56	9.2	975.4
OW-1A(2)	1030.6	1027.9	23.5-33.5(3)	12.9	1017.7
PZ-1	996.1	996.1	9-19	7.8	988.3
PZ-7	997.9	997.9	9-19	9.6	988.2

Notes:

- ⁽¹⁾: Screen length is unknown. Total depth of the well is
⁽²⁾: Well OW-1A has a casing extending above ground surface 2.7 ft.
⁽³⁾: Screen interval measured 7 November 2012.
NA: Not available

Table 3-2
Groundwater Sampling Results
April 2013
General Chemical Site
East Point, Georgia

Location	pH (-) EPA 150.1	Sulfate (mg/l) EPA 9056A	Aluminum (mg/l) EPA6010C
GCW-01D	4.0	280	6.11
GCW-02D	3.4	2,500	214
GCW-03D	3.3	3,600	331
GCW-04D	3.5	5,000	593
GCW-05	6.6	1,500	0.382
EPW-01	5.3	46	8.44
EPW-02	6.5	57	<0.1
EPW-03D	5.9	28	<0.1
OW-1A	4.2	51	0.829
Duplicates	--	270 ⁽¹⁾	5.94 ⁽¹⁾

Notes:

⁽¹⁾: Duplicate was taken from GCW-01D

Table 3-3
Summary of Statistical Trend Analysis
In Groundwater Samples
General Chemical Site
East Point, Georgia

Well ID	Parameter	Mann-Kendall Trend Analysis at 95% Confidence Level
GCW-01D	Alumimum	No Trend
GCW-02D		No Trend
GCW-03D		No Trend
GCW-04D		No Trend
GCW-05		No Trend
EPW-01		No Trend
EPW-02		Decreasing
EPW-03D		No Trend
OW-1A		Decreasing
GCW-01D		Sulfate
GCW-02D	No Trend	
GCW-03D	Decreasing	
GCW-04D	Decreasing	
GCW-05	No Trend	
EPW-01	No Trend	
EPW-02	No Trend	
EPW-03D	Decreasing	
OW-1A	Decreasing	

Table 3-4
Storm Drain Sampling Results
April 2013
General Chemical Site
East Point, Georgia

Location	Description	pH (-) EPA 150.1	Sulfate (mg/l) EPA 9056A	Aluminum (mg/l) EPA6010C
SW-02	On-site	4.1	990	99.4
SW-06	Cross-Gradient	4.3	1700	158
SW-07	Downgradient	4.4	510	38.9
SW-09	Upgradient	6.3	17	4.87
Duplicate	Duplicate SW-02	--	1100	98.9

Note:

Duplicate sample was taken from SW-02

Table 3-5
Summary of Statistical Trend Analysis
In Storm Drain Samples
General Chemical Site
East Point, Georgia

Sample Location	Parameter	Mann-Kendall Trend Analysis at 95% Confidence Level
SW-02	Aluminum	Increasing
SW-06		Increasing
SW-07		No Trend
SW-09		Increasing
SW-02	Sulfate	No Trend
SW-06		Increasing
SW-07		No Trend
SW-09		No Trend

SITE VICINITY MAP

GENERAL CHEMICAL EAST POINT, GEORGIA

LEGEND

-  Storm Drain
-  Approximate Property Line
-  Approximate Property Line
General Chemical Facility
-  South River
-  Unnamed Tributary



Geosyntec
consultants

ATLANTA, GEORGIA

DATE:	06/14/13	SCALE:	1" = 500'
PROJECT NO.	GR5060	FIGURE NO.	1-1
DOCUMENT NO.		FILE NO.	Figure 1.2.mxd





Legend

-  Monitoring Well
-  Approximate Property Boundary

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 Kennesaw, GA

JUNE 2013

MONITORING WELLS LOCATION MAP

General Chemical, East Point, GA

Figure
 1-2

N:\projects\chem\GIS\MXDs\cylfor_01_14_2011_GCR312



Legend

- Surface Water Sample Location
- Approximate Property Boundary

Geosyntec
 consultants
 Kennesaw, GA

JUNE 2013

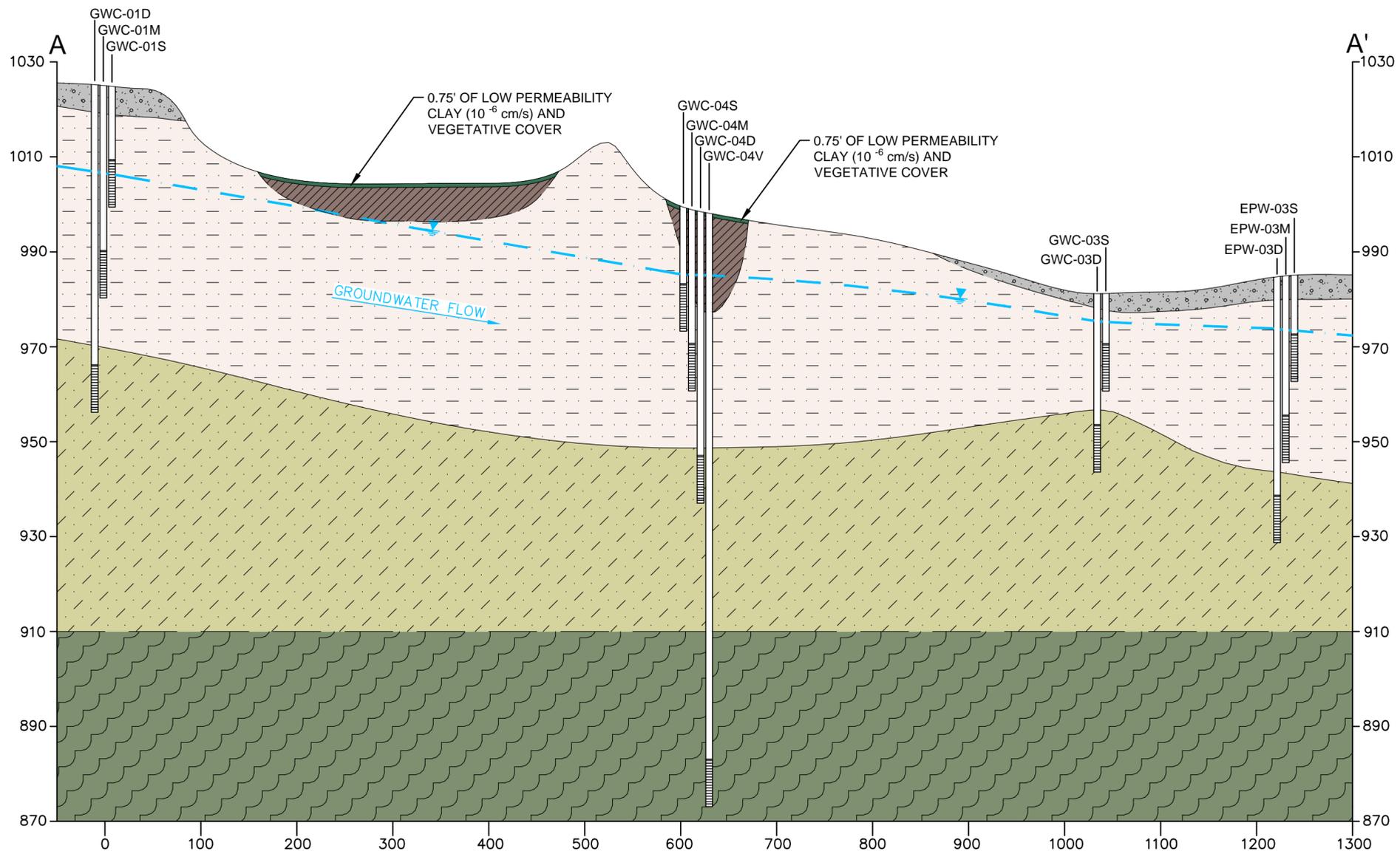
STORM DRAIN SAMPLE LOCATION MAP

General Chemical, Atlanta, GA

Figure
 1-3

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GEOLOGIC AND HYDROGEOLOGIC CROSS SECTION ALONG A-A'



KEY MAP



LEGEND

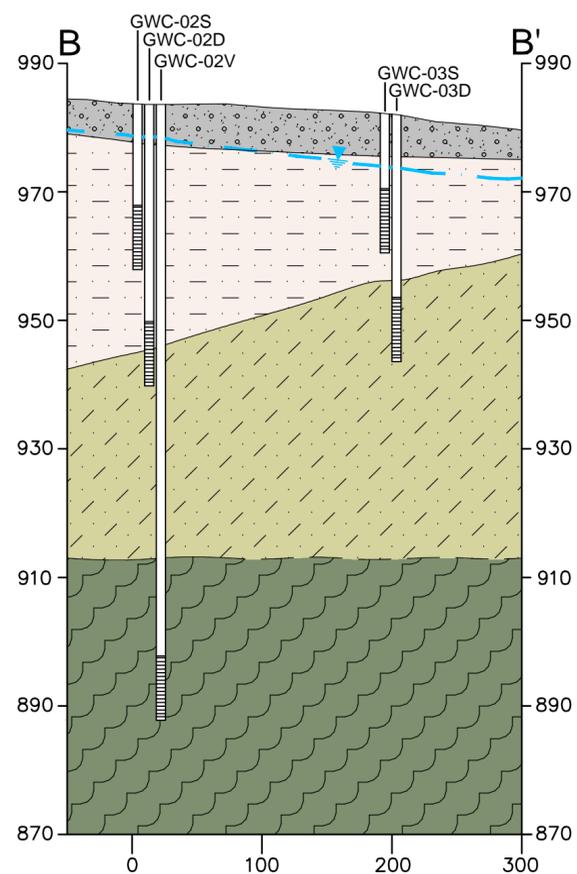
- 0.75' THICK LOW PERMEABILITY CLAY (10^{-6} cm/s) AND VEGETATIVE COVER
- GRAVELLEY CLAY, FILL
- CLAY, FILL AFTER EXCAVATION
- SILTY SAND, RELICT SCHISTOCITY, MICACEOUS (SAPROLITE)
- PARTRIALY WEATHERED SCHIST
- BEDROCK (SCHIST)
- LITHOLOGIC CONTACT, DASHED WHERE INFERRED
- MONITORING WELL SCREEN ZONE WITH WATER ELEVATION (FEET MSL), NOVEMBER, 2012

0 100' 200'
 HORIZONTAL SCALE IN FEET
 VERTICAL EXAGGERATION = 5X

Geosyntec
 consultants

DATE: JUN-13	SCALE: AS SHOWN
PROJECT NO. GR5060/12	FILE NO. 5060F001
DOCUMENT NO. GA 130020	FIGURE NO. 2-1

GEOLOGIC AND HYDROGEOLOGIC CROSS SECTION ALONG B-B'



KEY MAP



LEGEND

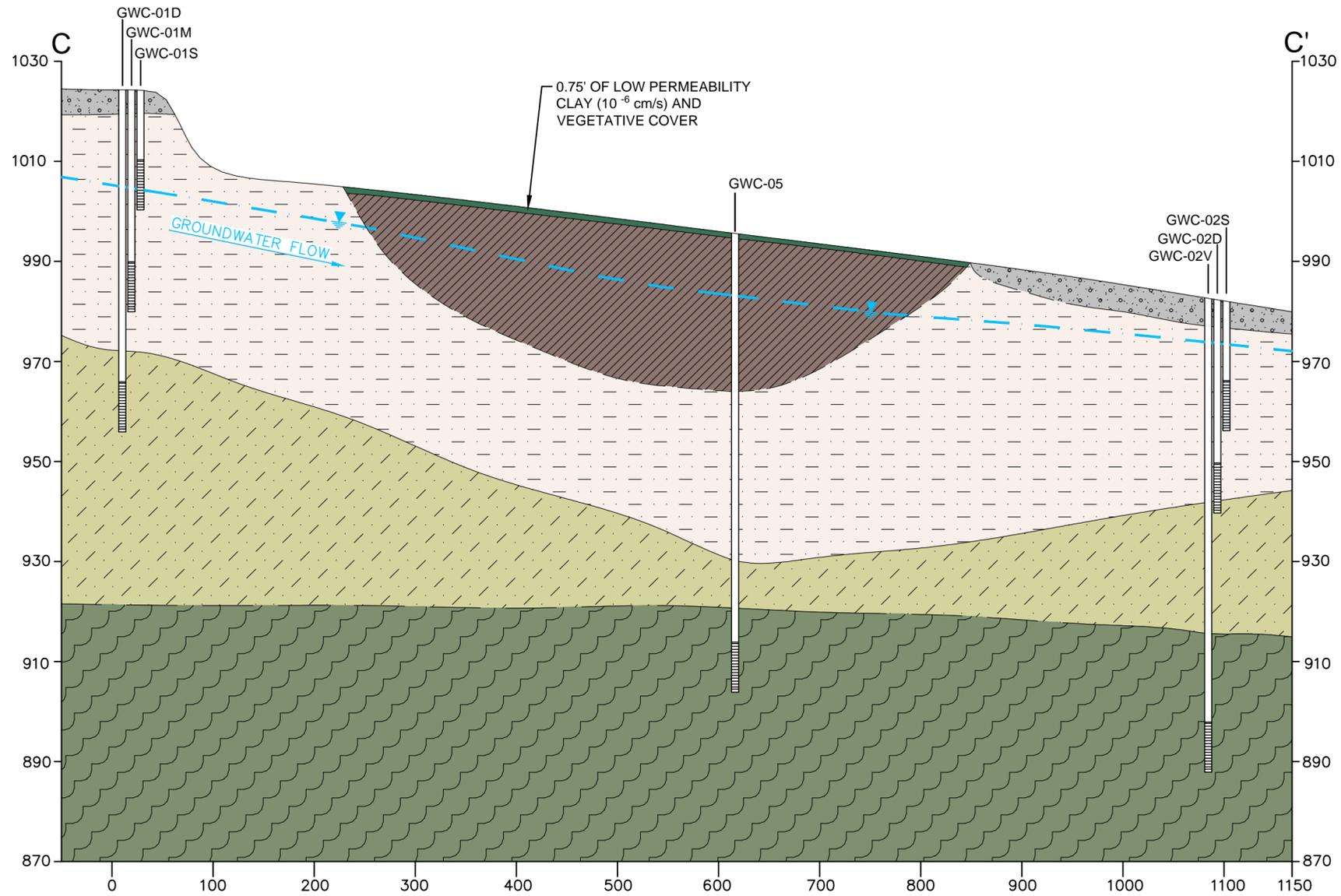
- GRAVELLY CLAY, FILL
- SILTY SAND, RELICT SCHISTOSITY, MICACEOUS (SAPROLITE)
- PARTIALLY WEATHERED SCHIST
- BEDROCK (SCHIST)
- LITHOLOGIC CONTACT, DASHED WHERE INFERRED
- MONITORING WELL SCREEN ZONE WITH WATER ELEVATION (FEET MSL), NOVEMBER, 2012

0 100' 200'
 ───────────
 HORIZONTAL SCALE IN FEET
 VERTICAL EXAGGERATION = 5X

Geosyntec
 consultants

DATE:	JUN-13	SCALE:	AS SHOWN
PROJECT NO.	GR5060/12	FILE NO.	5060F001
DOCUMENT NO.	GA 130020	FIGURE NO.	2-2

GEOLOGIC AND HYDROGEOLOGIC CROSS SECTION ALONG C-C'



KEY MAP



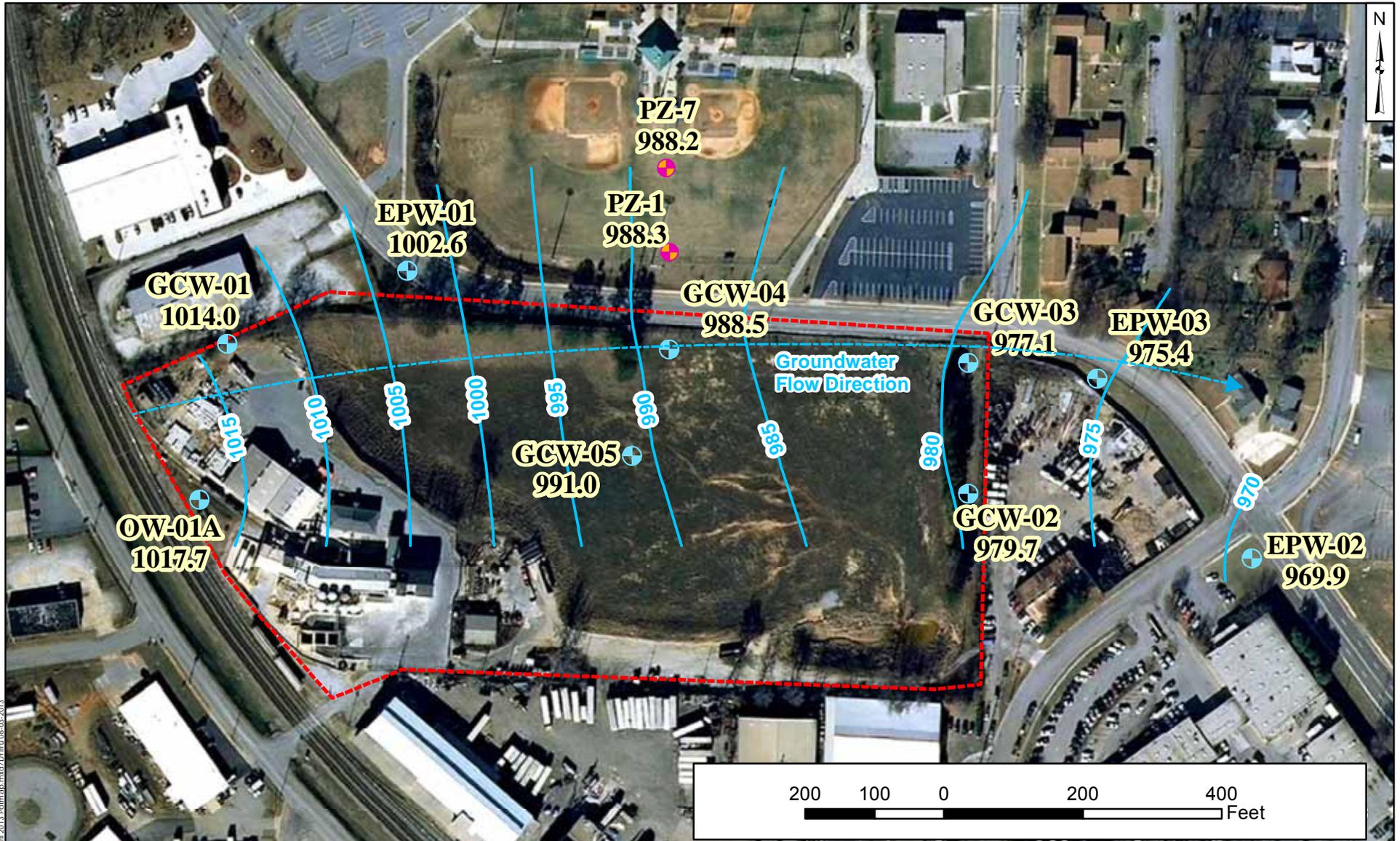
LEGEND

- 0.75' THICK LOW PERMEABILITY CLAY (10^{-6} cm/s) AND VEGETATIVE COVER
- GRAVELLY CLAY, FILL
- CLAY, FILL AFTER EXCAVATION
- SILTY SAND, RELICT SCHISTOCITY, MICACEOUS (SAPROLITE)
- PARTIALLY WEATHERED SCHIST
- BEDROCK (SCHIST)
- LITHOLOGIC CONTACT, DASHED WHERE INFERRED
- MONITORING WELL SCREEN ZONE WITH WATER ELEVATION (FEET MSL), NOVEMBER, 2012

0 100' 200'
 HORIZONTAL SCALE IN FEET
 VERTICAL EXAGGERATION = 5X

Geosyntec
consultants

DATE:	JUN-13	SCALE:	AS SHOWN
PROJECT NO.	GR5060/12	FILE NO.	5060F001
DOCUMENT NO.	GA 130020	FIGURE NO.	2-3



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Legend	
	Piezometer (Elevation in ft MSL)
	Monitoring Well (Elevation in ft MSL)
	Groundwater Elevation (17 April 2013)
	Approximate Property Boundary

Geosyntec
 consultants
 Kennesaw, GA
 June 2013

POTENTIOMETRIC SURFACE MAP
 General Chemical, East Point, GA

Figure
3-1

Figure 3-2
Monitoring Well Sulfate and pH Trends
General Chemical Site
East Point, Georgia

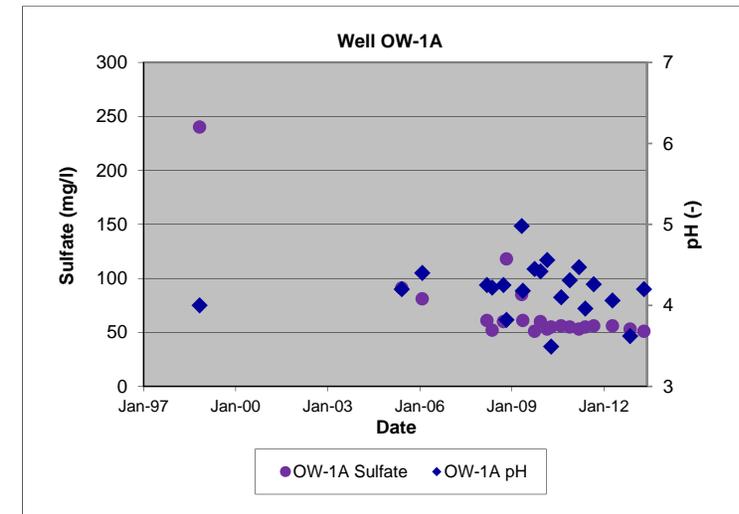
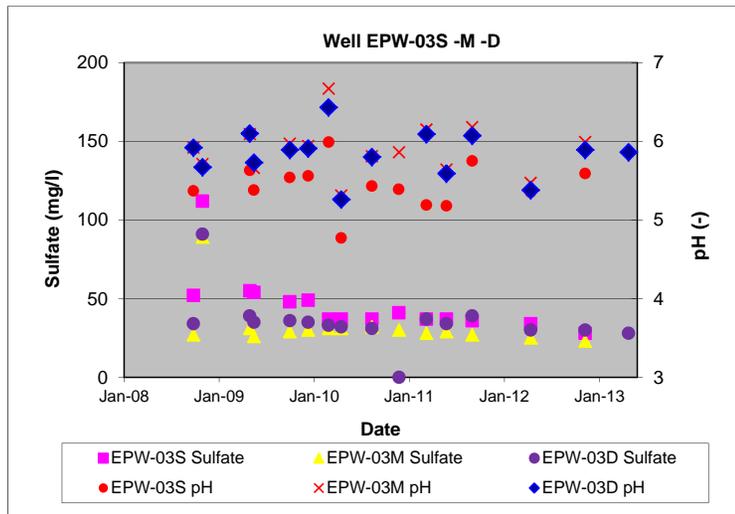
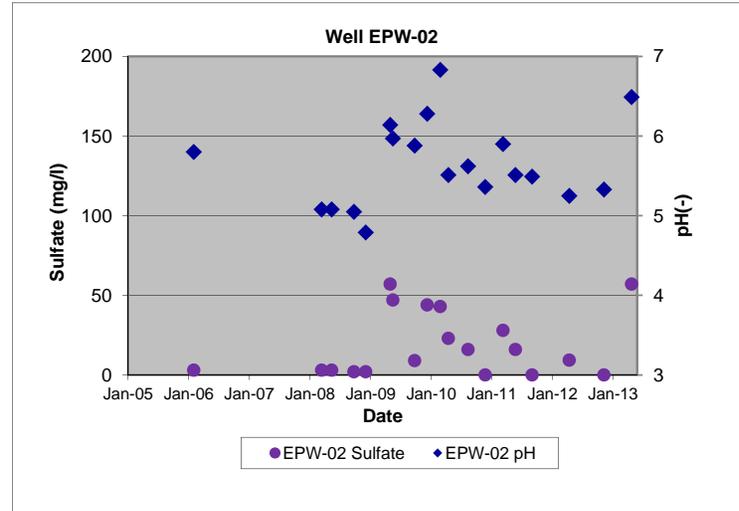
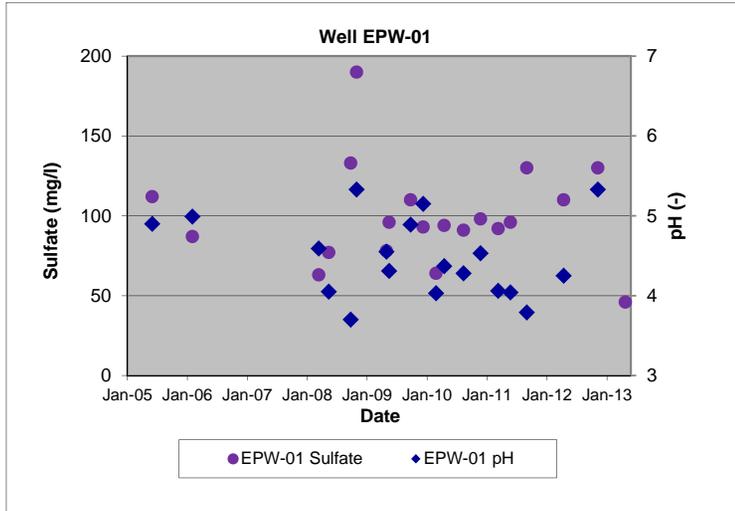
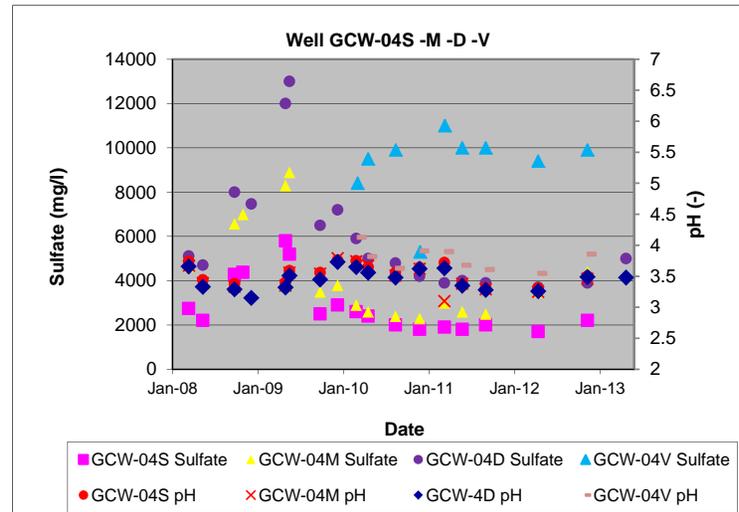
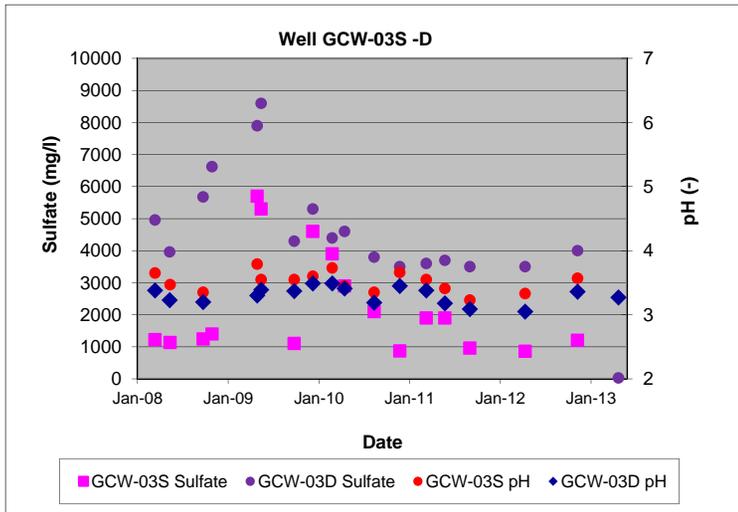
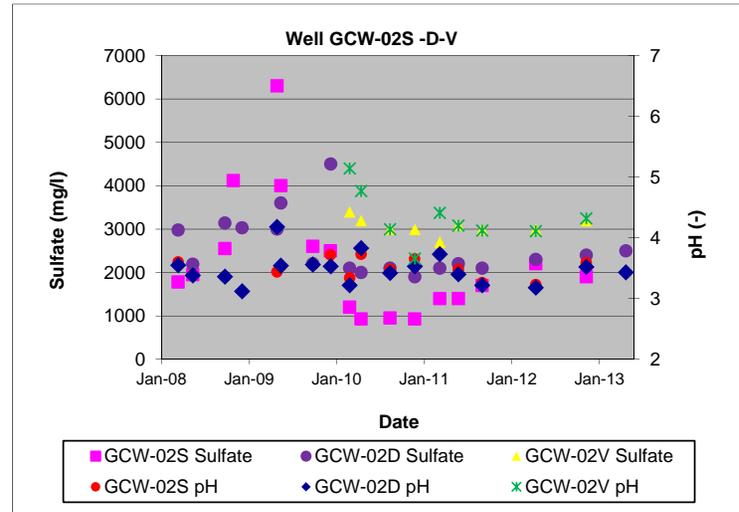
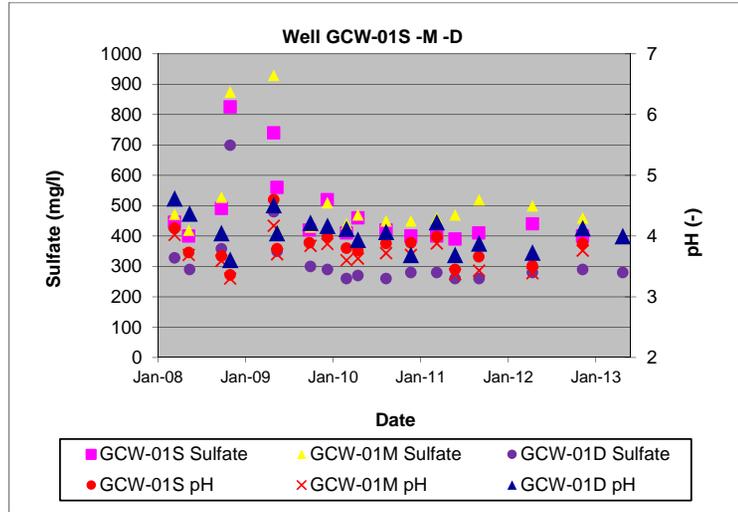


Figure 3-2 (Cont)
Monitoring Well Sulfate and pH Trends
General Chemical Site
East Point, Georgia



**Figure 3-3
Storm Drain Sulfate and pH Trends
General Chemical Site
East Point, Georgia**

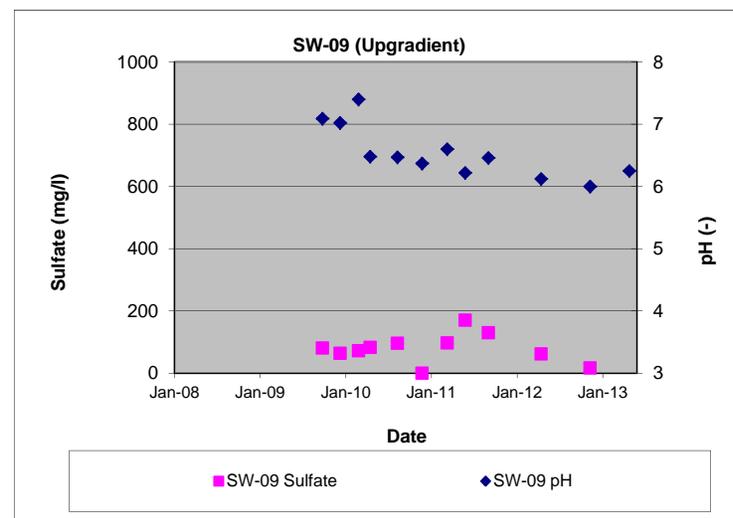
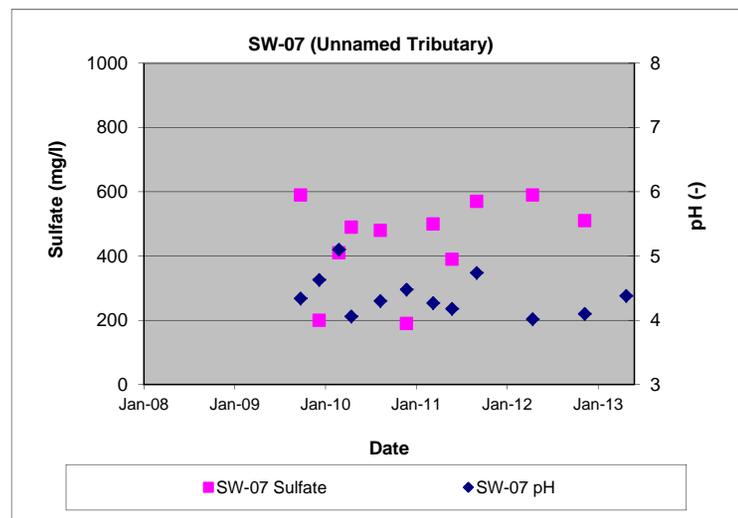
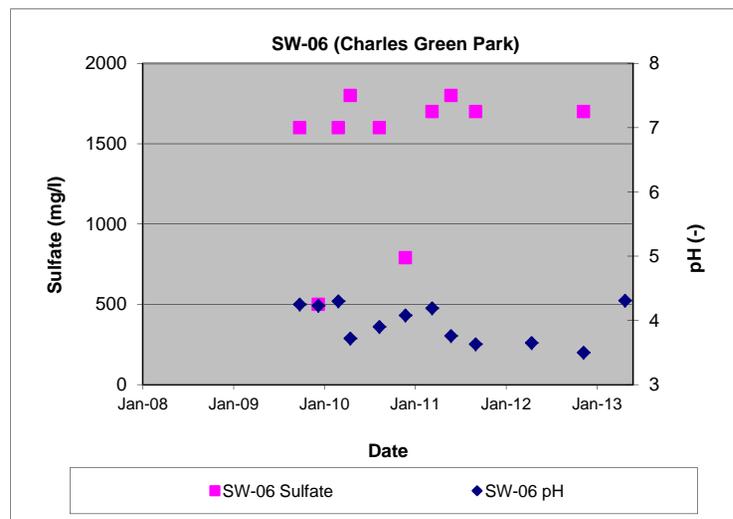
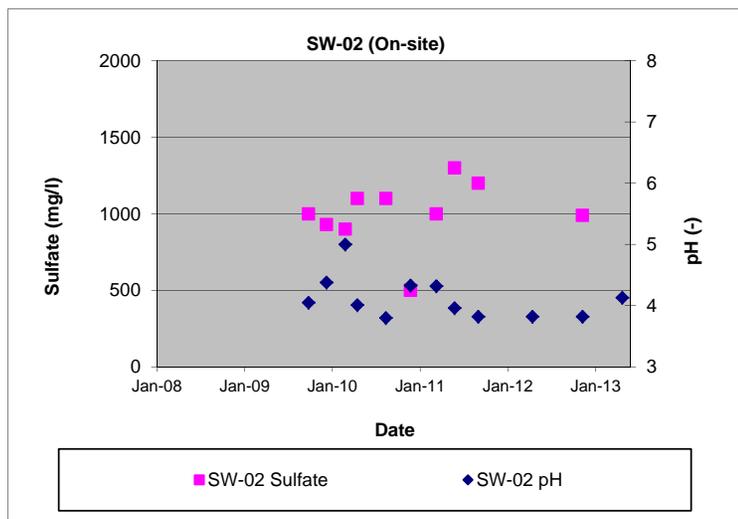


Figure 3-2 (Cont)
Monitoring Well Aluminum and pH Trends
General Chemical Site
East Point, Georgia

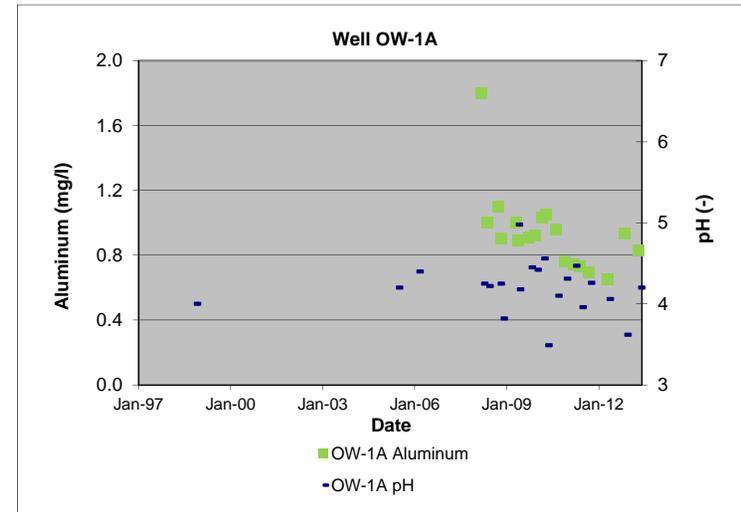
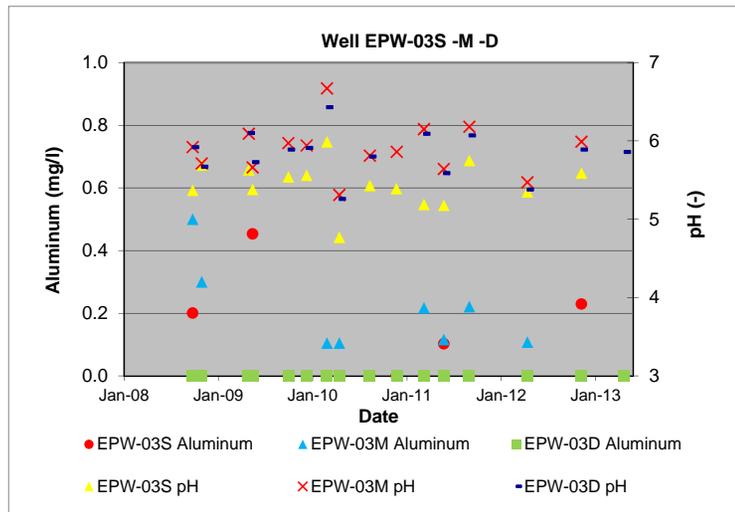
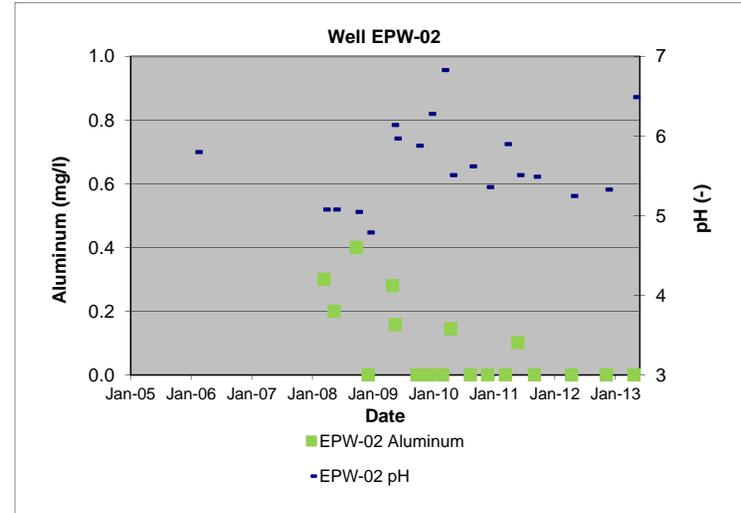
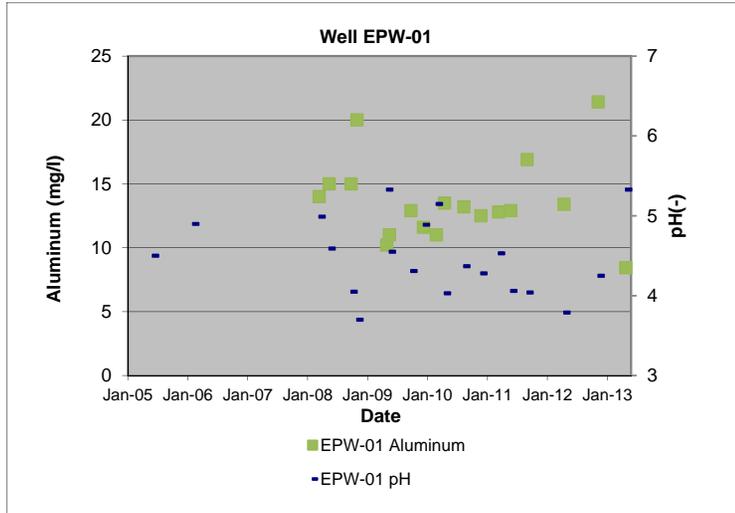


Figure 3-2 (Cont)
Monitoring Well Aluminum and pH Trends
General Chemical Site
East Point, Georgia

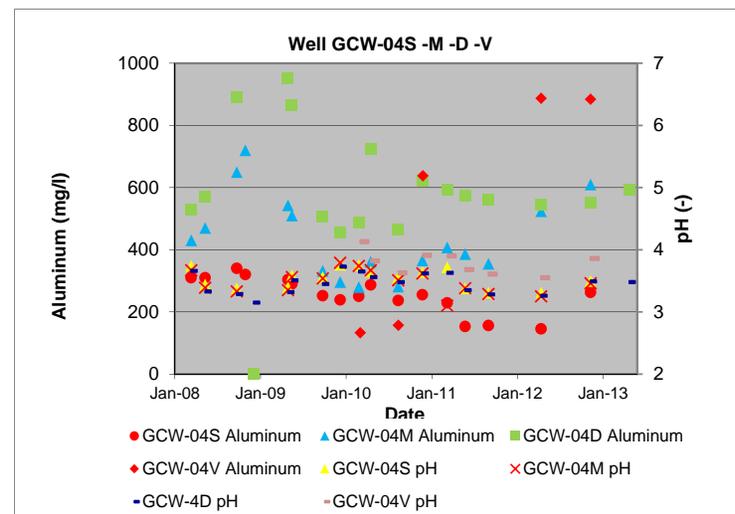
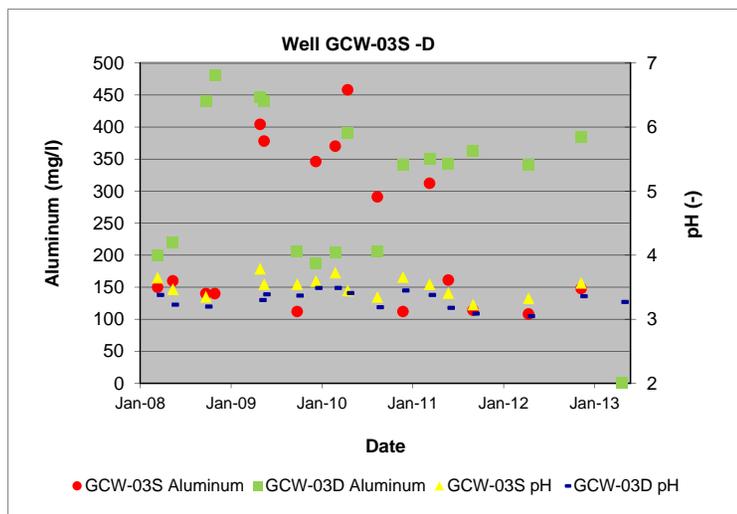
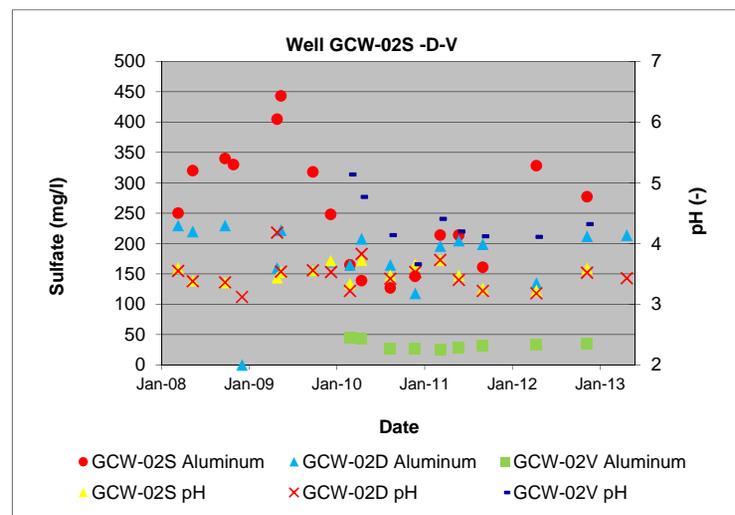
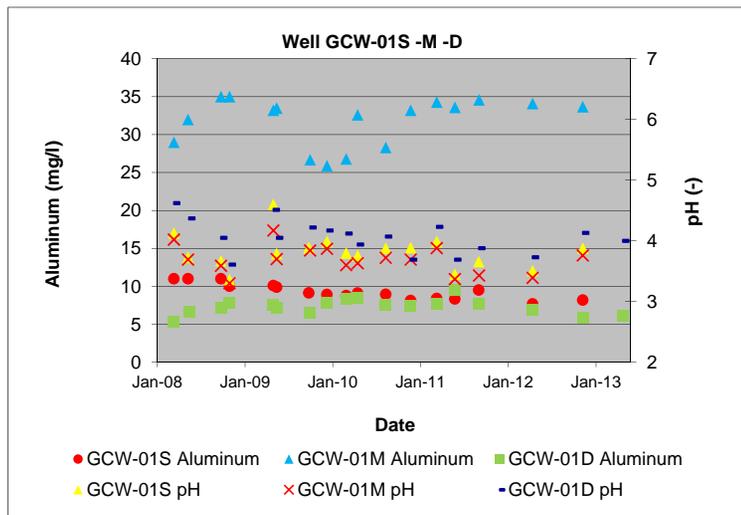


Figure 3-2 (Cont)
Monitoring Well Aluminum and pH Trends
General Chemical Site
East Point, Georgia

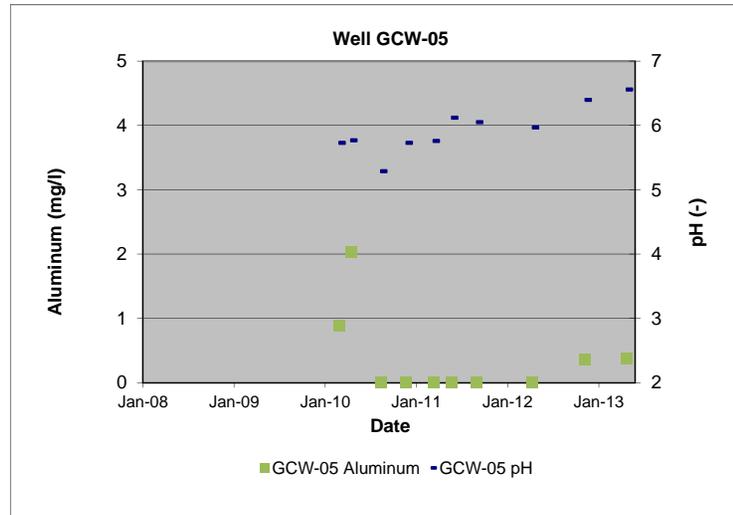
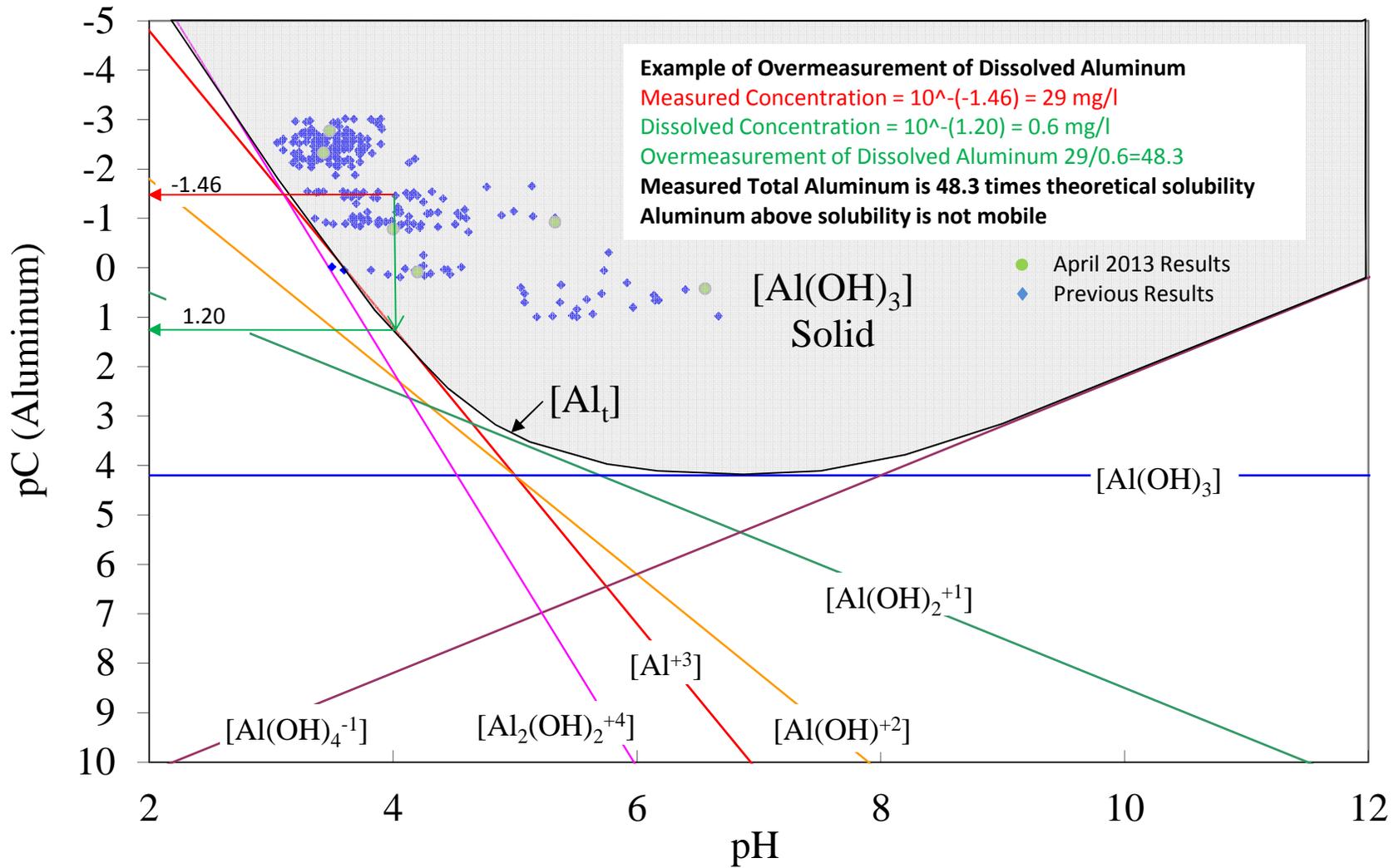


Figure 6-1
 General Chemical
 Groundwater Sampling
 April 2013
 Aluminum Results Analysis



Memorandum

Date: 31 July 2013
To: Mr. David Brownlee
From: Brian Jacobson, Geosyntec
Subject: Charles Green Park Property Soil Investigation
Geosyntec Project: GR5060

Geosyntec performed Geoprobe soil borings at the Charles Green Park on 22 and 23 January 2013 to evaluate the extent and type of sulfate impacts to soil. The access gate to the park was unlocked by City of East Point representative Joe Stallworth.

The objective of the soil borings was to (i) assess the potential presence of off-site sources in this area; and (ii) to assist with the location of an offsite sampling location. Two grab soil samples were collected at each boring, one above the groundwater table, between approximately 0-10 ft bgs (A Zone), and one in the saturated zone, between approximately 10 to 20 ft bgs (B Zone). An additional sample was collected at the SB-7 location where a white soil similar to High Clay Alumina was observed.

The results generally indicate lower sulfate concentrations above the water table than below. The average sulfate concentration above (A Zone) and below (B Zone) the water table was 173 and 385 mg/l, respectively. Sulfate concentrations were also generally higher closer to the site. The average sulfate concentrations for the B Zone borings close to the site (i.e., SB-1B through SB-5B) was 580 mg/l/. The average sulfate concentrations for the B Zone borings further from the site (i.e., SB-6B through SB-9B) was 141 mg/l/.

The results indicate the sulfate may be the result of residual groundwater impacts originating from the site. These impacts would be expected to attenuate over time as a result of the previous source removal. The suspected waste sample was non-detect for sulfate and the soil may have been weathered feldspar.

* * * * *

Charles Green Park Property Soil Investigation
31 July 2013
Page 2

Attachments:

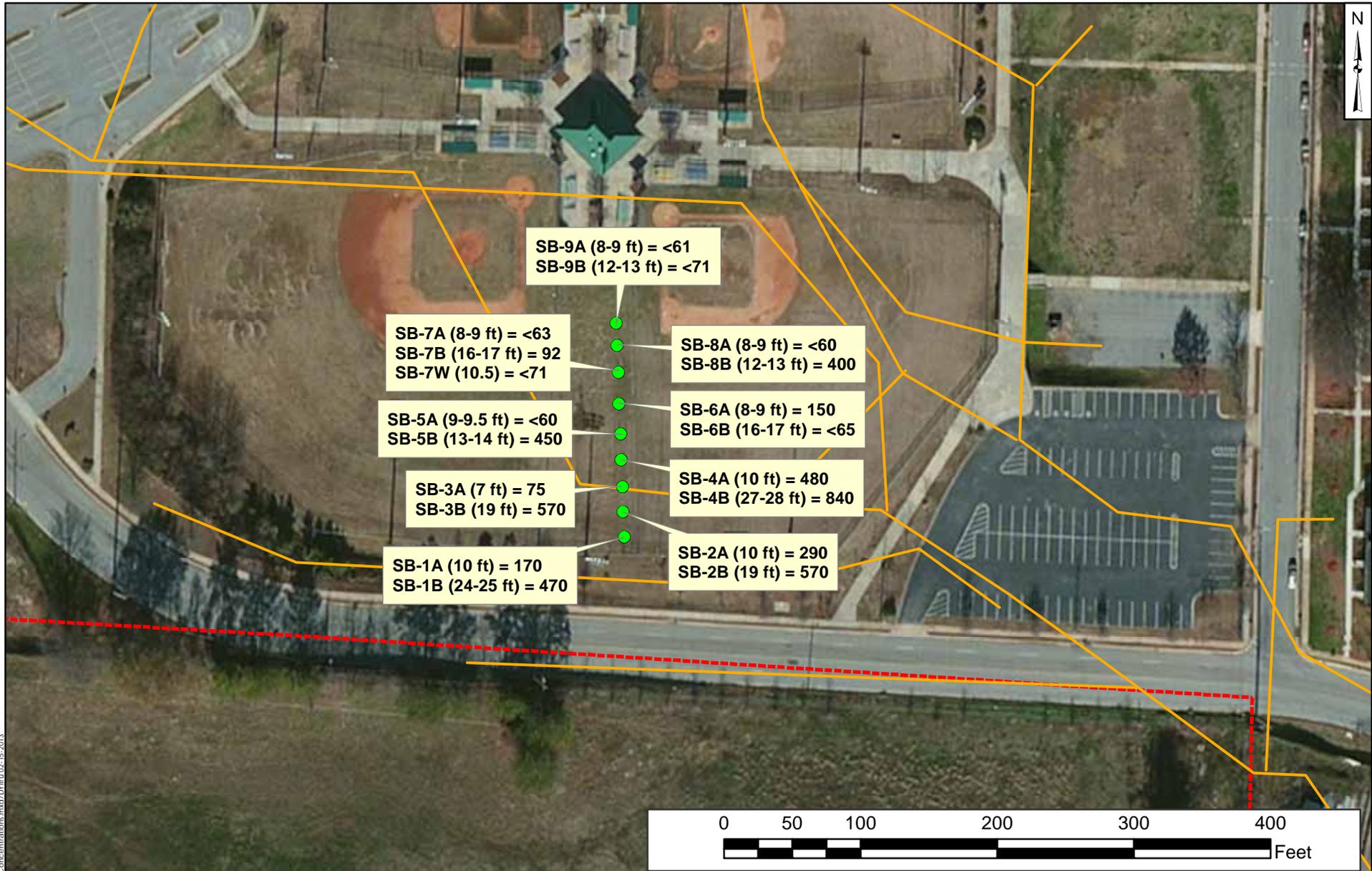
Table 1 Sulfate in Soil Results
Figure 1 Sulfate Concentration in Soil Samples January 2013
Laboratory Report AWA0654

Table 1
Sulfate in Soil Results
General Chemical, East Point, Georgia

Sample Location	Sample Interval	Result (mg/kg)
SB1-A	A	170
SB1-B	B	470
SB2-A	A	290
SB2-B	B	570
SB3-A	A	75
SB3-B	B	570
SB4-A	A	480
SB4-B	B	840
SB5-A	A	<60
SB5-B	B	450
SB6-A	A	150
SB6-B	B	<65
SB7-A	A	<63
SB7-B	B	92
SB8-A	A	<60
SB8-B	B	400
SB9-A	A	<61
SB9-B	B	<71

Notes:

- Sample interval A corresponds to the uppermost sampling interval
B corresponds to the lowermost sampling interval.
- Non-detects are shown as <Reporting Limit (RL)



N:\projects\GIS\MXD\Sulfate_Concentrations.mxd/DW/02-16-2013

	Approximate Soil Sample Location
	Storm Drain
	Approximate Site Boundary

Sulfate concentrations are in mg/kg.

Geosyntec
consultants
Kennesaw, GA

JANUARY 2013

Sulfate Concentration in Soil Samples
January 2013

General Chemical, East Point, GA

Figure
1



ANALYTICAL SERVICES, INC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Norcross, GA 30092
(770) 734-4200 FAX (770) 734-4201

Laboratory Report

Prepared For:

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw, GA 30144

Attention: Mr. Brian Jacobson

Report Number: AWA0654

February 05, 2013

Project: General Chemical

Project #:[none]

We appreciate the opportunity to provide the analytical support for your project. The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Approved:


Project Manager

This report may not be reproduced, except in full, without written approval from Analytical Services, Inc. Analytical Services, Inc. certifies that the following analytical results meet all requirements of the National Environmental Laboratory Accreditation Conference(NELAC).
All test results relate only to the samples analyzed.



ANALYTICAL SERVICES, INC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Norcross, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

February 05, 2013

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SB1-A	AWA0654-01	Soil	01/22/13 10:15	01/23/13 15:30
SB1-B	AWA0654-02	Soil	01/22/13 10:40	01/23/13 15:30
SB2-A	AWA0654-03	Soil	01/22/13 11:00	01/23/13 15:30
SB2-B	AWA0654-04	Soil	01/22/13 11:05	01/23/13 15:30
SB3-A	AWA0654-05	Soil	01/22/13 11:15	01/23/13 15:30
SB3-B	AWA0654-06	Soil	01/22/13 11:30	01/23/13 15:30
SB4-A	AWA0654-07	Soil	01/22/13 11:45	01/23/13 15:30
SB4-B	AWA0654-08	Soil	01/22/13 12:00	01/23/13 15:30
SB5-A	AWA0654-09	Soil	01/22/13 13:35	01/23/13 15:30
SB5-B	AWA0654-10	Soil	01/22/13 13:45	01/23/13 15:30
SB6-A	AWA0654-11	Soil	01/22/13 14:00	01/23/13 15:30
SB6-B	AWA0654-12	Soil	01/22/13 14:10	01/23/13 15:30
SB7-A	AWA0654-13	Soil	01/22/13 14:40	01/23/13 15:30
SB7-B	AWA0654-14	Soil	01/22/13 14:45	01/23/13 15:30
SB7-W	AWA0654-15	Soil	01/22/13 14:50	01/23/13 15:30
SB8-A	AWA0654-16	Soil	01/22/13 15:15	01/23/13 15:30
SB8-B	AWA0654-17	Soil	01/22/13 15:20	01/23/13 15:30
SB9-A	AWA0654-18	Soil	01/22/13 16:00	01/23/13 15:30
SB9-B	AWA0654-19	Soil	01/22/13 16:10	01/23/13 15:30



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Attention: Mr. Brian Jacobson

February 05, 2013

Report No.: AWA0654

Client ID: SB1-A

Date/Time Sampled: 1/22/2013 10:15:00AM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-01

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	73.8	0.04 %	by Weight	SOP Moisture	1		1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	170	68	mg/kg dry	EPA 9056A	1		2/01/13 2:12	2/01/13 2:12	3010697	MZP



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February 05, 2013

Report No.: AWA0654

Client ID: SB1-B

Date/Time Sampled: 1/22/2013 10:40:00AM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-02

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	73.0	0.04 % by Weight		SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	470	68	mg/kg dry	EPA 9056A		1	2/01/13 2:32	2/01/13 2:32	3010697	MZP



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February 05, 2013

Report No.: AWA0654

Client ID: SB2-A

Date/Time Sampled: 1/22/2013 11:00:00AM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-03

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	75.4	0.04 % by Weight		SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	290	66	mg/kg dry	EPA 9056A		1	2/01/13 2:53	2/01/13 2:53	3010697	MZP



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February 05, 2013

Report No.: AWA0654

Project: General Chemical

Client ID: SB2-B

Lab Number ID: AWA0654-04

Date/Time Sampled: 1/22/2013 11:05:00AM

Date/Time Received: 1/23/2013 3:30:00PM

Matrix: Soil

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	80.3	0.04 %	by Weight	SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	570	62	mg/kg dry	EPA 9056A		1	2/01/13 3:13	2/01/13 3:13	3010697	MZP



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Report No.: AWA0654

Client ID: SB3-A

Date/Time Sampled: 1/22/2013 11:15:00AM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-05

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	80.2	0.04 % by Weight		SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	75	63	mg/kg dry	EPA 9056A		1	2/01/13 3:34	2/01/13 3:34	3010697	MZP



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Report No.: AWA0654

Client ID: SB3-B

Date/Time Sampled: 1/22/2013 11:30:00AM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-06

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	79.0	0.04 % by Weight		SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	570	63	mg/kg dry	EPA 9056A		1	2/01/13 4:35	2/01/13 4:35	3010697	MZP



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February 05, 2013

Report No.: AWA0654

Client ID: SB4-A

Date/Time Sampled: 1/22/2013 11:45:00AM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-07

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	81.0	0.04 % by Weight		SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	480	62	mg/kg dry	EPA 9056A		1	2/01/13 4:55	2/01/13 4:55	3010697	MZP



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Report No.: AWA0654

Client ID: SB4-B

Date/Time Sampled: 1/22/2013 12:00:00PM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-08

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	76.7	0.04 %	by Weight	SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	840	130	mg/kg dry	EPA 9056A		2	2/01/13 11:48	2/01/13 11:48	3010697	MZP



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February 05, 2013

Report No.: AWA0654

Client ID: SB5-A

Date/Time Sampled: 1/22/2013 1:35:00PM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-09

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	82.4	0.04 % by Weight		SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	ND	60	mg/kg dry	EPA 9056A		1	2/01/13 5:36	2/01/13 5:36	3010697	MZP



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Report No.: AWA0654

Client ID: SB5-B

Date/Time Sampled: 1/22/2013 1:45:00PM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-10

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	82.6	0.04 %	by Weight	SOP Moisture	1		1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	450	60	mg/kg dry	EPA 9056A	1		2/02/13 20:26	2/02/13 20:26	3020013	MZP



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February 05, 2013

Report No.: AWA0654

Client ID: SB6-A

Date/Time Sampled: 1/22/2013 2:00:00PM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-11

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	87.5	0.04 % by Weight		SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	150	57	mg/kg dry	EPA 9056A		1	2/02/13 20:46	2/02/13 20:46	3020013	MZP



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Report No.: AWA0654

Client ID: SB6-B

Date/Time Sampled: 1/22/2013 2:10:00PM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-12

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	77.1	0.04 %	by Weight	SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	ND	65	mg/kg dry	EPA 9056A		1	2/02/13 21:06	2/02/13 21:06	3020013	MZP



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February 05, 2013

Report No.: AWA0654

Client ID: SB7-A

Date/Time Sampled: 1/22/2013 2:40:00PM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-13

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	79.0	0.04 % by Weight		SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	ND	63	mg/kg dry	EPA 9056A		1	2/02/13 21:27	2/02/13 21:27	3020013	MZP



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Report No.: AWA0654

Client ID: SB7-B

Date/Time Sampled: 1/22/2013 2:45:00PM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-14

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	74.2	0.04 %	by Weight	SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	92	68	mg/kg dry	EPA 9056A		1	2/02/13 21:47	2/02/13 21:47	3020013	MZP



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February 05, 2013

Report No.: AWA0654

Client ID: SB7-W

Date/Time Sampled: 1/22/2013 2:50:00PM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-15

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	70.0	0.04 % by Weight		SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	ND	71	mg/kg dry	EPA 9056A		1	2/02/13 22:08	2/02/13 22:08	3020013	MZP



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February 05, 2013

Report No.: AWA0654

Client ID: SB8-A

Date/Time Sampled: 1/22/2013 3:15:00PM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-16

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	84.2	0.04 %	by Weight	SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	ND	60	mg/kg dry	EPA 9056A		1	2/02/13 22:28	2/02/13 22:28	3020013	MZP



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Report No.: AWA0654

Client ID: SB8-B

Date/Time Sampled: 1/22/2013 3:20:00PM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-17

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	76.6	0.04 % by Weight		SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	400	65	mg/kg dry	EPA 9056A		1	2/02/13 22:48	2/02/13 22:48	3020013	MZP



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February 05, 2013

Report No.: AWA0654

Client ID: SB9-A

Date/Time Sampled: 1/22/2013 4:00:00PM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-18

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	80.5	0.04 %	by Weight	SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	ND	61	mg/kg dry	EPA 9056A		1	2/02/13 23:09	2/02/13 23:09	3020013	MZP



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Report No.: AWA0654

Client ID: SB9-B

Date/Time Sampled: 1/22/2013 4:10:00PM

Matrix: Soil

Project: General Chemical

Lab Number ID: AWA0654-19

Date/Time Received: 1/23/2013 3:30:00PM

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
General Chemistry										
% Solids	70.9	0.04 %	by Weight	SOP Moisture		1	1/30/13 14:10	1/30/13 14:10	3010547	ACM
Inorganic Anions										
Sulfate, Extractable	ND	71	mg/kg dry	EPA 9056A		1	2/02/13 23:29	2/02/13 23:29	3020013	MZP



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February 05, 2013

Report No.: AWA0654

General Chemistry - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 3010547 - % Solids										
Duplicate (3010547-DUP1)			Source: AWA0654-01			Prepared & Analyzed: 01/30/13				
% Solids	72.3	0.04	% by Weight		73.8			2	10	
Duplicate (3010547-DUP2)			Source: AWA0654-19			Prepared & Analyzed: 01/30/13				
% Solids	70.9	0.04	% by Weight		70.9			0.08	10	



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Report No.: AWA0654

Inorganic Anions - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
Batch 3010697 - EPA 9056A										
Blank (3010697-BLK1) Prepared & Analyzed: 02/01/13										
Sulfate, Extractable	ND	50	mg/kg wet							
LCS (3010697-BS1) Prepared & Analyzed: 02/01/13										
Sulfate, Extractable	97.4	50	mg/kg wet	100.20		97	90-110			
Matrix Spike (3010697-MS1) Source: AWA0654-05 Prepared & Analyzed: 02/01/13										
Sulfate, Extractable	223	62	mg/kg dry	124.63	74.5	119	90-110			QM-05
Matrix Spike Dup (3010697-MSD1) Source: AWA0654-05 Prepared & Analyzed: 02/01/13										
Sulfate, Extractable	221	62	mg/kg dry	124.13	74.5	118	90-110	1	10	QM-05
Batch 3020013 - EPA 9056A										
Blank (3020013-BLK1) Prepared & Analyzed: 02/02/13										
Sulfate, Extractable	ND	50	mg/kg wet							
LCS (3020013-BS1) Prepared & Analyzed: 02/02/13										
Sulfate, Extractable	98.6	50	mg/kg wet	100.20		98	90-110			
Matrix Spike (3020013-MS1) Source: AWA0654-19 Prepared & Analyzed: 02/02/13										
Sulfate, Extractable	145	70	mg/kg dry	139.45	ND	104	90-110			
Matrix Spike Dup (3020013-MSD1) Source: AWA0654-19 Prepared & Analyzed: 02/03/13										
Sulfate, Extractable	147	70	mg/kg dry	140.14	ND	105	90-110	1	10	



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February 05, 2013

Laboratory Certifications

Code	Description	Number	Expires
LA	Louisiana	02069	06/30/2013
NELAC	NELAC (Non-Potable Water, Solids)	E87315	06/30/2013
SC	South Carolina	98011001	06/30/2013
TX	Texas	T104704397-08-TX	03/31/2013
VA	Virginia	1340	12/14/2013



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February 05, 2013

Legend

Definition of Laboratory Terms

- ND** - None Detected at the Reporting Limit
- TIC** - Tentatively Identified Compound
- CFU** - Colony Forming Units
- SOP** - Method run per ASI Standard Operating Procedure
- RL** - Reporting Limit
- DF** - Dilution Factor
- * - Analyte not included in the NELAC list of certified analytes.

Sample Information

N-Nitrosodiphenylamine breaks down to diphenylamine in the GCMS; both analytes are reported as N-Nitrosodiphenylamine. ASI is not NELAC certified for diphenylamine.

Phthalic acid and phthalic anhydride are reported as dimethyl phthalate

Maleic acid and maleic anhydride are reported as dimethyl malate

1,2-Diphenylhydrazine breaks down to azobenzene in the GCMS; both analytes are reported as azobenzene

Definition of Qualifiers

- QM-05** The spike recovery was outside acceptance limits for the MS and/or MSD and/or PDS due to suspected matrix interference. Sample results for the QC batch were accepted based on acceptable LCS recoveries.

Note: Unless otherwise noted, all results are reported on an as received basis.



ANALYTICAL SERVICES, INC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Norcross, GA 30092
(770) 734-4200 FAX (770) 734-4201

Geosyntec Consultants Inc.
1255 Roberts Blvd N.W.
Kennesaw GA, 30144
Attention: Mr. Brian Jacobson

February 05, 2013

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(770) 734-4200 : FAX (770) 734-4201 : www.asi-lab.com



218584

CHAIN OF CUSTODY RECORD

CLIENT NAME: <u>Geosyntec</u>		ANALYSIS REQUESTED	
CLIENT ADDRESS/PHONE NUMBER/FAX NUMBER: <u>1255 Roberts Blvd NW, #200, Kennesaw, GA</u>		CONTAINER TYPE P - PLASTIC A - AMBER GLASS G - CLEAR GLASS V - VOA/VIAL S - STERILE O - OTHER	
REPORT TO: <u>Brian D. Jacobson</u>	CC:	PRESERVATION 1 - HCl, 4° 2 - H2SO4, 4° 3 - HNO3, 4° 4 - NaOH, 4° 5 - NaOH/ZnAc, 4° 6 - Na2S2O3, 4° <u>(7-5)</u>	
REQUESTED COMPLETION DATE:	PO #:	MATRIX CODES: DW - DRINKING WATER S - SOIL WW - WASTEWATER SL - SLUDGE GW - GROUNDWATER SD - SOLID SW - SURFACE WATER A - AIR ST - STORM WATER L - LIQUID W - WATER P - PRODUCT	
PROJECT NAME/STATE: <u>General Chemical</u>	PROJECT #:	REMARKS/ADDITIONAL INFORMATION	
DATE	TIME	MATRIX CODE	SAMPLE IDENTIFICATION
<u>1/22/13</u>	<u>1040</u>	<u>S</u>	<u>SB1-A SB1-B</u>
<u>1/22</u>	<u>1045</u>		<u>SB2-A SB2-B</u>
<u>1/22</u>	<u>1138</u>		<u>SB3-A SB3-B</u>
<u>1/22</u>	<u>1145</u>		<u>SB4-A SB4-B</u>
<u>1/22</u>	<u>1335</u>		<u>SB5-A SB5-B</u>
<u>1/22</u>	<u>1410</u>		<u>SB6-A SB6-B</u>
<u>1/22</u>	<u>1445</u>		<u>SB7-A SB7-B</u>
<u>1/22</u>	<u>1450</u>		<u>SB7-W</u>
<u>1/22</u>	<u>1520</u>		<u>SB8-A SB8-B</u>
<u>1/22</u>	<u>1600</u>		<u>SB9-A SB9-B</u>
SAMPLED BY AND TITLE: <u>J. Galligan / Geosyntec</u>		DATE/TIME:	DATE/TIME:
RECEIVED BY: <u>Mr. Ramanan</u>		DATE/TIME: <u>1/22/2013</u>	DATE/TIME: <u>1/22/13 1530</u>
RECEIVED BY LAB: <u>Mr. Ramanan</u>		DATE/TIME: <u>1/22/13 1530</u>	DATE/TIME: <u>1/22/13 1530</u>
pH: <u>NA</u>		Label Preserved (Yes/No): <u>NA</u>	Temperature: <u>4C</u>
LAB #:		RELINQUISHED BY:	RELINQUISHED BY:
<u>AWA0654</u>		<u>J. Galligan / Geosyntec</u>	<u>J. Galligan / Geosyntec</u>
In-house location:		COURIER:	OTHER:
<u>D5</u>		<u>Client</u>	<u>Client</u>
Entered into LIMS:		Temperature:	Other:
<u>MR</u>		<u>4C</u>	<u>Client</u>

