



Prepared for

Chemtrade Solutions LLC

90 East Halsey Road

Parsippany, New Jersey 07054

**SEMI-ANNUAL GROUNDWATER
MONITORING REPORT NO. 19
JULY THROUGH DECEMBER 2017
CHEMTRADE SITE
EAST POINT, GEORGIA
HSI# 10498**

Prepared by

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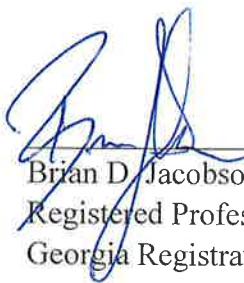
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PROFESSIONAL ENGINEER CERTIFICATION

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.



11/15/2018
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1. INTRODUCTION

1.1 Background

1.1.1 Site Location and Description

The Chemtrade Solutions LLC (Chemtrade), formerly General Chemical LCC 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 John D. Milner Sports Complex 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 Site 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 Site.

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), General Chemical 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 General Chemical 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.

General Chemical 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.

General Chemical 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.

General Chemical LLC was acquired by Chemtrade Solutions LLC on 24 January 2014. The General Chemical LLC name will be used when historically accurate and Chemtrade Solutions will be used for activities after the acquisition date.

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 Site in October 2017. This is the ninth semi-annual report submitted to Georgia EPD following approval of the VRPA in April 2013. However, this report is issued as “Semi-Annual Groundwater Monitoring Report No. 19” 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 summarizes the results of field sampling activities performed by Geosyntec in October 2017. 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 stormwater 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 shallow hydrogeologic unit 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 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). Groundwater flow at the Site is generally west to east.

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, encountered in all fourteen of the monitoring wells drilled at the Site, 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 encountered 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 eight 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 October sampling event. The measurements were performed on 5-6 October 2017. All monitoring wells were gauged. The results of the groundwater elevation measurements are provided in **Table 3-1**.

The potentiometric map for October 2017 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 5-6 October 2017. 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 eight of the nine monitoring wells sampled during the April 2017 sampling event. The sulfate concentrations were lower in the off-site wells, 85 mg/l at EPW-01 at the northwestern boundary of the Site, and <5.0 mg/l at EPW-02 to the east of the Site. Sulfate concentration in off-site well EPW-03D was 23 mg/l. On-site well OW-1A at the western boundary was measured at 39 mg/l. The background monitoring well GCW-01D at the upgradient edge of the Site had 160 mg/l of sulfate. The results indicate groundwater entering the Site contains background concentrations of sulfate between 39 and 85 mg/l as measured at OW-1A and EPW-01. These values are also consistent with the upgradient storm drain location SW-09 where sulfate was measured at 77 mg/l. The sulfate concentration along the northern property boundary at GCW-04D was 2,100 in October 2017. GCW-04D well is located outside the former impoundment areas. Sulfate at the eastern boundary at GCW-02D and GCW-03D were 1,500 and 2,900 mg/l, respectively. The source area monitoring well (GCW-05) sulfate concentration was 1,000 mg/l. The October 2017 sampling result sulfate concentrations were generally similar to or less than April 2017 sulfate concentrations.

Aluminum was detected at six of the nine monitoring wells sampled during the October 2017 sampling event. The concentrations were low at the off-site wells, 13.7 mg/l at EPW-01 at the northwestern boundary of the Site and <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 0.508 mg/l of aluminum. The background monitoring well GCW-01D at the upgradient edge of the Site contained 4.9 mg/l. The results indicate groundwater entering the Site contains background concentrations of aluminum between 0.508 to 13.7 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 5.6 mg/l. The aluminum concentration along the northern property boundary at GCW-04D was 412 mg/l.

Aluminum concentrations at GCW-04D have been low since it was measured at 0.1 mg/l in March 2015 through May 2016 when it was measured at 0.6 mg/L. Aluminum concentration is directly related to pH. The pH at GCW-04D increased to background levels between March 2015 and May 2016, resulting in the decrease in aluminum concentration. During the October 2016 sampling event, the pH dropped to 3.6, resulting in an increase in the aluminum concentration. In April 2017, the pH was measured to be 3.4, resulting in an aluminum concentration of 420 and in October 2017, the pH was

measured to be 3.5, which is consistent with the concentration in October 2016. Aluminum concentrations at the eastern boundary at GCW-02D and GCW-03D were 132 and 288 mg/l, respectively. The source area monitoring well (GCW-05) aluminum concentration was <0.1 mg/l.

The pH measurements were generally consistent with past measurements. The off-site wells EPW-01, -02, and -03 ranged from 4.3 to 6.2 standard units (s.u.). The upgradient wells GCW-01D and OW-1A were 4.1 and 4.4 s.u. respectively. The pH along the northern property boundary at well GCW-04D was 3.5 s.u. The northern and eastern wells GCW-02D and GCW-03D were measured at 3.6 and 4.3 s.u. The pH for source area monitoring well (GCW-05) was measured at 7.3 s.u.

3.2.3 Comparison to Previous Results for Groundwater

Table 3-3 summarizes 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 data used for the Mann-Kendall trend analysis calculations is presented in **Appendix C**. The procedure and methodologies employed in the analysis of the data are consistent with Georgia EPD and United States Environmental Protection Agency (EPA) recommended procedures. These methods meet the performance criteria specified in the rules of the Georgia EPD, Chapter 391-3-4-.14(19) and the technical standards described in the EPA "Statistical Analysis of Ground-Water 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 off-site and on-site wells in groundwater. The sulfate concentrations in monitoring wells GCW-01D, GCW-03D, GCW-04D, GCW-05, EPW-03D and OW-1A showed a statistically significant decreasing trend. EPW-01 is the only well that shows an increasing trend. This is consistent with the previous semi-annual report and EPW-01 is generally stable between 100 and 150 mg/l. During the October 2017 sampling event, the sulfate concentration at EPW-01 was 85 mg/L. Neither decreasing nor increasing trends were calculated for sulfate concentrations in monitoring wells GCW-02D 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 GCW-01D, GCW-04D, 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 of site constituents, following removal of source materials. These include the following:

- The pH of the groundwater in upgradient wells (OW-1A and GCW-01D) is low. Measured pH values 4.4 and 4.1 s.u. respectively. 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.
- The former fertilizer manufacturer (Furman Fertilizer, now MGA Holdings) operated an acid pit (Sanborn, 1925). Downgradient of the acid pits at delineation boring DB-05 sulfate was observed at a concentration of 1,000 mg/l. The delineation boring location is upgradient and side gradient to the former HCA impoundments shown in **Figure 1-2**.

It is encouraging that no significant impacts have been detected at downgradient wells EPW-02 or EPW-03D. The sulfate concentrations at EPW-02 appear stable and are similar or lower than regional background conditions of 46 to 140 mg/l as observed at well EPW-01. EPW-03D is located approximately 200 feet from the Site boundary. Sulfate concentrations at EPW-03D are similar to the regional background, and trends are decreasing. The pH trend at the EPW-03D is stable and typical for the Piedmont with measurements generally between 5 and 7 s.u. 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.

The groundwater measurements were compared to Type 4 Risk Reduction Standards (RRS) of 1,200 mg/l for sulfate and 102 mg/l for aluminum. The measured concentrations were interpolated to develop limits of area in excess of the Type 4 RRs. Comparisons of the Site groundwater to Type 4 RRS for sulfate and aluminum are presented in **Figures 3-4 and 3-5**.

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 October 2017. Surface water flows in the storm drain system in the following sequence: SW-09, SW-06, SW-02, 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 Georgia EPD. 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 in the four storm drain samples during the October 2017 sampling event. The upgradient (SW-09) sulfate concentration was measured at 77 mg/l. A sample was collected cross-gradient (SW-06) at a location in the John D. Milner Sports Complex. Sulfate was measured at 1,900 mg/l. At the on-site location (SW-02), sulfate was measured at 830 mg/l. The sulfate concentration at the discharge of the storm drain to surface water at SW-07 was measured at 450 mg/l.

Aluminum was detected in three of the four storm drain water monitoring locations during the October 2017 sampling event. The upgradient (SW-09) aluminum concentration was <0.1 mg/l. The sample for aluminum collected cross-gradient (SW-06) was measured at 191 mg/l. At the on-site location (SW-02) aluminum was measured at 89.5 mg/l. The aluminum concentration at the discharge of the storm drain to surface water at SW-07 was measured at 43.5 mg/l.

3.3.3 Comparison to Previous Results for Storm Drains

Table 3-5 summarizes statistical trend analysis of both aluminum and sulfate data in storm drains. Mann-Kendall trend analysis was performed using available data for each storm drain at a 95% confidence level. The data used for the Mann-Kendall trend analysis calculations is presented in **Appendix C**. The procedure and methodologies employed in the analysis of the data are consistent with Georgia EPD and United States Environmental Protection Agency (EPA) recommended procedures. These methods meet the performance criteria specified in the rules of the Georgia EPD, Chapter 391-3-4-.14(19) and the technical standards described in the EPA "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 or slowly increasing. A statistically significant increasing trend was calculated for sulfate in SW-06 (cross-gradient storm drain). The trend at SW-02 has changed from increasing to no trend between this sampling event and the previous sampling event. Neither decreasing nor increasing trends were calculated for sulfate in the remainder of the wells. Aluminum concentrations were generally stable or slowly increasing between sampling events. The pH measurements were relatively stable showing minor changes between sampling events at the same location. A statistically significant increasing trend was calculated for aluminum in the on-site storm drain SW-06. The trend at SW-02 has changed from increasing to no trend between this sampling event and the previous sampling event. Neither decreasing nor increasing trends were calculated for aluminum in the remainder of the wells. The pH measurements were generally stable. The pH measured upgradient was generally higher than the pH measured at the on-site, cross-gradient, and downgradient storm drains.

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.
- The former fertilizer manufacturer (Furman Fertilizer, now MGA Holdings) operated an acid pit (Sanborn, 1925). Downgradient of the acid pits at delineation boring DB-05 sulfate was observed at a concentration of 1,000 mg/l. The delineation boring location is upgradient and side gradient to the former HCA impoundments.

4. SAMPLE COLLECTION PROCEDURES

4.1 Summary

In October 2017, samples were collected from nine monitoring wells. Samples from monitoring wells were collected using dedicated tubing and low-flow purging techniques. Dedicated 1/8" polyethylene sampling tubing has been installed in each well. The end of the tubing is set in the middle of the screened interval. The end of tubing for EPW-01, EPW-02, and OW-01A is approximately 5 feet off the bottom of the well. 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 Pace 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 hand delivered by a courier 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. The samples were collected in general accordance with EPA's Field Branches Quality System and Technical Procedures (FBQSTP) Operating Procedure for "Groundwater Sampling", SESDPROC-301-R3 using the MicroPurge procedures for the "Tubing-in-Screened-Interval" Method. 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. The sample tubing is polyethylene instead of Teflon lined since the constituent concentrations are high (i.e., ppm not ppb) and sulfate and aluminum do not bind to polyethylene tubing.

Low flow purging was conducted by purging groundwater from the well at a low, constant rate for an extended period of time with the pump intake (i.e., the end of the dedicated tubing) set directly opposite the middle of 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 300 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 two and one-half to five gallons was removed, when possible, to represent at least one and one-half to 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 at least every 10 minutes. 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 groundwater at 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 drain water was sampled using peristaltic pumps or by hand. The pump-head tubing is silicone, while the down-hole tubing is polyethylene. Four locations were sampled for sulfate in October 2017.

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. At SW-09 and SW-06, the turbidity was measured above 20 NTUs during purging, but due to the limited amount of water in the storm drain, SW-09 and SW-06 were sampled after two consistent measurements of field parameters. 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 sampling (i.e., for SW-07), 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. A set of 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 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 500 mg/l depending on the required dilution to measure a result. The laboratory reporting limits for aluminum by Method 6010C was 0.1 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 nine years of data collection indicate concentrations of constituents of concern are generally showing significant decreasing trends or stability for on-site monitoring wells. The HCA source material has been removed for over nine 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 the general trend of concentrations of monitored constituents is decreasing. Groundwater levels (elevations) have been generally stable since 2008.

Sulfate concentrations show a statistically significant decreasing trend in five of six 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 on **Figure 6-1**, the measured total aluminum concentration was 26 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 between the sampling events. While this is encouraging, we believe that local precipitation which 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 be migrating off site.

6.2 Storm Drains

Storm drains at the Site have been sampled during 23 sampling events. Storm drain water and groundwater are related 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 were 4.4 and 4.2 s.u., respectively. The low pH values of groundwater entering the Site will slow a return to background conditions of stormwater mixed with groundwater exiting the Site. The pH of stormwater in the cross-gradient sampling location (SW-06) was measured at 4.0 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 sources may be contributing the elevated sulfate concentrations noted at SW-02 that were measured at 830 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 (SW-07) sulfate concentration at the exit to the storm drain and the start of open channel flow was measured at 450 mg/l which is greater than the background concentration of 77 mg/l.

The cross-gradient (SW-06) concentrations of sulfate and aluminum were higher than the on-site (SW-02) concentrations during the last sampling event. Since the on-site source has been removed and potential off-site sources likely remain the relative 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 cross-gradient SW-06, which is consistent with source removal on site and active potential impacts by a residual plume.

6.2 East Point Storm Drain Negotiations

The City of East Point requested a series of meetings during the period of February to March 2017 to discuss storm drain concerns related to the Newell Recycling property and the adjacent Chemtrade site. The meetings participants included representatives from The City of East Point, Newell Recycling, Chemtrade, and GaEPD. Chemtrade requested a meeting to discuss access and scope of work with the City of East Point on August 3rd, August 18th, and December 18th 2017. The City of East Point has not provided meeting times to progress the work. Chemtrade restarted the process of negotiations with the City of East Point on January 12th, 2018.

During the meetings Chemtrade explained a potential approach to line a portion of the the storm drains under Milner Sports Complex. The targeted portion of storm drain was selected to minimize the infiltration of sulfate containing and low pH groundwater into the storm drain. The City of East Point requested additional work be performed at the corner of the Chemtrade site at SW-02. Chemtrade and the City of East Point are planning negotiations to determine the extent of the additional work to be performed. Chemtrade plans to execute the work under the Milner Sports Complex shortly after successfully completing the negotiations with the City of East Point.

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

Table 3-1
Well Construction Data and Groundwater Elevations
Chemtrade Solutions Site
East Point, Georgia

Location	Well Casing Elevation	Adjacent Soil Elevation	Screen Interval (ft bgs)	Depth to Water (ft)	Groundwater Elevation (ft msl)
				Oct-17	Oct-17
GCW-01S	1023.6	1024	182	13.8	1009.8
GCW-01M	1023.8	1024	34-44	13.8	1010.0
GCW-01D	1023.9	1024	58-68	13.0	1010.9
GCW-02S	983.6	984	16-26	5.5	978.1
GCW-02D	983.4	984	34-44	5.1	978.3
GCW-02V	984.7	985.0	85.5-95.5	5.9	978.8
GCW-03S	981.3	981.6	11-21	5.3	976.0
GCW-03D	981.2	982	28-38	5.3	976.0
GCW-04S	996.6	997.0	13-23	10.6	986.0
GCW-04M	997.0	997.4	30-40	11.0	986.0
GCW-04D	996.8	997.1	50-60	10.6	986.2
GCW-04V	996.7	997.0	114-124	10.6	986.1
GCW-05	995.1	994.9	80-90	7.4	987.7
EPW-01	1017.5	1017.7	24.51 ⁽¹⁾	20.4	997.1
EPW-02	980.0	980.3	19.41 ⁽¹⁾	11.0	969.0
EPW-03S	984.5	984.8	12-22	10.2	974.3
EPW-03M	984.3	984.6	29-39	10.2	974.1
EPW-03D	984.6	984.9	46-56	10.3	974.3
OW-1A ⁽²⁾	1030.6	1027.9	23.5-33.5 ⁽³⁾	16.4	1014.3

Notes:

⁽¹⁾: Screen length is unknown. Total depth of the well is indicated in the table.

⁽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
Chemtrade Solutions Site
East Point, Georgia

Location	pH (-) EPA 150.1	Sulfate (mg/l) EPA 9056A	Aluminum (mg/l) EPA6010C	Type 4 RRS Exceeded	
				Sulfate 1200 mg/l	Aluminum 102 mg/l
GCW-01D	4.1	160	4.9	No	No
GCW-02D	3.6	1500	132	Yes	Yes
GCW-03D	4.3	2900	288	Yes	Yes
GCW-04D	3.5	2100	412	Yes	Yes
GCW-05	7.3	1000	<0.1	No	No
EPW-01	4.3	85	13.7	No	No
EPW-02	5.4	<5.0	<0.1	No	No
EPW-03D	6.2	23	<0.1	No	No
OW-1A	4.4	39	0.508	No	No
Duplicates	5.4	<5.0	<0.1	No	No

Notes:

⁽¹⁾: Duplicate was taken from EPW-02

Table 3-3
Summary of Statistical Trend Analysis
Groundwater Samples
Chemtrade Solutions Site
East Point, Georgia

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

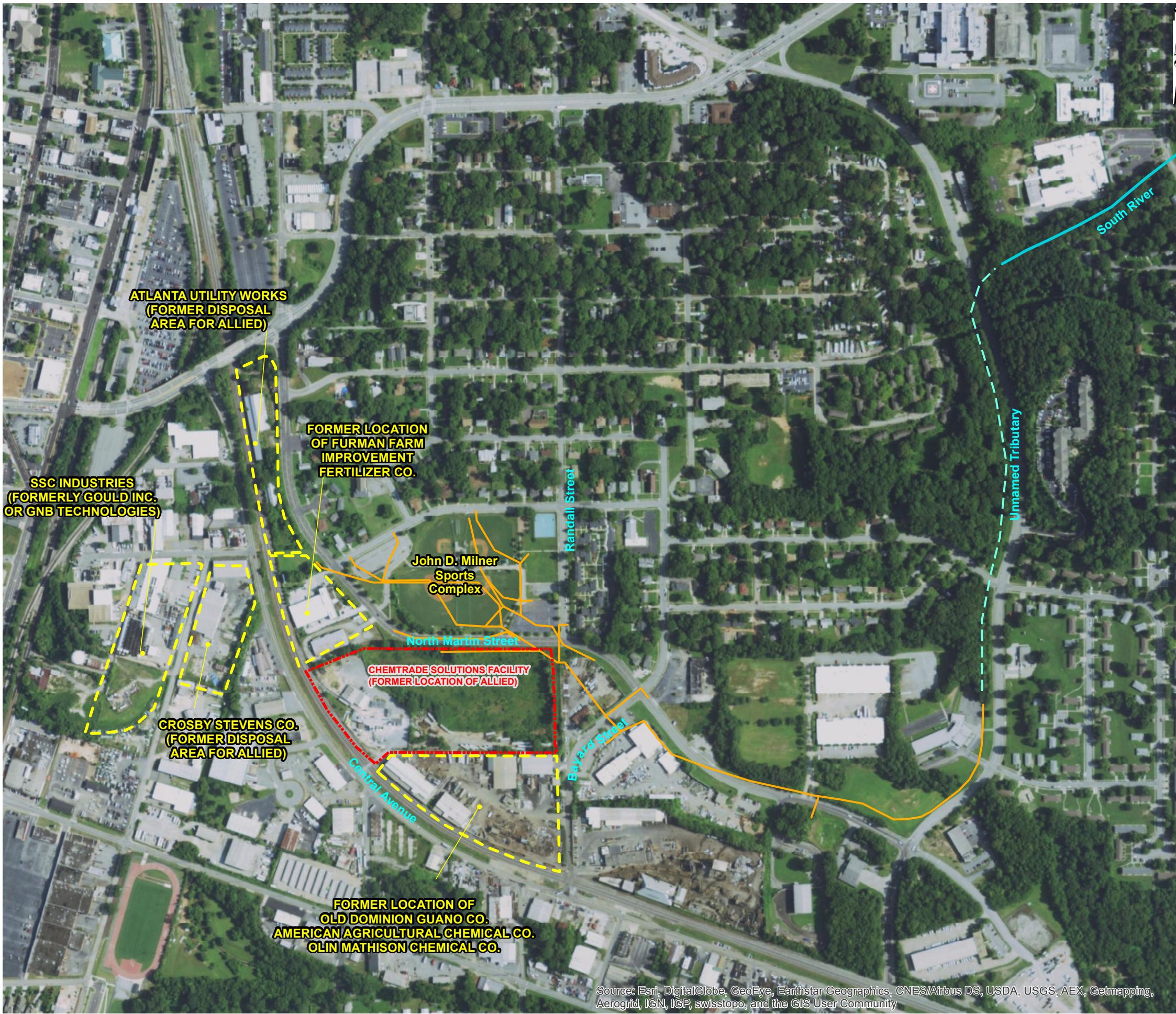
Table 3-4
Storm Drain Sampling Results
January 2017
Chemtrade Solutions Site
East Point, Georgia

Location	Description	pH (-) EPA 150.1	Sulfate (mg/l) EPA 9056A	Aluminum (mg/l) EPA6010C
SW-02	On-site	5.0	830	89.5
SW-06	Cross-Gradient	4.0	1900	191
SW-07	Downgradient	4.7	450	43.5
SW-09	Upgradient	6.7	77	<0.1
Duplicate	Duplicate SW-06	4.0	1700	202

Table 3-5
Summary of Statistical Trend Analysis
Storm Drain Samples
Chemtrade Solutions Site
East Point, Georgia

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

FIGURES



Geosyntec ▾
consultants

ATLANTA, GEORGIA

January 2018	SCALE: 1" = 500'
PROJECT NO. GR5060	FIGURE NO. 1-1
DOCUMENT NO.	FILE NO. Figure 1-1.mxd



N:\\genciem\\chemtrade\\MXD\\January 2017.dwg 01-12-2017

150 75 0 150 300
Feet

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend Monitoring Well selection

Excavation Cell

Approximate Property Boundary

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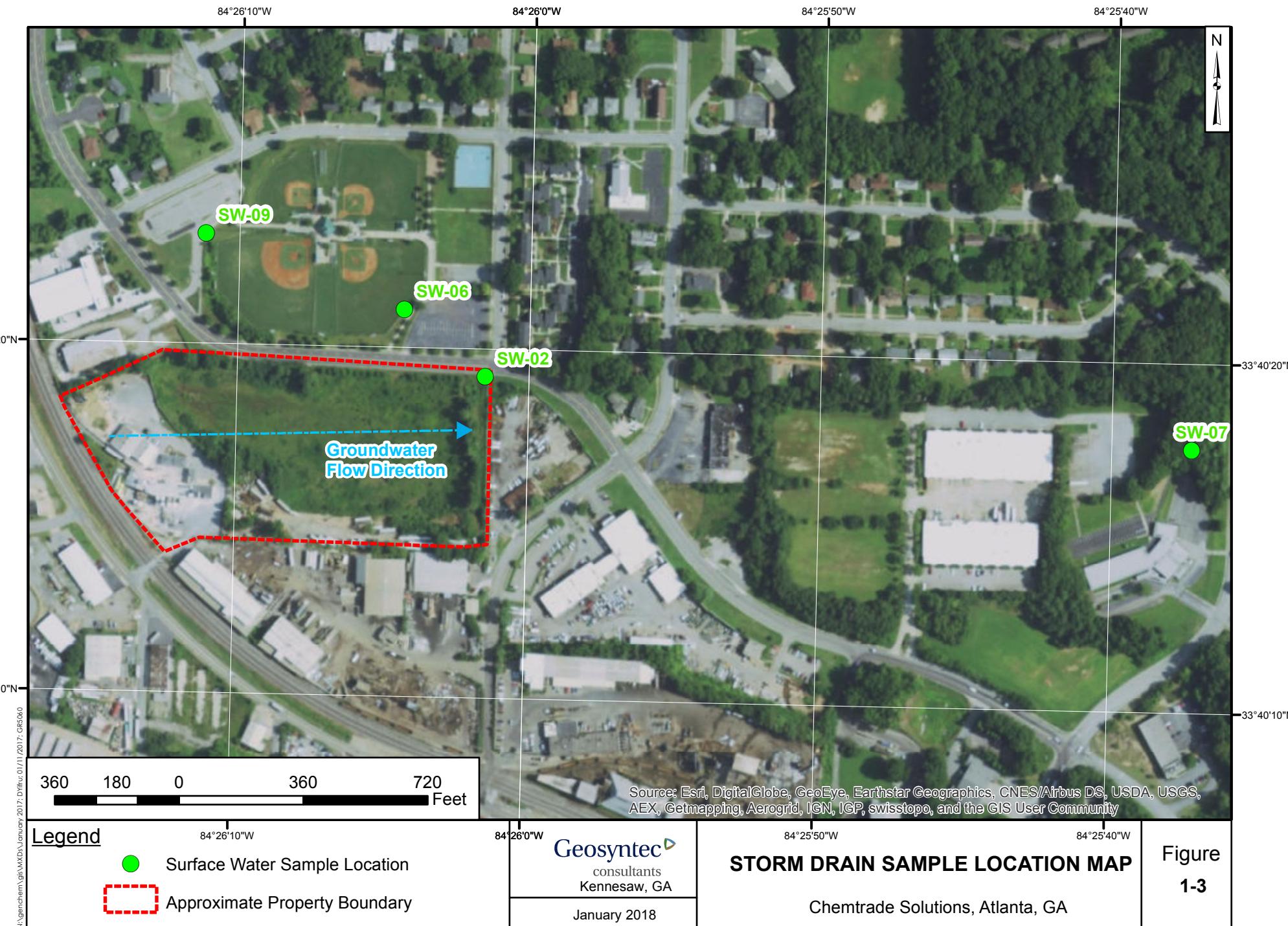
Kennesaw, GA

January 2018

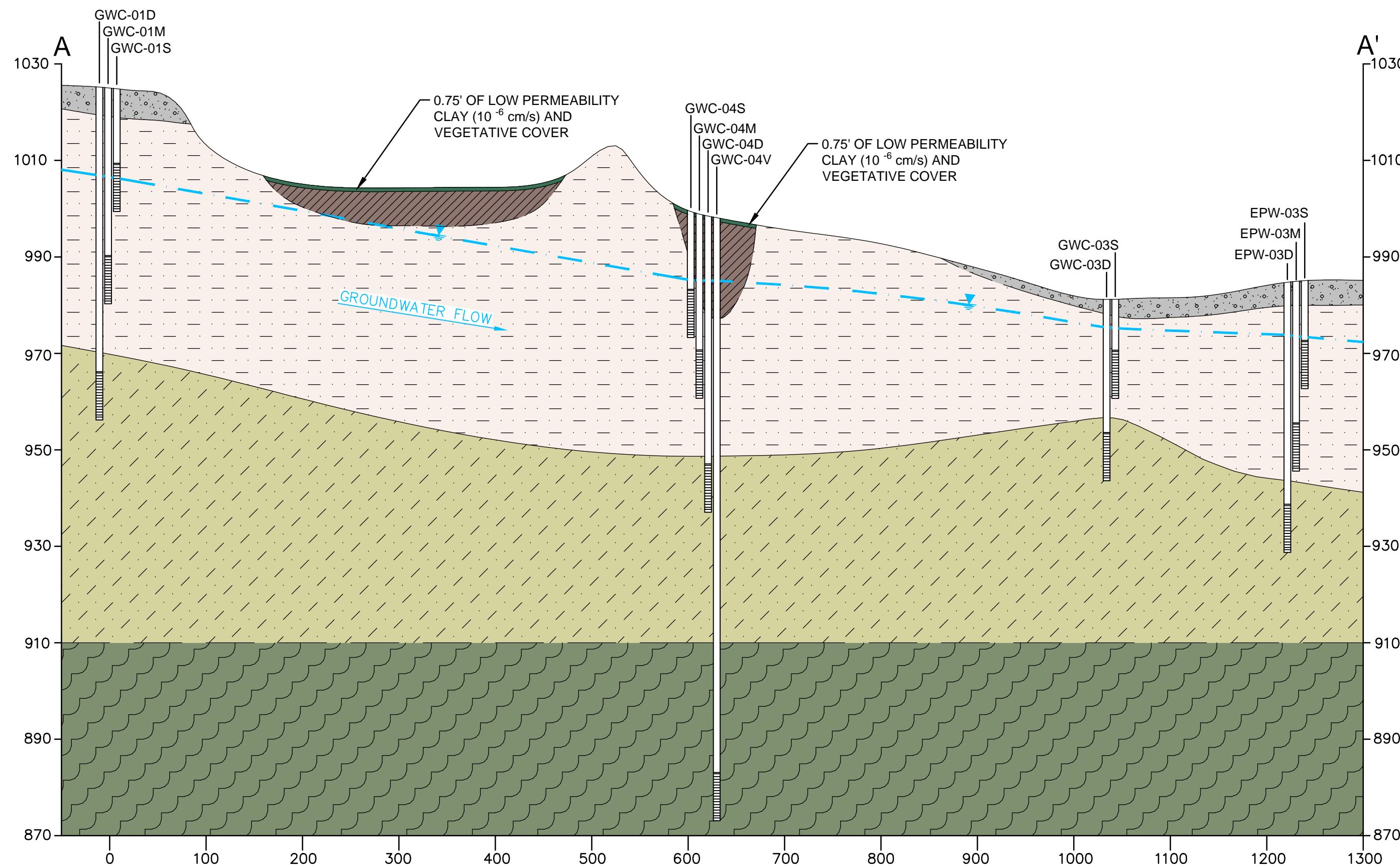
MONITORING WELLS LOCATION MAP

Chemtrade Solutions, East Point, GA

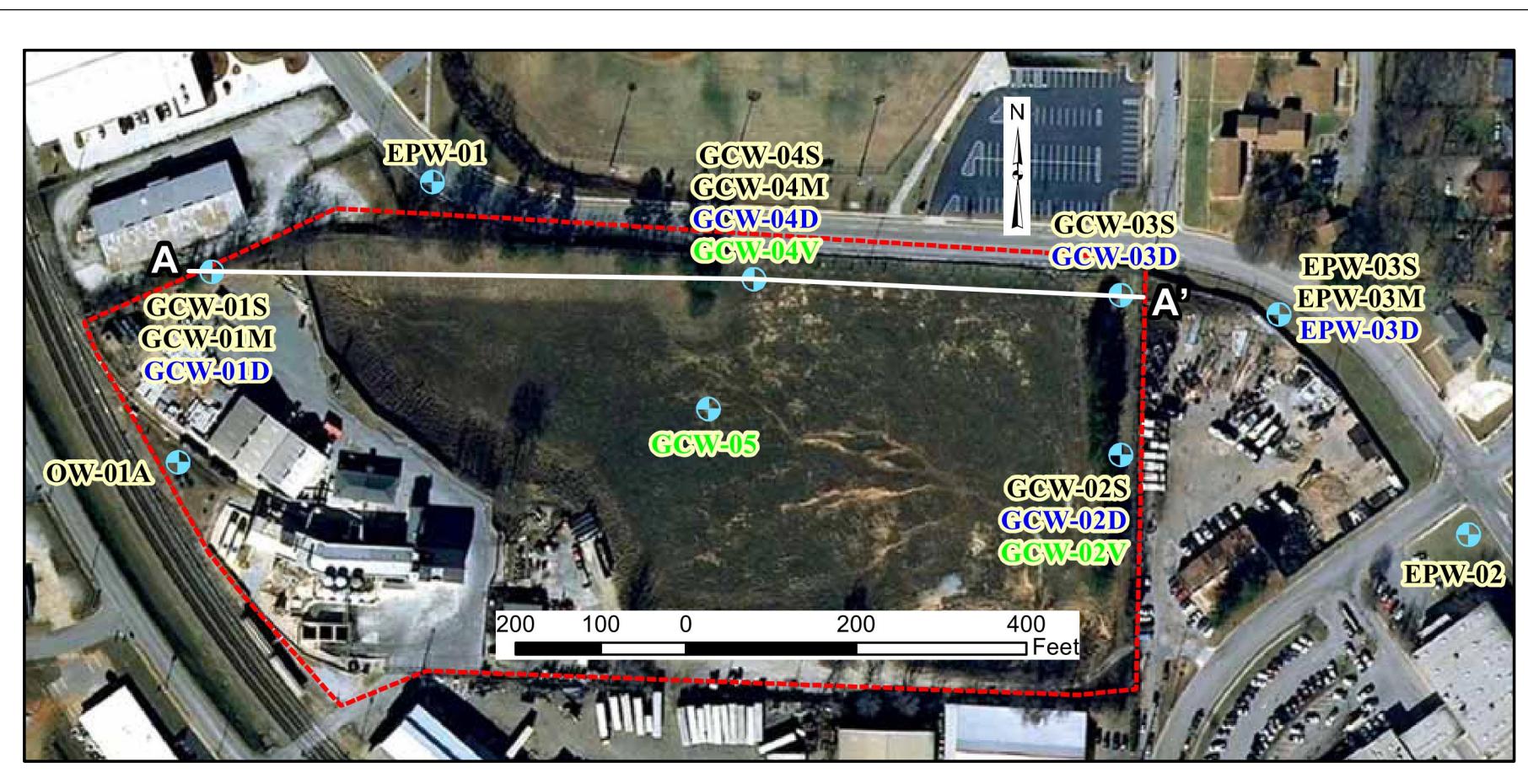
Figure
1-2



GEOLOGIC AND HYDROGEOLOGIC CROSS SECTION ALONG A-A'



KEY MAP



LEGEND

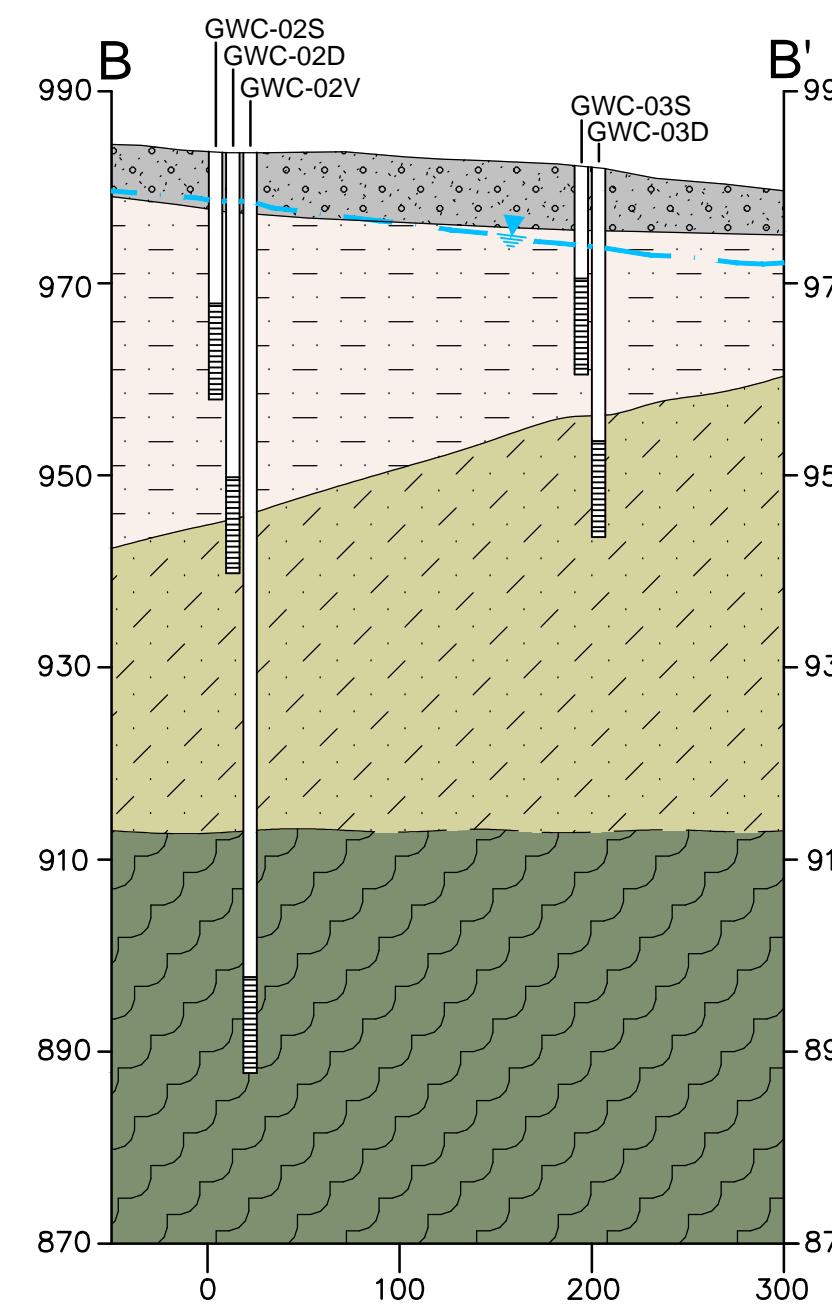
	0.75' THICK LOW PERMEABILITY CLAY (10^{-6} cm/s) AND VEGETATIVE COVER
	GRAVELLEY CLAY, FILL
	CLAY, FILL AFTER EXCAVATION
	SILTY SAND, RELICT SCHISTOCITY, MICACEOUS (SAPROLITE)
	PARTIALLY WEATHERED SCHIST
	BEDROCK (SCHIST)
	LITHOLOGIC CONTACT, DASHED WHERE INFERRED
	MONITORING WELL SCREEN ZONE WITH WATER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

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

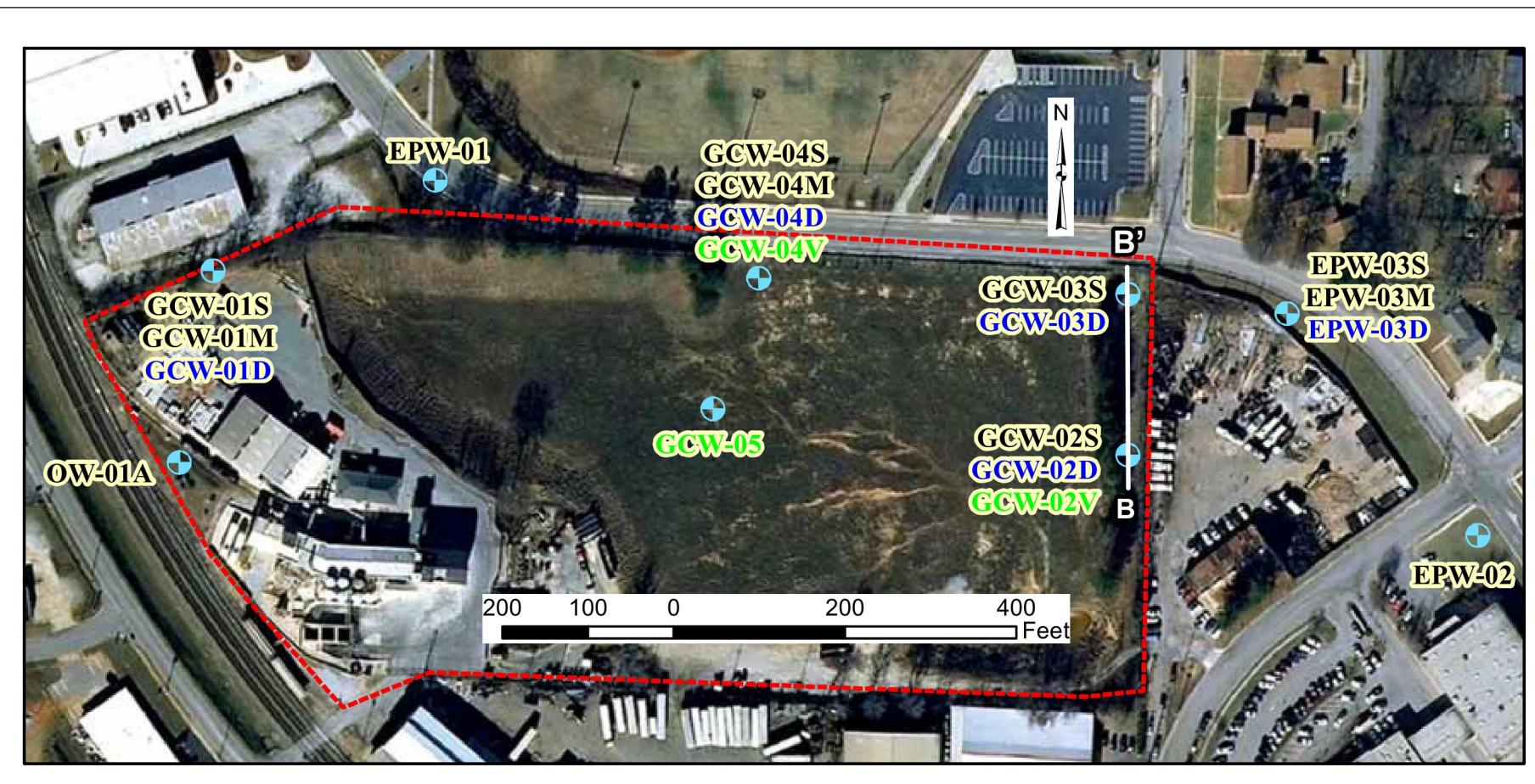
Geosyntec
consultants

DATE:	JUN-13	SCALE:	AS SHOWN
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DOCUMENT NO.	GA 130020	FIGURE NO.	2-1

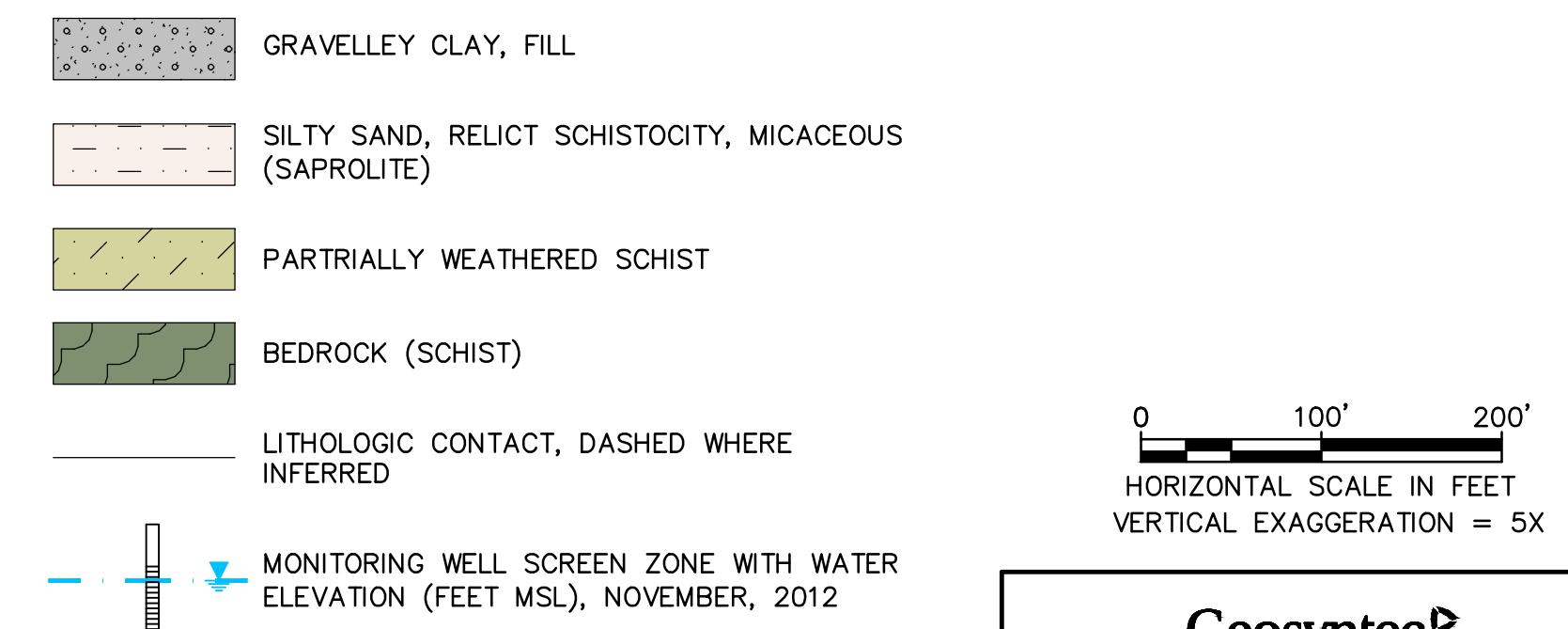
GEOLOGIC AND HYDROGEOLOGIC
CROSS SECTION ALONG B-B'



KEY MAP



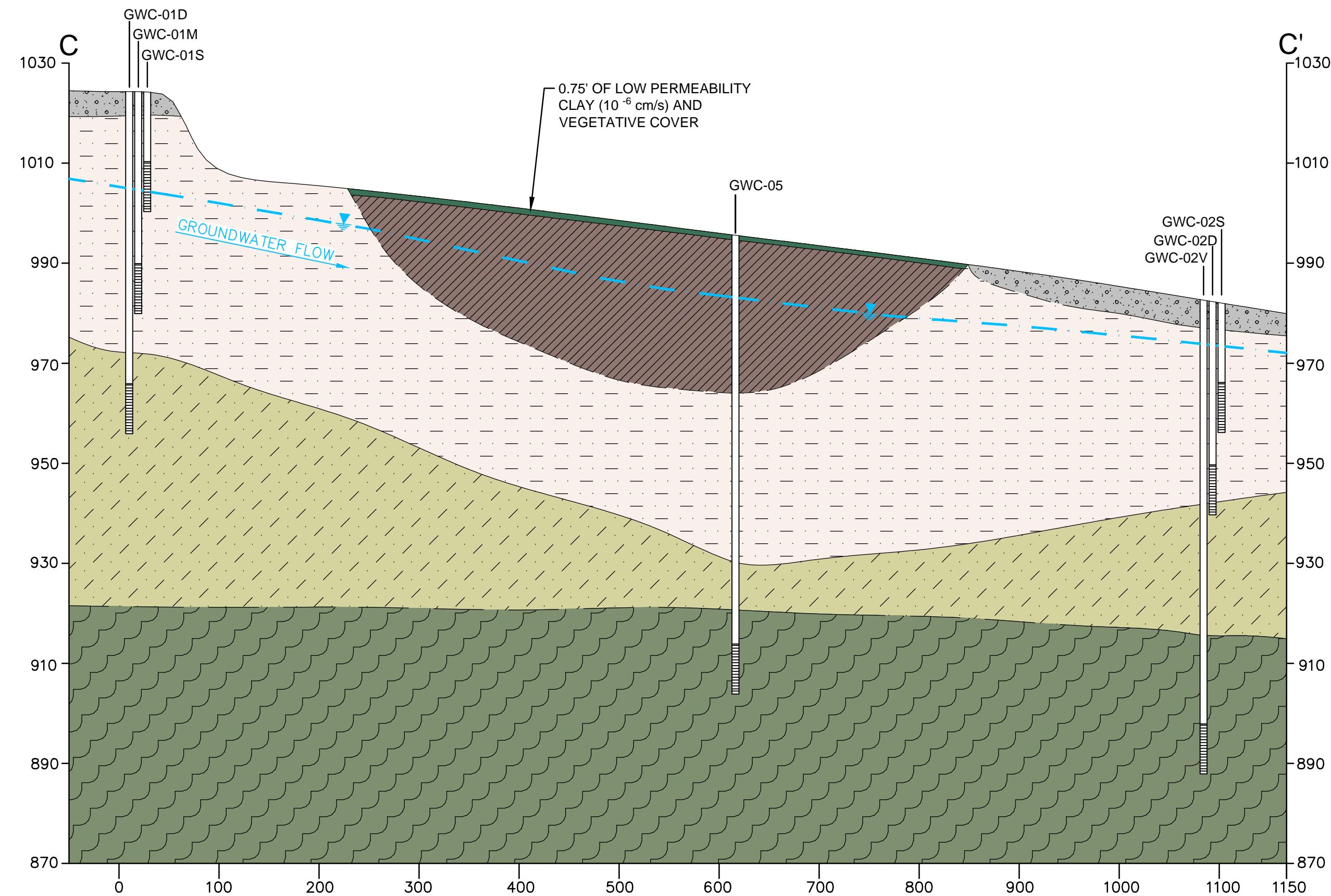
LEGEND



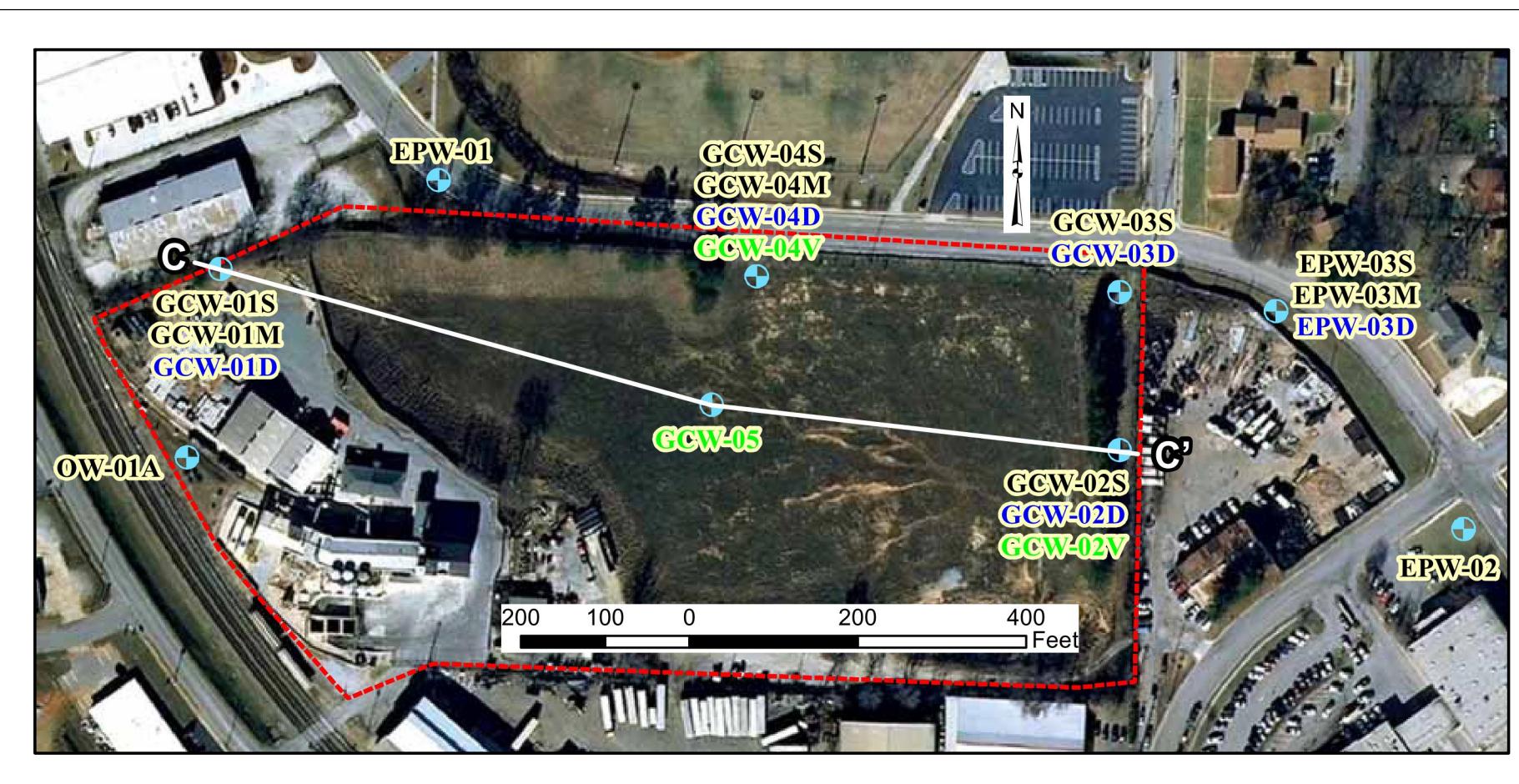
Geosyntec
consultants

DATE: JUN-13	SCALE: AS SHOWN
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DOCUMENT NO. GA 130020	FIGURE NO. 2-2

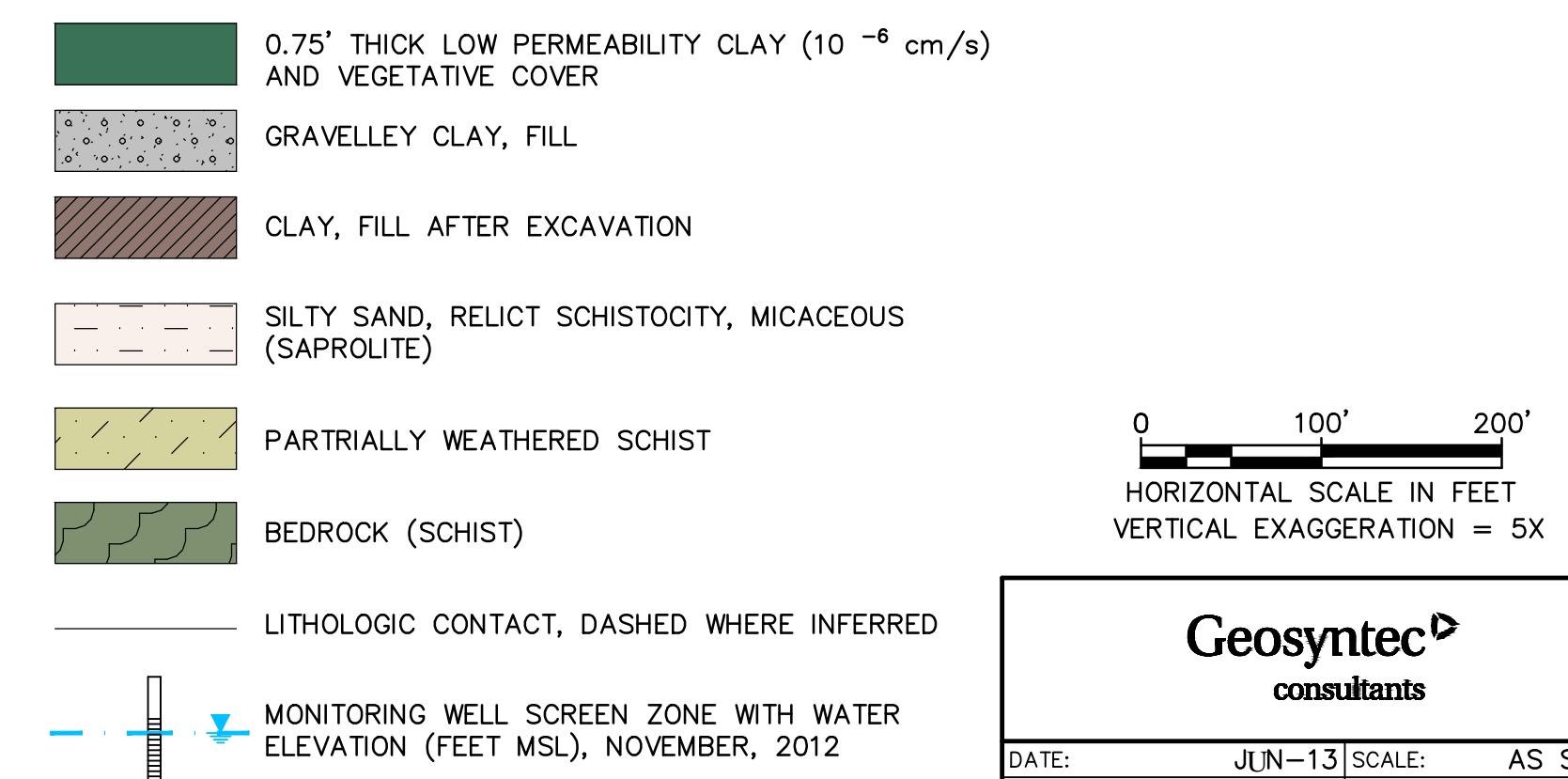
GEOLOGIC AND HYDROGEOLOGIC
CROSS SECTION ALONG C-C'



KEY MAP



LEGEND



Geosyntec
consultants

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PROJECT NO. GR5060/12	FILE NO. 5060F001
DOCUMENT NO. GA 130020	FIGURE NO. 2-3

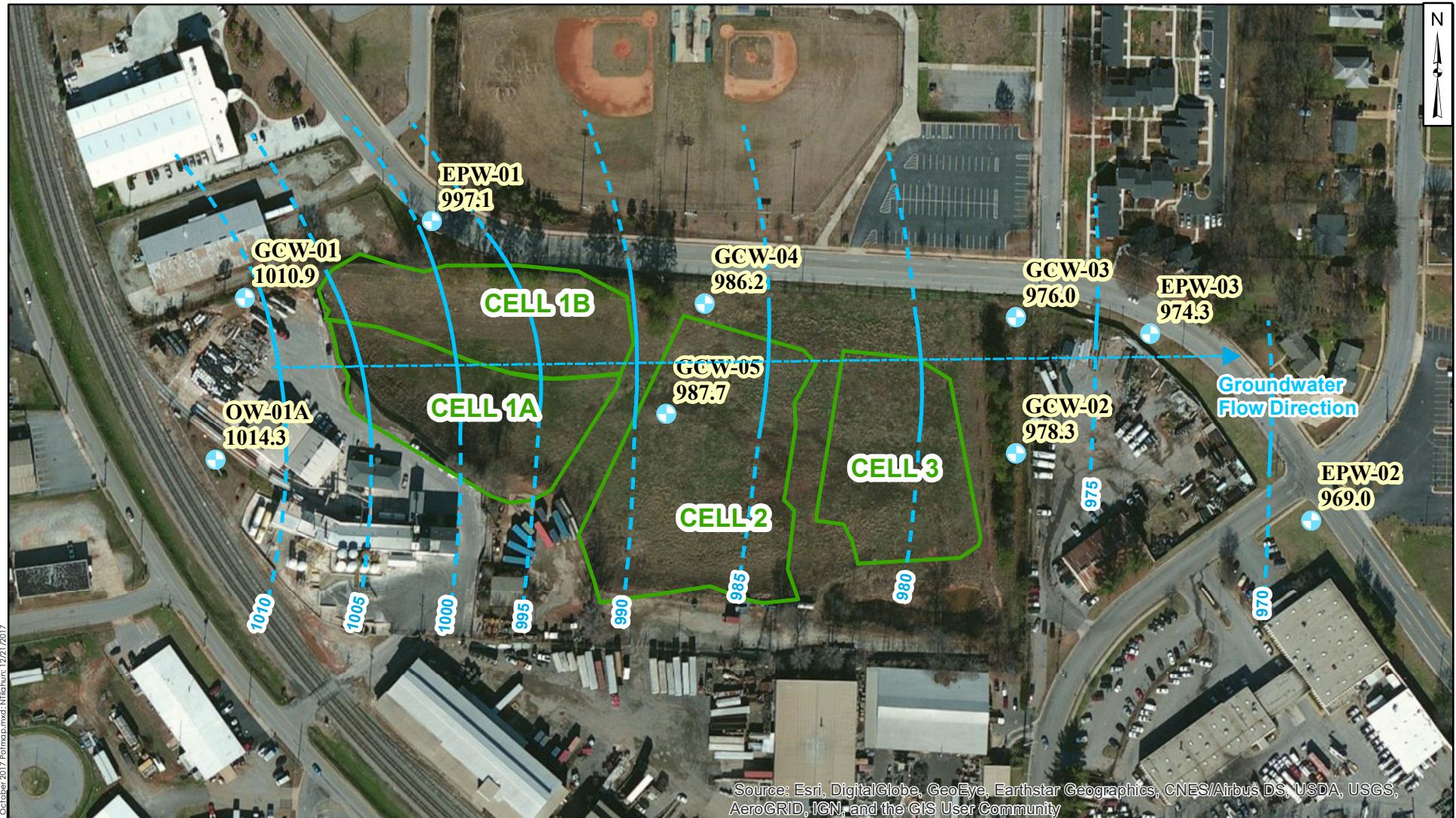


Figure 3-2
EPW-01 Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

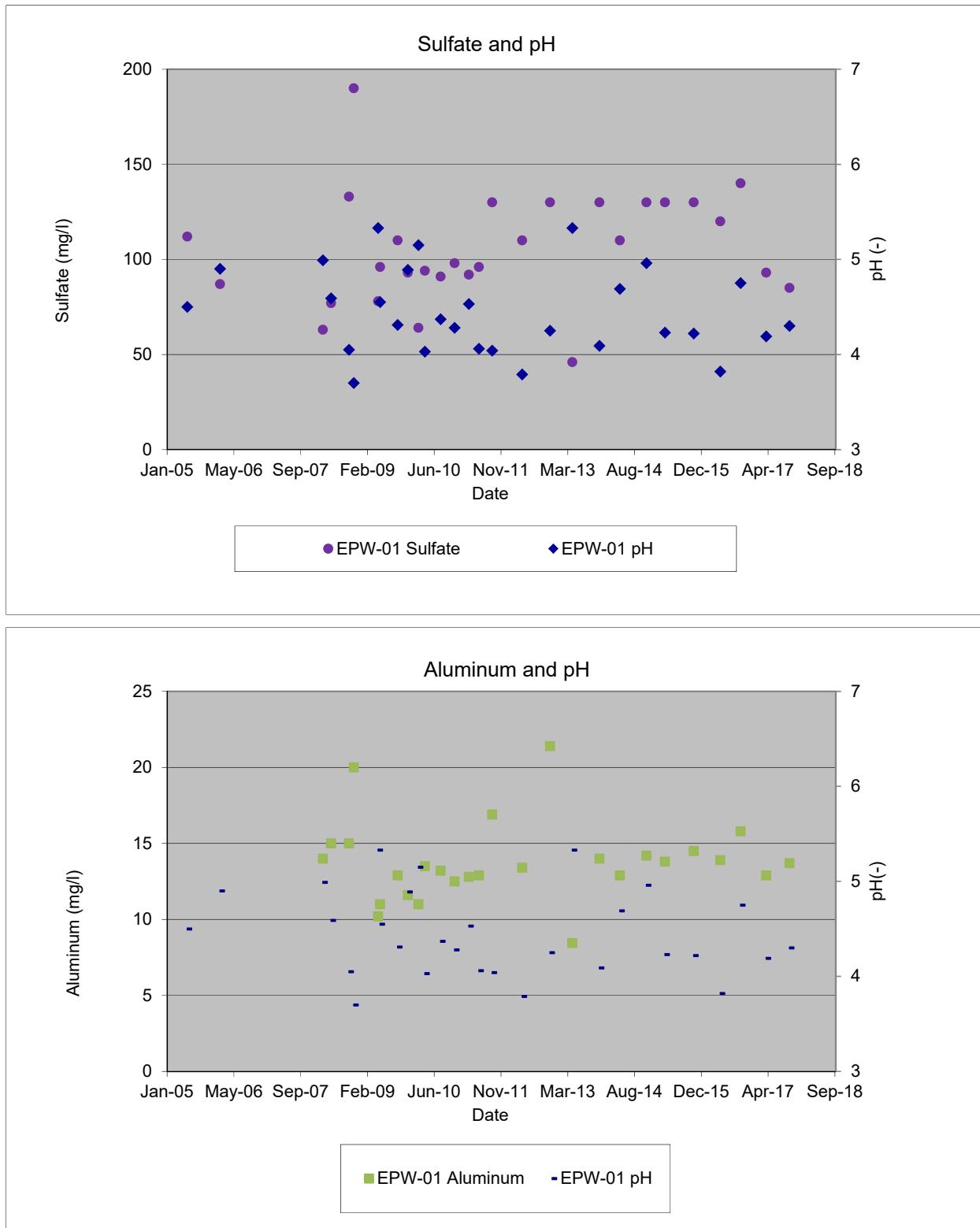


Figure 3-2 (Cont)
EPW-02 Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

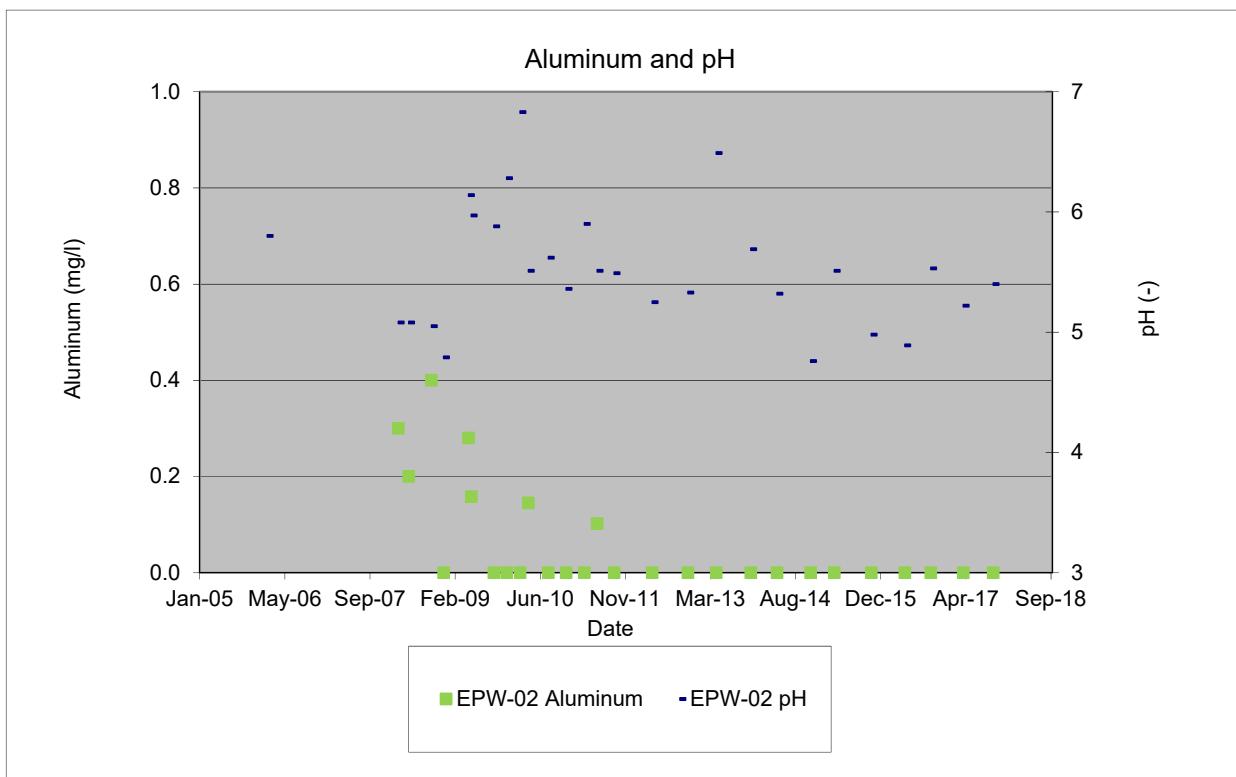
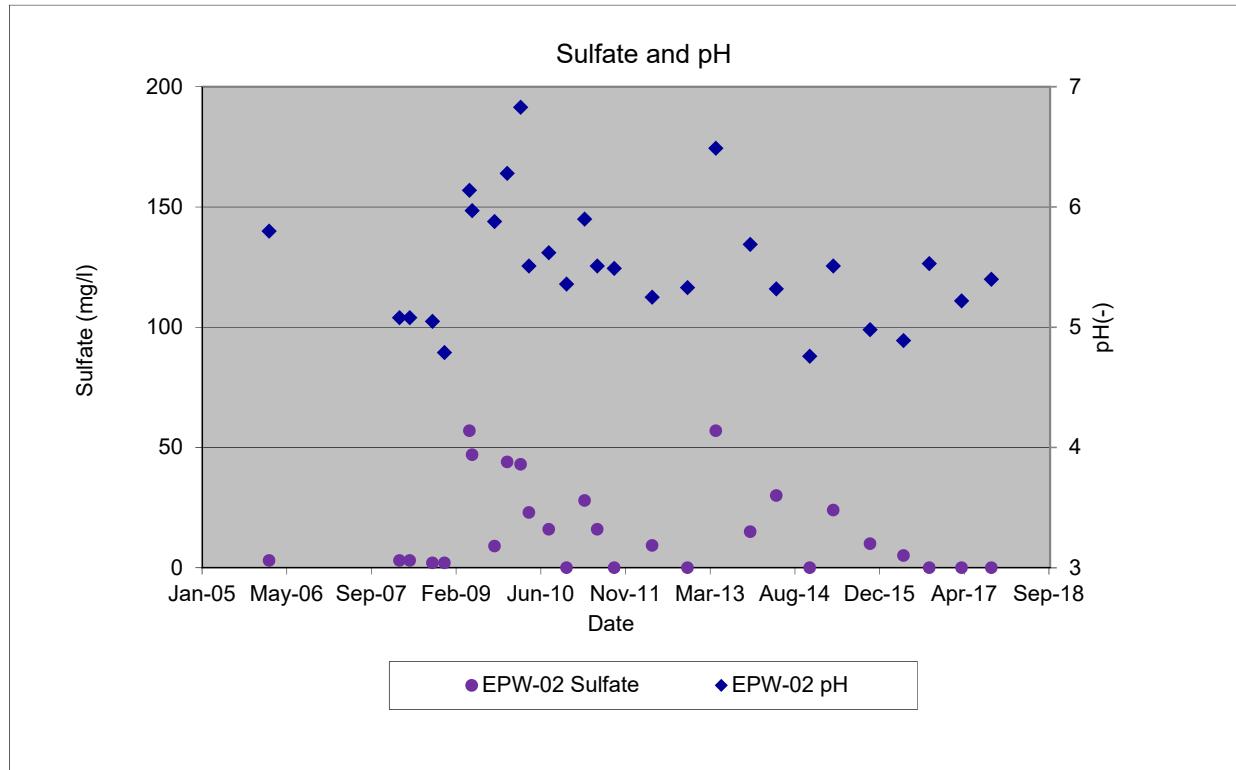


Figure 3-2 (Cont)
EPW-03S -M -D Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

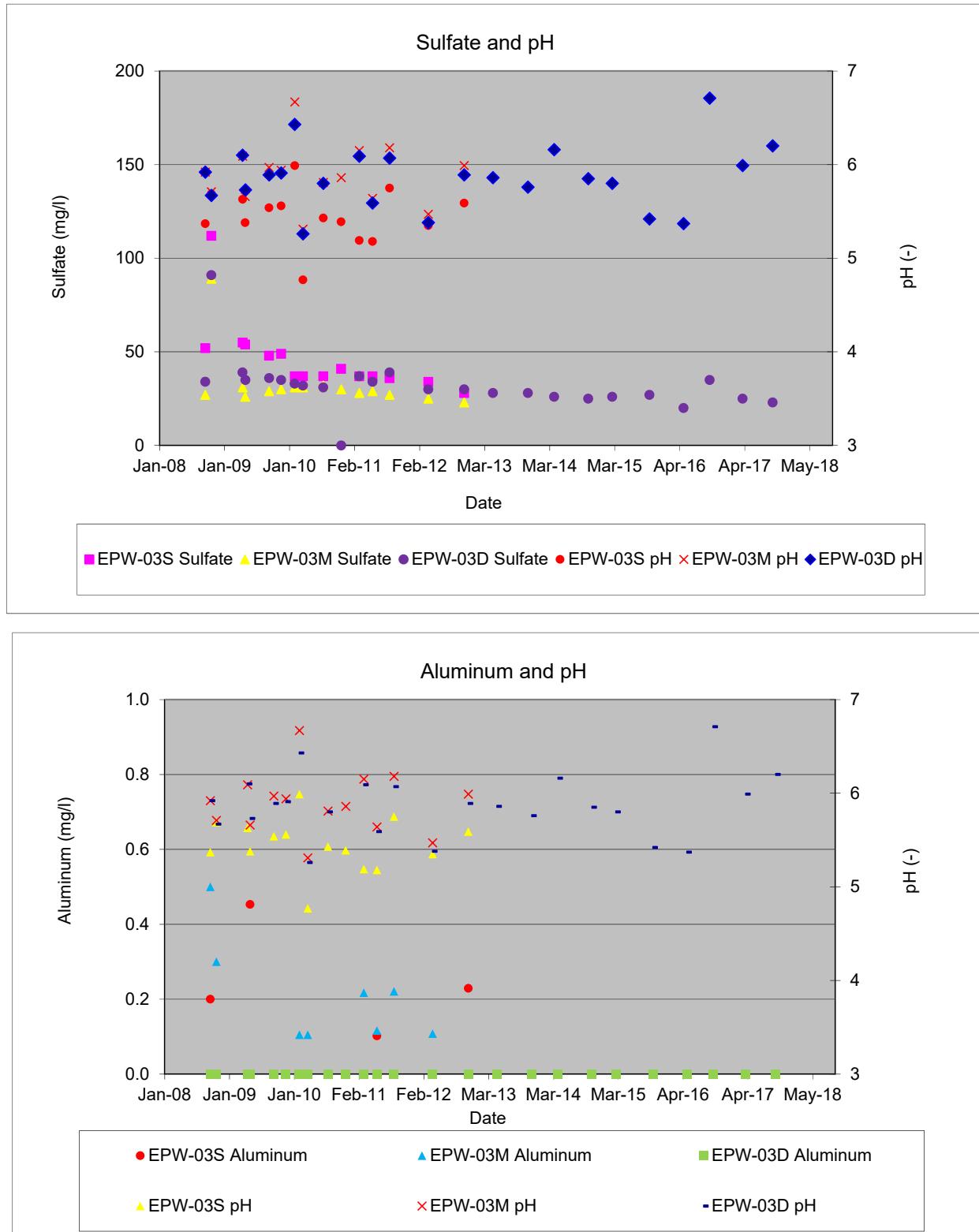


Figure 3-2 (Cont)
OW-1A Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

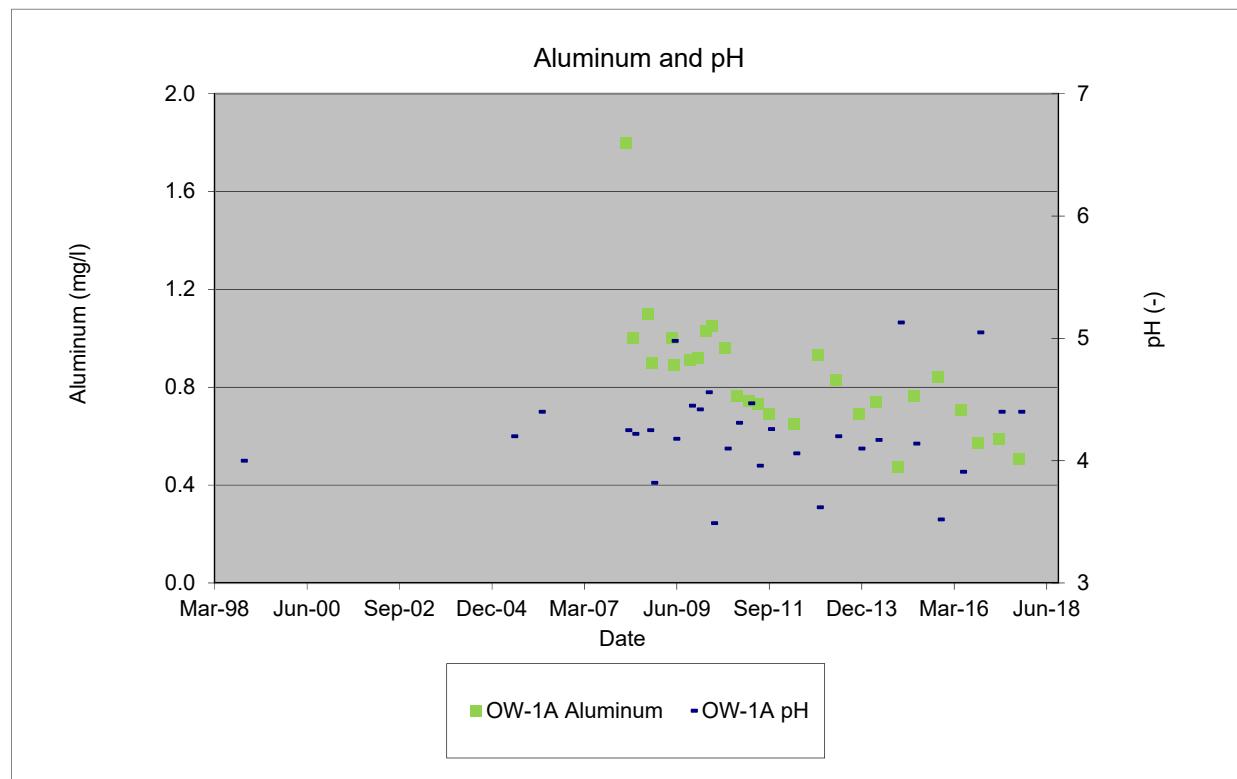
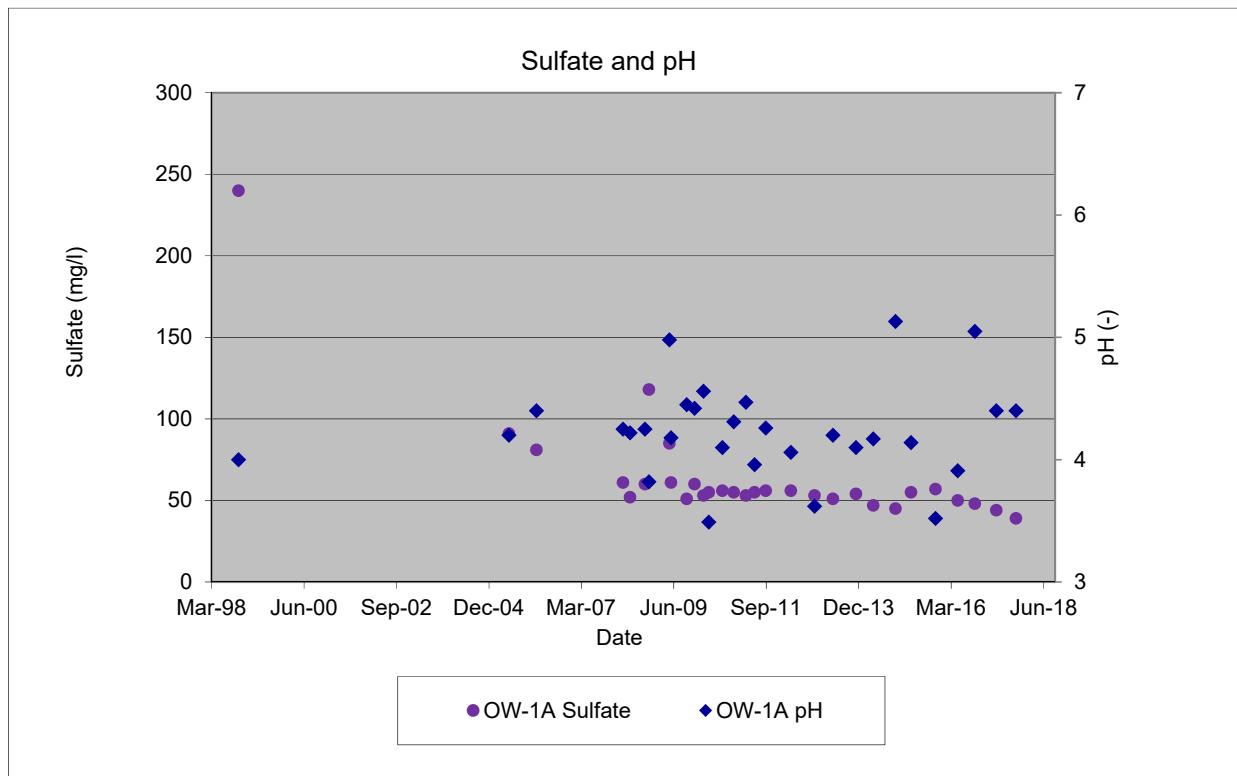


Figure 3-2 (Cont)
GCW-01S -M -D Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

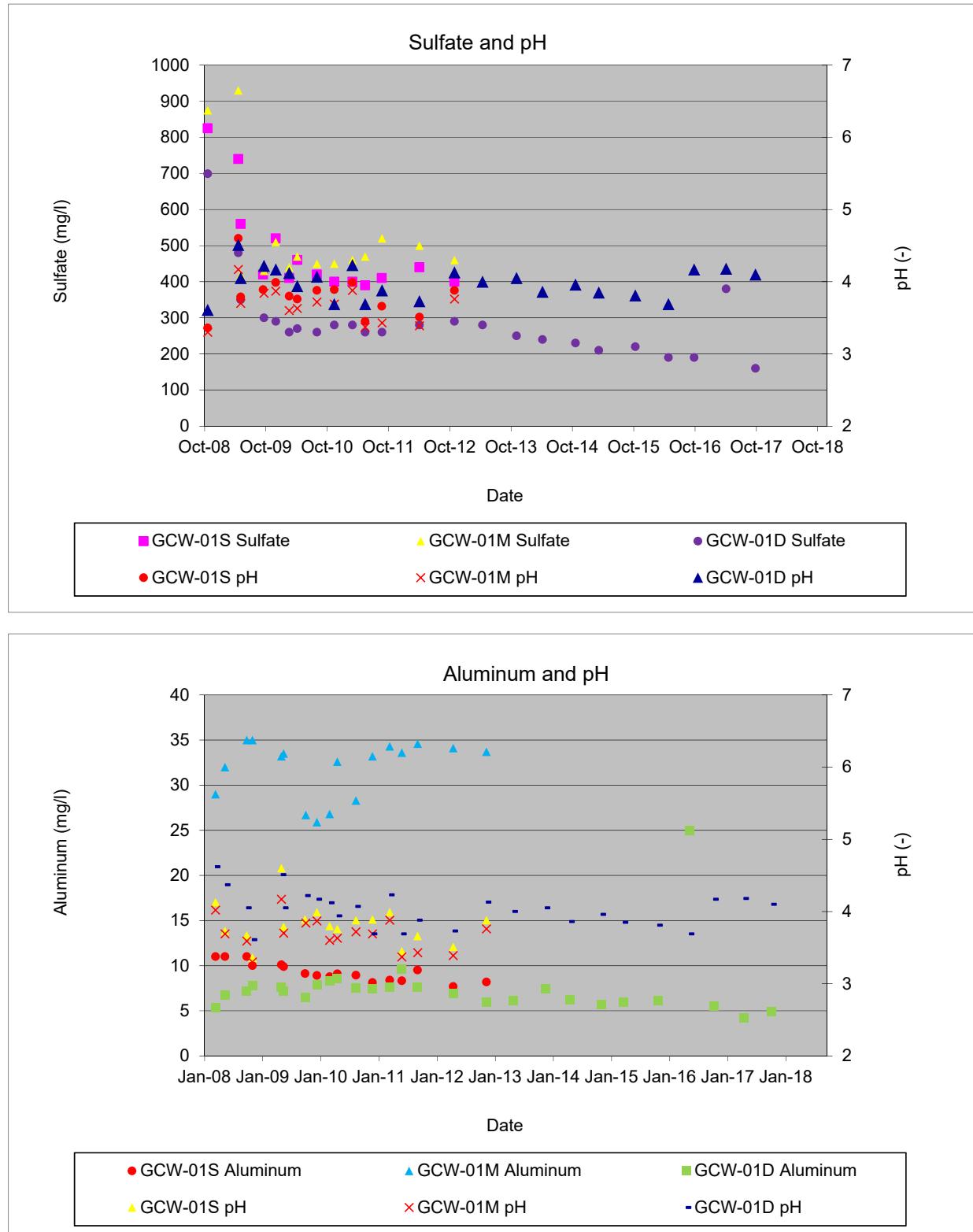


Figure 3-2 (Cont)
GCW-02S -D-V Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

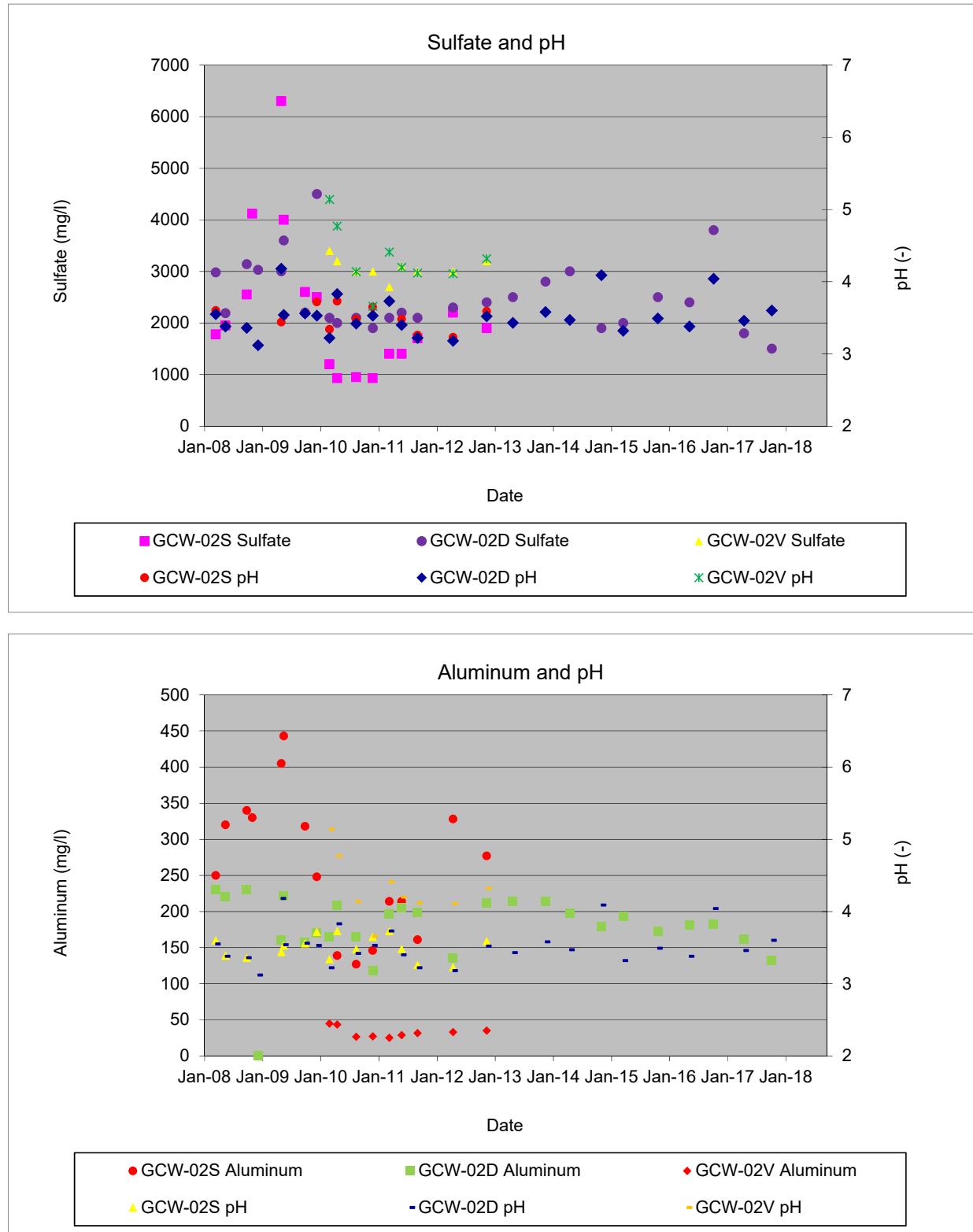


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GCW-03S -D Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

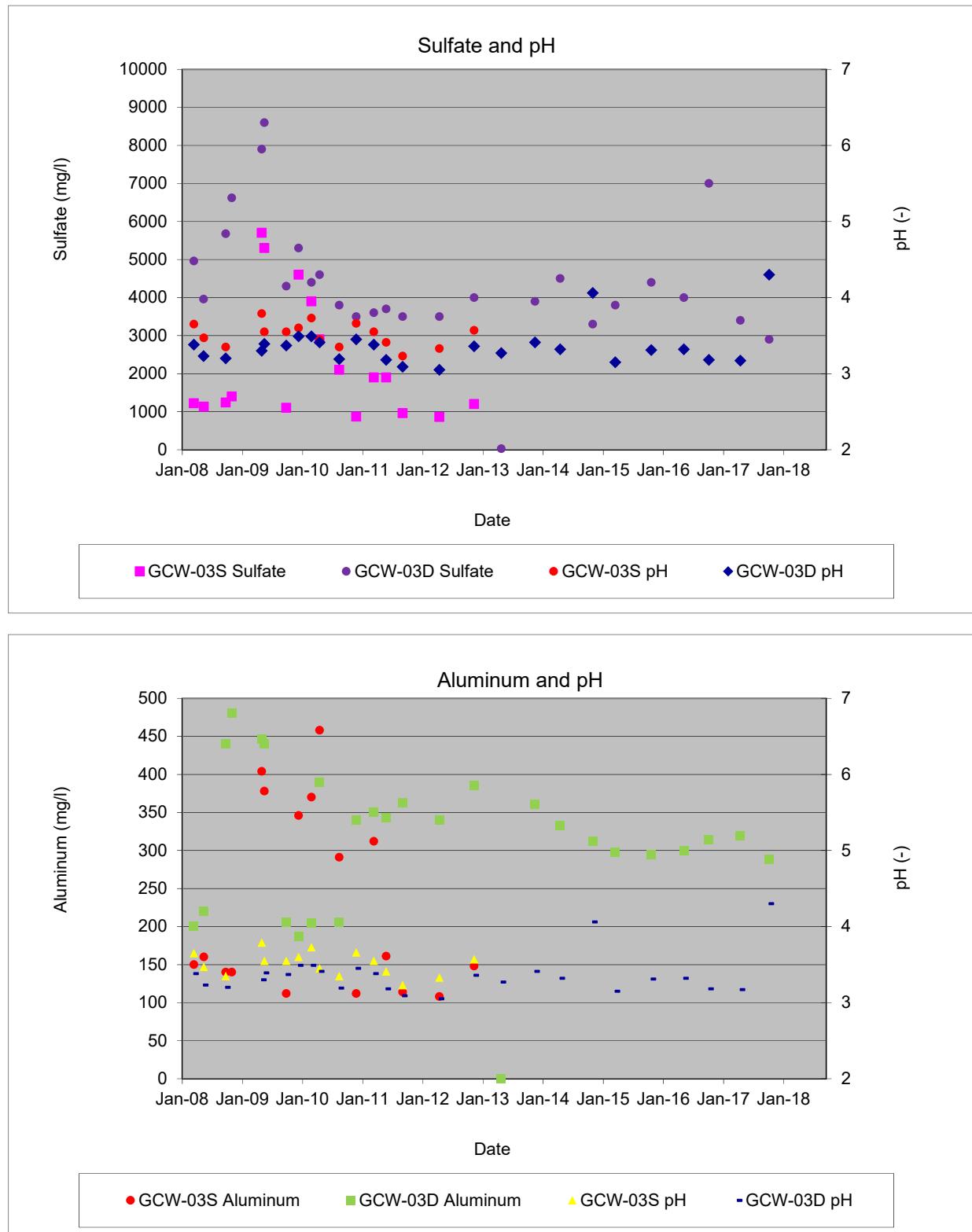


Figure 3-2 (Cont)
GCW-04S -M -D -V Sulfate and pH Trends and Aluminum and pH Trends
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East Point, Georgia

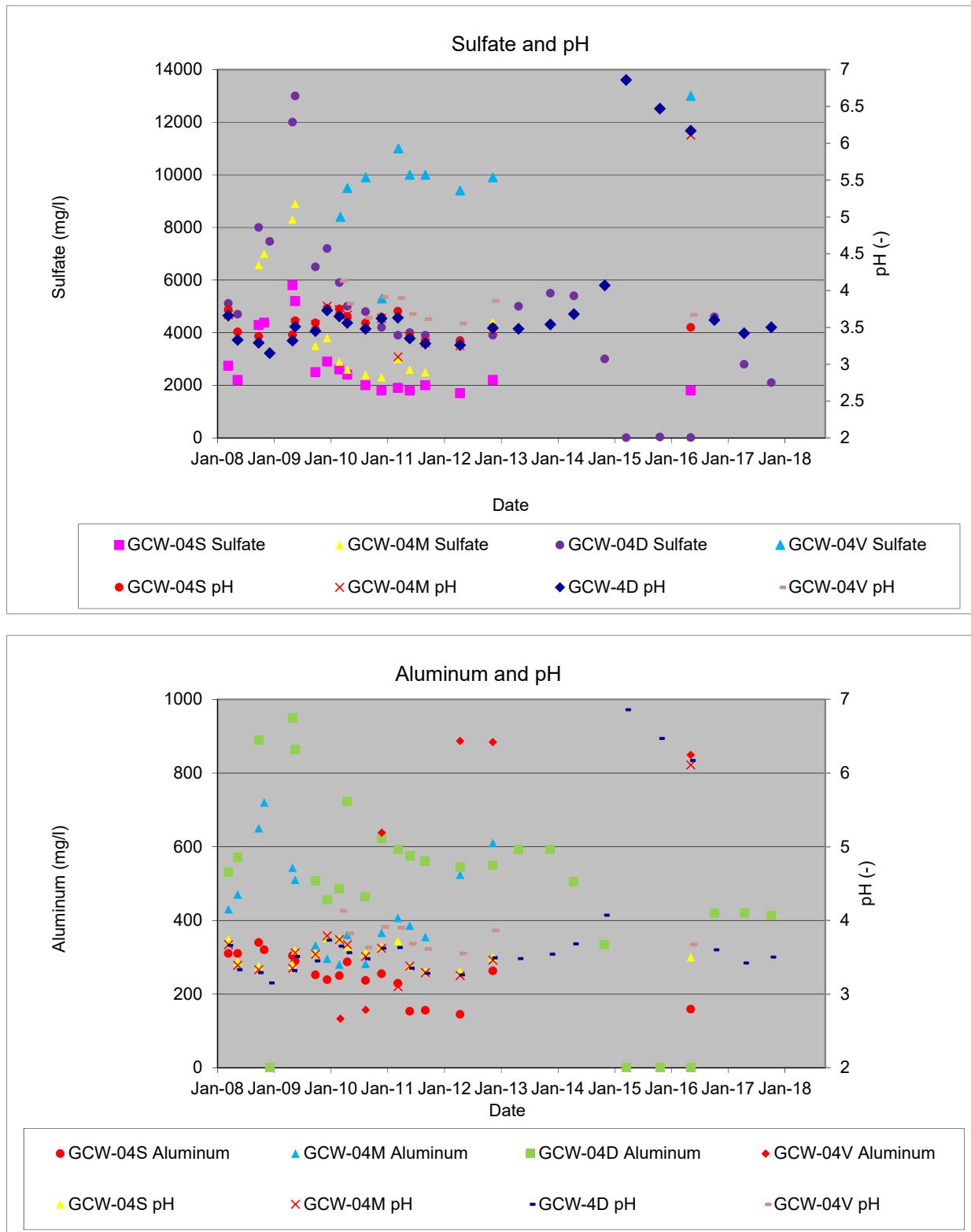


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GCW-05 Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
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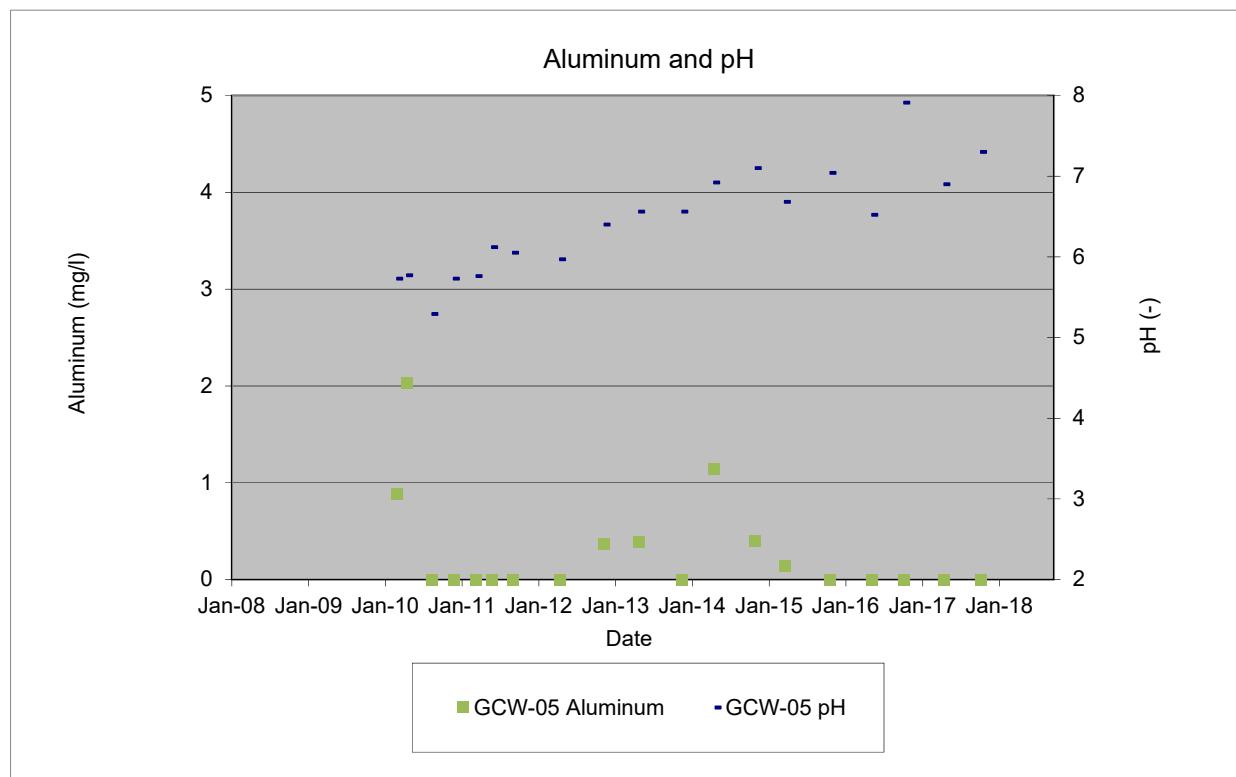
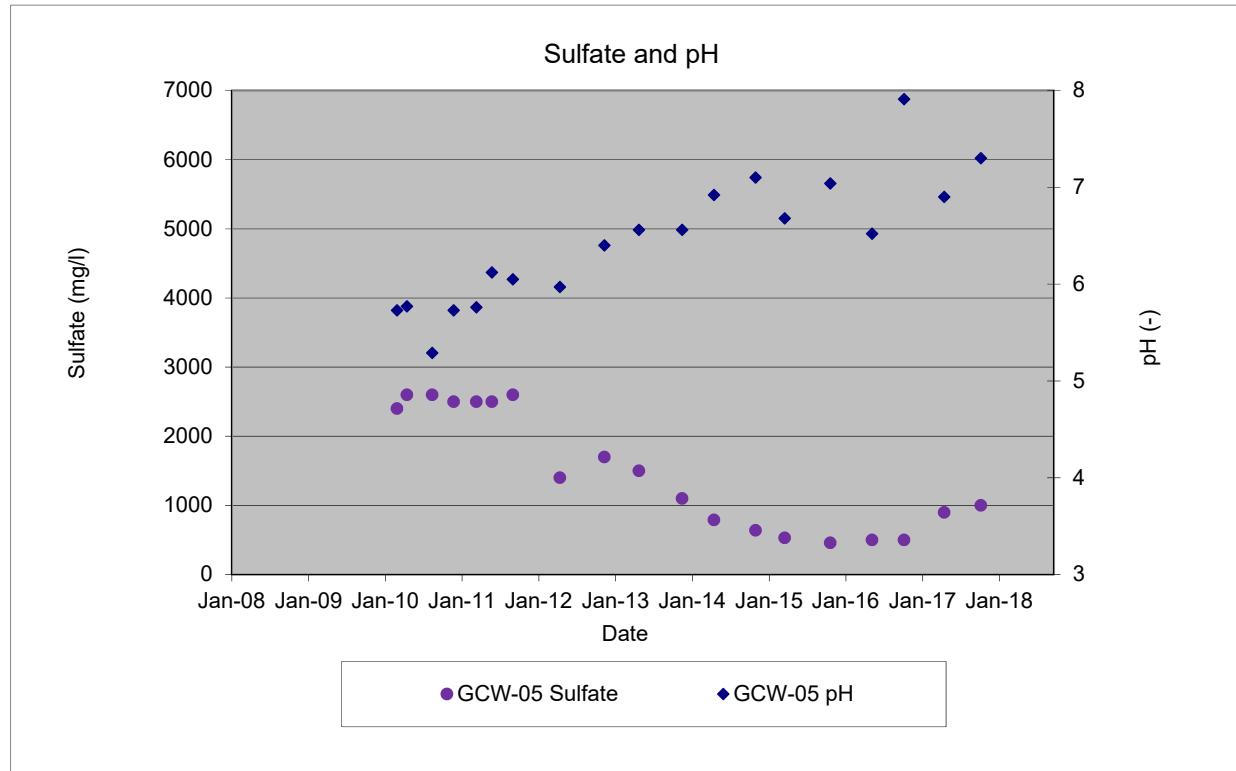


Figure 3-3
SW-02 (On-site) Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

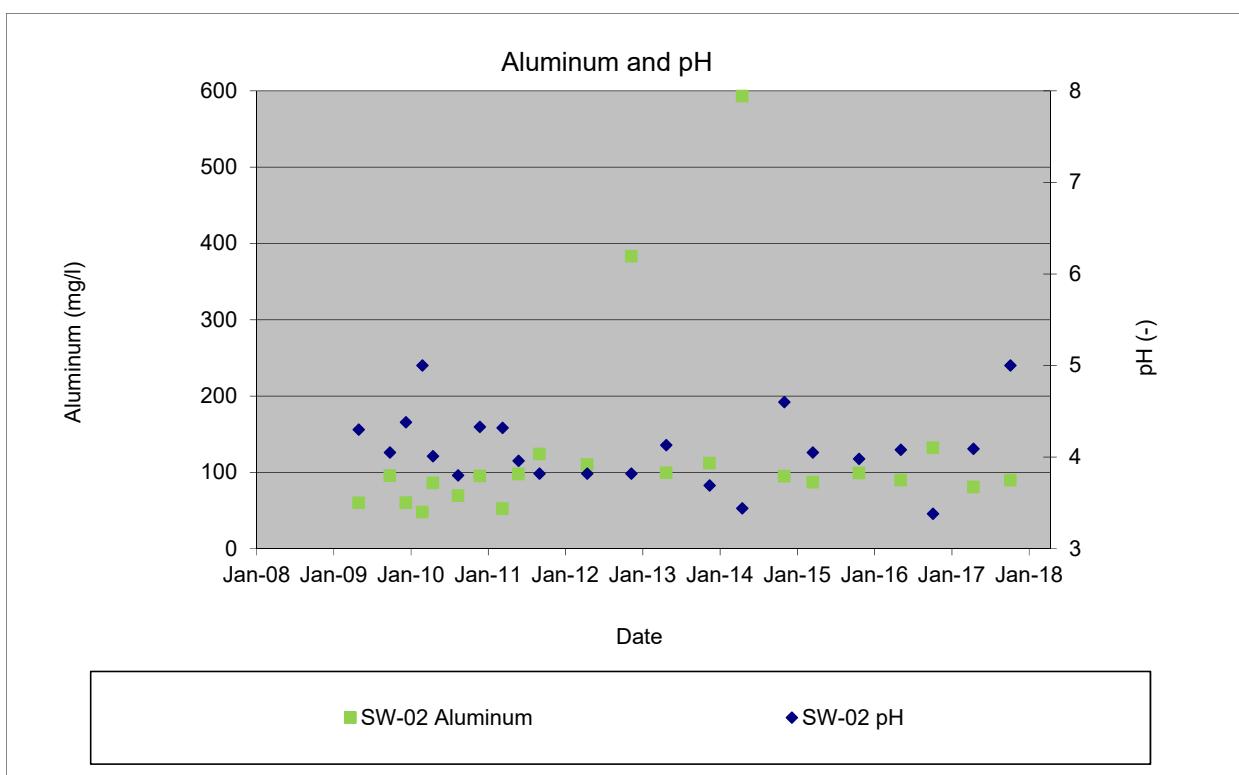
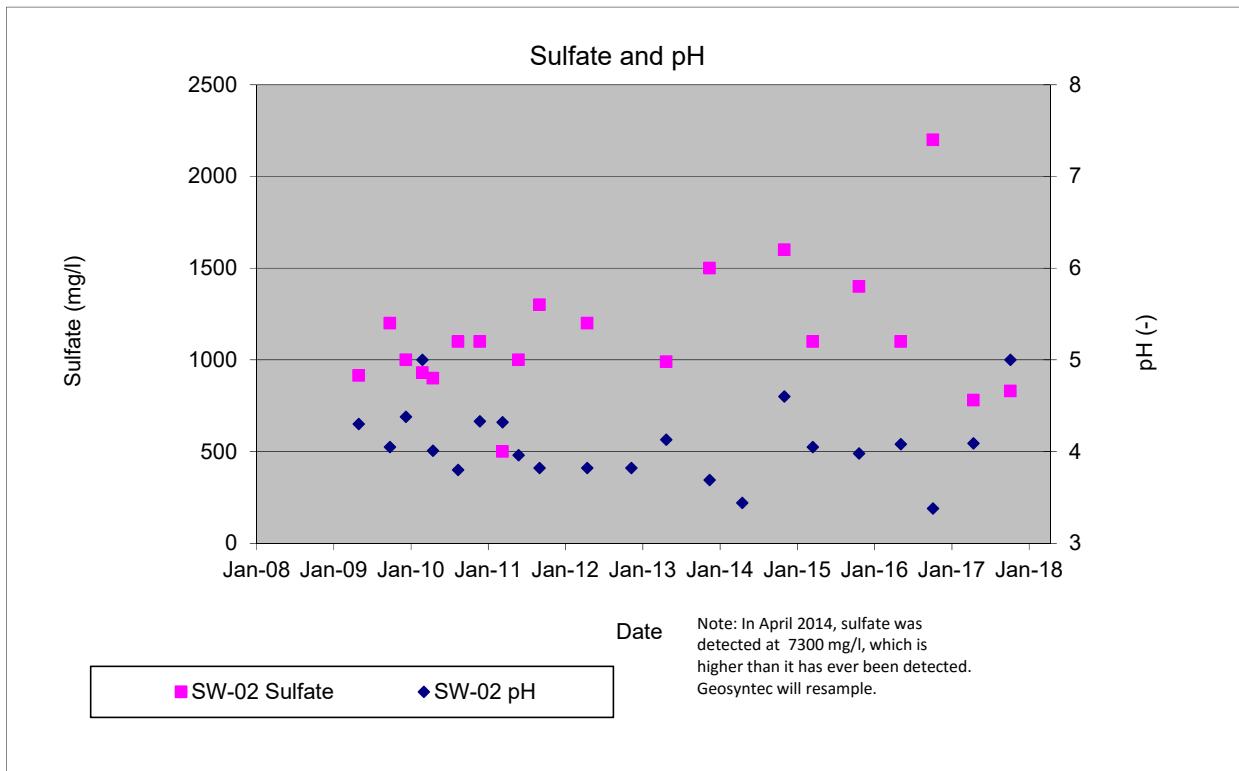


Figure 3-3 (Cont)
SW-06 (John D Milner Sports Complex) Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

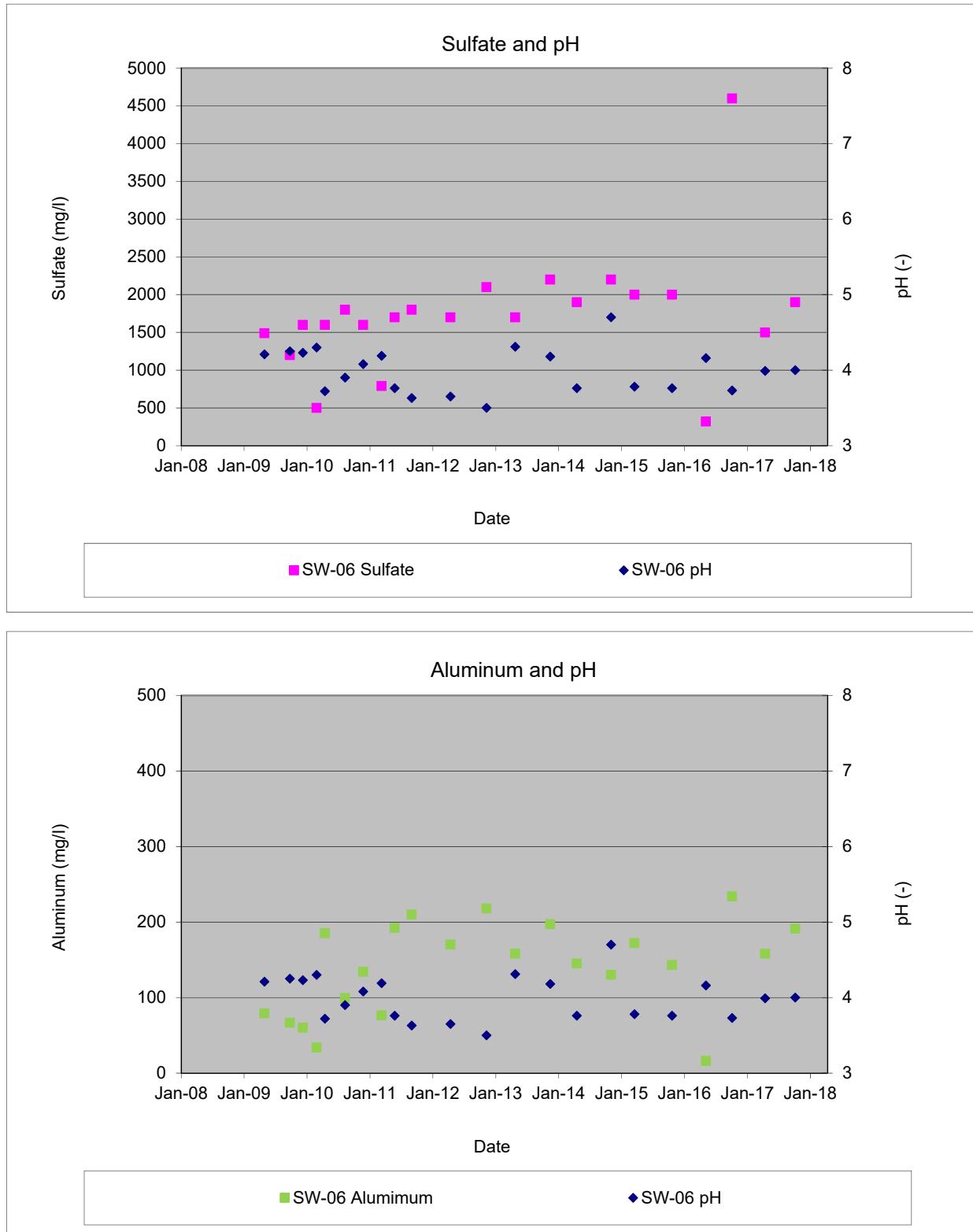


Figure 3-3 (Cont)
SW-07 (Unnamed Tributary) Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia

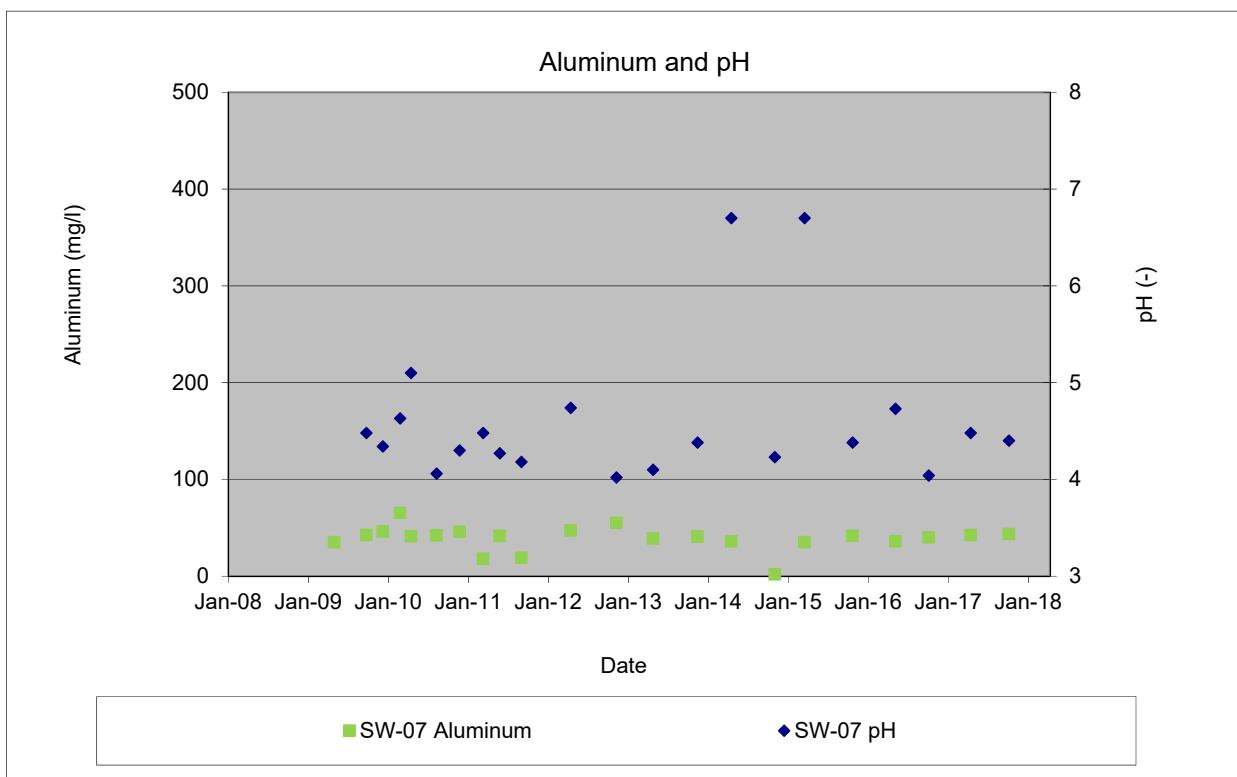
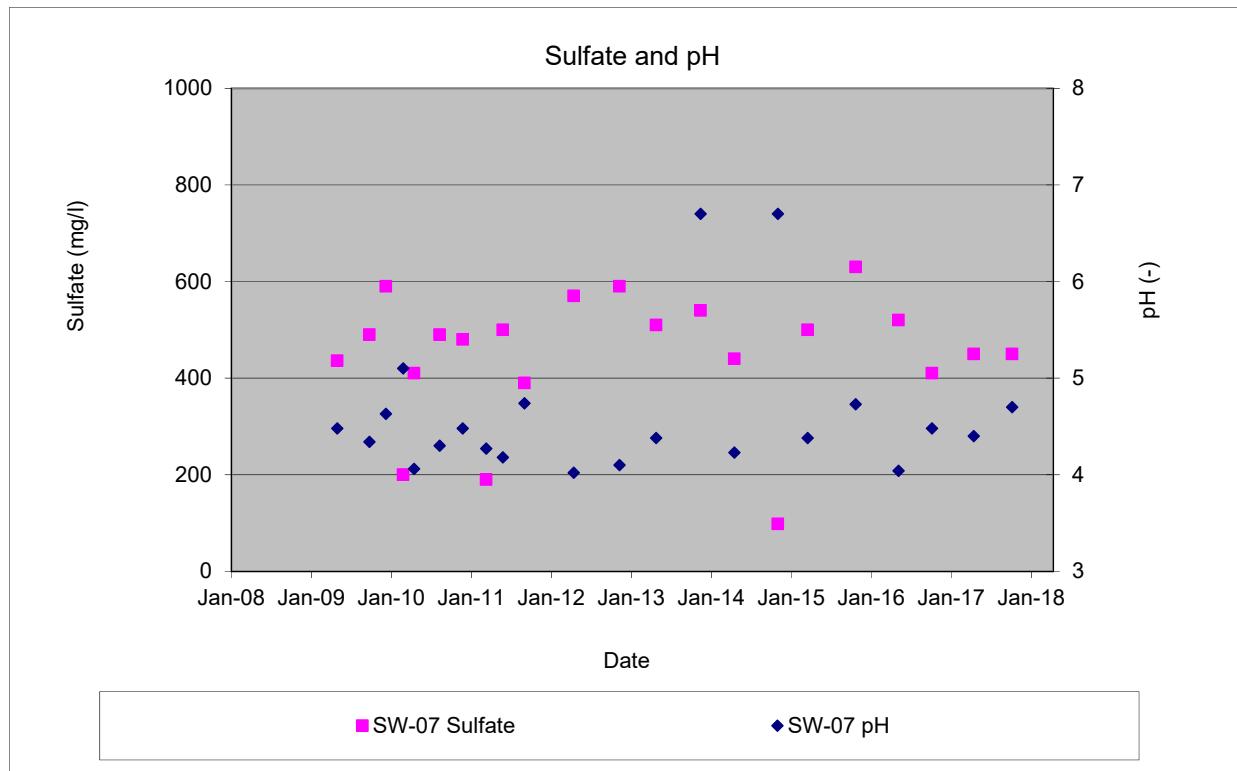
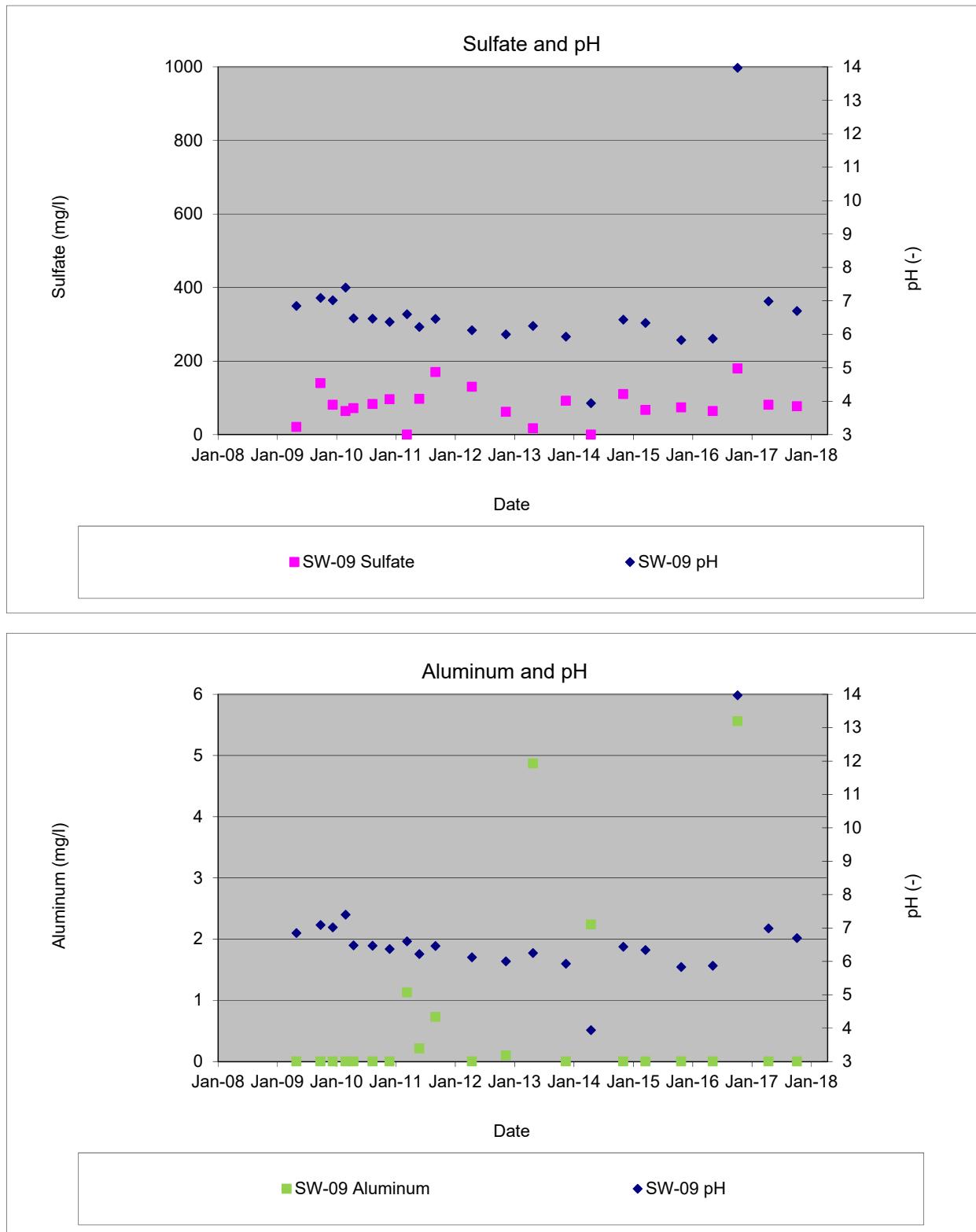


Figure 3-3 (Cont)
SW-09 (Upgradient) Sulfate and pH Trends and Aluminum and pH Trends
Chemtrade Solutions Site
East Point, Georgia





<u>Legend</u>	
	Monitoring Well
	Sulfate Concentration (Inferred)
	Sulfate Concentration (mg/L)
	Approximate Property Boundary

Geosyntec
consultants
Kennesaw, GA

December 2017

OCTOBER 2017 SULFATE CONCENTRATION ABOVE THE TYPE 4 RRS

Chemtrade Solutions, East Point, GA

Figure
3-4



Legend

- Monitoring Well
- Aluminum Concentration (mg/L)
- - - Aluminum Concentration (inferred)
- ◻ Approximate Property Boundary

Geosyntec
consultants
Kennesaw, GA

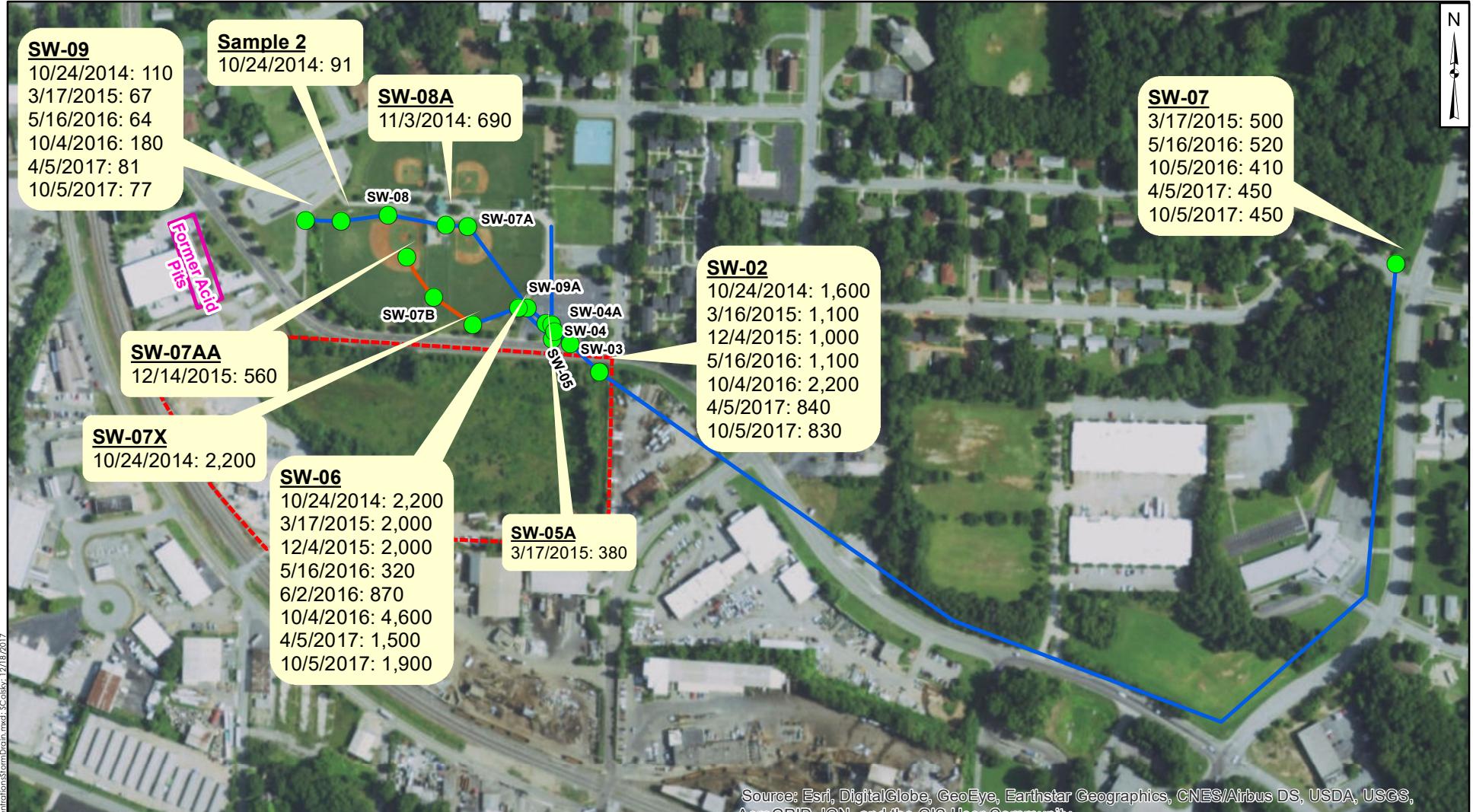
December 2017

OCTOBER 2017 ALUMINUM CONCENTRATION ABOVE THE TYPE 4 RRS

Chemtrade Solutions, East Point, GA

Figure

3-5



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Former Acid Pits
- Approximate Property Boundary
- Storm Drain Sample (Sulfate Concentration in mg/L)
- Storm Drain
- High Sulfate Storm Drain

400 200 0 400 800
Feet

Geosyntec
consultants

Kennesaw, GA

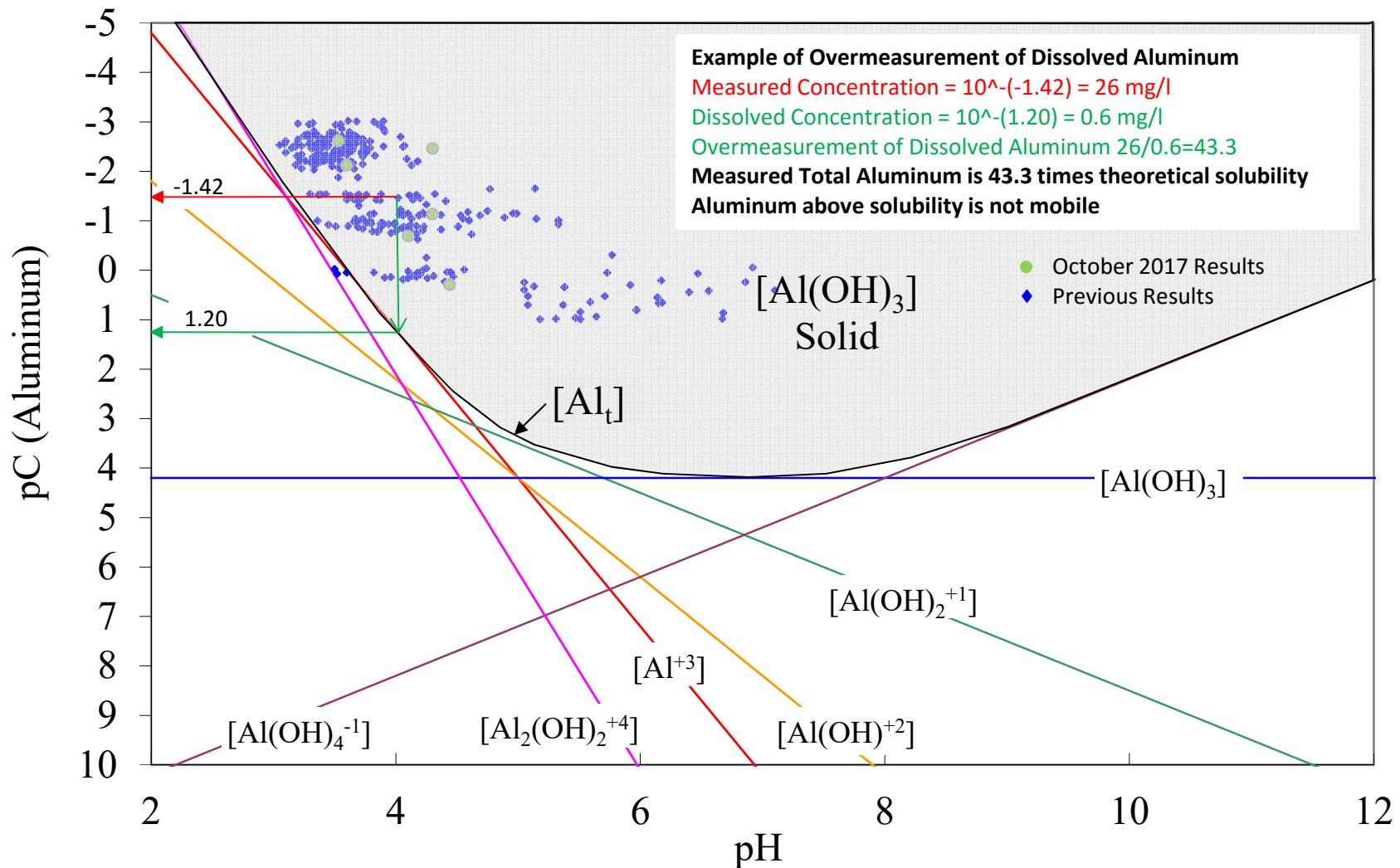
December 2017

SULFATE CONCENTRATION IN STORM DRAIN

Chemtrade Solutions, East Point, GA

Figure
3-6

Figure 6-1
 Chemtrade Solutions
 Groundwater Sampling
 October 2017
 Aluminum Results Analysis



APPENDIX A

GROUNDWATER AND STORM DRAIN LABORATORY RESULTS



PACE ANALYTICAL SERVICES, LLC.

Environmental Monitoring & Laboratory Analysis
110 Technology Parkway, Peachtree Corners, 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: AAJ0246

October 19, 2017

Project: Chemtrade

Project #:GR5060/2017

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:

A handwritten signature in black ink, appearing to read "Betty McDaniel".

Project Manager

This report may not be reproduced, except in full, without written approval from Pace Analytical Services, LLC. Pace Analytical Services, LLC. 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.



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Attention: Mr. Brian Jacobson

October 19, 2017

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
EPW-02-1017	AAJ0246-01	Ground Water	10/05/17 10:17	10/06/17 16:00
SW-06-1017	AAJ0246-02	Surface Water	10/05/17 10:57	10/06/17 16:00
SW-09-1017	AAJ0246-03	Surface Water	10/05/17 11:20	10/06/17 16:00
SW-07-1017	AAJ0246-04	Surface Water	10/05/17 11:30	10/06/17 16:00
EPW-03D-1017	AAJ0246-05	Ground Water	10/05/17 13:08	10/06/17 16:00
GCW-01D-1017	AAJ0246-06	Ground Water	10/05/17 14:15	10/06/17 16:00
EPW-01-1017	AAJ0246-07	Ground Water	10/05/17 13:08	10/06/17 16:00
Dup-1-1017	AAJ0246-08	Ground Water	10/05/17 00:00	10/06/17 16:00
Dup-2-1017	AAJ0246-09	Ground Water	10/05/17 00:00	10/06/17 16:00
OW-01A-1017	AAJ0246-10	Ground Water	10/05/17 14:21	10/06/17 16:00
GCW-02D-1017	AAJ0246-11	Ground Water	10/06/17 09:04	10/06/17 16:00
GCW-03D-1017	AAJ0246-12	Ground Water	10/06/17 09:20	10/06/17 16:00
GCW-05-1017	AAJ0246-13	Ground Water	10/06/17 12:03	10/06/17 16:00
GCW-04D-1017	AAJ0246-14	Ground Water	10/06/17 11:20	10/06/17 16:00
SW-02-1017	AAJ0246-15	Surface Water	10/05/17 15:05	10/06/17 16:00



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October 19, 2017

Report No.: AAJ0246

Project: Chemtrade

Client ID: EPW-02-1017

Lab Number ID: AAJ0246-01

Date/Time Sampled: 10/5/2017 10:17:00AM

Date/Time Received: 10/6/2017 4:00:00PM

Matrix: Ground Water

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	ND	5.0	mg/L	EPA 9056A		1	10/07/17 11:12	10/18/17 0:00	7100206	RLC
Metals, Total										
Aluminum	ND	0.100	mg/L	EPA 6010D		1	10/13/17 13:15	10/16/17 15:26	7100380	FBS



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October 19, 2017

Report No.: AAJ0246

Project: Chemtrade

Client ID: SW-06-1017

Lab Number ID: AAJ0246-02

Date/Time Sampled: 10/5/2017 10:57:00AM

Date/Time Received: 10/6/2017 4:00:00PM

Matrix: Surface Water

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	1900	500	mg/L	EPA 9056A		100	10/07/17 11:12	10/07/17 23:47	7100206	RLC
Metals, Total										
Aluminum	191	0.500	mg/L	EPA 6010D		5	10/13/17 13:15	10/16/17 15:22	7100380	FBS



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October 19, 2017

Report No.: AAJ0246

Project: Chemtrade

Client ID: SW-09-1017

Lab Number ID: AAJ0246-03

Date/Time Sampled: 10/5/2017 11:20:00AM

Date/Time Received: 10/6/2017 4:00:00PM

Matrix: Surface Water

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	77	50	mg/L	EPA 9056A		10	10/07/17 11:12	10/08/17 0:08	7100206	RLC
Metals, Total										
Aluminum	ND	0.100	mg/L	EPA 6010D		1	10/13/17 13:15	10/16/17 15:29	7100380	FBS



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October 19, 2017

Report No.: AAJ0246

Project: Chemtrade

Client ID: SW-07-1017

Lab Number ID: AAJ0246-04

Date/Time Sampled: 10/5/2017 11:30:00AM

Date/Time Received: 10/6/2017 4:00:00PM

Matrix: Surface Water

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	450	120	mg/L	EPA 9056A		25	10/07/17 11:12	10/08/17 0:28	7100206	RLC
Metals, Total										
Aluminum	43.5	0.100	mg/L	EPA 6010D		1	10/13/17 13:15	10/16/17 15:33	7100380	FBS



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October 19, 2017

Report No.: AAJ0246

Project: Chemtrade

Client ID: EPW-03D-1017

Lab Number ID: AAJ0246-05

Date/Time Sampled: 10/5/2017 1:08:00PM

Date/Time Received: 10/6/2017 4:00:00PM

Matrix: Ground Water

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	23	5.0	mg/L	EPA 9056A		1	10/07/17 11:12	10/08/17 0:49	7100206	RLC
Metals, Total										
Aluminum	ND	0.100	mg/L	EPA 6010D		1	10/13/17 13:15	10/16/17 15:44	7100380	FBS



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October 19, 2017

Report No.: AAJ0246

Project: Chemtrade

Client ID: GCW-01D-1017

Lab Number ID: AAJ0246-06

Date/Time Sampled: 10/5/2017 2:15:00PM

Date/Time Received: 10/6/2017 4:00:00PM

Matrix: Ground Water

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	160	50	mg/L	EPA 9056A		10	10/07/17 11:12	10/08/17 3:14	7100206	RLC
Metals, Total										
Aluminum	4.89	0.100	mg/L	EPA 6010D		1	10/13/17 13:15	10/16/17 15:48	7100380	FBS



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October 19, 2017

Report No.: AAJ0246

Project: Chemtrade

Client ID: EPW-01-1017

Lab Number ID: AAJ0246-07

Date/Time Sampled: 10/5/2017 1:08:00PM

Date/Time Received: 10/6/2017 4:00:00PM

Matrix: Ground Water

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	85	50	mg/L	EPA 9056A		10	10/07/17 11:12	10/08/17 3:34	7100206	RLC
Metals, Total										
Aluminum	13.7	0.100	mg/L	EPA 6010D		1	10/12/17 13:25	10/13/17 15:18	7100357	FBS



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October 19, 2017

Report No.: AAJ0246

Project: Chemtrade

Client ID: Dup-1-1017

Lab Number ID: AAJ0246-08

Date/Time Sampled: 10/5/2017 12:00:00AM

Date/Time Received: 10/6/2017 4:00:00PM

Matrix: Ground Water

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	ND	5.0	mg/L	EPA 9056A		1	10/07/17 11:12	10/18/17 0:21	7100206	RLC
Metals, Total										
Aluminum	ND	0.100	mg/L	EPA 6010D		1	10/12/17 13:25	10/13/17 15:21	7100357	FBS



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October 19, 2017

Report No.: AAJ0246

Project: Chemtrade

Client ID: Dup-2-1017

Lab Number ID: AAJ0246-09

Date/Time Sampled: 10/5/2017 12:00:00AM

Date/Time Received: 10/6/2017 4:00:00PM

Matrix: Ground Water

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	1700	250	mg/L	EPA 9056A		50	10/07/17 11:12	10/18/17 0:41	7100206	RLC
Metals, Total										
Aluminum	202	1.00	mg/L	EPA 6010D		10	10/12/17 13:25	10/13/17 16:24	7100357	FBS



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October 19, 2017

Report No.: AAJ0246

Project: Chemtrade

Client ID: OW-01A-1017

Lab Number ID: AAJ0246-10

Date/Time Sampled: 10/5/2017 2:21:00PM

Date/Time Received: 10/6/2017 4:00:00PM

Matrix: Ground Water

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	39	5.0	mg/L	EPA 9056A		1	10/07/17 11:12	10/08/17 4:36	7100206	RLC
Metals, Total										
Aluminum	0.508	0.100	mg/L	EPA 6010D		1	10/12/17 13:25	10/13/17 15:35	7100357	FBS



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October 19, 2017

Report No.: AAJ0246

Project: Chemtrade

Client ID: GCW-02D-1017

Lab Number ID: AAJ0246-11

Date/Time Sampled: 10/6/2017 9:04:00AM

Date/Time Received: 10/6/2017 4:00:00PM

Matrix: Ground Water

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	1500	500	mg/L	EPA 9056A		100	10/07/17 11:12	10/08/17 5:17	7100206	RLC
Metals, Total										
Aluminum	132	1.00	mg/L	EPA 6010D		10	10/12/17 13:25	10/13/17 16:27	7100357	FBS



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October 19, 2017

Report No.: AAJ0246

Project: Chemtrade

Client ID: GCW-03D-1017

Lab Number ID: AAJ0246-12

Date/Time Sampled: 10/6/2017 9:20:00AM

Date/Time Received: 10/6/2017 4:00:00PM

Matrix: Ground Water

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	2900	500	mg/L	EPA 9056A		100	10/07/17 11:12	10/08/17 5:38	7100206	RLC
Metals, Total										
Aluminum	288	1.00	mg/L	EPA 6010D		10	10/12/17 13:25	10/13/17 16:31	7100357	FBS



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October 19, 2017

Report No.: AAJ0246

Project: Chemtrade

Client ID: GCW-05-1017

Lab Number ID: AAJ0246-13

Date/Time Sampled: 10/6/2017 12:03:00PM

Date/Time Received: 10/6/2017 4:00:00PM

Matrix: Ground Water

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	1000	1000	mg/L	EPA 9056A		200	10/07/17 11:12	10/18/17 1:02	7100206	RLC
Metals, Total										
Aluminum	ND	0.100	mg/L	EPA 6010D		1	10/12/17 13:25	10/13/17 15:45	7100357	FBS



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October 19, 2017

Report No.: AAJ0246

Project: Chemtrade

Client ID: GCW-04D-1017

Lab Number ID: AAJ0246-14

Date/Time Sampled: 10/6/2017 11:20:00AM

Date/Time Received: 10/6/2017 4:00:00PM

Matrix: Ground Water

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	2100	500	mg/L	EPA 9056A		100	10/07/17 11:12	10/08/17 7:45	7100206	RLC
Metals, Total										
Aluminum	412	1.00	mg/L	EPA 6010D		10	10/12/17 13:25	10/13/17 16:34	7100357	FBS



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October 19, 2017

Report No.: AAJ0246

Project: Chemtrade

Client ID: SW-02-1017

Lab Number ID: AAJ0246-15

Date/Time Sampled: 10/5/2017 3:05:00PM

Date/Time Received: 10/6/2017 4:00:00PM

Matrix: Surface Water

Analyte	Result	RL	Units	Method	Qual.	DF	Preparation Date	Analytical Date	Batch	Init.
Inorganic Anions										
Sulfate	830	250	mg/L	EPA 9056A		50	10/07/17 11:12	10/08/17 8:06	7100206	RLC
Metals, Total										
Aluminum	89.5	0.100	mg/L	EPA 6010D		1	10/12/17 13:25	10/13/17 15:11	7100357	FBS



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Report No.: AAJ0246

Inorganic Anions - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD RPD	RPD Limit	Qual
Batch 7100206 - EPA 9056A										
Blank (7100206-BLK1)										Prepared & Analyzed: 10/07/17
Sulfate	ND	5.0	mg/L							
LCS (7100206-BS1)										
Sulfate	10.4	5.0	mg/L	10.050		104	90-110			
Matrix Spike (7100206-MS1)										Source: AAJ0246-05 Prepared: 10/07/17 Analyzed: 10/08/17
Sulfate	30.8	5.0	mg/L	10.050	23.4	73	90-110			QM-05
Matrix Spike (7100206-MS2)										Source: AAJ0246-10 Prepared: 10/07/17 Analyzed: 10/08/17
Sulfate	43.3	5.0	mg/L	10.050	38.8	45	90-110			QM-05
Matrix Spike Dup (7100206-MSD1)										Source: AAJ0246-05 Prepared: 10/07/17 Analyzed: 10/08/17
Sulfate	30.8	5.0	mg/L	10.050	23.4	74	90-110	0.2	15	QM-05



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Report No.: AAJ0246

Metals, Total - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
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Batch 7100357 - EPA 3010A

Blank (7100357-BLK1)					Prepared: 10/12/17 Analyzed: 10/13/17						
Aluminum	ND	0.100	mg/L								
LCS (7100357-BS1)						Prepared: 10/12/17 Analyzed: 10/13/17					
Aluminum	1.00	0.100	mg/L	1.0000		100	80-120				
Matrix Spike (7100357-MS1)						Source: AAJ0246-15 Prepared: 10/12/17 Analyzed: 10/13/17					
Aluminum	92.6	0.100	mg/L	1.0000	89.5	316	75-125			QM-02	
Matrix Spike Dup (7100357-MSD1)						Source: AAJ0246-15 Prepared: 10/12/17 Analyzed: 10/13/17					
Aluminum	92.8	0.100	mg/L	1.0000	89.5	328	75-125	0.1	20	QM-02	
Post Spike (7100357-PS1)						Source: AAJ0246-15 Prepared: 10/12/17 Analyzed: 10/13/17					
Aluminum	89.7		mg/L	1.0000	89.5	19	80-120			QM-02	

Batch 7100380 - EPA 3010A

Blank (7100380-BLK1)					Prepared: 10/13/17 Analyzed: 10/16/17						
Aluminum	ND	0.100	mg/L								
LCS (7100380-BS1)						Prepared: 10/13/17 Analyzed: 10/16/17					
Aluminum	1.01	0.100	mg/L	1.0000		101	80-120				
Matrix Spike (7100380-MS1)						Source: AAJ0246-02 Prepared: 10/13/17 Analyzed: 10/16/17					
Aluminum	192	0.500	mg/L	1.0000	191	81	75-125			QM-02	
Matrix Spike Dup (7100380-MSD1)						Source: AAJ0246-02 Prepared: 10/13/17 Analyzed: 10/16/17					
Aluminum	199	0.500	mg/L	1.0000	191	795	75-125	4	20	QM-02	



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Report No.: AAJ0246

Metals, Total - Quality Control

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Qual
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Batch 7100380 - EPA 3010A

Post Spike (7100380-PS1)	Source: AAJ0246-02			Prepared: 10/13/17 Analyzed: 10/16/17					
Aluminum	194	mg/L	1.0000	191	334	80-120	QM-02		



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Laboratory Certifications

Code	Description	Number	Expires
GADW	Georgia DW Inorganics Eff: 07/01/2016	812	06/30/2018
GADMW	Georgia DW Microbiology Eff: 07/01/2015	812	12/09/2019
NC	North Carolina	381	12/31/2017
NELAC	FL DOH (Non-Pot. Water, Solids) Eff: 07/01/2016	E87315	06/30/2018
NELDW	FL DOH NELAC (Drinking Water) Eff: 07/01/2016	E87315	06/30/2018
SC	South Carolina	98011001	10/31/2017
TX	Texas	T104704397-08-TX	03/31/2018
VA	Virginia	460204	12/14/2017



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October 19, 2017

Legend

Definition of Laboratory Terms

ND - None Detected at the Reporting Limit

TIC - Tentatively Identified Compound

CFU - Colony Forming Units

SOP - Method run per Pace 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. Pace 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

Drinking Water Records will be available for at least 5 years and are subject to disposal after the 5 years have elapsed.

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.

QM-02 The spike recovery is outside acceptance limits due to insignificant spike amount as compared to sample concentration.

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

CHAIN OF CUSTODY RECORD



Pace Analytical Services, LLC - Atlanta GA
110 TECHNOLOGY PARKWAY, PEACHTREE CORNERS, GA 30092
(770) 734-4200 : FAX (770) 734-4201

PAGE: 1 OF 2

CLIENT NAME: GEOSYNTEC		ANALYSIS REQUESTED									
CLIENT ADDRESS/PHONE NUMBER/FAX NUMBER: 1255 Roberts Blvd, Suite 200 Kennesaw, GA 30144		CONTAINER TYPE:	P	P							
REPORT TO: Brian Jacobson CC: Sjolsky@gosyntec.com		PRESERVATION:	3,7	7							
REQUESTED COMPLETION DATE:		# of CONTAINERS	6010	A1	SWATN						
PROJECT NAME/STATE: Chemtrate, GA											
PROJECT #: GR5060/2017											
Collection DATE	Collection TIME	MATRIX CODE*	C O R M A B P	SAMPLE IDENTIFICATION							
10/5/17	1017	GW	X EPW-02-1017	2	1	1					
10/5/17	1057	SW	X SW-06-1017	2	1	1					
10/5/17	1120	SW	X SW-09-1017	2	1	1					
10/5/17	1130	SW	X SW-07-1017	2	1	1					
10/5/17	1308	GW	X EPW-03D-1017	2	1	1					
10/5/17	1415	GW	X GCN-01D-1017	2	1	1					
10/5/17	1308	GW	X EPW-01-1017	2	1	1					
10/5/17	-	GW	X DUP-01-1017	2	1	1					
10/5/17	-	GW	X DUP-2-1017	2	1	1					
10/5/17	1421	GW	X GW-01A-1017	2	1	1					
10/6/17	0904	GW	X GCN-02D-1017	2	1	1					
10/6/17	0920	GW	X GCN-03D-1017	2	1	1					
SAMPLER BY AND TITLE: SHAW/ROBBIE WILSON		DATE/TIME: 10/5/17-10/6/17		RElinquished By: Shaw		DATE/TIME: 10/6/17 C1300		FOR LAB USE ONLY			
RECEIVED BY: NO ALMAN		DATE/TIME: 10/6/17 1600		RElinquished By: Shaw		DATE/TIME: 10/6/17 C1300		LAB #: AAJ0246			
RECEIVED BY LAB: NO ALMAN		DATE/TIME: 10/6/17 1600		SAMPLE SHIPPED VIA: UPS FED-EX USPS COURIER Pace		CLIENT OTHER FS		Entered Into LIMS: Tracking #:			
Specified: <input checked="" type="checkbox"/> No NA <input checked="" type="checkbox"/> Yes NA		Temperature: Min: 0 Max: 2		Custody Seal: Intact: Broken: Not Present N/A		# of Coolers 0		Cooler ID: 			

CHAIN OF CUSTODY RECORD



Pace Analytical Services, LLC - Atlanta GA
110 TECHNOLOGY PARKWAY, PEACHTREE CORNERS, GA 30092
(770) 734-4200 : FAX (770) 734-4201

PAGE: 2 OF 2

CLIENT NAME: GEOSYNTEC		ANALYSIS REQUESTED											
CLIENT ADDRESS/PHONE NUMBER/FAX NUMBER: 1255 Peachtree Blvd, Suite 200 Brentwood, GA 30014		CONTAINER TYPE:	P	P									
REPORT TO: Brian Johnson		PRESERVATION:	3.7	7									
REQUESTED COMPLETION DATE: PO#:		# of CONTAINERS	CONTAINER CODES: A1 ONLY outside										
PROJECT NAME/STATE: Chemtread, GA													
PROJECT #: GL5060/2017													
Collection DATE	Collection TIME	MATRIX CODE*	C O R M A B	SAMPLE IDENTIFICATION									
10/6/17	1203	GW	X	GCN-05-1017									
10/6/17	1120	GW	X	GCN-04D-1017									
10/5/17	1505	SW	X	SW-02-1017									
REMARKS/ADDITIONAL INFORMATION													
SAMPLER BY AND TITLE: SHIRLEY COLBY & PERE WILSON				DATE/TIME: 10/5/17-10/6/17	RELINQUISHED BY: MURRAY				DATE/TIME: 10/6/17 C1300	FOR LAB USE ONLY			
RECEIVED BY: ELIZABETH LUMAN				DATE/TIME: 10/6/17 1600	RELINQUISHED BY: LUMAN				DATE/TIME:	LAB #: AAT0246			
RECEIVED BY LAB: ELIZABETH LUMAN				DATE/TIME: 10/6/17 1600	SAMPLE SHIPPED VIA: UPS				FED-EX	USPS	SHIPIER: UPS	CLIENT: GEOSYNTEC	OTHER: FS
Sealed: NA	Leak: NO	Temperature: Min: 0 Max: 22	Custody Seal: Intact	Broken: Not Present	N/A	# of Coolers:	Cooler ID:		Entered into LIMS: Tracking #: <i>mp</i>				

Sample Condition Upon Receipt

Pace Analytical

Client Name: Cresyntec Project # AAJ0246

Courier: FedEx UPS USPS Client Commercial Pace Other
 Tracking #: _____

Custody Seal on Cooler/Box Present: yes no Seals intact: yes no

Packing Material: Bubble Wrap Bubble Bags None Other

Thermometer Used 1R-4Type of Ice: Wet Blue NoneCooler Temperature 0.2

Biological Tissue Is Frozen: Yes No

Temp should be above freezing to 6°C

Comments: _____

Optional	Project Dates
Proj. Name	Proj. Dates

Samples on ice, cooling process has begun

Date and Initials of person examining
contents: 10/06/17 MR

Chain of Custody Present:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	1.
Chain of Custody Filled Out:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	2.
Chain of Custody Relinquished:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	3.
Sampler Name & Signature on COC:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	4.
Samples Arrived within Hold Time:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	5.
Short Hold Time Analysis (<72hr):	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	6.
Rush Turn Around Time Requested:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	7.
Sufficient Volume:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	8.
Correct Containers Used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	9.
-Pace Containers Used:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Containers Intact:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	10.
Filtered volume received for Dissolved tests	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	11.
Sample Labels match COC:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	12.
-Includes date/time/ID/Analysis Matrix:	<u>G(A)/SG</u>	
All containers needing preservation have been checked:	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	13.
All containers needing preservation are found to be in compliance with EPA recommendation.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
exceptions: VOA, caliform, TOC, O&G, WI-DRO (water)	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Initial when completed
		Lot # of added preservative
Samples checked for dechlorination:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	14.
Headspace in VOA Vials (>6mm):	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	15.
Trip Blank Present:	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	16.
Trip Blank Custody Seals Present	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Pace Trip Blank Lot # (if purchased):		

Client Notification/ Resolution: _____ Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ Date: _____

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. out of hold, incorrect preservative, out of temp, incorrect containers)



PACE ANALYTICAL SERVICES, LLC.

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

LOG-IN CHECKLIST

Printed: 10/11/2017 11:55:05AM

Attn: Mr. Brian Jacobson

Client: Geosyntec Consultants Inc.

Project: Chemtrade

Date Received: 10/06/17 16:00

Work Order: AAJ0246

Logged In By: Mohammad M. Rahman

OBSERVATIONS

#Samples: 15	#Containers: 30
Minimum Temp(C): 0.2	Maximum Temp(C): 0.2
	Custody Seal(s) Used: Yes

CHECKLIST ITEMS

COC included with Samples	YES
Sample Container(s) Intact	YES
Chain of Custody Complete	YES
Sample Container(s) Match COC	YES
Custody seal Intact	YES
Temperature in Compliance	YES
Sufficient Sample Volume for Analysis	YES
Zero Headspace Maintained for VOA Analyses	YES
Samples labeled preserved (If Applicable)	YES
Samples received within Allowable Hold Times	YES
Samples Received on Ice	YES
Preservation Confirmed	YES

Comments:

APPENDIX B

GROUNDWATER AND STORM DRAIN SAMPLING FORM

Geosyntec Consultants

Water Level Measurements

**Chemtrade Site
East Point, GA**

Site: Chemtrade
Date: 10/18/17

Date: 10/5/17

Geosyntec Project No. GR5060 - 2017 - 01

Personnel: Shira Colsky & Reese Wilson

Notes:

btoc - below top of casing

DTW - Depth to water

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Geosyntec Project No.: GR5060-2017-01

Monitoring Well: MW-GCW-02D

Sampling Date: 10/6/2017

Sample ID: MW- GCV-02D-1017

Sampler: R. Wilson

Prime & Quality Control Samples

Miscellaneous

Sample ID

Description

Depth to Water: 5.13 ft

Turbidity: _____ NTUs

Dis. Oxygen: _____ ppm

Pump Rate: _____ in
_____ min, _____ sec.

Weather;

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

**WELL WAS PURGED & SAMPLED IN GENERAL ACCORDANCE WITH EPA SESD
GUIDANCE**

TOTAL PURGE VOLUME \approx 4 GAL

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Geosyntec Project No.: GR5060-2017-01

Monitoring Well: MW-JR CW-03D

Sampling Date: 10/6/17

Sample ID: MW-6CW-03D-1017

Sampler: 'SC

Time	Start Purge Readings	Start Samp. End Samp.	Temper- ature (°C)	pH (ATC)	Redox Potential (± mv)	Conduc- tivity (mS/cm) (ATC)	Turbidity (NTU)	DO (mg/L)	Appearance of Water
0830	X								
0835	X		14.38	5.60	347	3.21	1.0	0.47	Clear
0840	X		14.31	5.17	395	3.21	0.0	0.00	"
0845	X		14.40	4.90	417	3.20	1.4	0.00	"
0850	X		14.48	4.81	430	3.21	0.0	0.00	"
0855	X		14.52	4.67	439	3.22	0.0	0.00	"
0900	X		14.53	4.54	445	3.22	0.0	0.00	"
0905	X		14.55	4.46	446	3.22	0.0	0.00	"
0910	X		14.54	4.41	443	3.23	0.0	0.00	"
0915	X		14.55	4.35	442	3.23	0.0	0.00	"
0920	XX		14.55	4.33	439	3.23	0.0	0.00	"
Prime & Quality Control Samples									
Miscellaneous									
Sample ID	Description								Depth to Water: 5.25 ft
									Turbidity: _____ NTUs
									Dis. Oxygen: _____ ppm
									Pump Rate: _____ in min. sec.

Weather: Cloudy, 70°

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

Well was purged & sampled in general accordance w/ EPA SED guidance

total page volume ~ 5 gal

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Geosyntec Project No.: GR5060-2017-01

Monitoring Well: MW-5 GCW-04D

Sampling Date: 10/6/17

Sample ID: MW- GAW-04D-1017

Sampler: SC

Prime & Quality Control Samples

Miscellaneous

Sample ID

Description

Depth to Water: 10.55 ft

Turbidity: _____ NTUs

Dis. Oxygen: _____ ppm

Pump Rate: _____ in

min, sec.

Weather: Sunny, 90°

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

will bury + sample in general accordance with BPA SESD guidance
will ^{also} be very difficult to locate given tall grass (not mowed). Will place painted tires in well locations to help locate them easier in
the future buried ~2.5 gal

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Geosyntec Project No.: GR5060-2017-01

Monitoring Well: MW-GCW-05

Sampling Date: 10/6/17

Sample ID: MW- GLW-05-1017

Sampler: R. WILSON

Prime & Quality Control Samples

Miscellaneous

Sample ID

Description

Depth to Water: 7.42 ft

Turbidity: _____ NTUs

Dis. Oxygen: _____ ppm

Pump Rate: _____ in

_____ min, _____ sec

Weather:

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

WELL WAS PURGED AND SAMPLED PER EPA SESC GUIDANCE

5 GALLONS PURGED, SAMPLE COLLECTED.

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Geosyntec Project No.: GR5060-2017-01

Monitoring Well: MW-SN-02

Sampling Date: 10/5/17

Sample ID: MW-SW-02-1017

Sampler: SC

Prime & Quality Control Samples

Miscellaneous

Sample ID Description Depth to Water: _____ ft

Turbidity: _____ NTUs

Dis. Oxygen: ppm

Pump Rate: _____ in

min sec

Weather: sunny, 85°

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Geosyntec Project No.: GR5060-2017-01

Monitoring Well: MW-0W-01A

Sampling Date: 10/5/17

Sample ID: MW-OW-01A-1017

Sampler: pw

Prime & Quality Control Samples

Miscellaneous

Sample ID

Description

Depth to Water: 16.35 ft

Turbidity: _____ NTUs

Dis. Oxygen: _____ ppm

Pump Rate: _____ in

min, _____ sec.

Weather:

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

WELL WAS PURGED AND SAMPLED PER EPA SED PROCEDURES

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Geosyntec Project No.: GR5060-2017-01

Monitoring Well: MW-6CW-01 D

Sampling Date: 10/5/17

Sample ID: MW-6CW-01D-1017

Sampler: SC

Weather: Sunny, 89°

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

MISSING WOLTS FOR WELL CAP.

well was purged & sampled per EPA STEO guidance.

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Geosyntec Project No.: GR5060-2017-01

Monitoring Well: MW-5B-01

Sampling Date: 10/5/17

Sample ID: MW-E8W-01-1017

Sampler: SC

Prime & Quality Control Samples

Miscellaneous

Sample ID

Description

Depth to Water: 26.39 ft

Turbidity: _____ NTUs

Dis. Oxygen: _____ ppm

Pump Rate: _____ in

min, _____ sec.

Weather: Sunny, 80°

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

~~NO well cap or cover & well cap is broken~~

Well was sumped according to EPA SESD guidance.

poured ~ 4 gal

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Geosyntec Project No.: GR5060-2017-01

Monitoring Well: MW-EPW-03D

Sampling Date: 10/5/17

Sample ID: MW-EPW-03D-1017

Sampler: RW

Weather: SUNNY 95°

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

WELL WAS PURGED AND SAMPLED PER EPA SESD OPERATING PROCEDURES

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Geosyntec Project No.: GR5060-2017-01

Monitoring Well: MW-SW-07

Sampling Date: 10/5/17

Sample ID: MW^{SC} SW-07-1017

Sampler: SL

Prime & Quality Control Samples

Miscellaneous

Sample ID

Description

Depth to Water: _____ ft

Turbidity: _____ NTUs

Dis. Oxygen: _____ ppm

Pump Rate: _____ in

min, sec.

Weather: ~~SUNNY 80°~~

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

Geosyntec Consultants

Stom Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Geosyntec Project No.: GR5060-2017-01

Monitoring Well: MW-09 SW-09 TC

Sampling Date: 16/5/17

Sample ID: MW-SW-09-1017

Sampler: SC

Prime & Quality Control Samples

Miscellaneous

Sample ID

Description

Depth to Water: _____ ft

Turbidity: NTUs

Dis. Oxygen: _____ ppm

Pump Rate: _____ in

min, sec.

Weather: sunny, 80°

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

Geosyntec Consultants

Storm Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Geosyntec Project No.: GR5060-2017-01

Monitoring Well: MW^sSW-06

Sampling Date: 10/5/17

Sample ID: MW-5 SW-06-1017

Sampler: SC/RW

Prime & Quality Control Samples

Miscellaneous

Sample ID

Description

Depth to Water: ft

DUP-2-101 Field duplicate

Turbidity: NTUs

Parity: _____ NTOS

Dis. Oxygen: _____ ppm

Pump Rate: _____ in
min, sec.

Weather: SUNNY, 80°

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

185

Geosyntec Consultants

Ground Water Sampling Measurements for Low-Flow Purging

Site: Chemtrade

Geosyntec Project No.: GR5060-2017-01

Monitoring Well: MW-EPW-02
Sample ID: MW-EPW-02-1017

Sampling Date: 11/5/17
Sampler: SC/RW

Time	Start Purge	Readings	Start Samp.	End Samp.	Temperature (°C)	pH (ATC)	Redox Potential (± mv)	Conductivity (mS/cm) (ATC)	Turbidity (NTU)	DO (mg/L)	Appearance of Water
0920	X										
0924	X	19.91	6.38	-163	0.242	81.7	0.00	HORIBA NOT MEASURING,			
0929	X	20.05	6.15	-191	0.170	31.5	0.00	DO ALUMINUM (Pb)			
0934	X	20.18	5.96	-168	0.138	12.5	0.00				
0939	X	20.43	5.97	-118	0.140	198	0.00				
0940		STOP PURGE, REPLACE BARB FITTINGS ON HORIBA									
0945	X										
0946	X	20.32	5.80	-104	0.129	33.4	0.00				
0951	X	20.25	5.68	-112	0.121	14.1	0.00				
0956	X	20.14	5.58	-98	0.114	11.0	4.89				
1001	X	20.13	5.54	-102	0.118	12.8	4.99				
1006	X	20.09	5.51	-93	0.112	7.5	4.47				
1011	X	20.11	5.41	-75	0.108	4.9	4.04				
1016	X	20.12	5.37	-66	0.107	4.0	3.73				
1017	X										
1021	X										

Prime & Quality Control Samples

Miscellaneous

Sample ID	Description	Depth to Water: 10.99 ft
DUP-01-1017	FIELD DUPLICATE	Turbidity: NTUs
		Dis. Oxygen: ppm
		Pump Rate: in min, sec.

Weather: SUNNY, 40°F

Notes: (well condition, nearby activities or changes in land use, odors, problems, deviations from plan, etc.)

Well was purged & sampled per EPA SEDD operating procedures.

Bubbles in purge line

DO, READINGS WERE LOW, OBSERVED HIGH ORGANIC CONTENT (ANTS) IN PURGE LINE AND WELL CASING

APPENDIX C

MANN-KENDALL TREND ANALYSIS
DATA
(provided in electronic submittal only)

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: EPW-01

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
15	14	1	1	0
15	14	1	2	0
20	14	6	3	0
10.2	14	-3.8	3	1
11	14	-3	3	2
12.9	14	-1.1	3	3
11.6	14	-2.4	3	4
11	14	-3	3	5
13.5	14	-0.5	3	6
13.2	14	-0.8	3	7
12.5	14	-1.5	3	8
12.8	14	-1.2	3	9
12.9	14	-1.1	3	10
16.9	14	2.9	4	10
13.4	14	-0.6	4	11
21.4	14	7.4	5	11
8.44	14	-5.56	5	12
14	14	0	5	12
12.9	14	-1.1	5	13
14.2	14	0.2	6	13
13.8	14	-0.2	6	14
14.5	14	0.5	7	14
13.9	14	-0.1	7	15
15.8	14	1.8	8	15
12.9	14	-1.1	8	16
13.7	14	-0.3	8	17
15	15	0	8	17
20	15	5	9	17
10.2	15	-4.8	9	18
11	15	-4	9	19
12.9	15	-2.1	9	20
11.6	15	-3.4	9	21
11	15	-4	9	22
13.5	15	-1.5	9	23
13.2	15	-1.8	9	24
12.5	15	-2.5	9	25
12.8	15	-2.2	9	26
12.9	15	-2.1	9	27
16.9	15	1.9	10	27
13.4	15	-1.6	10	28
21.4	15	6.4	11	28
8.44	15	-6.56	11	29
14	15	-1	11	30
12.9	15	-2.1	11	31
14.2	15	-0.8	11	32

13.8	15	-1.2	11	33
14.5	15	-0.5	11	34
13.9	15	-1.1	11	35
15.8	15	0.8	12	35
12.9	15	-2.1	12	36
13.7	15	-1.3	12	37
20	15	5	13	37
10.2	15	-4.8	13	38
11	15	-4	13	39
12.9	15	-2.1	13	40
11.6	15	-3.4	13	41
11	15	-4	13	42
13.5	15	-1.5	13	43
13.2	15	-1.8	13	44
12.5	15	-2.5	13	45
12.8	15	-2.2	13	46
12.9	15	-2.1	13	47
16.9	15	1.9	14	47
13.4	15	-1.6	14	48
21.4	15	6.4	15	48
8.44	15	-6.56	15	49
14	15	-1	15	50
12.9	15	-2.1	15	51
14.2	15	-0.8	15	52
13.8	15	-1.2	15	53
14.5	15	-0.5	15	54
13.9	15	-1.1	15	55
15.8	15	0.8	16	55
12.9	15	-2.1	16	56
13.7	15	-1.3	16	57
10.2	20	-9.8	16	58
11	20	-9	16	59
12.9	20	-7.1	16	60
11.6	20	-8.4	16	61
11	20	-9	16	62
13.5	20	-6.5	16	63
13.2	20	-6.8	16	64
12.5	20	-7.5	16	65
12.8	20	-7.2	16	66
12.9	20	-7.1	16	67
16.9	20	-3.1	16	68
13.4	20	-6.6	16	69
21.4	20	1.4	17	69
8.44	20	-11.56	17	70
14	20	-6	17	71
12.9	20	-7.1	17	72
14.2	20	-5.8	17	73
13.8	20	-6.2	17	74
14.5	20	-5.5	17	75
13.9	20	-6.1	17	76
15.8	20	-4.2	17	77
12.9	20	-7.1	17	78
13.7	20	-6.3	17	79
11	10.2	0.8	18	79

12.9	10.2	2.7	19	79
11.6	10.2	1.4	20	79
11	10.2	0.8	21	79
13.5	10.2	3.3	22	79
13.2	10.2	3	23	79
12.5	10.2	2.3	24	79
12.8	10.2	2.6	25	79
12.9	10.2	2.7	26	79
16.9	10.2	6.7	27	79
13.4	10.2	3.2	28	79
21.4	10.2	11.2	29	79
8.44	10.2	-1.76	29	80
14	10.2	3.8	30	80
12.9	10.2	2.7	31	80
14.2	10.2	4	32	80
13.8	10.2	3.6	33	80
14.5	10.2	4.3	34	80
13.9	10.2	3.7	35	80
15.8	10.2	5.6	36	80
12.9	10.2	2.7	37	80
13.7	10.2	3.5	38	80
12.9	11	1.9	39	80
11.6	11	0.6	40	80
11	11	0	40	80
13.5	11	2.5	41	80
13.2	11	2.2	42	80
12.5	11	1.5	43	80
12.8	11	1.8	44	80
12.9	11	1.9	45	80
16.9	11	5.9	46	80
13.4	11	2.4	47	80
21.4	11	10.4	48	80
8.44	11	-2.56	48	81
14	11	3	49	81
12.9	11	1.9	50	81
14.2	11	3.2	51	81
13.8	11	2.8	52	81
14.5	11	3.5	53	81
13.9	11	2.9	54	81
15.8	11	4.8	55	81
12.9	11	1.9	56	81
13.7	11	2.7	57	81
11.6	12.9	-1.3	57	82
11	12.9	-1.9	57	83
13.5	12.9	0.6	58	83
13.2	12.9	0.3	59	83
12.5	12.9	-0.4	59	84
12.8	12.9	-0.1	59	85
12.9	12.9	0	59	85
16.9	12.9	4	60	85
13.4	12.9	0.5	61	85
21.4	12.9	8.5	62	85
8.44	12.9	-4.46	62	86
14	12.9	1.1	63	86
12.9	12.9	0	63	86

14.2	12.9	1.3	64	86
13.8	12.9	0.9	65	86
14.5	12.9	1.6	66	86
13.9	12.9	1	67	86
15.8	12.9	2.9	68	86
12.9	12.9	0	68	86
13.7	12.9	0.8	69	86
11	11.6	-0.6	69	87
13.5	11.6	1.9	70	87
13.2	11.6	1.6	71	87
12.5	11.6	0.9	72	87
12.8	11.6	1.2	73	87
12.9	11.6	1.3	74	87
16.9	11.6	5.3	75	87
13.4	11.6	1.8	76	87
21.4	11.6	9.8	77	87
8.44	11.6	-3.16	77	88
14	11.6	2.4	78	88
12.9	11.6	1.3	79	88
14.2	11.6	2.6	80	88
13.8	11.6	2.2	81	88
14.5	11.6	2.9	82	88
13.9	11.6	2.3	83	88
15.8	11.6	4.2	84	88
12.9	11.6	1.3	85	88
13.7	11.6	2.1	86	88
13.5	11	2.5	87	88
13.2	11	2.2	88	88
12.5	11	1.5	89	88
12.8	11	1.8	90	88
12.9	11	1.9	91	88
16.9	11	5.9	92	88
13.4	11	2.4	93	88
21.4	11	10.4	94	88
8.44	11	-2.56	94	89
14	11	3	95	89
12.9	11	1.9	96	89
14.2	11	3.2	97	89
13.8	11	2.8	98	89
14.5	11	3.5	99	89
13.9	11	2.9	100	89
15.8	11	4.8	101	89
12.9	11	1.9	102	89
13.7	11	2.7	103	89
13.2	13.5	-0.3	103	90
12.5	13.5	-1	103	91
12.8	13.5	-0.7	103	92
12.9	13.5	-0.6	103	93
16.9	13.5	3.4	104	93
13.4	13.5	-0.1	104	94
21.4	13.5	7.9	105	94
8.44	13.5	-5.06	105	95
14	13.5	0.5	106	95
12.9	13.5	-0.6	106	96

14.2	13.5	0.7	107	96
13.8	13.5	0.3	108	96
14.5	13.5	1	109	96
13.9	13.5	0.4	110	96
15.8	13.5	2.3	111	96
12.9	13.5	-0.6	111	97
13.7	13.5	0.2	112	97
12.5	13.2	-0.7	112	98
12.8	13.2	-0.4	112	99
12.9	13.2	-0.3	112	100
16.9	13.2	3.7	113	100
13.4	13.2	0.2	114	100
21.4	13.2	8.2	115	100
8.44	13.2	-4.76	115	101
14	13.2	0.8	116	101
12.9	13.2	-0.3	116	102
14.2	13.2	1	117	102
13.8	13.2	0.6	118	102
14.5	13.2	1.3	119	102
13.9	13.2	0.7	120	102
15.8	13.2	2.6	121	102
12.9	13.2	-0.3	121	103
13.7	13.2	0.5	122	103
12.8	12.5	0.3	123	103
12.9	12.5	0.4	124	103
16.9	12.5	4.4	125	103
13.4	12.5	0.9	126	103
21.4	12.5	8.9	127	103
8.44	12.5	-4.06	127	104
14	12.5	1.5	128	104
12.9	12.5	0.4	129	104
14.2	12.5	1.7	130	104
13.8	12.5	1.3	131	104
14.5	12.5	2	132	104
13.9	12.5	1.4	133	104
15.8	12.5	3.3	134	104
12.9	12.5	0.4	135	104
13.7	12.5	1.2	136	104
12.9	12.8	0.1	137	104
16.9	12.8	4.1	138	104
13.4	12.8	0.6	139	104
21.4	12.8	8.6	140	104
8.44	12.8	-4.36	140	105
14	12.8	1.2	141	105
12.9	12.8	0.1	142	105
14.2	12.8	1.4	143	105
13.8	12.8	1	144	105
14.5	12.8	1.7	145	105
13.9	12.8	1.1	146	105
15.8	12.8	3	147	105
12.9	12.8	0.1	148	105
13.7	12.8	0.9	149	105
16.9	12.9	4	150	105

13.4	12.9	0.5	151	105
21.4	12.9	8.5	152	105
8.44	12.9	-4.46	152	106
14	12.9	1.1	153	106
12.9	12.9	0	153	106
14.2	12.9	1.3	154	106
13.8	12.9	0.9	155	106
14.5	12.9	1.6	156	106
13.9	12.9	1	157	106
15.8	12.9	2.9	158	106
12.9	12.9	0	158	106
13.7	12.9	0.8	159	106
13.4	16.9	-3.5	159	107
21.4	16.9	4.5	160	107
8.44	16.9	-8.46	160	108
14	16.9	-2.9	160	109
12.9	16.9	-4	160	110
14.2	16.9	-2.7	160	111
13.8	16.9	-3.1	160	112
14.5	16.9	-2.4	160	113
13.9	16.9	-3	160	114
15.8	16.9	-1.1	160	115
12.9	16.9	-4	160	116
13.7	16.9	-3.2	160	117
21.4	13.4	8	161	117
8.44	13.4	-4.96	161	118
14	13.4	0.6	162	118
12.9	13.4	-0.5	162	119
14.2	13.4	0.8	163	119
13.8	13.4	0.4	164	119
14.5	13.4	1.1	165	119
13.9	13.4	0.5	166	119
15.8	13.4	2.4	167	119
12.9	13.4	-0.5	167	120
13.7	13.4	0.3	168	120
8.44	21.4	-12.96	168	121
14	21.4	-7.4	168	122
12.9	21.4	-8.5	168	123
14.2	21.4	-7.2	168	124
13.8	21.4	-7.6	168	125
14.5	21.4	-6.9	168	126
13.9	21.4	-7.5	168	127
15.8	21.4	-5.6	168	128
12.9	21.4	-8.5	168	129
13.7	21.4	-7.7	168	130
14	8.44	5.56	169	130
12.9	8.44	4.46	170	130
14.2	8.44	5.76	171	130
13.8	8.44	5.36	172	130
14.5	8.44	6.06	173	130
13.9	8.44	5.46	174	130
15.8	8.44	7.36	175	130
12.9	8.44	4.46	176	130

13.7	8.44	5.26	177	130
12.9	14	-1.1	177	131
14.2	14	0.2	178	131
13.8	14	-0.2	178	132
14.5	14	0.5	179	132
13.9	14	-0.1	179	133
15.8	14	1.8	180	133
12.9	14	-1.1	180	134
13.7	14	-0.3	180	135
14.2	12.9	1.3	181	135
13.8	12.9	0.9	182	135
14.5	12.9	1.6	183	135
13.9	12.9	1	184	135
15.8	12.9	2.9	185	135
12.9	12.9	0	185	135
13.7	12.9	0.8	186	135
13.8	14.2	-0.4	186	136
14.5	14.2	0.3	187	136
13.9	14.2	-0.3	187	137
15.8	14.2	1.6	188	137
12.9	14.2	-1.3	188	138
13.7	14.2	-0.5	188	139
14.5	13.8	0.7	189	139
13.9	13.8	0.1	190	139
15.8	13.8	2	191	139
12.9	13.8	-0.9	191	140
13.7	13.8	-0.1	191	141
13.9	14.5	-0.6	191	142
15.8	14.5	1.3	192	142
12.9	14.5	-1.6	192	143
13.7	14.5	-0.8	192	144
15.8	13.9	1.9	193	144
12.9	13.9	-1	193	145
13.7	13.9	-0.2	193	146
12.9	15.8	-2.9	193	147
13.7	15.8	-2.1	193	148
13.7	12.9	0.8	194	148

S Statistic = 194 - 148 = 46

Tied Group Value	Members
1	14
2	15
3	11
4	12.9

Time Period	Observations
3/12/2008	1

5/12/2008	1
9/23/2008	1
10/29/2008	1
4/29/2009	1
5/15/2009	1
9/23/2009	1
12/8/2009	1
2/25/2010	1
4/15/2010	1
8/11/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/19/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 210

B = 0

C = 24

D = 0

E = 18

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2289.33

Z-Score = 0.940498

Comparison Level at 95% confidence level = -1.65463 (downward trend)

0.940498 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: EPW-01

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
15	14	1	1	0
15	14	1	2	0
20	14	6	3	0
10.2	14	-3.8	3	1
11	14	-3	3	2
12.9	14	-1.1	3	3
11.6	14	-2.4	3	4
11	14	-3	3	5
13.5	14	-0.5	3	6
13.2	14	-0.8	3	7
12.5	14	-1.5	3	8
12.8	14	-1.2	3	9
12.9	14	-1.1	3	10
16.9	14	2.9	4	10
13.4	14	-0.6	4	11
21.4	14	7.4	5	11
8.44	14	-5.56	5	12
14	14	0	5	12
12.9	14	-1.1	5	13
14.2	14	0.2	6	13
13.8	14	-0.2	6	14
14.5	14	0.5	7	14
13.9	14	-0.1	7	15
15.8	14	1.8	8	15
12.9	14	-1.1	8	16
13.7	14	-0.3	8	17
15	15	0	8	17
20	15	5	9	17
10.2	15	-4.8	9	18
11	15	-4	9	19
12.9	15	-2.1	9	20
11.6	15	-3.4	9	21
11	15	-4	9	22
13.5	15	-1.5	9	23
13.2	15	-1.8	9	24
12.5	15	-2.5	9	25
12.8	15	-2.2	9	26
12.9	15	-2.1	9	27
16.9	15	1.9	10	27
13.4	15	-1.6	10	28
21.4	15	6.4	11	28
8.44	15	-6.56	11	29
14	15	-1	11	30
12.9	15	-2.1	11	31
14.2	15	-0.8	11	32

13.8	15	-1.2	11	33
14.5	15	-0.5	11	34
13.9	15	-1.1	11	35
15.8	15	0.8	12	35
12.9	15	-2.1	12	36
13.7	15	-1.3	12	37
20	15	5	13	37
10.2	15	-4.8	13	38
11	15	-4	13	39
12.9	15	-2.1	13	40
11.6	15	-3.4	13	41
11	15	-4	13	42
13.5	15	-1.5	13	43
13.2	15	-1.8	13	44
12.5	15	-2.5	13	45
12.8	15	-2.2	13	46
12.9	15	-2.1	13	47
16.9	15	1.9	14	47
13.4	15	-1.6	14	48
21.4	15	6.4	15	48
8.44	15	-6.56	15	49
14	15	-1	15	50
12.9	15	-2.1	15	51
14.2	15	-0.8	15	52
13.8	15	-1.2	15	53
14.5	15	-0.5	15	54
13.9	15	-1.1	15	55
15.8	15	0.8	16	55
12.9	15	-2.1	16	56
13.7	15	-1.3	16	57
10.2	20	-9.8	16	58
11	20	-9	16	59
12.9	20	-7.1	16	60
11.6	20	-8.4	16	61
11	20	-9	16	62
13.5	20	-6.5	16	63
13.2	20	-6.8	16	64
12.5	20	-7.5	16	65
12.8	20	-7.2	16	66
12.9	20	-7.1	16	67
16.9	20	-3.1	16	68
13.4	20	-6.6	16	69
21.4	20	1.4	17	69
8.44	20	-11.56	17	70
14	20	-6	17	71
12.9	20	-7.1	17	72
14.2	20	-5.8	17	73
13.8	20	-6.2	17	74
14.5	20	-5.5	17	75
13.9	20	-6.1	17	76
15.8	20	-4.2	17	77
12.9	20	-7.1	17	78
13.7	20	-6.3	17	79
11	10.2	0.8	18	79

12.9	10.2	2.7	19	79
11.6	10.2	1.4	20	79
11	10.2	0.8	21	79
13.5	10.2	3.3	22	79
13.2	10.2	3	23	79
12.5	10.2	2.3	24	79
12.8	10.2	2.6	25	79
12.9	10.2	2.7	26	79
16.9	10.2	6.7	27	79
13.4	10.2	3.2	28	79
21.4	10.2	11.2	29	79
8.44	10.2	-1.76	29	80
14	10.2	3.8	30	80
12.9	10.2	2.7	31	80
14.2	10.2	4	32	80
13.8	10.2	3.6	33	80
14.5	10.2	4.3	34	80
13.9	10.2	3.7	35	80
15.8	10.2	5.6	36	80
12.9	10.2	2.7	37	80
13.7	10.2	3.5	38	80
12.9	11	1.9	39	80
11.6	11	0.6	40	80
11	11	0	40	80
13.5	11	2.5	41	80
13.2	11	2.2	42	80
12.5	11	1.5	43	80
12.8	11	1.8	44	80
12.9	11	1.9	45	80
16.9	11	5.9	46	80
13.4	11	2.4	47	80
21.4	11	10.4	48	80
8.44	11	-2.56	48	81
14	11	3	49	81
12.9	11	1.9	50	81
14.2	11	3.2	51	81
13.8	11	2.8	52	81
14.5	11	3.5	53	81
13.9	11	2.9	54	81
15.8	11	4.8	55	81
12.9	11	1.9	56	81
13.7	11	2.7	57	81
11.6	12.9	-1.3	57	82
11	12.9	-1.9	57	83
13.5	12.9	0.6	58	83
13.2	12.9	0.3	59	83
12.5	12.9	-0.4	59	84
12.8	12.9	-0.1	59	85
12.9	12.9	0	59	85
16.9	12.9	4	60	85
13.4	12.9	0.5	61	85
21.4	12.9	8.5	62	85
8.44	12.9	-4.46	62	86
14	12.9	1.1	63	86
12.9	12.9	0	63	86

14.2	12.9	1.3	64	86
13.8	12.9	0.9	65	86
14.5	12.9	1.6	66	86
13.9	12.9	1	67	86
15.8	12.9	2.9	68	86
12.9	12.9	0	68	86
13.7	12.9	0.8	69	86
11	11.6	-0.6	69	87
13.5	11.6	1.9	70	87
13.2	11.6	1.6	71	87
12.5	11.6	0.9	72	87
12.8	11.6	1.2	73	87
12.9	11.6	1.3	74	87
16.9	11.6	5.3	75	87
13.4	11.6	1.8	76	87
21.4	11.6	9.8	77	87
8.44	11.6	-3.16	77	88
14	11.6	2.4	78	88
12.9	11.6	1.3	79	88
14.2	11.6	2.6	80	88
13.8	11.6	2.2	81	88
14.5	11.6	2.9	82	88
13.9	11.6	2.3	83	88
15.8	11.6	4.2	84	88
12.9	11.6	1.3	85	88
13.7	11.6	2.1	86	88
13.5	11	2.5	87	88
13.2	11	2.2	88	88
12.5	11	1.5	89	88
12.8	11	1.8	90	88
12.9	11	1.9	91	88
16.9	11	5.9	92	88
13.4	11	2.4	93	88
21.4	11	10.4	94	88
8.44	11	-2.56	94	89
14	11	3	95	89
12.9	11	1.9	96	89
14.2	11	3.2	97	89
13.8	11	2.8	98	89
14.5	11	3.5	99	89
13.9	11	2.9	100	89
15.8	11	4.8	101	89
12.9	11	1.9	102	89
13.7	11	2.7	103	89
13.2	13.5	-0.3	103	90
12.5	13.5	-1	103	91
12.8	13.5	-0.7	103	92
12.9	13.5	-0.6	103	93
16.9	13.5	3.4	104	93
13.4	13.5	-0.1	104	94
21.4	13.5	7.9	105	94
8.44	13.5	-5.06	105	95
14	13.5	0.5	106	95
12.9	13.5	-0.6	106	96

14.2	13.5	0.7	107	96
13.8	13.5	0.3	108	96
14.5	13.5	1	109	96
13.9	13.5	0.4	110	96
15.8	13.5	2.3	111	96
12.9	13.5	-0.6	111	97
13.7	13.5	0.2	112	97
12.5	13.2	-0.7	112	98
12.8	13.2	-0.4	112	99
12.9	13.2	-0.3	112	100
16.9	13.2	3.7	113	100
13.4	13.2	0.2	114	100
21.4	13.2	8.2	115	100
8.44	13.2	-4.76	115	101
14	13.2	0.8	116	101
12.9	13.2	-0.3	116	102
14.2	13.2	1	117	102
13.8	13.2	0.6	118	102
14.5	13.2	1.3	119	102
13.9	13.2	0.7	120	102
15.8	13.2	2.6	121	102
12.9	13.2	-0.3	121	103
13.7	13.2	0.5	122	103
12.8	12.5	0.3	123	103
12.9	12.5	0.4	124	103
16.9	12.5	4.4	125	103
13.4	12.5	0.9	126	103
21.4	12.5	8.9	127	103
8.44	12.5	-4.06	127	104
14	12.5	1.5	128	104
12.9	12.5	0.4	129	104
14.2	12.5	1.7	130	104
13.8	12.5	1.3	131	104
14.5	12.5	2	132	104
13.9	12.5	1.4	133	104
15.8	12.5	3.3	134	104
12.9	12.5	0.4	135	104
13.7	12.5	1.2	136	104
12.9	12.8	0.1	137	104
16.9	12.8	4.1	138	104
13.4	12.8	0.6	139	104
21.4	12.8	8.6	140	104
8.44	12.8	-4.36	140	105
14	12.8	1.2	141	105
12.9	12.8	0.1	142	105
14.2	12.8	1.4	143	105
13.8	12.8	1	144	105
14.5	12.8	1.7	145	105
13.9	12.8	1.1	146	105
15.8	12.8	3	147	105
12.9	12.8	0.1	148	105
13.7	12.8	0.9	149	105
16.9	12.9	4	150	105

13.4	12.9	0.5	151	105
21.4	12.9	8.5	152	105
8.44	12.9	-4.46	152	106
14	12.9	1.1	153	106
12.9	12.9	0	153	106
14.2	12.9	1.3	154	106
13.8	12.9	0.9	155	106
14.5	12.9	1.6	156	106
13.9	12.9	1	157	106
15.8	12.9	2.9	158	106
12.9	12.9	0	158	106
13.7	12.9	0.8	159	106
13.4	16.9	-3.5	159	107
21.4	16.9	4.5	160	107
8.44	16.9	-8.46	160	108
14	16.9	-2.9	160	109
12.9	16.9	-4	160	110
14.2	16.9	-2.7	160	111
13.8	16.9	-3.1	160	112
14.5	16.9	-2.4	160	113
13.9	16.9	-3	160	114
15.8	16.9	-1.1	160	115
12.9	16.9	-4	160	116
13.7	16.9	-3.2	160	117
21.4	13.4	8	161	117
8.44	13.4	-4.96	161	118
14	13.4	0.6	162	118
12.9	13.4	-0.5	162	119
14.2	13.4	0.8	163	119
13.8	13.4	0.4	164	119
14.5	13.4	1.1	165	119
13.9	13.4	0.5	166	119
15.8	13.4	2.4	167	119
12.9	13.4	-0.5	167	120
13.7	13.4	0.3	168	120
8.44	21.4	-12.96	168	121
14	21.4	-7.4	168	122
12.9	21.4	-8.5	168	123
14.2	21.4	-7.2	168	124
13.8	21.4	-7.6	168	125
14.5	21.4	-6.9	168	126
13.9	21.4	-7.5	168	127
15.8	21.4	-5.6	168	128
12.9	21.4	-8.5	168	129
13.7	21.4	-7.7	168	130
14	8.44	5.56	169	130
12.9	8.44	4.46	170	130
14.2	8.44	5.76	171	130
13.8	8.44	5.36	172	130
14.5	8.44	6.06	173	130
13.9	8.44	5.46	174	130
15.8	8.44	7.36	175	130
12.9	8.44	4.46	176	130

13.7	8.44	5.26	177	130
12.9	14	-1.1	177	131
14.2	14	0.2	178	131
13.8	14	-0.2	178	132
14.5	14	0.5	179	132
13.9	14	-0.1	179	133
15.8	14	1.8	180	133
12.9	14	-1.1	180	134
13.7	14	-0.3	180	135
14.2	12.9	1.3	181	135
13.8	12.9	0.9	182	135
14.5	12.9	1.6	183	135
13.9	12.9	1	184	135
15.8	12.9	2.9	185	135
12.9	12.9	0	185	135
13.7	12.9	0.8	186	135
13.8	14.2	-0.4	186	136
14.5	14.2	0.3	187	136
13.9	14.2	-0.3	187	137
15.8	14.2	1.6	188	137
12.9	14.2	-1.3	188	138
13.7	14.2	-0.5	188	139
14.5	13.8	0.7	189	139
13.9	13.8	0.1	190	139
15.8	13.8	2	191	139
12.9	13.8	-0.9	191	140
13.7	13.8	-0.1	191	141
13.9	14.5	-0.6	191	142
15.8	14.5	1.3	192	142
12.9	14.5	-1.6	192	143
13.7	14.5	-0.8	192	144
15.8	13.9	1.9	193	144
12.9	13.9	-1	193	145
13.7	13.9	-0.2	193	146
12.9	15.8	-2.9	193	147
13.7	15.8	-2.1	193	148
13.7	12.9	0.8	194	148

S Statistic = 194 - 148 = 46

Tied Group Value	Members
1	14
2	15
3	11
4	12.9

Time Period	Observations
3/12/2008	1

5/12/2008	1
9/23/2008	1
10/29/2008	1
4/29/2009	1
5/15/2009	1
9/23/2009	1
12/8/2009	1
2/25/2010	1
4/15/2010	1
8/11/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/19/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 210

B = 0

C = 24

D = 0

E = 18

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2289.33

Z-Score = 0.940498

Comparison Level at 95% confidence level = 1.65463 (upward trend)

0.940498 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: EPW-02

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
0.2	0.3	-0.1	0	1
0.4	0.3	0.1	1	1
ND<0	0.3	-0.3	1	2
0.3	0.3	0	1	2
0.2	0.3	-0.1	1	3
ND<0	0.3	-0.3	1	4
ND<0	0.3	-0.3	1	5
ND<0	0.3	-0.3	1	6
0.1	0.3	-0.2	1	7
ND<0	0.3	-0.3	1	8
ND<0	0.3	-0.3	1	9
ND<0	0.3	-0.3	1	10
0.1	0.3	-0.2	1	11
ND<0	0.3	-0.3	1	12
ND<0	0.3	-0.3	1	13
ND<0	0.3	-0.3	1	14
ND<0	0.3	-0.3	1	15
ND<0	0.3	-0.3	1	16
ND<0	0.3	-0.3	1	17
ND<0	0.3	-0.3	1	18
ND<0	0.3	-0.3	1	19
ND<0	0.3	-0.3	1	20
ND<0	0.3	-0.3	1	21
ND<0	0.3	-0.3	1	22
ND<0	0.3	-0.3	1	23
ND<0	0.3	-0.3	1	24
0.4	0.2	0.2	2	24
ND<0	0.2	-0.2	2	25
0.3	0.2	0.1	3	25
0.2	0.2	0	3	25
ND<0	0.2	-0.2	3	26
ND<0	0.2	-0.2	3	27
ND<0	0.2	-0.2	3	28
0.1	0.2	-0.1	3	29
ND<0	0.2	-0.2	3	30
ND<0	0.2	-0.2	3	31
ND<0	0.2	-0.2	3	32
0.1	0.2	-0.1	3	33
ND<0	0.2	-0.2	3	34
ND<0	0.2	-0.2	3	35
ND<0	0.2	-0.2	3	36
ND<0	0.2	-0.2	3	37
ND<0	0.2	-0.2	3	38
ND<0	0.2	-0.2	3	39
ND<0	0.2	-0.2	3	40

ND<0	0.2	-0.2	3	41
ND<0	0.2	-0.2	3	42
ND<0	0.2	-0.2	3	43
ND<0	0.2	-0.2	3	44
ND<0	0.2	-0.2	3	45
ND<0	0.2	-0.2	3	46
ND<0	0.4	-0.4	3	47
0.3	0.4	-0.1	3	48
0.2	0.4	-0.2	3	49
ND<0	0.4	-0.4	3	50
ND<0	0.4	-0.4	3	51
ND<0	0.4	-0.4	3	52
0.1	0.4	-0.3	3	53
ND<0	0.4	-0.4	3	54
ND<0	0.4	-0.4	3	55
ND<0	0.4	-0.4	3	56
0.1	0.4	-0.3	3	57
ND<0	0.4	-0.4	3	58
ND<0	0.4	-0.4	3	59
ND<0	0.4	-0.4	3	60
ND<0	0.4	-0.4	3	61
ND<0	0.4	-0.4	3	62
ND<0	0.4	-0.4	3	63
ND<0	0.4	-0.4	3	64
ND<0	0.4	-0.4	3	65
ND<0	0.4	-0.4	3	66
ND<0	0.4	-0.4	3	67
ND<0	0.4	-0.4	3	68
ND<0	0.4	-0.4	3	69
ND<0	0.4	-0.4	3	70
0.3	ND<0	0.3	4	70
0.2	ND<0	0.2	5	70
ND<0	ND<0	0	5	70
ND<0	ND<0	0	5	70
ND<0	ND<0	0	5	70
0.1	ND<0	0.1	6	70
ND<0	ND<0	0	6	70
ND<0	ND<0	0	6	70
ND<0	ND<0	0	6	70
0.1	ND<0	0.1	7	70
ND<0	ND<0	0	7	70
ND<0	ND<0	0	7	70
ND<0	ND<0	0	7	70
ND<0	ND<0	0	7	70
ND<0	ND<0	0	7	70
ND<0	ND<0	0	7	70
ND<0	ND<0	0	7	70
ND<0	ND<0	0	7	70
ND<0	ND<0	0	7	70
ND<0	ND<0	0	7	70
ND<0	ND<0	0	7	70
ND<0	ND<0	0	7	70
ND<0	ND<0	0	7	70
0.2	0.3	-0.1	7	71

ND<0	0.3	-0.3	7	72
ND<0	0.3	-0.3	7	73
ND<0	0.3	-0.3	7	74
0.1	0.3	-0.2	7	75
ND<0	0.3	-0.3	7	76
ND<0	0.3	-0.3	7	77
ND<0	0.3	-0.3	7	78
0.1	0.3	-0.2	7	79
ND<0	0.3	-0.3	7	80
ND<0	0.3	-0.3	7	81
ND<0	0.3	-0.3	7	82
ND<0	0.3	-0.3	7	83
ND<0	0.3	-0.3	7	84
ND<0	0.3	-0.3	7	85
ND<0	0.3	-0.3	7	86
ND<0	0.3	-0.3	7	87
ND<0	0.3	-0.3	7	88
ND<0	0.3	-0.3	7	89
ND<0	0.3	-0.3	7	90
ND<0	0.3	-0.3	7	91
ND<0	0.3	-0.3	7	92
ND<0	0.2	-0.2	7	93
ND<0	0.2	-0.2	7	94
ND<0	0.2	-0.2	7	95
0.1	0.2	-0.1	7	96
ND<0	0.2	-0.2	7	97
ND<0	0.2	-0.2	7	98
ND<0	0.2	-0.2	7	99
0.1	0.2	-0.1	7	100
ND<0	0.2	-0.2	7	101
ND<0	0.2	-0.2	7	102
ND<0	0.2	-0.2	7	103
ND<0	0.2	-0.2	7	104
ND<0	0.2	-0.2	7	105
ND<0	0.2	-0.2	7	106
ND<0	0.2	-0.2	7	107
ND<0	0.2	-0.2	7	108
ND<0	0.2	-0.2	7	109
ND<0	0.2	-0.2	7	110
ND<0	0.2	-0.2	7	111
ND<0	0.2	-0.2	7	112
ND<0	0.2	-0.2	7	113
ND<0	ND<0	0	7	113
ND<0	ND<0	0	7	113
0.1	ND<0	0.1	8	113
ND<0	ND<0	0	8	113
ND<0	ND<0	0	8	113
ND<0	ND<0	0	8	113
0.1	ND<0	0.1	9	113
ND<0	ND<0	0	9	113
ND<0	ND<0	0	9	113
ND<0	ND<0	0	9	113
ND<0	ND<0	0	9	113
ND<0	ND<0	0	9	113
ND<0	ND<0	0	9	113

$$S \text{ Statistic} = 16 - 142 = -126$$

Tied Group	Value	Members
1	0.3	2
2	0.2	2
3	0	20
4	0.1	2

Time Period	Observations
3/12/2008	1

5/12/2008	1
9/23/2008	1
12/3/2008	1
4/29/2009	1
5/15/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/15/2010	1
8/11/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 17154

B = 0

C = 6840

D = 0

E = 386

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 1348

Z-Score = -3.40459

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-3.40459 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-03D

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
220	200	20	1	0
440	200	240	2	0
480	200	280	3	0
446	200	246	4	0
440	200	240	5	0
205	200	5	6	0
187	200	-13	6	1
204	200	4	7	1
390	200	190	8	1
205	200	5	9	1
340	200	140	10	1
350	200	150	11	1
343	200	143	12	1
363	200	163	13	1
340	200	140	14	1
385	200	185	15	1
331	200	131	16	1
361	200	161	17	1
333	200	133	18	1
312	200	112	19	1
298	200	98	20	1
294	200	94	21	1
300	200	100	22	1
314	200	114	23	1
319	200	119	24	1
288	200	88	25	1
440	220	220	26	1
480	220	260	27	1
446	220	226	28	1
440	220	220	29	1
205	220	-15	29	2
187	220	-33	29	3
204	220	-16	29	4
390	220	170	30	4
205	220	-15	30	5
340	220	120	31	5
350	220	130	32	5
343	220	123	33	5
363	220	143	34	5
340	220	120	35	5
385	220	165	36	5
331	220	111	37	5
361	220	141	38	5
333	220	113	39	5
312	220	92	40	5

298	220	78	41	5
294	220	74	42	5
300	220	80	43	5
314	220	94	44	5
319	220	99	45	5
288	220	68	46	5
480	440	40	47	5
446	440	6	48	5
440	440	0	48	5
205	440	-235	48	6
187	440	-253	48	7
204	440	-236	48	8
390	440	-50	48	9
205	440	-235	48	10
340	440	-100	48	11
350	440	-90	48	12
343	440	-97	48	13
363	440	-77	48	14
340	440	-100	48	15
385	440	-55	48	16
331	440	-109	48	17
361	440	-79	48	18
333	440	-107	48	19
312	440	-128	48	20
298	440	-142	48	21
294	440	-146	48	22
300	440	-140	48	23
314	440	-126	48	24
319	440	-121	48	25
288	440	-152	48	26
446	480	-34	48	27
440	480	-40	48	28
205	480	-275	48	29
187	480	-293	48	30
204	480	-276	48	31
390	480	-90	48	32
205	480	-275	48	33
340	480	-140	48	34
350	480	-130	48	35
343	480	-137	48	36
363	480	-117	48	37
340	480	-140	48	38
385	480	-95	48	39
331	480	-149	48	40
361	480	-119	48	41
333	480	-147	48	42
312	480	-168	48	43
298	480	-182	48	44
294	480	-186	48	45
300	480	-180	48	46
314	480	-166	48	47
319	480	-161	48	48
288	480	-192	48	49
440	446	-6	48	50

205	446	-241	48	51
187	446	-259	48	52
204	446	-242	48	53
390	446	-56	48	54
205	446	-241	48	55
340	446	-106	48	56
350	446	-96	48	57
343	446	-103	48	58
363	446	-83	48	59
340	446	-106	48	60
385	446	-61	48	61
331	446	-115	48	62
361	446	-85	48	63
333	446	-113	48	64
312	446	-134	48	65
298	446	-148	48	66
294	446	-152	48	67
300	446	-146	48	68
314	446	-132	48	69
319	446	-127	48	70
288	446	-158	48	71
205	440	-235	48	72
187	440	-253	48	73
204	440	-236	48	74
390	440	-50	48	75
205	440	-235	48	76
340	440	-100	48	77
350	440	-90	48	78
343	440	-97	48	79
363	440	-77	48	80
340	440	-100	48	81
385	440	-55	48	82
331	440	-109	48	83
361	440	-79	48	84
333	440	-107	48	85
312	440	-128	48	86
298	440	-142	48	87
294	440	-146	48	88
300	440	-140	48	89
314	440	-126	48	90
319	440	-121	48	91
288	440	-152	48	92
187	205	-18	48	93
204	205	-1	48	94
390	205	185	49	94
205	205	0	49	94
340	205	135	50	94
350	205	145	51	94
343	205	138	52	94
363	205	158	53	94
340	205	135	54	94
385	205	180	55	94
331	205	126	56	94
361	205	156	57	94
333	205	128	58	94

312	205	107	59	94
298	205	93	60	94
294	205	89	61	94
300	205	95	62	94
314	205	109	63	94
319	205	114	64	94
288	205	83	65	94
204	187	17	66	94
390	187	203	67	94
205	187	18	68	94
340	187	153	69	94
350	187	163	70	94
343	187	156	71	94
363	187	176	72	94
340	187	153	73	94
385	187	198	74	94
331	187	144	75	94
361	187	174	76	94
333	187	146	77	94
312	187	125	78	94
298	187	111	79	94
294	187	107	80	94
300	187	113	81	94
314	187	127	82	94
319	187	132	83	94
288	187	101	84	94
390	204	186	85	94
205	204	1	86	94
340	204	136	87	94
350	204	146	88	94
343	204	139	89	94
363	204	159	90	94
340	204	136	91	94
385	204	181	92	94
331	204	127	93	94
361	204	157	94	94
333	204	129	95	94
312	204	108	96	94
298	204	94	97	94
294	204	90	98	94
300	204	96	99	94
314	204	110	100	94
319	204	115	101	94
288	204	84	102	94
205	390	-185	102	95
340	390	-50	102	96
350	390	-40	102	97
343	390	-47	102	98
363	390	-27	102	99
340	390	-50	102	100
385	390	-5	102	101
331	390	-59	102	102
361	390	-29	102	103
333	390	-57	102	104

312	390	-78	102	105
298	390	-92	102	106
294	390	-96	102	107
300	390	-90	102	108
314	390	-76	102	109
319	390	-71	102	110
288	390	-102	102	111
340	205	135	103	111
350	205	145	104	111
343	205	138	105	111
363	205	158	106	111
340	205	135	107	111
385	205	180	108	111
331	205	126	109	111
361	205	156	110	111
333	205	128	111	111
312	205	107	112	111
298	205	93	113	111
294	205	89	114	111
300	205	95	115	111
314	205	109	116	111
319	205	114	117	111
288	205	83	118	111
350	340	10	119	111
343	340	3	120	111
363	340	23	121	111
340	340	0	121	111
385	340	45	122	111
331	340	-9	122	112
361	340	21	123	112
333	340	-7	123	113
312	340	-28	123	114
298	340	-42	123	115
294	340	-46	123	116
300	340	-40	123	117
314	340	-26	123	118
319	340	-21	123	119
288	340	-52	123	120
343	350	-7	123	121
363	350	13	124	121
340	350	-10	124	122
385	350	35	125	122
331	350	-19	125	123
361	350	11	126	123
333	350	-17	126	124
312	350	-38	126	125
298	350	-52	126	126
294	350	-56	126	127
300	350	-50	126	128
314	350	-36	126	129
319	350	-31	126	130
288	350	-62	126	131
363	343	20	127	131

340	343	-3	127	132
385	343	42	128	132
331	343	-12	128	133
361	343	18	129	133
333	343	-10	129	134
312	343	-31	129	135
298	343	-45	129	136
294	343	-49	129	137
300	343	-43	129	138
314	343	-29	129	139
319	343	-24	129	140
288	343	-55	129	141
340	363	-23	129	142
385	363	22	130	142
331	363	-32	130	143
361	363	-2	130	144
333	363	-30	130	145
312	363	-51	130	146
298	363	-65	130	147
294	363	-69	130	148
300	363	-63	130	149
314	363	-49	130	150
319	363	-44	130	151
288	363	-75	130	152
385	340	45	131	152
331	340	-9	131	153
361	340	21	132	153
333	340	-7	132	154
312	340	-28	132	155
298	340	-42	132	156
294	340	-46	132	157
300	340	-40	132	158
314	340	-26	132	159
319	340	-21	132	160
288	340	-52	132	161
331	385	-54	132	162
361	385	-24	132	163
333	385	-52	132	164
312	385	-73	132	165
298	385	-87	132	166
294	385	-91	132	167
300	385	-85	132	168
314	385	-71	132	169
319	385	-66	132	170
288	385	-97	132	171
361	331	30	133	171
333	331	2	134	171
312	331	-19	134	172
298	331	-33	134	173
294	331	-37	134	174
300	331	-31	134	175
314	331	-17	134	176
319	331	-12	134	177

288	331	-43	134	178
333	361	-28	134	179
312	361	-49	134	180
298	361	-63	134	181
294	361	-67	134	182
300	361	-61	134	183
314	361	-47	134	184
319	361	-42	134	185
288	361	-73	134	186
312	333	-21	134	187
298	333	-35	134	188
294	333	-39	134	189
300	333	-33	134	190
314	333	-19	134	191
319	333	-14	134	192
288	333	-45	134	193
298	312	-14	134	194
294	312	-18	134	195
300	312	-12	134	196
314	312	2	135	196
319	312	7	136	196
288	312	-24	136	197
294	298	-4	136	198
300	298	2	137	198
314	298	16	138	198
319	298	21	139	198
288	298	-10	139	199
300	294	6	140	199
314	294	20	141	199
319	294	25	142	199
288	294	-6	142	200
314	300	14	143	200
319	300	19	144	200
288	300	-12	144	201
319	314	5	145	201
288	314	-26	145	202
288	319	-31	145	203

S Statistic = 145 - 203 = -58

Tied Group Value	Members
1	440
2	205
3	340

Time Period	Observations
3/12/2008	1
5/10/2008	1

9/22/2008	1
10/28/2008	1
4/28/2009	1
5/14/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 54

B = 0

C = 0

D = 0

E = 6

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2298

Z-Score = -1.18905

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-1.18905 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-03D

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
220	200	20	1	0
440	200	240	2	0
480	200	280	3	0
446	200	246	4	0
440	200	240	5	0
205	200	5	6	0
187	200	-13	6	1
204	200	4	7	1
390	200	190	8	1
205	200	5	9	1
340	200	140	10	1
350	200	150	11	1
343	200	143	12	1
363	200	163	13	1
340	200	140	14	1
385	200	185	15	1
331	200	131	16	1
361	200	161	17	1
333	200	133	18	1
312	200	112	19	1
298	200	98	20	1
294	200	94	21	1
300	200	100	22	1
314	200	114	23	1
319	200	119	24	1
288	200	88	25	1
440	220	220	26	1
480	220	260	27	1
446	220	226	28	1
440	220	220	29	1
205	220	-15	29	2
187	220	-33	29	3
204	220	-16	29	4
390	220	170	30	4
205	220	-15	30	5
340	220	120	31	5
350	220	130	32	5
343	220	123	33	5
363	220	143	34	5
340	220	120	35	5
385	220	165	36	5
331	220	111	37	5
361	220	141	38	5
333	220	113	39	5
312	220	92	40	5

298	220	78	41	5
294	220	74	42	5
300	220	80	43	5
314	220	94	44	5
319	220	99	45	5
288	220	68	46	5
480	440	40	47	5
446	440	6	48	5
440	440	0	48	5
205	440	-235	48	6
187	440	-253	48	7
204	440	-236	48	8
390	440	-50	48	9
205	440	-235	48	10
340	440	-100	48	11
350	440	-90	48	12
343	440	-97	48	13
363	440	-77	48	14
340	440	-100	48	15
385	440	-55	48	16
331	440	-109	48	17
361	440	-79	48	18
333	440	-107	48	19
312	440	-128	48	20
298	440	-142	48	21
294	440	-146	48	22
300	440	-140	48	23
314	440	-126	48	24
319	440	-121	48	25
288	440	-152	48	26
446	480	-34	48	27
440	480	-40	48	28
205	480	-275	48	29
187	480	-293	48	30
204	480	-276	48	31
390	480	-90	48	32
205	480	-275	48	33
340	480	-140	48	34
350	480	-130	48	35
343	480	-137	48	36
363	480	-117	48	37
340	480	-140	48	38
385	480	-95	48	39
331	480	-149	48	40
361	480	-119	48	41
333	480	-147	48	42
312	480	-168	48	43
298	480	-182	48	44
294	480	-186	48	45
300	480	-180	48	46
314	480	-166	48	47
319	480	-161	48	48
288	480	-192	48	49
440	446	-6	48	50

205	446	-241	48	51
187	446	-259	48	52
204	446	-242	48	53
390	446	-56	48	54
205	446	-241	48	55
340	446	-106	48	56
350	446	-96	48	57
343	446	-103	48	58
363	446	-83	48	59
340	446	-106	48	60
385	446	-61	48	61
331	446	-115	48	62
361	446	-85	48	63
333	446	-113	48	64
312	446	-134	48	65
298	446	-148	48	66
294	446	-152	48	67
300	446	-146	48	68
314	446	-132	48	69
319	446	-127	48	70
288	446	-158	48	71
205	440	-235	48	72
187	440	-253	48	73
204	440	-236	48	74
390	440	-50	48	75
205	440	-235	48	76
340	440	-100	48	77
350	440	-90	48	78
343	440	-97	48	79
363	440	-77	48	80
340	440	-100	48	81
385	440	-55	48	82
331	440	-109	48	83
361	440	-79	48	84
333	440	-107	48	85
312	440	-128	48	86
298	440	-142	48	87
294	440	-146	48	88
300	440	-140	48	89
314	440	-126	48	90
319	440	-121	48	91
288	440	-152	48	92
187	205	-18	48	93
204	205	-1	48	94
390	205	185	49	94
205	205	0	49	94
340	205	135	50	94
350	205	145	51	94
343	205	138	52	94
363	205	158	53	94
340	205	135	54	94
385	205	180	55	94
331	205	126	56	94
361	205	156	57	94
333	205	128	58	94

312	205	107	59	94
298	205	93	60	94
294	205	89	61	94
300	205	95	62	94
314	205	109	63	94
319	205	114	64	94
288	205	83	65	94
204	187	17	66	94
390	187	203	67	94
205	187	18	68	94
340	187	153	69	94
350	187	163	70	94
343	187	156	71	94
363	187	176	72	94
340	187	153	73	94
385	187	198	74	94
331	187	144	75	94
361	187	174	76	94
333	187	146	77	94
312	187	125	78	94
298	187	111	79	94
294	187	107	80	94
300	187	113	81	94
314	187	127	82	94
319	187	132	83	94
288	187	101	84	94
390	204	186	85	94
205	204	1	86	94
340	204	136	87	94
350	204	146	88	94
343	204	139	89	94
363	204	159	90	94
340	204	136	91	94
385	204	181	92	94
331	204	127	93	94
361	204	157	94	94
333	204	129	95	94
312	204	108	96	94
298	204	94	97	94
294	204	90	98	94
300	204	96	99	94
314	204	110	100	94
319	204	115	101	94
288	204	84	102	94
205	390	-185	102	95
340	390	-50	102	96
350	390	-40	102	97
343	390	-47	102	98
363	390	-27	102	99
340	390	-50	102	100
385	390	-5	102	101
331	390	-59	102	102
361	390	-29	102	103
333	390	-57	102	104

312	390	-78	102	105
298	390	-92	102	106
294	390	-96	102	107
300	390	-90	102	108
314	390	-76	102	109
319	390	-71	102	110
288	390	-102	102	111
340	205	135	103	111
350	205	145	104	111
343	205	138	105	111
363	205	158	106	111
340	205	135	107	111
385	205	180	108	111
331	205	126	109	111
361	205	156	110	111
333	205	128	111	111
312	205	107	112	111
298	205	93	113	111
294	205	89	114	111
300	205	95	115	111
314	205	109	116	111
319	205	114	117	111
288	205	83	118	111
350	340	10	119	111
343	340	3	120	111
363	340	23	121	111
340	340	0	121	111
385	340	45	122	111
331	340	-9	122	112
361	340	21	123	112
333	340	-7	123	113
312	340	-28	123	114
298	340	-42	123	115
294	340	-46	123	116
300	340	-40	123	117
314	340	-26	123	118
319	340	-21	123	119
288	340	-52	123	120
343	350	-7	123	121
363	350	13	124	121
340	350	-10	124	122
385	350	35	125	122
331	350	-19	125	123
361	350	11	126	123
333	350	-17	126	124
312	350	-38	126	125
298	350	-52	126	126
294	350	-56	126	127
300	350	-50	126	128
314	350	-36	126	129
319	350	-31	126	130
288	350	-62	126	131
363	343	20	127	131

340	343	-3	127	132
385	343	42	128	132
331	343	-12	128	133
361	343	18	129	133
333	343	-10	129	134
312	343	-31	129	135
298	343	-45	129	136
294	343	-49	129	137
300	343	-43	129	138
314	343	-29	129	139
319	343	-24	129	140
288	343	-55	129	141
340	363	-23	129	142
385	363	22	130	142
331	363	-32	130	143
361	363	-2	130	144
333	363	-30	130	145
312	363	-51	130	146
298	363	-65	130	147
294	363	-69	130	148
300	363	-63	130	149
314	363	-49	130	150
319	363	-44	130	151
288	363	-75	130	152
385	340	45	131	152
331	340	-9	131	153
361	340	21	132	153
333	340	-7	132	154
312	340	-28	132	155
298	340	-42	132	156
294	340	-46	132	157
300	340	-40	132	158
314	340	-26	132	159
319	340	-21	132	160
288	340	-52	132	161
331	385	-54	132	162
361	385	-24	132	163
333	385	-52	132	164
312	385	-73	132	165
298	385	-87	132	166
294	385	-91	132	167
300	385	-85	132	168
314	385	-71	132	169
319	385	-66	132	170
288	385	-97	132	171
361	331	30	133	171
333	331	2	134	171
312	331	-19	134	172
298	331	-33	134	173
294	331	-37	134	174
300	331	-31	134	175
314	331	-17	134	176
319	331	-12	134	177

288	331	-43	134	178
333	361	-28	134	179
312	361	-49	134	180
298	361	-63	134	181
294	361	-67	134	182
300	361	-61	134	183
314	361	-47	134	184
319	361	-42	134	185
288	361	-73	134	186
312	333	-21	134	187
298	333	-35	134	188
294	333	-39	134	189
300	333	-33	134	190
314	333	-19	134	191
319	333	-14	134	192
288	333	-45	134	193
298	312	-14	134	194
294	312	-18	134	195
300	312	-12	134	196
314	312	2	135	196
319	312	7	136	196
288	312	-24	136	197
294	298	-4	136	198
300	298	2	137	198
314	298	16	138	198
319	298	21	139	198
288	298	-10	139	199
300	294	6	140	199
314	294	20	141	199
319	294	25	142	199
288	294	-6	142	200
314	300	14	143	200
319	300	19	144	200
288	300	-12	144	201
319	314	5	145	201
288	314	-26	145	202
288	319	-31	145	203

S Statistic = 145 - 203 = -58

Tied Group Value	Members
1	440
2	205
3	340

Time Period	Observations
3/12/2008	1
5/10/2008	1

9/22/2008	1
10/28/2008	1
4/28/2009	1
5/14/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 54

B = 0

C = 0

D = 0

E = 6

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2298

Z-Score = -1.18905

Comparison Level at 95% confidence level = 1.65463 (upward trend)

-1.18905 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-01D

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
6.7	5.3	1.4	1	0
7.2	5.3	1.9	2	0
7.8	5.3	2.5	3	0
7.6	5.3	2.3	4	0
7.2	5.3	1.9	5	0
6.5	5.3	1.2	6	0
7.8	5.3	2.5	7	0
8.3	5.3	3	8	0
8.5	5.3	3.2	9	0
7.5	5.3	2.2	10	0
7.4	5.3	2.1	11	0
7.6	5.3	2.3	12	0
9.6	5.3	4.3	13	0
7.6	5.3	2.3	14	0
6.9	5.3	1.6	15	0
5.9	5.3	0.6	16	0
6.1	5.3	0.8	17	0
7.4	5.3	2.1	18	0
6.2	5.3	0.9	19	0
5.7	5.3	0.4	20	0
6	5.3	0.7	21	0
6.1	5.3	0.8	22	0
25	5.3	19.7	23	0
5.49	5.3	0.19	24	0
4.2	5.3	-1.1	24	1
4.89	5.3	-0.41	24	2
7.2	6.7	0.5	25	2
7.8	6.7	1.1	26	2
7.6	6.7	0.9	27	2
7.2	6.7	0.5	28	2
6.5	6.7	-0.2	28	3
7.8	6.7	1.1	29	3
8.3	6.7	1.6	30	3
8.5	6.7	1.8	31	3
7.5	6.7	0.8	32	3
7.4	6.7	0.7	33	3
7.6	6.7	0.9	34	3
9.6	6.7	2.9	35	3
7.6	6.7	0.9	36	3
6.9	6.7	0.2	37	3
5.9	6.7	-0.8	37	4
6.1	6.7	-0.6	37	5
7.4	6.7	0.7	38	5
6.2	6.7	-0.5	38	6
5.7	6.7	-1	38	7

6	6.7	-0.7	38	8
6.1	6.7	-0.6	38	9
25	6.7	18.3	39	9
5.49	6.7	-1.21	39	10
4.2	6.7	-2.5	39	11
4.89	6.7	-1.81	39	12
7.8	7.2	0.6	40	12
7.6	7.2	0.4	41	12
7.2	7.2	0	41	12
6.5	7.2	-0.7	41	13
7.8	7.2	0.6	42	13
8.3	7.2	1.1	43	13
8.5	7.2	1.3	44	13
7.5	7.2	0.3	45	13
7.4	7.2	0.2	46	13
7.6	7.2	0.4	47	13
9.6	7.2	2.4	48	13
7.6	7.2	0.4	49	13
6.9	7.2	-0.3	49	14
5.9	7.2	-1.3	49	15
6.1	7.2	-1.1	49	16
7.4	7.2	0.2	50	16
6.2	7.2	-1	50	17
5.7	7.2	-1.5	50	18
6	7.2	-1.2	50	19
6.1	7.2	-1.1	50	20
25	7.2	17.8	51	20
5.49	7.2	-1.71	51	21
4.2	7.2	-3	51	22
4.89	7.2	-2.31	51	23
7.6	7.8	-0.2	51	24
7.2	7.8	-0.6	51	25
6.5	7.8	-1.3	51	26
7.8	7.8	0	51	26
8.3	7.8	0.5	52	26
8.5	7.8	0.7	53	26
7.5	7.8	-0.3	53	27
7.4	7.8	-0.4	53	28
7.6	7.8	-0.2	53	29
9.6	7.8	1.8	54	29
7.6	7.8	-0.2	54	30
6.9	7.8	-0.9	54	31
5.9	7.8	-1.9	54	32
6.1	7.8	-1.7	54	33
7.4	7.8	-0.4	54	34
6.2	7.8	-1.6	54	35
5.7	7.8	-2.1	54	36
6	7.8	-1.8	54	37
6.1	7.8	-1.7	54	38
25	7.8	17.2	55	38
5.49	7.8	-2.31	55	39
4.2	7.8	-3.6	55	40
4.89	7.8	-2.91	55	41
7.2	7.6	-0.4	55	42

6.5	7.6	-1.1	55	43
7.8	7.6	0.2	56	43
8.3	7.6	0.7	57	43
8.5	7.6	0.9	58	43
7.5	7.6	-0.1	58	44
7.4	7.6	-0.2	58	45
7.6	7.6	0	58	45
9.6	7.6	2	59	45
7.6	7.6	0	59	45
6.9	7.6	-0.7	59	46
5.9	7.6	-1.7	59	47
6.1	7.6	-1.5	59	48
7.4	7.6	-0.2	59	49
6.2	7.6	-1.4	59	50
5.7	7.6	-1.9	59	51
6	7.6	-1.6	59	52
6.1	7.6	-1.5	59	53
25	7.6	17.4	60	53
5.49	7.6	-2.11	60	54
4.2	7.6	-3.4	60	55
4.89	7.6	-2.71	60	56
6.5	7.2	-0.7	60	57
7.8	7.2	0.6	61	57
8.3	7.2	1.1	62	57
8.5	7.2	1.3	63	57
7.5	7.2	0.3	64	57
7.4	7.2	0.2	65	57
7.6	7.2	0.4	66	57
9.6	7.2	2.4	67	57
7.6	7.2	0.4	68	57
6.9	7.2	-0.3	68	58
5.9	7.2	-1.3	68	59
6.1	7.2	-1.1	68	60
7.4	7.2	0.2	69	60
6.2	7.2	-1	69	61
5.7	7.2	-1.5	69	62
6	7.2	-1.2	69	63
6.1	7.2	-1.1	69	64
25	7.2	17.8	70	64
5.49	7.2	-1.71	70	65
4.2	7.2	-3	70	66
4.89	7.2	-2.31	70	67
7.8	6.5	1.3	71	67
8.3	6.5	1.8	72	67
8.5	6.5	2	73	67
7.5	6.5	1	74	67
7.4	6.5	0.9	75	67
7.6	6.5	1.1	76	67
9.6	6.5	3.1	77	67
7.6	6.5	1.1	78	67
6.9	6.5	0.4	79	67
5.9	6.5	-0.6	79	68
6.1	6.5	-0.4	79	69
7.4	6.5	0.9	80	69
6.2	6.5	-0.3	80	70

5.7	6.5	-0.8	80	71
6	6.5	-0.5	80	72
6.1	6.5	-0.4	80	73
25	6.5	18.5	81	73
5.49	6.5	-1.01	81	74
4.2	6.5	-2.3	81	75
4.89	6.5	-1.61	81	76
8.3	7.8	0.5	82	76
8.5	7.8	0.7	83	76
7.5	7.8	-0.3	83	77
7.4	7.8	-0.4	83	78
7.6	7.8	-0.2	83	79
9.6	7.8	1.8	84	79
7.6	7.8	-0.2	84	80
6.9	7.8	-0.9	84	81
5.9	7.8	-1.9	84	82
6.1	7.8	-1.7	84	83
7.4	7.8	-0.4	84	84
6.2	7.8	-1.6	84	85
5.7	7.8	-2.1	84	86
6	7.8	-1.8	84	87
6.1	7.8	-1.7	84	88
25	7.8	17.2	85	88
5.49	7.8	-2.31	85	89
4.2	7.8	-3.6	85	90
4.89	7.8	-2.91	85	91
8.5	8.3	0.2	86	91
7.5	8.3	-0.8	86	92
7.4	8.3	-0.9	86	93
7.6	8.3	-0.7	86	94
9.6	8.3	1.3	87	94
7.6	8.3	-0.7	87	95
6.9	8.3	-1.4	87	96
5.9	8.3	-2.4	87	97
6.1	8.3	-2.2	87	98
7.4	8.3	-0.9	87	99
6.2	8.3	-2.1	87	100
5.7	8.3	-2.6	87	101
6	8.3	-2.3	87	102
6.1	8.3	-2.2	87	103
25	8.3	16.7	88	103
5.49	8.3	-2.81	88	104
4.2	8.3	-4.1	88	105
4.89	8.3	-3.41	88	106
7.5	8.5	-1	88	107
7.4	8.5	-1.1	88	108
7.6	8.5	-0.9	88	109
9.6	8.5	1.1	89	109
7.6	8.5	-0.9	89	110
6.9	8.5	-1.6	89	111
5.9	8.5	-2.6	89	112
6.1	8.5	-2.4	89	113
7.4	8.5	-1.1	89	114
6.2	8.5	-2.3	89	115

5.7	8.5	-2.8	89	116
6	8.5	-2.5	89	117
6.1	8.5	-2.4	89	118
25	8.5	16.5	90	118
5.49	8.5	-3.01	90	119
4.2	8.5	-4.3	90	120
4.89	8.5	-3.61	90	121
7.4	7.5	-0.1	90	122
7.6	7.5	0.1	91	122
9.6	7.5	2.1	92	122
7.6	7.5	0.1	93	122
6.9	7.5	-0.6	93	123
5.9	7.5	-1.6	93	124
6.1	7.5	-1.4	93	125
7.4	7.5	-0.1	93	126
6.2	7.5	-1.3	93	127
5.7	7.5	-1.8	93	128
6	7.5	-1.5	93	129
6.1	7.5	-1.4	93	130
25	7.5	17.5	94	130
5.49	7.5	-2.01	94	131
4.2	7.5	-3.3	94	132
4.89	7.5	-2.61	94	133
7.6	7.4	0.2	95	133
9.6	7.4	2.2	96	133
7.6	7.4	0.2	97	133
6.9	7.4	-0.5	97	134
5.9	7.4	-1.5	97	135
6.1	7.4	-1.3	97	136
7.4	7.4	0	97	136
6.2	7.4	-1.2	97	137
5.7	7.4	-1.7	97	138
6	7.4	-1.4	97	139
6.1	7.4	-1.3	97	140
25	7.4	17.6	98	140
5.49	7.4	-1.91	98	141
4.2	7.4	-3.2	98	142
4.89	7.4	-2.51	98	143
9.6	7.6	2	99	143
7.6	7.6	0	99	143
6.9	7.6	-0.7	99	144
5.9	7.6	-1.7	99	145
6.1	7.6	-1.5	99	146
7.4	7.6	-0.2	99	147
6.2	7.6	-1.4	99	148
5.7	7.6	-1.9	99	149
6	7.6	-1.6	99	150
6.1	7.6	-1.5	99	151
25	7.6	17.4	100	151
5.49	7.6	-2.11	100	152
4.2	7.6	-3.4	100	153
4.89	7.6	-2.71	100	154
7.6	9.6	-2	100	155

6.9	9.6	-2.7	100	156
5.9	9.6	-3.7	100	157
6.1	9.6	-3.5	100	158
7.4	9.6	-2.2	100	159
6.2	9.6	-3.4	100	160
5.7	9.6	-3.9	100	161
6	9.6	-3.6	100	162
6.1	9.6	-3.5	100	163
25	9.6	15.4	101	163
5.49	9.6	-4.11	101	164
4.2	9.6	-5.4	101	165
4.89	9.6	-4.71	101	166
6.9	7.6	-0.7	101	167
5.9	7.6	-1.7	101	168
6.1	7.6	-1.5	101	169
7.4	7.6	-0.2	101	170
6.2	7.6	-1.4	101	171
5.7	7.6	-1.9	101	172
6	7.6	-1.6	101	173
6.1	7.6	-1.5	101	174
25	7.6	17.4	102	174
5.49	7.6	-2.11	102	175
4.2	7.6	-3.4	102	176
4.89	7.6	-2.71	102	177
5.9	6.9	-1	102	178
6.1	6.9	-0.8	102	179
7.4	6.9	0.5	103	179
6.2	6.9	-0.7	103	180
5.7	6.9	-1.2	103	181
6	6.9	-0.9	103	182
6.1	6.9	-0.8	103	183
25	6.9	18.1	104	183
5.49	6.9	-1.41	104	184
4.2	6.9	-2.7	104	185
4.89	6.9	-2.01	104	186
6.1	5.9	0.2	105	186
7.4	5.9	1.5	106	186
6.2	5.9	0.3	107	186
5.7	5.9	-0.2	107	187
6	5.9	0.1	108	187
6.1	5.9	0.2	109	187
25	5.9	19.1	110	187
5.49	5.9	-0.41	110	188
4.2	5.9	-1.7	110	189
4.89	5.9	-1.01	110	190
7.4	6.1	1.3	111	190
6.2	6.1	0.1	112	190
5.7	6.1	-0.4	112	191
6	6.1	-0.1	112	192
6.1	6.1	0	112	192
25	6.1	18.9	113	192
5.49	6.1	-0.61	113	193
4.2	6.1	-1.9	113	194

4.89	6.1	-1.21	113	195
6.2	7.4	-1.2	113	196
5.7	7.4	-1.7	113	197
6	7.4	-1.4	113	198
6.1	7.4	-1.3	113	199
25	7.4	17.6	114	199
5.49	7.4	-1.91	114	200
4.2	7.4	-3.2	114	201
4.89	7.4	-2.51	114	202
5.7	6.2	-0.5	114	203
6	6.2	-0.2	114	204
6.1	6.2	-0.1	114	205
25	6.2	18.8	115	205
5.49	6.2	-0.71	115	206
4.2	6.2	-2	115	207
4.89	6.2	-1.31	115	208
6	5.7	0.3	116	208
6.1	5.7	0.4	117	208
25	5.7	19.3	118	208
5.49	5.7	-0.21	118	209
4.2	5.7	-1.5	118	210
4.89	5.7	-0.81	118	211
6.1	6	0.1	119	211
25	6	19	120	211
5.49	6	-0.51	120	212
4.2	6	-1.8	120	213
4.89	6	-1.11	120	214
25	6.1	18.9	121	214
5.49	6.1	-0.61	121	215
4.2	6.1	-1.9	121	216
4.89	6.1	-1.21	121	217
5.49	25	-19.51	121	218
4.2	25	-20.8	121	219
4.89	25	-20.11	121	220
4.2	5.49	-1.29	121	221
4.89	5.49	-0.6	121	222
4.89	4.2	0.69	122	222

S Statistic = 122 - 222 = -100

Tied Group Value	Members
1	7.2
2	7.8
3	7.6
4	7.4
5	6.1

Time Period	Observations
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3/11/2008	1
5/13/2008	1
9/23/2008	1
10/29/2008	1
4/29/2009	1
5/13/2009	1
9/29/2009	1
12/9/2009	1
2/26/2010	1
4/15/2010	1
8/10/2010	1
11/22/2010	1
3/10/2011	1
5/25/2011	1
9/2/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 138

B = 0

C = 6

D = 0

E = 14

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2293.33

Z-Score = -2.06729

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-2.06729 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-02D

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
220	230	-10	0	1
230	230	0	0	1
240	230	10	1	1
160	230	-70	1	2
222	230	-8	1	3
157	230	-73	1	4
170	230	-60	1	5
165	230	-65	1	6
208	230	-22	1	7
165	230	-65	1	8
118	230	-112	1	9
196	230	-34	1	10
205	230	-25	1	11
199	230	-31	1	12
135	230	-95	1	13
212	230	-18	1	14
214	230	-16	1	15
214	230	-16	1	16
197	230	-33	1	17
179	230	-51	1	18
193	230	-37	1	19
173	230	-57	1	20
181	230	-49	1	21
500	230	270	2	21
162	230	-68	2	22
132	230	-98	2	23
230	220	10	3	23
240	220	20	4	23
160	220	-60	4	24
222	220	2	5	24
157	220	-63	5	25
170	220	-50	5	26
165	220	-55	5	27
208	220	-12	5	28
165	220	-55	5	29
118	220	-102	5	30
196	220	-24	5	31
205	220	-15	5	32
199	220	-21	5	33
135	220	-85	5	34
212	220	-8	5	35
214	220	-6	5	36
214	220	-6	5	37
197	220	-23	5	38
179	220	-41	5	39

193	220	-27	5	40
173	220	-47	5	41
181	220	-39	5	42
500	220	280	6	42
162	220	-58	6	43
132	220	-88	6	44
240	230	10	7	44
160	230	-70	7	45
222	230	-8	7	46
157	230	-73	7	47
170	230	-60	7	48
165	230	-65	7	49
208	230	-22	7	50
165	230	-65	7	51
118	230	-112	7	52
196	230	-34	7	53
205	230	-25	7	54
199	230	-31	7	55
135	230	-95	7	56
212	230	-18	7	57
214	230	-16	7	58
214	230	-16	7	59
197	230	-33	7	60
179	230	-51	7	61
193	230	-37	7	62
173	230	-57	7	63
181	230	-49	7	64
500	230	270	8	64
162	230	-68	8	65
132	230	-98	8	66
160	240	-80	8	67
222	240	-18	8	68
157	240	-83	8	69
170	240	-70	8	70
165	240	-75	8	71
208	240	-32	8	72
165	240	-75	8	73
118	240	-122	8	74
196	240	-44	8	75
205	240	-35	8	76
199	240	-41	8	77
135	240	-105	8	78
212	240	-28	8	79
214	240	-26	8	80
214	240	-26	8	81
197	240	-43	8	82
179	240	-61	8	83
193	240	-47	8	84
173	240	-67	8	85
181	240	-59	8	86
500	240	260	9	86
162	240	-78	9	87
132	240	-108	9	88
222	160	62	10	88

157	160	-3	10	89
170	160	10	11	89
165	160	5	12	89
208	160	48	13	89
165	160	5	14	89
118	160	-42	14	90
196	160	36	15	90
205	160	45	16	90
199	160	39	17	90
135	160	-25	17	91
212	160	52	18	91
214	160	54	19	91
214	160	54	20	91
197	160	37	21	91
179	160	19	22	91
193	160	33	23	91
173	160	13	24	91
181	160	21	25	91
500	160	340	26	91
162	160	2	27	91
132	160	-28	27	92
157	222	-65	27	93
170	222	-52	27	94
165	222	-57	27	95
208	222	-14	27	96
165	222	-57	27	97
118	222	-104	27	98
196	222	-26	27	99
205	222	-17	27	100
199	222	-23	27	101
135	222	-87	27	102
212	222	-10	27	103
214	222	-8	27	104
214	222	-8	27	105
197	222	-25	27	106
179	222	-43	27	107
193	222	-29	27	108
173	222	-49	27	109
181	222	-41	27	110
500	222	278	28	110
162	222	-60	28	111
132	222	-90	28	112
170	157	13	29	112
165	157	8	30	112
208	157	51	31	112
165	157	8	32	112
118	157	-39	32	113
196	157	39	33	113
205	157	48	34	113
199	157	42	35	113
135	157	-22	35	114
212	157	55	36	114
214	157	57	37	114
214	157	57	38	114
197	157	40	39	114

179	157	22	40	114
193	157	36	41	114
173	157	16	42	114
181	157	24	43	114
500	157	343	44	114
162	157	5	45	114
132	157	-25	45	115
165	170	-5	45	116
208	170	38	46	116
165	170	-5	46	117
118	170	-52	46	118
196	170	26	47	118
205	170	35	48	118
199	170	29	49	118
135	170	-35	49	119
212	170	42	50	119
214	170	44	51	119
214	170	44	52	119
197	170	27	53	119
179	170	9	54	119
193	170	23	55	119
173	170	3	56	119
181	170	11	57	119
500	170	330	58	119
162	170	-8	58	120
132	170	-38	58	121
208	165	43	59	121
165	165	0	59	121
118	165	-47	59	122
196	165	31	60	122
205	165	40	61	122
199	165	34	62	122
135	165	-30	62	123
212	165	47	63	123
214	165	49	64	123
214	165	49	65	123
197	165	32	66	123
179	165	14	67	123
193	165	28	68	123
173	165	8	69	123
181	165	16	70	123
500	165	335	71	123
162	165	-3	71	124
132	165	-33	71	125
165	208	-43	71	126
118	208	-90	71	127
196	208	-12	71	128
205	208	-3	71	129
199	208	-9	71	130
135	208	-73	71	131
212	208	4	72	131
214	208	6	73	131
214	208	6	74	131
197	208	-11	74	132

179	208	-29	74	133
193	208	-15	74	134
173	208	-35	74	135
181	208	-27	74	136
500	208	292	75	136
162	208	-46	75	137
132	208	-76	75	138
118	165	-47	75	139
196	165	31	76	139
205	165	40	77	139
199	165	34	78	139
135	165	-30	78	140
212	165	47	79	140
214	165	49	80	140
214	165	49	81	140
197	165	32	82	140
179	165	14	83	140
193	165	28	84	140
173	165	8	85	140
181	165	16	86	140
500	165	335	87	140
162	165	-3	87	141
132	165	-33	87	142
196	118	78	88	142
205	118	87	89	142
199	118	81	90	142
135	118	17	91	142
212	118	94	92	142
214	118	96	93	142
214	118	96	94	142
197	118	79	95	142
179	118	61	96	142
193	118	75	97	142
173	118	55	98	142
181	118	63	99	142
500	118	382	100	142
162	118	44	101	142
132	118	14	102	142
205	196	9	103	142
199	196	3	104	142
135	196	-61	104	143
212	196	16	105	143
214	196	18	106	143
214	196	18	107	143
197	196	1	108	143
179	196	-17	108	144
193	196	-3	108	145
173	196	-23	108	146
181	196	-15	108	147
500	196	304	109	147
162	196	-34	109	148
132	196	-64	109	149
199	205	-6	109	150

135	205	-70	109	151
212	205	7	110	151
214	205	9	111	151
214	205	9	112	151
197	205	-8	112	152
179	205	-26	112	153
193	205	-12	112	154
173	205	-32	112	155
181	205	-24	112	156
500	205	295	113	156
162	205	-43	113	157
132	205	-73	113	158
135	199	-64	113	159
212	199	13	114	159
214	199	15	115	159
214	199	15	116	159
197	199	-2	116	160
179	199	-20	116	161
193	199	-6	116	162
173	199	-26	116	163
181	199	-18	116	164
500	199	301	117	164
162	199	-37	117	165
132	199	-67	117	166
212	135	77	118	166
214	135	79	119	166
214	135	79	120	166
197	135	62	121	166
179	135	44	122	166
193	135	58	123	166
173	135	38	124	166
181	135	46	125	166
500	135	365	126	166
162	135	27	127	166
132	135	-3	127	167
214	212	2	128	167
214	212	2	129	167
197	212	-15	129	168
179	212	-33	129	169
193	212	-19	129	170
173	212	-39	129	171
181	212	-31	129	172
500	212	288	130	172
162	212	-50	130	173
132	212	-80	130	174
214	214	0	130	174
197	214	-17	130	175
179	214	-35	130	176
193	214	-21	130	177
173	214	-41	130	178
181	214	-33	130	179
500	214	286	131	179
162	214	-52	131	180

132	214	-82	131	181
197	214	-17	131	182
179	214	-35	131	183
193	214	-21	131	184
173	214	-41	131	185
181	214	-33	131	186
500	214	286	132	186
162	214	-52	132	187
132	214	-82	132	188
179	197	-18	132	189
193	197	-4	132	190
173	197	-24	132	191
181	197	-16	132	192
500	197	303	133	192
162	197	-35	133	193
132	197	-65	133	194
193	179	14	134	194
173	179	-6	134	195
181	179	2	135	195
500	179	321	136	195
162	179	-17	136	196
132	179	-47	136	197
173	193	-20	136	198
181	193	-12	136	199
500	193	307	137	199
162	193	-31	137	200
132	193	-61	137	201
181	173	8	138	201
500	173	327	139	201
162	173	-11	139	202
132	173	-41	139	203
500	181	319	140	203
162	181	-19	140	204
132	181	-49	140	205
162	500	-338	140	206
132	500	-368	140	207
132	162	-30	140	208

S Statistic = 140 - 208 = -68

Tied Group Value	Members
1	230
2	165
3	214

Time Period	Observations
3/12/2008	1
5/12/2008	1

9/23/2008	1
12/3/2008	1
4/28/2009	1
5/14/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/14/2010	1
8/12/2010	1
11/24/2010	1
3/8/2011	1
5/24/2011	1
9/1/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 54

B = 0

C = 0

D = 0

E = 6

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2298

Z-Score = -1.39765

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-1.39765 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-02D

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
220	230	-10	0	1
230	230	0	0	1
240	230	10	1	1
160	230	-70	1	2
222	230	-8	1	3
157	230	-73	1	4
170	230	-60	1	5
165	230	-65	1	6
208	230	-22	1	7
165	230	-65	1	8
118	230	-112	1	9
196	230	-34	1	10
205	230	-25	1	11
199	230	-31	1	12
135	230	-95	1	13
212	230	-18	1	14
214	230	-16	1	15
214	230	-16	1	16
197	230	-33	1	17
179	230	-51	1	18
193	230	-37	1	19
173	230	-57	1	20
181	230	-49	1	21
500	230	270	2	21
162	230	-68	2	22
132	230	-98	2	23
230	220	10	3	23
240	220	20	4	23
160	220	-60	4	24
222	220	2	5	24
157	220	-63	5	25
170	220	-50	5	26
165	220	-55	5	27
208	220	-12	5	28
165	220	-55	5	29
118	220	-102	5	30
196	220	-24	5	31
205	220	-15	5	32
199	220	-21	5	33
135	220	-85	5	34
212	220	-8	5	35
214	220	-6	5	36
214	220	-6	5	37
197	220	-23	5	38
179	220	-41	5	39

193	220	-27	5	40
173	220	-47	5	41
181	220	-39	5	42
500	220	280	6	42
162	220	-58	6	43
132	220	-88	6	44
240	230	10	7	44
160	230	-70	7	45
222	230	-8	7	46
157	230	-73	7	47
170	230	-60	7	48
165	230	-65	7	49
208	230	-22	7	50
165	230	-65	7	51
118	230	-112	7	52
196	230	-34	7	53
205	230	-25	7	54
199	230	-31	7	55
135	230	-95	7	56
212	230	-18	7	57
214	230	-16	7	58
214	230	-16	7	59
197	230	-33	7	60
179	230	-51	7	61
193	230	-37	7	62
173	230	-57	7	63
181	230	-49	7	64
500	230	270	8	64
162	230	-68	8	65
132	230	-98	8	66
160	240	-80	8	67
222	240	-18	8	68
157	240	-83	8	69
170	240	-70	8	70
165	240	-75	8	71
208	240	-32	8	72
165	240	-75	8	73
118	240	-122	8	74
196	240	-44	8	75
205	240	-35	8	76
199	240	-41	8	77
135	240	-105	8	78
212	240	-28	8	79
214	240	-26	8	80
214	240	-26	8	81
197	240	-43	8	82
179	240	-61	8	83
193	240	-47	8	84
173	240	-67	8	85
181	240	-59	8	86
500	240	260	9	86
162	240	-78	9	87
132	240	-108	9	88
222	160	62	10	88

157	160	-3	10	89
170	160	10	11	89
165	160	5	12	89
208	160	48	13	89
165	160	5	14	89
118	160	-42	14	90
196	160	36	15	90
205	160	45	16	90
199	160	39	17	90
135	160	-25	17	91
212	160	52	18	91
214	160	54	19	91
214	160	54	20	91
197	160	37	21	91
179	160	19	22	91
193	160	33	23	91
173	160	13	24	91
181	160	21	25	91
500	160	340	26	91
162	160	2	27	91
132	160	-28	27	92
157	222	-65	27	93
170	222	-52	27	94
165	222	-57	27	95
208	222	-14	27	96
165	222	-57	27	97
118	222	-104	27	98
196	222	-26	27	99
205	222	-17	27	100
199	222	-23	27	101
135	222	-87	27	102
212	222	-10	27	103
214	222	-8	27	104
214	222	-8	27	105
197	222	-25	27	106
179	222	-43	27	107
193	222	-29	27	108
173	222	-49	27	109
181	222	-41	27	110
500	222	278	28	110
162	222	-60	28	111
132	222	-90	28	112
170	157	13	29	112
165	157	8	30	112
208	157	51	31	112
165	157	8	32	112
118	157	-39	32	113
196	157	39	33	113
205	157	48	34	113
199	157	42	35	113
135	157	-22	35	114
212	157	55	36	114
214	157	57	37	114
214	157	57	38	114
197	157	40	39	114

179	157	22	40	114
193	157	36	41	114
173	157	16	42	114
181	157	24	43	114
500	157	343	44	114
162	157	5	45	114
132	157	-25	45	115
165	170	-5	45	116
208	170	38	46	116
165	170	-5	46	117
118	170	-52	46	118
196	170	26	47	118
205	170	35	48	118
199	170	29	49	118
135	170	-35	49	119
212	170	42	50	119
214	170	44	51	119
214	170	44	52	119
197	170	27	53	119
179	170	9	54	119
193	170	23	55	119
173	170	3	56	119
181	170	11	57	119
500	170	330	58	119
162	170	-8	58	120
132	170	-38	58	121
208	165	43	59	121
165	165	0	59	121
118	165	-47	59	122
196	165	31	60	122
205	165	40	61	122
199	165	34	62	122
135	165	-30	62	123
212	165	47	63	123
214	165	49	64	123
214	165	49	65	123
197	165	32	66	123
179	165	14	67	123
193	165	28	68	123
173	165	8	69	123
181	165	16	70	123
500	165	335	71	123
162	165	-3	71	124
132	165	-33	71	125
165	208	-43	71	126
118	208	-90	71	127
196	208	-12	71	128
205	208	-3	71	129
199	208	-9	71	130
135	208	-73	71	131
212	208	4	72	131
214	208	6	73	131
214	208	6	74	131
197	208	-11	74	132

179	208	-29	74	133
193	208	-15	74	134
173	208	-35	74	135
181	208	-27	74	136
500	208	292	75	136
162	208	-46	75	137
132	208	-76	75	138
118	165	-47	75	139
196	165	31	76	139
205	165	40	77	139
199	165	34	78	139
135	165	-30	78	140
212	165	47	79	140
214	165	49	80	140
214	165	49	81	140
197	165	32	82	140
179	165	14	83	140
193	165	28	84	140
173	165	8	85	140
181	165	16	86	140
500	165	335	87	140
162	165	-3	87	141
132	165	-33	87	142
196	118	78	88	142
205	118	87	89	142
199	118	81	90	142
135	118	17	91	142
212	118	94	92	142
214	118	96	93	142
214	118	96	94	142
197	118	79	95	142
179	118	61	96	142
193	118	75	97	142
173	118	55	98	142
181	118	63	99	142
500	118	382	100	142
162	118	44	101	142
132	118	14	102	142
205	196	9	103	142
199	196	3	104	142
135	196	-61	104	143
212	196	16	105	143
214	196	18	106	143
214	196	18	107	143
197	196	1	108	143
179	196	-17	108	144
193	196	-3	108	145
173	196	-23	108	146
181	196	-15	108	147
500	196	304	109	147
162	196	-34	109	148
132	196	-64	109	149
199	205	-6	109	150

135	205	-70	109	151
212	205	7	110	151
214	205	9	111	151
214	205	9	112	151
197	205	-8	112	152
179	205	-26	112	153
193	205	-12	112	154
173	205	-32	112	155
181	205	-24	112	156
500	205	295	113	156
162	205	-43	113	157
132	205	-73	113	158
135	199	-64	113	159
212	199	13	114	159
214	199	15	115	159
214	199	15	116	159
197	199	-2	116	160
179	199	-20	116	161
193	199	-6	116	162
173	199	-26	116	163
181	199	-18	116	164
500	199	301	117	164
162	199	-37	117	165
132	199	-67	117	166
212	135	77	118	166
214	135	79	119	166
214	135	79	120	166
197	135	62	121	166
179	135	44	122	166
193	135	58	123	166
173	135	38	124	166
181	135	46	125	166
500	135	365	126	166
162	135	27	127	166
132	135	-3	127	167
214	212	2	128	167
214	212	2	129	167
197	212	-15	129	168
179	212	-33	129	169
193	212	-19	129	170
173	212	-39	129	171
181	212	-31	129	172
500	212	288	130	172
162	212	-50	130	173
132	212	-80	130	174
214	214	0	130	174
197	214	-17	130	175
179	214	-35	130	176
193	214	-21	130	177
173	214	-41	130	178
181	214	-33	130	179
500	214	286	131	179
162	214	-52	131	180

132	214	-82	131	181
197	214	-17	131	182
179	214	-35	131	183
193	214	-21	131	184
173	214	-41	131	185
181	214	-33	131	186
500	214	286	132	186
162	214	-52	132	187
132	214	-82	132	188
179	197	-18	132	189
193	197	-4	132	190
173	197	-24	132	191
181	197	-16	132	192
500	197	303	133	192
162	197	-35	133	193
132	197	-65	133	194
193	179	14	134	194
173	179	-6	134	195
181	179	2	135	195
500	179	321	136	195
162	179	-17	136	196
132	179	-47	136	197
173	193	-20	136	198
181	193	-12	136	199
500	193	307	137	199
162	193	-31	137	200
132	193	-61	137	201
181	173	8	138	201
500	173	327	139	201
162	173	-11	139	202
132	173	-41	139	203
500	181	319	140	203
162	181	-19	140	204
132	181	-49	140	205
162	500	-338	140	206
132	500	-368	140	207
132	162	-30	140	208

S Statistic = 140 - 208 = -68

Tied Group Value	Members
1	230
2	165
3	214

Time Period	Observations
3/12/2008	1
5/12/2008	1

9/23/2008	1
12/3/2008	1
4/28/2009	1
5/14/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/14/2010	1
8/12/2010	1
11/24/2010	1
3/8/2011	1
5/24/2011	1
9/1/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 54

B = 0

C = 0

D = 0

E = 6

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2298

Z-Score = -1.39765

Comparison Level at 95% confidence level = 1.65463 (upward trend)

-1.39765 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-03D

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
220	200	20	1	0
440	200	240	2	0
480	200	280	3	0
446	200	246	4	0
440	200	240	5	0
205	200	5	6	0
187	200	-13	6	1
204	200	4	7	1
390	200	190	8	1
205	200	5	9	1
340	200	140	10	1
350	200	150	11	1
343	200	143	12	1
363	200	163	13	1
340	200	140	14	1
385	200	185	15	1
331	200	131	16	1
361	200	161	17	1
333	200	133	18	1
312	200	112	19	1
298	200	98	20	1
294	200	94	21	1
300	200	100	22	1
314	200	114	23	1
319	200	119	24	1
288	200	88	25	1
440	220	220	26	1
480	220	260	27	1
446	220	226	28	1
440	220	220	29	1
205	220	-15	29	2
187	220	-33	29	3
204	220	-16	29	4
390	220	170	30	4
205	220	-15	30	5
340	220	120	31	5
350	220	130	32	5
343	220	123	33	5
363	220	143	34	5
340	220	120	35	5
385	220	165	36	5
331	220	111	37	5
361	220	141	38	5
333	220	113	39	5
312	220	92	40	5

298	220	78	41	5
294	220	74	42	5
300	220	80	43	5
314	220	94	44	5
319	220	99	45	5
288	220	68	46	5
480	440	40	47	5
446	440	6	48	5
440	440	0	48	5
205	440	-235	48	6
187	440	-253	48	7
204	440	-236	48	8
390	440	-50	48	9
205	440	-235	48	10
340	440	-100	48	11
350	440	-90	48	12
343	440	-97	48	13
363	440	-77	48	14
340	440	-100	48	15
385	440	-55	48	16
331	440	-109	48	17
361	440	-79	48	18
333	440	-107	48	19
312	440	-128	48	20
298	440	-142	48	21
294	440	-146	48	22
300	440	-140	48	23
314	440	-126	48	24
319	440	-121	48	25
288	440	-152	48	26
446	480	-34	48	27
440	480	-40	48	28
205	480	-275	48	29
187	480	-293	48	30
204	480	-276	48	31
390	480	-90	48	32
205	480	-275	48	33
340	480	-140	48	34
350	480	-130	48	35
343	480	-137	48	36
363	480	-117	48	37
340	480	-140	48	38
385	480	-95	48	39
331	480	-149	48	40
361	480	-119	48	41
333	480	-147	48	42
312	480	-168	48	43
298	480	-182	48	44
294	480	-186	48	45
300	480	-180	48	46
314	480	-166	48	47
319	480	-161	48	48
288	480	-192	48	49
440	446	-6	48	50

205	446	-241	48	51
187	446	-259	48	52
204	446	-242	48	53
390	446	-56	48	54
205	446	-241	48	55
340	446	-106	48	56
350	446	-96	48	57
343	446	-103	48	58
363	446	-83	48	59
340	446	-106	48	60
385	446	-61	48	61
331	446	-115	48	62
361	446	-85	48	63
333	446	-113	48	64
312	446	-134	48	65
298	446	-148	48	66
294	446	-152	48	67
300	446	-146	48	68
314	446	-132	48	69
319	446	-127	48	70
288	446	-158	48	71
205	440	-235	48	72
187	440	-253	48	73
204	440	-236	48	74
390	440	-50	48	75
205	440	-235	48	76
340	440	-100	48	77
350	440	-90	48	78
343	440	-97	48	79
363	440	-77	48	80
340	440	-100	48	81
385	440	-55	48	82
331	440	-109	48	83
361	440	-79	48	84
333	440	-107	48	85
312	440	-128	48	86
298	440	-142	48	87
294	440	-146	48	88
300	440	-140	48	89
314	440	-126	48	90
319	440	-121	48	91
288	440	-152	48	92
187	205	-18	48	93
204	205	-1	48	94
390	205	185	49	94
205	205	0	49	94
340	205	135	50	94
350	205	145	51	94
343	205	138	52	94
363	205	158	53	94
340	205	135	54	94
385	205	180	55	94
331	205	126	56	94
361	205	156	57	94
333	205	128	58	94

312	205	107	59	94
298	205	93	60	94
294	205	89	61	94
300	205	95	62	94
314	205	109	63	94
319	205	114	64	94
288	205	83	65	94
204	187	17	66	94
390	187	203	67	94
205	187	18	68	94
340	187	153	69	94
350	187	163	70	94
343	187	156	71	94
363	187	176	72	94
340	187	153	73	94
385	187	198	74	94
331	187	144	75	94
361	187	174	76	94
333	187	146	77	94
312	187	125	78	94
298	187	111	79	94
294	187	107	80	94
300	187	113	81	94
314	187	127	82	94
319	187	132	83	94
288	187	101	84	94
390	204	186	85	94
205	204	1	86	94
340	204	136	87	94
350	204	146	88	94
343	204	139	89	94
363	204	159	90	94
340	204	136	91	94
385	204	181	92	94
331	204	127	93	94
361	204	157	94	94
333	204	129	95	94
312	204	108	96	94
298	204	94	97	94
294	204	90	98	94
300	204	96	99	94
314	204	110	100	94
319	204	115	101	94
288	204	84	102	94
205	390	-185	102	95
340	390	-50	102	96
350	390	-40	102	97
343	390	-47	102	98
363	390	-27	102	99
340	390	-50	102	100
385	390	-5	102	101
331	390	-59	102	102
361	390	-29	102	103
333	390	-57	102	104

312	390	-78	102	105
298	390	-92	102	106
294	390	-96	102	107
300	390	-90	102	108
314	390	-76	102	109
319	390	-71	102	110
288	390	-102	102	111
340	205	135	103	111
350	205	145	104	111
343	205	138	105	111
363	205	158	106	111
340	205	135	107	111
385	205	180	108	111
331	205	126	109	111
361	205	156	110	111
333	205	128	111	111
312	205	107	112	111
298	205	93	113	111
294	205	89	114	111
300	205	95	115	111
314	205	109	116	111
319	205	114	117	111
288	205	83	118	111
350	340	10	119	111
343	340	3	120	111
363	340	23	121	111
340	340	0	121	111
385	340	45	122	111
331	340	-9	122	112
361	340	21	123	112
333	340	-7	123	113
312	340	-28	123	114
298	340	-42	123	115
294	340	-46	123	116
300	340	-40	123	117
314	340	-26	123	118
319	340	-21	123	119
288	340	-52	123	120
343	350	-7	123	121
363	350	13	124	121
340	350	-10	124	122
385	350	35	125	122
331	350	-19	125	123
361	350	11	126	123
333	350	-17	126	124
312	350	-38	126	125
298	350	-52	126	126
294	350	-56	126	127
300	350	-50	126	128
314	350	-36	126	129
319	350	-31	126	130
288	350	-62	126	131
363	343	20	127	131

340	343	-3	127	132
385	343	42	128	132
331	343	-12	128	133
361	343	18	129	133
333	343	-10	129	134
312	343	-31	129	135
298	343	-45	129	136
294	343	-49	129	137
300	343	-43	129	138
314	343	-29	129	139
319	343	-24	129	140
288	343	-55	129	141
340	363	-23	129	142
385	363	22	130	142
331	363	-32	130	143
361	363	-2	130	144
333	363	-30	130	145
312	363	-51	130	146
298	363	-65	130	147
294	363	-69	130	148
300	363	-63	130	149
314	363	-49	130	150
319	363	-44	130	151
288	363	-75	130	152
385	340	45	131	152
331	340	-9	131	153
361	340	21	132	153
333	340	-7	132	154
312	340	-28	132	155
298	340	-42	132	156
294	340	-46	132	157
300	340	-40	132	158
314	340	-26	132	159
319	340	-21	132	160
288	340	-52	132	161
331	385	-54	132	162
361	385	-24	132	163
333	385	-52	132	164
312	385	-73	132	165
298	385	-87	132	166
294	385	-91	132	167
300	385	-85	132	168
314	385	-71	132	169
319	385	-66	132	170
288	385	-97	132	171
361	331	30	133	171
333	331	2	134	171
312	331	-19	134	172
298	331	-33	134	173
294	331	-37	134	174
300	331	-31	134	175
314	331	-17	134	176
319	331	-12	134	177

288	331	-43	134	178
333	361	-28	134	179
312	361	-49	134	180
298	361	-63	134	181
294	361	-67	134	182
300	361	-61	134	183
314	361	-47	134	184
319	361	-42	134	185
288	361	-73	134	186
312	333	-21	134	187
298	333	-35	134	188
294	333	-39	134	189
300	333	-33	134	190
314	333	-19	134	191
319	333	-14	134	192
288	333	-45	134	193
298	312	-14	134	194
294	312	-18	134	195
300	312	-12	134	196
314	312	2	135	196
319	312	7	136	196
288	312	-24	136	197
294	298	-4	136	198
300	298	2	137	198
314	298	16	138	198
319	298	21	139	198
288	298	-10	139	199
300	294	6	140	199
314	294	20	141	199
319	294	25	142	199
288	294	-6	142	200
314	300	14	143	200
319	300	19	144	200
288	300	-12	144	201
319	314	5	145	201
288	314	-26	145	202
288	319	-31	145	203

S Statistic = 145 - 203 = -58

Tied Group Value	Members
1	440
2	205
3	340

Time Period	Observations
3/12/2008	1
5/10/2008	1

9/22/2008	1
10/28/2008	1
4/28/2009	1
5/14/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 54

B = 0

C = 0

D = 0

E = 6

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2298

Z-Score = -1.18905

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-1.18905 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-03D

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
220	200	20	1	0
440	200	240	2	0
480	200	280	3	0
446	200	246	4	0
440	200	240	5	0
205	200	5	6	0
187	200	-13	6	1
204	200	4	7	1
390	200	190	8	1
205	200	5	9	1
340	200	140	10	1
350	200	150	11	1
343	200	143	12	1
363	200	163	13	1
340	200	140	14	1
385	200	185	15	1
331	200	131	16	1
361	200	161	17	1
333	200	133	18	1
312	200	112	19	1
298	200	98	20	1
294	200	94	21	1
300	200	100	22	1
314	200	114	23	1
319	200	119	24	1
288	200	88	25	1
440	220	220	26	1
480	220	260	27	1
446	220	226	28	1
440	220	220	29	1
205	220	-15	29	2
187	220	-33	29	3
204	220	-16	29	4
390	220	170	30	4
205	220	-15	30	5
340	220	120	31	5
350	220	130	32	5
343	220	123	33	5
363	220	143	34	5
340	220	120	35	5
385	220	165	36	5
331	220	111	37	5
361	220	141	38	5
333	220	113	39	5
312	220	92	40	5

298	220	78	41	5
294	220	74	42	5
300	220	80	43	5
314	220	94	44	5
319	220	99	45	5
288	220	68	46	5
480	440	40	47	5
446	440	6	48	5
440	440	0	48	5
205	440	-235	48	6
187	440	-253	48	7
204	440	-236	48	8
390	440	-50	48	9
205	440	-235	48	10
340	440	-100	48	11
350	440	-90	48	12
343	440	-97	48	13
363	440	-77	48	14
340	440	-100	48	15
385	440	-55	48	16
331	440	-109	48	17
361	440	-79	48	18
333	440	-107	48	19
312	440	-128	48	20
298	440	-142	48	21
294	440	-146	48	22
300	440	-140	48	23
314	440	-126	48	24
319	440	-121	48	25
288	440	-152	48	26
446	480	-34	48	27
440	480	-40	48	28
205	480	-275	48	29
187	480	-293	48	30
204	480	-276	48	31
390	480	-90	48	32
205	480	-275	48	33
340	480	-140	48	34
350	480	-130	48	35
343	480	-137	48	36
363	480	-117	48	37
340	480	-140	48	38
385	480	-95	48	39
331	480	-149	48	40
361	480	-119	48	41
333	480	-147	48	42
312	480	-168	48	43
298	480	-182	48	44
294	480	-186	48	45
300	480	-180	48	46
314	480	-166	48	47
319	480	-161	48	48
288	480	-192	48	49
440	446	-6	48	50

205	446	-241	48	51
187	446	-259	48	52
204	446	-242	48	53
390	446	-56	48	54
205	446	-241	48	55
340	446	-106	48	56
350	446	-96	48	57
343	446	-103	48	58
363	446	-83	48	59
340	446	-106	48	60
385	446	-61	48	61
331	446	-115	48	62
361	446	-85	48	63
333	446	-113	48	64
312	446	-134	48	65
298	446	-148	48	66
294	446	-152	48	67
300	446	-146	48	68
314	446	-132	48	69
319	446	-127	48	70
288	446	-158	48	71
205	440	-235	48	72
187	440	-253	48	73
204	440	-236	48	74
390	440	-50	48	75
205	440	-235	48	76
340	440	-100	48	77
350	440	-90	48	78
343	440	-97	48	79
363	440	-77	48	80
340	440	-100	48	81
385	440	-55	48	82
331	440	-109	48	83
361	440	-79	48	84
333	440	-107	48	85
312	440	-128	48	86
298	440	-142	48	87
294	440	-146	48	88
300	440	-140	48	89
314	440	-126	48	90
319	440	-121	48	91
288	440	-152	48	92
187	205	-18	48	93
204	205	-1	48	94
390	205	185	49	94
205	205	0	49	94
340	205	135	50	94
350	205	145	51	94
343	205	138	52	94
363	205	158	53	94
340	205	135	54	94
385	205	180	55	94
331	205	126	56	94
361	205	156	57	94
333	205	128	58	94

312	205	107	59	94
298	205	93	60	94
294	205	89	61	94
300	205	95	62	94
314	205	109	63	94
319	205	114	64	94
288	205	83	65	94
204	187	17	66	94
390	187	203	67	94
205	187	18	68	94
340	187	153	69	94
350	187	163	70	94
343	187	156	71	94
363	187	176	72	94
340	187	153	73	94
385	187	198	74	94
331	187	144	75	94
361	187	174	76	94
333	187	146	77	94
312	187	125	78	94
298	187	111	79	94
294	187	107	80	94
300	187	113	81	94
314	187	127	82	94
319	187	132	83	94
288	187	101	84	94
390	204	186	85	94
205	204	1	86	94
340	204	136	87	94
350	204	146	88	94
343	204	139	89	94
363	204	159	90	94
340	204	136	91	94
385	204	181	92	94
331	204	127	93	94
361	204	157	94	94
333	204	129	95	94
312	204	108	96	94
298	204	94	97	94
294	204	90	98	94
300	204	96	99	94
314	204	110	100	94
319	204	115	101	94
288	204	84	102	94
205	390	-185	102	95
340	390	-50	102	96
350	390	-40	102	97
343	390	-47	102	98
363	390	-27	102	99
340	390	-50	102	100
385	390	-5	102	101
331	390	-59	102	102
361	390	-29	102	103
333	390	-57	102	104

312	390	-78	102	105
298	390	-92	102	106
294	390	-96	102	107
300	390	-90	102	108
314	390	-76	102	109
319	390	-71	102	110
288	390	-102	102	111
340	205	135	103	111
350	205	145	104	111
343	205	138	105	111
363	205	158	106	111
340	205	135	107	111
385	205	180	108	111
331	205	126	109	111
361	205	156	110	111
333	205	128	111	111
312	205	107	112	111
298	205	93	113	111
294	205	89	114	111
300	205	95	115	111
314	205	109	116	111
319	205	114	117	111
288	205	83	118	111
350	340	10	119	111
343	340	3	120	111
363	340	23	121	111
340	340	0	121	111
385	340	45	122	111
331	340	-9	122	112
361	340	21	123	112
333	340	-7	123	113
312	340	-28	123	114
298	340	-42	123	115
294	340	-46	123	116
300	340	-40	123	117
314	340	-26	123	118
319	340	-21	123	119
288	340	-52	123	120
343	350	-7	123	121
363	350	13	124	121
340	350	-10	124	122
385	350	35	125	122
331	350	-19	125	123
361	350	11	126	123
333	350	-17	126	124
312	350	-38	126	125
298	350	-52	126	126
294	350	-56	126	127
300	350	-50	126	128
314	350	-36	126	129
319	350	-31	126	130
288	350	-62	126	131
363	343	20	127	131

340	343	-3	127	132
385	343	42	128	132
331	343	-12	128	133
361	343	18	129	133
333	343	-10	129	134
312	343	-31	129	135
298	343	-45	129	136
294	343	-49	129	137
300	343	-43	129	138
314	343	-29	129	139
319	343	-24	129	140
288	343	-55	129	141
340	363	-23	129	142
385	363	22	130	142
331	363	-32	130	143
361	363	-2	130	144
333	363	-30	130	145
312	363	-51	130	146
298	363	-65	130	147
294	363	-69	130	148
300	363	-63	130	149
314	363	-49	130	150
319	363	-44	130	151
288	363	-75	130	152
385	340	45	131	152
331	340	-9	131	153
361	340	21	132	153
333	340	-7	132	154
312	340	-28	132	155
298	340	-42	132	156
294	340	-46	132	157
300	340	-40	132	158
314	340	-26	132	159
319	340	-21	132	160
288	340	-52	132	161
331	385	-54	132	162
361	385	-24	132	163
333	385	-52	132	164
312	385	-73	132	165
298	385	-87	132	166
294	385	-91	132	167
300	385	-85	132	168
314	385	-71	132	169
319	385	-66	132	170
288	385	-97	132	171
361	331	30	133	171
333	331	2	134	171
312	331	-19	134	172
298	331	-33	134	173
294	331	-37	134	174
300	331	-31	134	175
314	331	-17	134	176
319	331	-12	134	177

288	331	-43	134	178
333	361	-28	134	179
312	361	-49	134	180
298	361	-63	134	181
294	361	-67	134	182
300	361	-61	134	183
314	361	-47	134	184
319	361	-42	134	185
288	361	-73	134	186
312	333	-21	134	187
298	333	-35	134	188
294	333	-39	134	189
300	333	-33	134	190
314	333	-19	134	191
319	333	-14	134	192
288	333	-45	134	193
298	312	-14	134	194
294	312	-18	134	195
300	312	-12	134	196
314	312	2	135	196
319	312	7	136	196
288	312	-24	136	197
294	298	-4	136	198
300	298	2	137	198
314	298	16	138	198
319	298	21	139	198
288	298	-10	139	199
300	294	6	140	199
314	294	20	141	199
319	294	25	142	199
288	294	-6	142	200
314	300	14	143	200
319	300	19	144	200
288	300	-12	144	201
319	314	5	145	201
288	314	-26	145	202
288	319	-31	145	203

S Statistic = 145 - 203 = -58

Tied Group Value	Members
1	440
2	205
3	340

Time Period	Observations
3/12/2008	1
5/10/2008	1

9/22/2008	1
10/28/2008	1
4/28/2009	1
5/14/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 54

B = 0

C = 0

D = 0

E = 6

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2298

Z-Score = -1.18905

Comparison Level at 95% confidence level = 1.65463 (upward trend)

-1.18905 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-04D

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
570	530	40	1	0
890	530	360	2	0
920	530	390	3	0
950	530	420	4	0
864	530	334	5	0
506	530	-24	5	1
456	530	-74	5	2
486	530	-44	5	3
723	530	193	6	3
464	530	-66	6	4
622	530	92	7	4
593	530	63	8	4
575	530	45	9	4
561	530	31	10	4
546	530	16	11	4
550	530	20	12	4
593	530	63	13	4
592	530	62	14	4
505	530	-25	14	5
333	530	-197	14	6
0.6	530	-529.4	14	7
0.9	530	-529.1	14	8
0.6	530	-529.4	14	9
419	530	-111	14	10
420	530	-110	14	11
412	530	-118	14	12
890	570	320	15	12
920	570	350	16	12
950	570	380	17	12
864	570	294	18	12
506	570	-64	18	13
456	570	-114	18	14
486	570	-84	18	15
723	570	153	19	15
464	570	-106	19	16
622	570	52	20	16
593	570	23	21	16
575	570	5	22	16
561	570	-9	22	17
546	570	-24	22	18
550	570	-20	22	19
593	570	23	23	19
592	570	22	24	19
505	570	-65	24	20
333	570	-237	24	21

0.6	570	-569.4	24	22
0.9	570	-569.1	24	23
0.6	570	-569.4	24	24
419	570	-151	24	25
420	570	-150	24	26
412	570	-158	24	27
920	890	30	25	27
950	890	60	26	27
864	890	-26	26	28
506	890	-384	26	29
456	890	-434	26	30
486	890	-404	26	31
723	890	-167	26	32
464	890	-426	26	33
622	890	-268	26	34
593	890	-297	26	35
575	890	-315	26	36
561	890	-329	26	37
546	890	-344	26	38
550	890	-340	26	39
593	890	-297	26	40
592	890	-298	26	41
505	890	-385	26	42
333	890	-557	26	43
0.6	890	-889.4	26	44
0.9	890	-889.1	26	45
0.6	890	-889.4	26	46
419	890	-471	26	47
420	890	-470	26	48
412	890	-478	26	49
950	920	30	27	49
864	920	-56	27	50
506	920	-414	27	51
456	920	-464	27	52
486	920	-434	27	53
723	920	-197	27	54
464	920	-456	27	55
622	920	-298	27	56
593	920	-327	27	57
575	920	-345	27	58
561	920	-359	27	59
546	920	-374	27	60
550	920	-370	27	61
593	920	-327	27	62
592	920	-328	27	63
505	920	-415	27	64
333	920	-587	27	65
0.6	920	-919.4	27	66
0.9	920	-919.1	27	67
0.6	920	-919.4	27	68
419	920	-501	27	69
420	920	-500	27	70
412	920	-508	27	71
864	950	-86	27	72

506	950	-444	27	73
456	950	-494	27	74
486	950	-464	27	75
723	950	-227	27	76
464	950	-486	27	77
622	950	-328	27	78
593	950	-357	27	79
575	950	-375	27	80
561	950	-389	27	81
546	950	-404	27	82
550	950	-400	27	83
593	950	-357	27	84
592	950	-358	27	85
505	950	-445	27	86
333	950	-617	27	87
0.6	950	-949.4	27	88
0.9	950	-949.1	27	89
0.6	950	-949.4	27	90
419	950	-531	27	91
420	950	-530	27	92
412	950	-538	27	93
506	864	-358	27	94
456	864	-408	27	95
486	864	-378	27	96
723	864	-141	27	97
464	864	-400	27	98
622	864	-242	27	99
593	864	-271	27	100
575	864	-289	27	101
561	864	-303	27	102
546	864	-318	27	103
550	864	-314	27	104
593	864	-271	27	105
592	864	-272	27	106
505	864	-359	27	107
333	864	-531	27	108
0.6	864	-863.4	27	109
0.9	864	-863.1	27	110
0.6	864	-863.4	27	111
419	864	-445	27	112
420	864	-444	27	113
412	864	-452	27	114
456	506	-50	27	115
486	506	-20	27	116
723	506	217	28	116
464	506	-42	28	117
622	506	116	29	117
593	506	87	30	117
575	506	69	31	117
561	506	55	32	117
546	506	40	33	117
550	506	44	34	117
593	506	87	35	117
592	506	86	36	117
505	506	-1	36	118

333	506	-173	36	119
0.6	506	-505.4	36	120
0.9	506	-505.1	36	121
0.6	506	-505.4	36	122
419	506	-87	36	123
420	506	-86	36	124
412	506	-94	36	125
486	456	30	37	125
723	456	267	38	125
464	456	8	39	125
622	456	166	40	125
593	456	137	41	125
575	456	119	42	125
561	456	105	43	125
546	456	90	44	125
550	456	94	45	125
593	456	137	46	125
592	456	136	47	125
505	456	49	48	125
333	456	-123	48	126
0.6	456	-455.4	48	127
0.9	456	-455.1	48	128
0.6	456	-455.4	48	129
419	456	-37	48	130
420	456	-36	48	131
412	456	-44	48	132
723	486	237	49	132
464	486	-22	49	133
622	486	136	50	133
593	486	107	51	133
575	486	89	52	133
561	486	75	53	133
546	486	60	54	133
550	486	64	55	133
593	486	107	56	133
592	486	106	57	133
505	486	19	58	133
333	486	-153	58	134
0.6	486	-485.4	58	135
0.9	486	-485.1	58	136
0.6	486	-485.4	58	137
419	486	-67	58	138
420	486	-66	58	139
412	486	-74	58	140
464	723	-259	58	141
622	723	-101	58	142
593	723	-130	58	143
575	723	-148	58	144
561	723	-162	58	145
546	723	-177	58	146
550	723	-173	58	147
593	723	-130	58	148
592	723	-131	58	149
505	723	-218	58	150

333	723	-390	58	151
0.6	723	-722.4	58	152
0.9	723	-722.1	58	153
0.6	723	-722.4	58	154
419	723	-304	58	155
420	723	-303	58	156
412	723	-311	58	157
622	464	158	59	157
593	464	129	60	157
575	464	111	61	157
561	464	97	62	157
546	464	82	63	157
550	464	86	64	157
593	464	129	65	157
592	464	128	66	157
505	464	41	67	157
333	464	-131	67	158
0.6	464	-463.4	67	159
0.9	464	-463.1	67	160
0.6	464	-463.4	67	161
419	464	-45	67	162
420	464	-44	67	163
412	464	-52	67	164
593	622	-29	67	165
575	622	-47	67	166
561	622	-61	67	167
546	622	-76	67	168
550	622	-72	67	169
593	622	-29	67	170
592	622	-30	67	171
505	622	-117	67	172
333	622	-289	67	173
0.6	622	-621.4	67	174
0.9	622	-621.1	67	175
0.6	622	-621.4	67	176
419	622	-203	67	177
420	622	-202	67	178
412	622	-210	67	179
575	593	-18	67	180
561	593	-32	67	181
546	593	-47	67	182
550	593	-43	67	183
593	593	0	67	183
592	593	-1	67	184
505	593	-88	67	185
333	593	-260	67	186
0.6	593	-592.4	67	187
0.9	593	-592.1	67	188
0.6	593	-592.4	67	189
419	593	-174	67	190
420	593	-173	67	191
412	593	-181	67	192
561	575	-14	67	193

546	575	-29	67	194
550	575	-25	67	195
593	575	18	68	195
592	575	17	69	195
505	575	-70	69	196
333	575	-242	69	197
0.6	575	-574.4	69	198
0.9	575	-574.1	69	199
0.6	575	-574.4	69	200
419	575	-156	69	201
420	575	-155	69	202
412	575	-163	69	203
546	561	-15	69	204
550	561	-11	69	205
593	561	32	70	205
592	561	31	71	205
505	561	-56	71	206
333	561	-228	71	207
0.6	561	-560.4	71	208
0.9	561	-560.1	71	209
0.6	561	-560.4	71	210
419	561	-142	71	211
420	561	-141	71	212
412	561	-149	71	213
550	546	4	72	213
593	546	47	73	213
592	546	46	74	213
505	546	-41	74	214
333	546	-213	74	215
0.6	546	-545.4	74	216
0.9	546	-545.1	74	217
0.6	546	-545.4	74	218
419	546	-127	74	219
420	546	-126	74	220
412	546	-134	74	221
593	550	43	75	221
592	550	42	76	221
505	550	-45	76	222
333	550	-217	76	223
0.6	550	-549.4	76	224
0.9	550	-549.1	76	225
0.6	550	-549.4	76	226
419	550	-131	76	227
420	550	-130	76	228
412	550	-138	76	229
592	593	-1	76	230
505	593	-88	76	231
333	593	-260	76	232
0.6	593	-592.4	76	233
0.9	593	-592.1	76	234
0.6	593	-592.4	76	235
419	593	-174	76	236
420	593	-173	76	237

412	593	-181	76	238
505	592	-87	76	239
333	592	-259	76	240
0.6	592	-591.4	76	241
0.9	592	-591.1	76	242
0.6	592	-591.4	76	243
419	592	-173	76	244
420	592	-172	76	245
412	592	-180	76	246
333	505	-172	76	247
0.6	505	-504.4	76	248
0.9	505	-504.1	76	249
0.6	505	-504.4	76	250
419	505	-86	76	251
420	505	-85	76	252
412	505	-93	76	253
0.6	333	-332.4	76	254
0.9	333	-332.1	76	255
0.6	333	-332.4	76	256
419	333	86	77	256
420	333	87	78	256
412	333	79	79	256
0.9	0.6	0.3	80	256
0.6	0.6	0	80	256
419	0.6	418.4	81	256
420	0.6	419.4	82	256
412	0.6	411.4	83	256
0.6	0.9	-0.3	83	257
419	0.9	418.1	84	257
420	0.9	419.1	85	257
412	0.9	411.1	86	257
419	0.6	418.4	87	257
420	0.6	419.4	88	257
412	0.6	411.4	89	257
420	419	1	90	257
412	419	-7	90	258
412	420	-8	90	259

S Statistic = 90 - 259 = -169

Tied Group Value	Members
1	593
2	0.6

Time Period	Observations
3/11/2008	1
5/10/2008	1
9/22/2008	1

12/3/2008	1
4/28/2009	1
5/15/2009	1
9/23/2009	1
12/7/2009	1
2/24/2010	1
4/16/2010	1
8/11/2010	1
11/22/2010	1
3/8/2011	1
5/23/2011	1
8/31/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/19/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 36

B = 0

C = 0

D = 0

E = 4

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2299

Z-Score = -3.5038

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-3.5038 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-05

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
2.03	0.883	1.147	1	0
ND<0	0.883	-0.883	1	1
ND<0	0.883	-0.883	1	2
ND<0	0.883	-0.883	1	3
ND<0	0.883	-0.883	1	4
ND<0	0.883	-0.883	1	5
ND<0	0.883	-0.883	1	6
0.4	0.883	-0.483	1	7
0.4	0.883	-0.483	1	8
ND<0	0.883	-0.883	1	9
1.1	0.883	0.217	2	9
0.4	0.883	-0.483	2	10
0.1	0.883	-0.783	2	11
ND<0	0.883	-0.883	2	12
ND<0	0.883	-0.883	2	13
ND<0	0.883	-0.883	2	14
ND<0	0.883	-0.883	2	15
ND<0	0.883	-0.883	2	16
ND<0	2.03	-2.03	2	17
ND<0	2.03	-2.03	2	18
ND<0	2.03	-2.03	2	19
ND<0	2.03	-2.03	2	20
ND<0	2.03	-2.03	2	21
ND<0	2.03	-2.03	2	22
0.4	2.03	-1.63	2	23
0.4	2.03	-1.63	2	24
ND<0	2.03	-2.03	2	25
1.1	2.03	-0.93	2	26
0.4	2.03	-1.63	2	27
0.1	2.03	-1.93	2	28
ND<0	2.03	-2.03	2	29
ND<0	2.03	-2.03	2	30
ND<0	2.03	-2.03	2	31
ND<0	2.03	-2.03	2	32
ND<0	2.03	-2.03	2	33
ND<0	ND<0	0	2	33
ND<0	ND<0	0	2	33
ND<0	ND<0	0	2	33
ND<0	ND<0	0	2	33
ND<0	ND<0	0	2	33
0.4	ND<0	0.4	3	33
0.4	ND<0	0.4	4	33
ND<0	ND<0	0	4	33
1.1	ND<0	1.1	5	33

1.1	ND<0	1.1	25	33
0.4	ND<0	0.4	26	33
0.1	ND<0	0.1	27	33
ND<0	ND<0	0	27	33
ND<0	ND<0	0	27	33
ND<0	ND<0	0	27	33
ND<0	ND<0	0	27	33
ND<0	ND<0	0	27	33
0.4	ND<0	0.4	28	33
0.4	ND<0	0.4	29	33
ND<0	ND<0	0	29	33
1.1	ND<0	1.1	30	33
0.4	ND<0	0.4	31	33
0.1	ND<0	0.1	32	33
ND<0	ND<0	0	32	33
ND<0	ND<0	0	32	33
ND<0	ND<0	0	32	33
ND<0	ND<0	0	32	33
0.4	0.4	0	32	33
ND<0	0.4	-0.4	32	34
1.1	0.4	0.7	33	34
0.4	0.4	0	33	34
0.1	0.4	-0.3	33	35
ND<0	0.4	-0.4	33	36
ND<0	0.4	-0.4	33	37
ND<0	0.4	-0.4	33	38
ND<0	0.4	-0.4	33	39
ND<0	0.4	-0.4	33	40
ND<0	0.4	-0.4	33	41
1.1	0.4	0.7	34	41
0.4	0.4	0	34	41
0.1	0.4	-0.3	34	42
ND<0	0.4	-0.4	34	43
ND<0	0.4	-0.4	34	44
ND<0	0.4	-0.4	34	45
ND<0	0.4	-0.4	34	46
ND<0	0.4	-0.4	34	47
1.1	ND<0	1.1	35	47
0.4	ND<0	0.4	36	47
0.1	ND<0	0.1	37	47
ND<0	ND<0	0	37	47
ND<0	ND<0	0	37	47
ND<0	ND<0	0	37	47
ND<0	ND<0	0	37	47
0.4	1.1	-0.7	37	48
0.1	1.1	-1	37	49
ND<0	1.1	-1.1	37	50
ND<0	1.1	-1.1	37	51
ND<0	1.1	-1.1	37	52
ND<0	1.1	-1.1	37	53

ND<0	1.1	-1.1	37	54
0.1	0.4	-0.3	37	55
ND<0	0.4	-0.4	37	56
ND<0	0.4	-0.4	37	57
ND<0	0.4	-0.4	37	58
ND<0	0.4	-0.4	37	59
ND<0	0.4	-0.4	37	60
ND<0	0.1	-0.1	37	61
ND<0	0.1	-0.1	37	62
ND<0	0.1	-0.1	37	63
ND<0	0.1	-0.1	37	64
ND<0	0.1	-0.1	37	65
ND<0	ND<0	0	37	65
ND<0	ND<0	0	37	65
ND<0	ND<0	0	37	65
ND<0	ND<0	0	37	65
ND<0	ND<0	0	37	65
ND<0	ND<0	0	37	65
ND<0	ND<0	0	37	65
ND<0	ND<0	0	37	65

S Statistic = 37 - 65 = -28

Tied Group Value	Members
1	12
2	3

Time Period	Observations
2/26/2010	1
4/14/2010	1
8/12/2010	1
11/22/2010	1
3/10/2011	1
5/23/2011	1
8/31/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/19/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 3894
B = 0
C = 1326
D = 0
E = 138
F = 0
a = 14706
b = 52326
c = 684
Group Variance = 600.667
Z-Score = -1.10166
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-1.10166 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: GCW-05

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
2.03	0.883	1.147	1	0
ND<0	0.883	-0.883	1	1
ND<0	0.883	-0.883	1	2
ND<0	0.883	-0.883	1	3
ND<0	0.883	-0.883	1	4
ND<0	0.883	-0.883	1	5
ND<0	0.883	-0.883	1	6
0.4	0.883	-0.483	1	7
0.4	0.883	-0.483	1	8
ND<0	0.883	-0.883	1	9
1.1	0.883	0.217	2	9
0.4	0.883	-0.483	2	10
0.1	0.883	-0.783	2	11
ND<0	0.883	-0.883	2	12
ND<0	0.883	-0.883	2	13
ND<0	0.883	-0.883	2	14
ND<0	0.883	-0.883	2	15
ND<0	0.883	-0.883	2	16
ND<0	2.03	-2.03	2	17
ND<0	2.03	-2.03	2	18
ND<0	2.03	-2.03	2	19
ND<0	2.03	-2.03	2	20
ND<0	2.03	-2.03	2	21
ND<0	2.03	-2.03	2	22
0.4	2.03	-1.63	2	23
0.4	2.03	-1.63	2	24
ND<0	2.03	-2.03	2	25
1.1	2.03	-0.93	2	26
0.4	2.03	-1.63	2	27
0.1	2.03	-1.93	2	28
ND<0	2.03	-2.03	2	29
ND<0	2.03	-2.03	2	30
ND<0	2.03	-2.03	2	31
ND<0	2.03	-2.03	2	32
ND<0	2.03	-2.03	2	33
ND<0	ND<0	0	2	33
ND<0	ND<0	0	2	33
ND<0	ND<0	0	2	33
ND<0	ND<0	0	2	33
ND<0	ND<0	0	2	33
0.4	ND<0	0.4	3	33
0.4	ND<0	0.4	4	33
ND<0	ND<0	0	4	33
1.1	ND<0	1.1	5	33

1.1	ND<0	1.1	25	33
0.4	ND<0	0.4	26	33
0.1	ND<0	0.1	27	33
ND<0	ND<0	0	27	33
ND<0	ND<0	0	27	33
ND<0	ND<0	0	27	33
ND<0	ND<0	0	27	33
ND<0	ND<0	0	27	33
0.4	ND<0	0.4	28	33
0.4	ND<0	0.4	29	33
ND<0	ND<0	0	29	33
1.1	ND<0	1.1	30	33
0.4	ND<0	0.4	31	33
0.1	ND<0	0.1	32	33
ND<0	ND<0	0	32	33
ND<0	ND<0	0	32	33
ND<0	ND<0	0	32	33
ND<0	ND<0	0	32	33
0.4	0.4	0	32	33
ND<0	0.4	-0.4	32	34
1.1	0.4	0.7	33	34
0.4	0.4	0	33	34
0.1	0.4	-0.3	33	35
ND<0	0.4	-0.4	33	36
ND<0	0.4	-0.4	33	37
ND<0	0.4	-0.4	33	38
ND<0	0.4	-0.4	33	39
ND<0	0.4	-0.4	33	40
ND<0	0.4	-0.4	33	41
1.1	0.4	0.7	34	41
0.4	0.4	0	34	41
0.1	0.4	-0.3	34	42
ND<0	0.4	-0.4	34	43
ND<0	0.4	-0.4	34	44
ND<0	0.4	-0.4	34	45
ND<0	0.4	-0.4	34	46
ND<0	0.4	-0.4	34	47
1.1	ND<0	1.1	35	47
0.4	ND<0	0.4	36	47
0.1	ND<0	0.1	37	47
ND<0	ND<0	0	37	47
ND<0	ND<0	0	37	47
ND<0	ND<0	0	37	47
ND<0	ND<0	0	37	47
0.4	1.1	-0.7	37	48
0.1	1.1	-1	37	49
ND<0	1.1	-1.1	37	50
ND<0	1.1	-1.1	37	51
ND<0	1.1	-1.1	37	52
ND<0	1.1	-1.1	37	53

ND<0	1.1	-1.1	37	54
0.1	0.4	-0.3	37	55
ND<0	0.4	-0.4	37	56
ND<0	0.4	-0.4	37	57
ND<0	0.4	-0.4	37	58
ND<0	0.4	-0.4	37	59
ND<0	0.4	-0.4	37	60
ND<0	0.1	-0.1	37	61
ND<0	0.1	-0.1	37	62
ND<0	0.1	-0.1	37	63
ND<0	0.1	-0.1	37	64
ND<0	0.1	-0.1	37	65
ND<0	ND<0	0	37	65
ND<0	ND<0	0	37	65
ND<0	ND<0	0	37	65
ND<0	ND<0	0	37	65
ND<0	ND<0	0	37	65
ND<0	ND<0	0	37	65
ND<0	ND<0	0	37	65
ND<0	ND<0	0	37	65

S Statistic = 37 - 65 = -28

Tied Group Value	Members
1	12
2	3

Time Period	Observations
2/26/2010	1
4/14/2010	1
8/12/2010	1
11/22/2010	1
3/10/2011	1
5/23/2011	1
8/31/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/19/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 3894
B = 0
C = 1326
D = 0
E = 138
F = 0
a = 14706
b = 52326
c = 684
Group Variance = 600.667
Z-Score = -1.10166
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.10166 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: OW-01A

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
1	1.8	-0.8	0	1
1.1	1.8	-0.7	0	2
0.9	1.8	-0.9	0	3
1	1.8	-0.8	0	4
0.9	1.8	-0.9	0	5
0.9	1.8	-0.9	0	6
0.9	1.8	-0.9	0	7
1	1.8	-0.8	0	8
1.1	1.8	-0.7	0	9
1	1.8	-0.8	0	10
0.8	1.8	-1	0	11
0.7	1.8	-1.1	0	12
0.7	1.8	-1.1	0	13
0.7	1.8	-1.1	0	14
0.6	1.8	-1.2	0	15
0.9	1.8	-0.9	0	16
0.8	1.8	-1	0	17
0.7	1.8	-1.1	0	18
0.7	1.8	-1.1	0	19
0.5	1.8	-1.3	0	20
0.8	1.8	-1	0	21
0.8	1.8	-1	0	22
0.7	1.8	-1.1	0	23
0.572	1.8	-1.228	0	24
0.587	1.8	-1.213	0	25
0.508	1.8	-1.292	0	26
1.1	1	0.1	1	26
0.9	1	-0.1	1	27
1	1	0	1	27
0.9	1	-0.1	1	28
0.9	1	-0.1	1	29
0.9	1	-0.1	1	30
1	1	0	1	30
1.1	1	0.1	2	30
1	1	0	2	30
0.8	1	-0.2	2	31
0.7	1	-0.3	2	32
0.7	1	-0.3	2	33
0.7	1	-0.3	2	34
0.6	1	-0.4	2	35
0.9	1	-0.1	2	36
0.8	1	-0.2	2	37
0.7	1	-0.3	2	38
0.7	1	-0.3	2	39
0.5	1	-0.5	2	40

0.8	1	-0.2	2	41
0.8	1	-0.2	2	42
0.7	1	-0.3	2	43
0.572	1	-0.428	2	44
0.587	1	-0.413	2	45
0.508	1	-0.492	2	46
0.9	1.1	-0.2	2	47
1	1.1	-0.1	2	48
0.9	1.1	-0.2	2	49
0.9	1.1	-0.2	2	50
0.9	1.1	-0.2	2	51
1	1.1	-0.1	2	52
1.1	1.1	0	2	52
1	1.1	-0.1	2	53
0.8	1.1	-0.3	2	54
0.7	1.1	-0.4	2	55
0.7	1.1	-0.4	2	56
0.7	1.1	-0.4	2	57
0.6	1.1	-0.5	2	58
0.9	1.1	-0.2	2	59
0.8	1.1	-0.3	2	60
0.7	1.1	-0.4	2	61
0.7	1.1	-0.4	2	62
0.5	1.1	-0.6	2	63
0.8	1.1	-0.3	2	64
0.8	1.1	-0.3	2	65
0.7	1.1	-0.4	2	66
0.572	1.1	-0.528	2	67
0.587	1.1	-0.513	2	68
0.508	1.1	-0.592	2	69
1	0.9	0.1	3	69
0.9	0.9	0	3	69
0.9	0.9	0	3	69
0.9	0.9	0	3	69
1	0.9	0.1	4	69
1.1	0.9	0.2	5	69
1	0.9	0.1	6	69
0.8	0.9	-0.1	6	70
0.7	0.9	-0.2	6	71
0.7	0.9	-0.2	6	72
0.7	0.9	-0.2	6	73
0.6	0.9	-0.3	6	74
0.9	0.9	0	6	74
0.8	0.9	-0.1	6	75
0.7	0.9	-0.2	6	76
0.7	0.9	-0.2	6	77
0.5	0.9	-0.4	6	78
0.8	0.9	-0.1	6	79
0.8	0.9	-0.1	6	80
0.7	0.9	-0.2	6	81
0.572	0.9	-0.328	6	82
0.587	0.9	-0.313	6	83
0.508	0.9	-0.392	6	84
0.9	1	-0.1	6	85

0.9	1	-0.1	6	86
0.9	1	-0.1	6	87
1	1	0	6	87
1.1	1	0.1	7	87
1	1	0	7	87
0.8	1	-0.2	7	88
0.7	1	-0.3	7	89
0.7	1	-0.3	7	90
0.7	1	-0.3	7	91
0.6	1	-0.4	7	92
0.9	1	-0.1	7	93
0.8	1	-0.2	7	94
0.7	1	-0.3	7	95
0.7	1	-0.3	7	96
0.5	1	-0.5	7	97
0.8	1	-0.2	7	98
0.8	1	-0.2	7	99
0.7	1	-0.3	7	100
0.572	1	-0.428	7	101
0.587	1	-0.413	7	102
0.508	1	-0.492	7	103
0.9	0.9	0	7	103
0.9	0.9	0	7	103
1	0.9	0.1	8	103
1.1	0.9	0.2	9	103
1	0.9	0.1	10	103
0.8	0.9	-0.1	10	104
0.7	0.9	-0.2	10	105
0.7	0.9	-0.2	10	106
0.7	0.9	-0.2	10	107
0.6	0.9	-0.3	10	108
0.9	0.9	0	10	108
0.8	0.9	-0.1	10	109
0.7	0.9	-0.2	10	110
0.7	0.9	-0.2	10	111
0.5	0.9	-0.4	10	112
0.8	0.9	-0.1	10	113
0.8	0.9	-0.1	10	114
0.7	0.9	-0.2	10	115
0.572	0.9	-0.328	10	116
0.587	0.9	-0.313	10	117
0.508	0.9	-0.392	10	118
0.9	0.9	0	10	118
1	0.9	0.1	11	118
1.1	0.9	0.2	12	118
1	0.9	0.1	13	118
0.8	0.9	-0.1	13	119
0.7	0.9	-0.2	13	120
0.7	0.9	-0.2	13	121
0.7	0.9	-0.2	13	122
0.6	0.9	-0.3	13	123
0.9	0.9	0	13	123
0.8	0.9	-0.1	13	124
0.7	0.9	-0.2	13	125
0.7	0.9	-0.2	13	126

0.5	0.9	-0.4	13	127
0.8	0.9	-0.1	13	128
0.8	0.9	-0.1	13	129
0.7	0.9	-0.2	13	130
0.572	0.9	-0.328	13	131
0.587	0.9	-0.313	13	132
0.508	0.9	-0.392	13	133
1	0.9	0.1	14	133
1.1	0.9	0.2	15	133
1	0.9	0.1	16	133
0.8	0.9	-0.1	16	134
0.7	0.9	-0.2	16	135
0.7	0.9	-0.2	16	136
0.7	0.9	-0.2	16	137
0.6	0.9	-0.3	16	138
0.9	0.9	0	16	138
0.8	0.9	-0.1	16	139
0.7	0.9	-0.2	16	140
0.7	0.9	-0.2	16	141
0.5	0.9	-0.4	16	142
0.8	0.9	-0.1	16	143
0.8	0.9	-0.1	16	144
0.7	0.9	-0.2	16	145
0.572	0.9	-0.328	16	146
0.587	0.9	-0.313	16	147
0.508	0.9	-0.392	16	148
1.1	1	0.1	17	148
1	1	0	17	148
0.8	1	-0.2	17	149
0.7	1	-0.3	17	150
0.7	1	-0.3	17	151
0.7	1	-0.3	17	152
0.6	1	-0.4	17	153
0.9	1	-0.1	17	154
0.8	1	-0.2	17	155
0.7	1	-0.3	17	156
0.7	1	-0.3	17	157
0.5	1	-0.5	17	158
0.8	1	-0.2	17	159
0.8	1	-0.2	17	160
0.7	1	-0.3	17	161
0.572	1	-0.428	17	162
0.587	1	-0.413	17	163
0.508	1	-0.492	17	164
1	1.1	-0.1	17	165
0.8	1.1	-0.3	17	166
0.7	1.1	-0.4	17	167
0.7	1.1	-0.4	17	168
0.7	1.1	-0.4	17	169
0.6	1.1	-0.5	17	170
0.9	1.1	-0.2	17	171
0.8	1.1	-0.3	17	172
0.7	1.1	-0.4	17	173
0.7	1.1	-0.4	17	174

0.5	1.1	-0.6	17	175
0.8	1.1	-0.3	17	176
0.8	1.1	-0.3	17	177
0.7	1.1	-0.4	17	178
0.572	1.1	-0.528	17	179
0.587	1.1	-0.513	17	180
0.508	1.1	-0.592	17	181
0.8	1	-0.2	17	182
0.7	1	-0.3	17	183
0.7	1	-0.3	17	184
0.7	1	-0.3	17	185
0.6	1	-0.4	17	186
0.9	1	-0.1	17	187
0.8	1	-0.2	17	188
0.7	1	-0.3	17	189
0.7	1	-0.3	17	190
0.5	1	-0.5	17	191
0.8	1	-0.2	17	192
0.8	1	-0.2	17	193
0.7	1	-0.3	17	194
0.572	1	-0.428	17	195
0.587	1	-0.413	17	196
0.508	1	-0.492	17	197
0.7	0.8	-0.1	17	198
0.7	0.8	-0.1	17	199
0.7	0.8	-0.1	17	200
0.6	0.8	-0.2	17	201
0.9	0.8	0.1	18	201
0.8	0.8	0	18	201
0.7	0.8	-0.1	18	202
0.7	0.8	-0.1	18	203
0.5	0.8	-0.3	18	204
0.8	0.8	0	18	204
0.8	0.8	0	18	204
0.7	0.8	-0.1	18	205
0.572	0.8	-0.228	18	206
0.587	0.8	-0.213	18	207
0.508	0.8	-0.292	18	208
0.7	0.7	0	18	208
0.7	0.7	0	18	208
0.6	0.7	-0.1	18	209
0.9	0.7	0.2	19	209
0.8	0.7	0.1	20	209
0.7	0.7	0	20	209
0.7	0.7	0	20	209
0.5	0.7	-0.2	20	210
0.8	0.7	0.1	21	210
0.8	0.7	0.1	22	210
0.7	0.7	0	22	210
0.572	0.7	-0.128	22	211
0.587	0.7	-0.113	22	212
0.508	0.7	-0.192	22	213
0.7	0.7	0	22	213

0.6	0.7	-0.1	22	214
0.9	0.7	0.2	23	214
0.8	0.7	0.1	24	214
0.7	0.7	0	24	214
0.7	0.7	0	24	214
0.5	0.7	-0.2	24	215
0.8	0.7	0.1	25	215
0.8	0.7	0.1	26	215
0.7	0.7	0	26	215
0.572	0.7	-0.128	26	216
0.587	0.7	-0.113	26	217
0.508	0.7	-0.192	26	218
0.6	0.7	-0.1	26	219
0.9	0.7	0.2	27	219
0.8	0.7	0.1	28	219
0.7	0.7	0	28	219
0.7	0.7	0	28	219
0.5	0.7	-0.2	28	220
0.8	0.7	0.1	29	220
0.8	0.7	0.1	30	220
0.7	0.7	0	30	220
0.572	0.7	-0.128	30	221
0.587	0.7	-0.113	30	222
0.508	0.7	-0.192	30	223
0.9	0.6	0.3	31	223
0.8	0.6	0.2	32	223
0.7	0.6	0.1	33	223
0.7	0.6	0.1	34	223
0.5	0.6	-0.1	34	224
0.8	0.6	0.2	35	224
0.8	0.6	0.2	36	224
0.7	0.6	0.1	37	224
0.572	0.6	-0.028	37	225
0.587	0.6	-0.013	37	226
0.508	0.6	-0.092	37	227
0.8	0.9	-0.1	37	228
0.7	0.9	-0.2	37	229
0.7	0.9	-0.2	37	230
0.5	0.9	-0.4	37	231
0.8	0.9	-0.1	37	232
0.8	0.9	-0.1	37	233
0.7	0.9	-0.2	37	234
0.572	0.9	-0.328	37	235
0.587	0.9	-0.313	37	236
0.508	0.9	-0.392	37	237
0.7	0.8	-0.1	37	238
0.7	0.8	-0.1	37	239
0.5	0.8	-0.3	37	240
0.8	0.8	0	37	240
0.8	0.8	0	37	240
0.7	0.8	-0.1	37	241
0.572	0.8	-0.228	37	242
0.587	0.8	-0.213	37	243

0.508	0.8	-0.292	37	244
0.7	0.7	0	37	244
0.5	0.7	-0.2	37	245
0.8	0.7	0.1	38	245
0.8	0.7	0.1	39	245
0.7	0.7	0	39	245
0.572	0.7	-0.128	39	246
0.587	0.7	-0.113	39	247
0.508	0.7	-0.192	39	248
0.5	0.7	-0.2	39	249
0.8	0.7	0.1	40	249
0.8	0.7	0.1	41	249
0.7	0.7	0	41	249
0.572	0.7	-0.128	41	250
0.587	0.7	-0.113	41	251
0.508	0.7	-0.192	41	252
0.8	0.5	0.3	42	252
0.8	0.5	0.3	43	252
0.7	0.5	0.2	44	252
0.572	0.5	0.072	45	252
0.587	0.5	0.087	46	252
0.508	0.5	0.008	47	252
0.8	0.8	0	47	252
0.7	0.8	-0.1	47	253
0.572	0.8	-0.228	47	254
0.587	0.8	-0.213	47	255
0.508	0.8	-0.292	47	256
0.7	0.8	-0.1	47	257
0.572	0.8	-0.228	47	258
0.587	0.8	-0.213	47	259
0.508	0.8	-0.292	47	260
0.572	0.7	-0.128	47	261
0.587	0.7	-0.113	47	262
0.508	0.7	-0.192	47	263
0.587	0.572	0.015	48	263
0.508	0.572	-0.064	48	264
0.508	0.587	-0.079	48	265

S Statistic = 48 - 265 = -217

Tied Group Value	Members
1	1
2	1.1
3	0.9
4	0.8
5	0.7

Time Period	Observations
-------------	--------------

3/12/2008	1
5/13/2008	1
9/23/2008	1
10/29/2008	1
4/29/2009	1
5/13/2009	1
9/29/2009	1
12/8/2009	1
2/26/2010	1
4/14/2010	1
8/12/2010	1
11/22/2010	1
3/10/2011	1
5/25/2011	1
9/2/2011	1
4/13/2012	1
11/9/2012	1
4/22/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 1140

B = 0

C = 228

D = 0

E = 76

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2237.67

Z-Score = -4.56621

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-4.56621 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: EPW-01

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
87	112	-25	0	1
63	112	-49	0	2
77	112	-35	0	3
133	112	21	1	3
190	112	78	2	3
78	112	-34	2	4
96	112	-16	2	5
110	112	-2	2	6
93	112	-19	2	7
64	112	-48	2	8
94	112	-18	2	9
91	112	-21	2	10
98	112	-14	2	11
92	112	-20	2	12
96	112	-16	2	13
130	112	18	3	13
110	112	-2	3	14
130	112	18	4	14
46	112	-66	4	15
130	112	18	5	15
110	112	-2	5	16
130	112	18	6	16
130	112	18	7	16
130	112	18	8	16
120	112	8	9	16
140	112	28	10	16
93	112	-19	10	17
63	87	-24	10	18
77	87	-10	10	19
133	87	46	11	19
190	87	103	12	19
78	87	-9	12	20
96	87	9	13	20
110	87	23	14	20
93	87	6	15	20
64	87	-23	15	21
94	87	7	16	21
91	87	4	17	21
98	87	11	18	21
92	87	5	19	21
96	87	9	20	21
130	87	43	21	21
110	87	23	22	21
130	87	43	23	21
46	87	-41	23	22

130	87	43	24	22
110	87	23	25	22
130	87	43	26	22
130	87	43	27	22
130	87	43	28	22
120	87	33	29	22
140	87	53	30	22
93	87	6	31	22
77	63	14	32	22
133	63	70	33	22
190	63	127	34	22
78	63	15	35	22
96	63	33	36	22
110	63	47	37	22
93	63	30	38	22
64	63	1	39	22
94	63	31	40	22
91	63	28	41	22
98	63	35	42	22
92	63	29	43	22
96	63	33	44	22
130	63	67	45	22
110	63	47	46	22
130	63	67	47	22
46	63	-17	47	23
130	63	67	48	23
110	63	47	49	23
130	63	67	50	23
130	63	67	51	23
130	63	67	52	23
120	63	57	53	23
140	63	77	54	23
93	63	30	55	23
133	77	56	56	23
190	77	113	57	23
78	77	1	58	23
96	77	19	59	23
110	77	33	60	23
93	77	16	61	23
64	77	-13	61	24
94	77	17	62	24
91	77	14	63	24
98	77	21	64	24
92	77	15	65	24
96	77	19	66	24
130	77	53	67	24
110	77	33	68	24
130	77	53	69	24
46	77	-31	69	25
130	77	53	70	25
110	77	33	71	25
130	77	53	72	25
130	77	53	73	25
130	77	53	74	25
120	77	43	75	25

140	77	63	76	25
93	77	16	77	25
190	133	57	78	25
78	133	-55	78	26
96	133	-37	78	27
110	133	-23	78	28
93	133	-40	78	29
64	133	-69	78	30
94	133	-39	78	31
91	133	-42	78	32
98	133	-35	78	33
92	133	-41	78	34
96	133	-37	78	35
130	133	-3	78	36
110	133	-23	78	37
130	133	-3	78	38
46	133	-87	78	39
130	133	-3	78	40
110	133	-23	78	41
130	133	-3	78	42
130	133	-3	78	43
130	133	-3	78	44
120	133	-13	78	45
140	133	7	79	45
93	133	-40	79	46
78	190	-112	79	47
96	190	-94	79	48
110	190	-80	79	49
93	190	-97	79	50
64	190	-126	79	51
94	190	-96	79	52
91	190	-99	79	53
98	190	-92	79	54
92	190	-98	79	55
96	190	-94	79	56
130	190	-60	79	57
110	190	-80	79	58
130	190	-60	79	59
46	190	-144	79	60
130	190	-60	79	61
110	190	-80	79	62
130	190	-60	79	63
130	190	-60	79	64
130	190	-60	79	65
120	190	-70	79	66
140	190	-50	79	67
93	190	-97	79	68
96	78	18	80	68
110	78	32	81	68
93	78	15	82	68
64	78	-14	82	69
94	78	16	83	69
91	78	13	84	69
98	78	20	85	69

92	78	14	86	69
96	78	18	87	69
130	78	52	88	69
110	78	32	89	69
130	78	52	90	69
46	78	-32	90	70
130	78	52	91	70
110	78	32	92	70
130	78	52	93	70
130	78	52	94	70
130	78	52	95	70
120	78	42	96	70
140	78	62	97	70
93	78	15	98	70
110	96	14	99	70
93	96	-3	99	71
64	96	-32	99	72
94	96	-2	99	73
91	96	-5	99	74
98	96	2	100	74
92	96	-4	100	75
96	96	0	100	75
130	96	34	101	75
110	96	14	102	75
130	96	34	103	75
46	96	-50	103	76
130	96	34	104	76
110	96	14	105	76
130	96	34	106	76
130	96	34	107	76
130	96	34	108	76
120	96	24	109	76
140	96	44	110	76
93	96	-3	110	77
93	110	-17	110	78
64	110	-46	110	79
94	110	-16	110	80
91	110	-19	110	81
98	110	-12	110	82
92	110	-18	110	83
96	110	-14	110	84
130	110	20	111	84
110	110	0	111	84
130	110	20	112	84
46	110	-64	112	85
130	110	20	113	85
110	110	0	113	85
130	110	20	114	85
130	110	20	115	85
130	110	20	116	85
120	110	10	117	85
140	110	30	118	85
93	110	-17	118	86
64	93	-29	118	87

94	93	1	119	87
91	93	-2	119	88
98	93	5	120	88
92	93	-1	120	89
96	93	3	121	89
130	93	37	122	89
110	93	17	123	89
130	93	37	124	89
46	93	-47	124	90
130	93	37	125	90
110	93	17	126	90
130	93	37	127	90
130	93	37	128	90
130	93	37	129	90
120	93	27	130	90
140	93	47	131	90
93	93	0	131	90
94	64	30	132	90
91	64	27	133	90
98	64	34	134	90
92	64	28	135	90
96	64	32	136	90
130	64	66	137	90
110	64	46	138	90
130	64	66	139	90
46	64	-18	139	91
130	64	66	140	91
110	64	46	141	91
130	64	66	142	91
130	64	66	143	91
130	64	66	144	91
120	64	56	145	91
140	64	76	146	91
93	64	29	147	91
91	94	-3	147	92
98	94	4	148	92
92	94	-2	148	93
96	94	2	149	93
130	94	36	150	93
110	94	16	151	93
130	94	36	152	93
46	94	-48	152	94
130	94	36	153	94
110	94	16	154	94
130	94	36	155	94
130	94	36	156	94
130	94	36	157	94
120	94	26	158	94
140	94	46	159	94
93	94	-1	159	95
98	91	7	160	95
92	91	1	161	95
96	91	5	162	95
130	91	39	163	95

110	91	19	164	95
130	91	39	165	95
46	91	-45	165	96
130	91	39	166	96
110	91	19	167	96
130	91	39	168	96
130	91	39	169	96
130	91	39	170	96
120	91	29	171	96
140	91	49	172	96
93	91	2	173	96
92	98	-6	173	97
96	98	-2	173	98
130	98	32	174	98
110	98	12	175	98
130	98	32	176	98
46	98	-52	176	99
130	98	32	177	99
110	98	12	178	99
130	98	32	179	99
130	98	32	180	99
130	98	32	181	99
120	98	22	182	99
140	98	42	183	99
93	98	-5	183	100
96	92	4	184	100
130	92	38	185	100
110	92	18	186	100
130	92	38	187	100
46	92	-46	187	101
130	92	38	188	101
110	92	18	189	101
130	92	38	190	101
130	92	38	191	101
130	92	38	192	101
120	92	28	193	101
140	92	48	194	101
93	92	1	195	101
130	96	34	196	101
110	96	14	197	101
130	96	34	198	101
46	96	-50	198	102
130	96	34	199	102
110	96	14	200	102
130	96	34	201	102
130	96	34	202	102
130	96	34	203	102
120	96	24	204	102
140	96	44	205	102
93	96	-3	205	103
110	130	-20	205	104
130	130	0	205	104
46	130	-84	205	105

130	130	0	205	105
110	130	-20	205	106
130	130	0	205	106
130	130	0	205	106
130	130	0	205	106
120	130	-10	205	107
140	130	10	206	107
93	130	-37	206	108
130	110	20	207	108
46	110	-64	207	109
130	110	20	208	109
110	110	0	208	109
130	110	20	209	109
130	110	20	210	109
130	110	20	211	109
120	110	10	212	109
140	110	30	213	109
93	110	-17	213	110
46	130	-84	213	111
130	130	0	213	111
110	130	-20	213	112
130	130	0	213	112
130	130	0	213	112
130	130	0	213	112
120	130	-10	213	113
140	130	10	214	113
93	130	-37	214	114
130	46	84	215	114
110	46	64	216	114
130	46	84	217	114
130	46	84	218	114
130	46	84	219	114
120	46	74	220	114
140	46	94	221	114
93	46	47	222	114
110	130	-20	222	115
130	130	0	222	115
130	130	0	222	115
130	130	0	222	115
120	130	-10	222	116
140	130	10	223	116
93	130	-37	223	117
130	110	20	224	117
130	110	20	225	117
130	110	20	226	117
120	110	10	227	117
140	110	30	228	117
93	110	-17	228	118
130	130	0	228	118
130	130	0	228	118
120	130	-10	228	119

140	130	10	229	119
93	130	-37	229	120
130	130	0	229	120
120	130	-10	229	121
140	130	10	230	121
93	130	-37	230	122
120	130	-10	230	123
140	130	10	231	123
93	130	-37	231	124
140	120	20	232	124
93	120	-27	232	125
93	140	-47	232	126

S Statistic = 232 - 126 = 106

Tied Group Value	Members
1	96
2	110
3	93
4	130

Time Period	Observations
6/1/2005	1
2/1/2006	1
3/12/2008	1
5/12/2008	1
9/23/2008	1
10/29/2008	1
4/29/2009	1
5/15/2009	1
9/23/2009	1
12/8/2009	1
2/25/2010	1
4/15/2010	1
8/11/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/19/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1

There are 0 time periods with multiple data

A = 612

B = 0

C = 126

D = 0

E = 40

F = 0

a = 46116

b = 176904

c = 1512

Group Variance = 2528

Z-Score = 2.08834

Comparison Level at 95% confidence level = 1.65463 (upward trend)

2.08834 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: EPW-02

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
3	3	0	0	0
3	3	0	0	0
2	3	-1	0	1
2	3	-1	0	2
57	3	54	1	2
47	3	44	2	2
9	3	6	3	2
44	3	41	4	2
43	3	40	5	2
23	3	20	6	2
16	3	13	7	2
ND<0	3	-3	7	3
28	3	25	8	3
16	3	13	9	3
ND<0	3	-3	9	4
9.3	3	6.3	10	4
ND<0	3	-3	10	5
57	3	54	11	5
15	3	12	12	5
30	3	27	13	5
ND<0	3	-3	13	6
24	3	21	14	6
10	3	7	15	6
5.1	3	2.1	16	6
ND<0	3	-3	16	7
ND<0	3	-3	16	8
85	3	82	17	8
ND<0	3	-3	17	9
3	3	0	17	9
2	3	-1	17	10
2	3	-1	17	11
57	3	54	18	11
47	3	44	19	11
9	3	6	20	11
44	3	41	21	11
43	3	40	22	11
23	3	20	23	11
16	3	13	24	11
ND<0	3	-3	24	12
28	3	25	25	12
16	3	13	26	12
ND<0	3	-3	26	13
9.3	3	6.3	27	13
ND<0	3	-3	27	14
57	3	54	28	14

15	3	12	29	14
30	3	27	30	14
ND<0	3	-3	30	15
24	3	21	31	15
10	3	7	32	15
5.1	3	2.1	33	15
ND<0	3	-3	33	16
ND<0	3	-3	33	17
85	3	82	34	17
ND<0	3	-3	34	18
2	3	-1	34	19
2	3	-1	34	20
57	3	54	35	20
47	3	44	36	20
9	3	6	37	20
44	3	41	38	20
43	3	40	39	20
23	3	20	40	20
16	3	13	41	20
ND<0	3	-3	41	21
28	3	25	42	21
16	3	13	43	21
ND<0	3	-3	43	22
9.3	3	6.3	44	22
ND<0	3	-3	44	23
57	3	54	45	23
15	3	12	46	23
30	3	27	47	23
ND<0	3	-3	47	24
24	3	21	48	24
10	3	7	49	24
5.1	3	2.1	50	24
ND<0	3	-3	50	25
ND<0	3	-3	50	26
85	3	82	51	26
ND<0	3	-3	51	27
2	2	0	51	27
57	2	55	52	27
47	2	45	53	27
9	2	7	54	27
44	2	42	55	27
43	2	41	56	27
23	2	21	57	27
16	2	14	58	27
ND<0	2	-2	58	28
28	2	26	59	28
16	2	14	60	28
ND<0	2	-2	60	29
9.3	2	7.3	61	29
ND<0	2	-2	61	30
57	2	55	62	30
15	2	13	63	30
30	2	28	64	30
ND<0	2	-2	64	31
24	2	22	65	31

10	2	8	66	31
5.1	2	3.1	67	31
ND<0	2	-2	67	32
ND<0	2	-2	67	33
85	2	83	68	33
ND<0	2	-2	68	34
57	2	55	69	34
47	2	45	70	34
9	2	7	71	34
44	2	42	72	34
43	2	41	73	34
23	2	21	74	34
16	2	14	75	34
ND<0	2	-2	75	35
28	2	26	76	35
16	2	14	77	35
ND<0	2	-2	77	36
9.3	2	7.3	78	36
ND<0	2	-2	78	37
57	2	55	79	37
15	2	13	80	37
30	2	28	81	37
ND<0	2	-2	81	38
24	2	22	82	38
10	2	8	83	38
5.1	2	3.1	84	38
ND<0	2	-2	84	39
ND<0	2	-2	84	40
85	2	83	85	40
ND<0	2	-2	85	41
47	57	-10	85	42
9	57	-48	85	43
44	57	-13	85	44
43	57	-14	85	45
23	57	-34	85	46
16	57	-41	85	47
ND<0	57	-57	85	48
28	57	-29	85	49
16	57	-41	85	50
ND<0	57	-57	85	51
9.3	57	-47.7	85	52
ND<0	57	-57	85	53
57	57	0	85	53
15	57	-42	85	54
30	57	-27	85	55
ND<0	57	-57	85	56
24	57	-33	85	57
10	57	-47	85	58
5.1	57	-51.9	85	59
ND<0	57	-57	85	60
ND<0	57	-57	85	61
85	57	28	86	61
ND<0	57	-57	86	62
9	47	-38	86	63

44	47	-3	86	64
43	47	-4	86	65
23	47	-24	86	66
16	47	-31	86	67
ND<0	47	-47	86	68
28	47	-19	86	69
16	47	-31	86	70
ND<0	47	-47	86	71
9.3	47	-37.7	86	72
ND<0	47	-47	86	73
57	47	10	87	73
15	47	-32	87	74
30	47	-17	87	75
ND<0	47	-47	87	76
24	47	-23	87	77
10	47	-37	87	78
5.1	47	-41.9	87	79
ND<0	47	-47	87	80
ND<0	47	-47	87	81
85	47	38	88	81
ND<0	47	-47	88	82
44	9	35	89	82
43	9	34	90	82
23	9	14	91	82
16	9	7	92	82
ND<0	9	-9	92	83
28	9	19	93	83
16	9	7	94	83
ND<0	9	-9	94	84
9.3	9	0.3	95	84
ND<0	9	-9	95	85
57	9	48	96	85
15	9	6	97	85
30	9	21	98	85
ND<0	9	-9	98	86
24	9	15	99	86
10	9	1	100	86
5.1	9	-3.9	100	87
ND<0	9	-9	100	88
ND<0	9	-9	100	89
85	9	76	101	89
ND<0	9	-9	101	90
43	44	-1	101	91
23	44	-21	101	92
16	44	-28	101	93
ND<0	44	-44	101	94
28	44	-16	101	95
16	44	-28	101	96
ND<0	44	-44	101	97
9.3	44	-34.7	101	98
ND<0	44	-44	101	99
57	44	13	102	99
15	44	-29	102	100
30	44	-14	102	101
ND<0	44	-44	102	102

24	44	-20	102	103
10	44	-34	102	104
5.1	44	-38.9	102	105
ND<0	44	-44	102	106
ND<0	44	-44	102	107
85	44	41	103	107
ND<0	44	-44	103	108
23	43	-20	103	109
16	43	-27	103	110
ND<0	43	-43	103	111
28	43	-15	103	112
16	43	-27	103	113
ND<0	43	-43	103	114
9.3	43	-33.7	103	115
ND<0	43	-43	103	116
57	43	14	104	116
15	43	-28	104	117
30	43	-13	104	118
ND<0	43	-43	104	119
24	43	-19	104	120
10	43	-33	104	121
5.1	43	-37.9	104	122
ND<0	43	-43	104	123
ND<0	43	-43	104	124
85	43	42	105	124
ND<0	43	-43	105	125
16	23	-7	105	126
ND<0	23	-23	105	127
28	23	5	106	127
16	23	-7	106	128
ND<0	23	-23	106	129
9.3	23	-13.7	106	130
ND<0	23	-23	106	131
57	23	34	107	131
15	23	-8	107	132
30	23	7	108	132
ND<0	23	-23	108	133
24	23	1	109	133
10	23	-13	109	134
5.1	23	-17.9	109	135
ND<0	23	-23	109	136
ND<0	23	-23	109	137
85	23	62	110	137
ND<0	23	-23	110	138
ND<0	16	-16	110	139
28	16	12	111	139
16	16	0	111	139
ND<0	16	-16	111	140
9.3	16	-6.7	111	141
ND<0	16	-16	111	142
57	16	41	112	142
15	16	-1	112	143
30	16	14	113	143
ND<0	16	-16	113	144

24	16	8	114	144
10	16	-6	114	145
5.1	16	-10.9	114	146
ND<0	16	-16	114	147
ND<0	16	-16	114	148
85	16	69	115	148
ND<0	16	-16	115	149
28	ND<0	28	116	149
16	ND<0	16	117	149
ND<0	ND<0	0	117	149
9.3	ND<0	9.3	118	149
ND<0	ND<0	0	118	149
57	ND<0	57	119	149
15	ND<0	15	120	149
30	ND<0	30	121	149
ND<0	ND<0	0	121	149
24	ND<0	24	122	149
10	ND<0	10	123	149
5.1	ND<0	5.1	124	149
ND<0	ND<0	0	124	149
ND<0	ND<0	0	124	149
85	ND<0	85	125	149
ND<0	ND<0	0	125	149
16	28	-12	125	150
ND<0	28	-28	125	151
9.3	28	-18.7	125	152
ND<0	28	-28	125	153
57	28	29	126	153
15	28	-13	126	154
30	28	2	127	154
ND<0	28	-28	127	155
24	28	-4	127	156
10	28	-18	127	157
5.1	28	-22.9	127	158
ND<0	28	-28	127	159
ND<0	28	-28	127	160
85	28	57	128	160
ND<0	28	-28	128	161
ND<0	16	-16	128	162
9.3	16	-6.7	128	163
ND<0	16	-16	128	164
57	16	41	129	164
15	16	-1	129	165
30	16	14	130	165
ND<0	16	-16	130	166
24	16	8	131	166
10	16	-6	131	167
5.1	16	-10.9	131	168
ND<0	16	-16	131	169
ND<0	16	-16	131	170
85	16	69	132	170
ND<0	16	-16	132	171
9.3	ND<0	9.3	133	171

ND<0	ND<0	0	133	171
57	ND<0	57	134	171
15	ND<0	15	135	171
30	ND<0	30	136	171
ND<0	ND<0	0	136	171
24	ND<0	24	137	171
10	ND<0	10	138	171
5.1	ND<0	5.1	139	171
ND<0	ND<0	0	139	171
ND<0	ND<0	0	139	171
85	ND<0	85	140	171
ND<0	ND<0	0	140	171
ND<0	9.3	-9.3	140	172
57	9.3	47.7	141	172
15	9.3	5.7	142	172
30	9.3	20.7	143	172
ND<0	9.3	-9.3	143	173
24	9.3	14.7	144	173
10	9.3	0.7	145	173
5.1	9.3	-4.2	145	174
ND<0	9.3	-9.3	145	175
ND<0	9.3	-9.3	145	176
85	9.3	75.7	146	176
ND<0	9.3	-9.3	146	177
57	ND<0	57	147	177
15	ND<0	15	148	177
30	ND<0	30	149	177
ND<0	ND<0	0	149	177
24	ND<0	24	150	177
10	ND<0	10	151	177
5.1	ND<0	5.1	152	177
ND<0	ND<0	0	152	177
ND<0	ND<0	0	152	177
85	ND<0	85	153	177
ND<0	ND<0	0	153	177
15	57	-42	153	178
30	57	-27	153	179
ND<0	57	-57	153	180
24	57	-33	153	181
10	57	-47	153	182
5.1	57	-51.9	153	183
ND<0	57	-57	153	184
ND<0	57	-57	153	185
85	57	28	154	185
ND<0	57	-57	154	186
30	15	15	155	186
ND<0	15	-15	155	187
24	15	9	156	187
10	15	-5	156	188
5.1	15	-9.9	156	189
ND<0	15	-15	156	190
ND<0	15	-15	156	191
85	15	70	157	191

ND<0	15	-15	157	192
ND<0	30	-30	157	193
24	30	-6	157	194
10	30	-20	157	195
5.1	30	-24.9	157	196
ND<0	30	-30	157	197
ND<0	30	-30	157	198
85	30	55	158	198
ND<0	30	-30	158	199
24	ND<0	24	159	199
10	ND<0	10	160	199
5.1	ND<0	5.1	161	199
ND<0	ND<0	0	161	199
ND<0	ND<0	0	161	199
85	ND<0	85	162	199
ND<0	ND<0	0	162	199
10	24	-14	162	200
5.1	24	-18.9	162	201
ND<0	24	-24	162	202
ND<0	24	-24	162	203
85	24	61	163	203
ND<0	24	-24	163	204
5.1	10	-4.9	163	205
ND<0	10	-10	163	206
ND<0	10	-10	163	207
85	10	75	164	207
ND<0	10	-10	164	208
ND<0	5.1	-5.1	164	209
ND<0	5.1	-5.1	164	210
85	5.1	79.9	165	210
ND<0	5.1	-5.1	165	211
ND<0	ND<0	0	165	211
85	ND<0	85	166	211
ND<0	ND<0	0	166	211
85	ND<0	85	167	211
ND<0	ND<0	0	167	211
ND<0	85	Same Date	167	211

S Statistic = 167 - 211 = -44

Tied Group Value	Members
1	3
2	2
3	2
4	2
5	7

Time Period	Observations
-------------	--------------

2/1/2006	1
3/12/2008	1
5/12/2008	1
9/23/2008	1
12/3/2008	1
4/29/2009	1
5/15/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/15/2010	1
8/11/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	2

There are 1 time periods with multiple data

A = 918

B = 18

C = 216

D = 0

E = 54

F = 2

a = 51156

b = 197316

c = 1624

Group Variance = 2790.07

Z-Score = -0.814069

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-0.814069 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: EPW-02

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
3	3	0	0	0
3	3	0	0	0
2	3	-1	0	1
2	3	-1	0	2
57	3	54	1	2
47	3	44	2	2
9	3	6	3	2
44	3	41	4	2
43	3	40	5	2
23	3	20	6	2
16	3	13	7	2
ND<0	3	-3	7	3
28	3	25	8	3
16	3	13	9	3
ND<0	3	-3	9	4
9.3	3	6.3	10	4
ND<0	3	-3	10	5
57	3	54	11	5
15	3	12	12	5
30	3	27	13	5
ND<0	3	-3	13	6
24	3	21	14	6
10	3	7	15	6
5.1	3	2.1	16	6
ND<0	3	-3	16	7
ND<0	3	-3	16	8
85	3	82	17	8
ND<0	3	-3	17	9
3	3	0	17	9
2	3	-1	17	10
2	3	-1	17	11
57	3	54	18	11
47	3	44	19	11
9	3	6	20	11
44	3	41	21	11
43	3	40	22	11
23	3	20	23	11
16	3	13	24	11
ND<0	3	-3	24	12
28	3	25	25	12
16	3	13	26	12
ND<0	3	-3	26	13
9.3	3	6.3	27	13
ND<0	3	-3	27	14
57	3	54	28	14

15	3	12	29	14
30	3	27	30	14
ND<0	3	-3	30	15
24	3	21	31	15
10	3	7	32	15
5.1	3	2.1	33	15
ND<0	3	-3	33	16
ND<0	3	-3	33	17
85	3	82	34	17
ND<0	3	-3	34	18
2	3	-1	34	19
2	3	-1	34	20
57	3	54	35	20
47	3	44	36	20
9	3	6	37	20
44	3	41	38	20
43	3	40	39	20
23	3	20	40	20
16	3	13	41	20
ND<0	3	-3	41	21
28	3	25	42	21
16	3	13	43	21
ND<0	3	-3	43	22
9.3	3	6.3	44	22
ND<0	3	-3	44	23
57	3	54	45	23
15	3	12	46	23
30	3	27	47	23
ND<0	3	-3	47	24
24	3	21	48	24
10	3	7	49	24
5.1	3	2.1	50	24
ND<0	3	-3	50	25
ND<0	3	-3	50	26
85	3	82	51	26
ND<0	3	-3	51	27
2	2	0	51	27
57	2	55	52	27
47	2	45	53	27
9	2	7	54	27
44	2	42	55	27
43	2	41	56	27
23	2	21	57	27
16	2	14	58	27
ND<0	2	-2	58	28
28	2	26	59	28
16	2	14	60	28
ND<0	2	-2	60	29
9.3	2	7.3	61	29
ND<0	2	-2	61	30
57	2	55	62	30
15	2	13	63	30
30	2	28	64	30
ND<0	2	-2	64	31
24	2	22	65	31

10	2	8	66	31
5.1	2	3.1	67	31
ND<0	2	-2	67	32
ND<0	2	-2	67	33
85	2	83	68	33
ND<0	2	-2	68	34
57	2	55	69	34
47	2	45	70	34
9	2	7	71	34
44	2	42	72	34
43	2	41	73	34
23	2	21	74	34
16	2	14	75	34
ND<0	2	-2	75	35
28	2	26	76	35
16	2	14	77	35
ND<0	2	-2	77	36
9.3	2	7.3	78	36
ND<0	2	-2	78	37
57	2	55	79	37
15	2	13	80	37
30	2	28	81	37
ND<0	2	-2	81	38
24	2	22	82	38
10	2	8	83	38
5.1	2	3.1	84	38
ND<0	2	-2	84	39
ND<0	2	-2	84	40
85	2	83	85	40
ND<0	2	-2	85	41
47	57	-10	85	42
9	57	-48	85	43
44	57	-13	85	44
43	57	-14	85	45
23	57	-34	85	46
16	57	-41	85	47
ND<0	57	-57	85	48
28	57	-29	85	49
16	57	-41	85	50
ND<0	57	-57	85	51
9.3	57	-47.7	85	52
ND<0	57	-57	85	53
57	57	0	85	53
15	57	-42	85	54
30	57	-27	85	55
ND<0	57	-57	85	56
24	57	-33	85	57
10	57	-47	85	58
5.1	57	-51.9	85	59
ND<0	57	-57	85	60
ND<0	57	-57	85	61
85	57	28	86	61
ND<0	57	-57	86	62
9	47	-38	86	63

44	47	-3	86	64
43	47	-4	86	65
23	47	-24	86	66
16	47	-31	86	67
ND<0	47	-47	86	68
28	47	-19	86	69
16	47	-31	86	70
ND<0	47	-47	86	71
9.3	47	-37.7	86	72
ND<0	47	-47	86	73
57	47	10	87	73
15	47	-32	87	74
30	47	-17	87	75
ND<0	47	-47	87	76
24	47	-23	87	77
10	47	-37	87	78
5.1	47	-41.9	87	79
ND<0	47	-47	87	80
ND<0	47	-47	87	81
85	47	38	88	81
ND<0	47	-47	88	82
44	9	35	89	82
43	9	34	90	82
23	9	14	91	82
16	9	7	92	82
ND<0	9	-9	92	83
28	9	19	93	83
16	9	7	94	83
ND<0	9	-9	94	84
9.3	9	0.3	95	84
ND<0	9	-9	95	85
57	9	48	96	85
15	9	6	97	85
30	9	21	98	85
ND<0	9	-9	98	86
24	9	15	99	86
10	9	1	100	86
5.1	9	-3.9	100	87
ND<0	9	-9	100	88
ND<0	9	-9	100	89
85	9	76	101	89
ND<0	9	-9	101	90
43	44	-1	101	91
23	44	-21	101	92
16	44	-28	101	93
ND<0	44	-44	101	94
28	44	-16	101	95
16	44	-28	101	96
ND<0	44	-44	101	97
9.3	44	-34.7	101	98
ND<0	44	-44	101	99
57	44	13	102	99
15	44	-29	102	100
30	44	-14	102	101
ND<0	44	-44	102	102

24	44	-20	102	103
10	44	-34	102	104
5.1	44	-38.9	102	105
ND<0	44	-44	102	106
ND<0	44	-44	102	107
85	44	41	103	107
ND<0	44	-44	103	108
23	43	-20	103	109
16	43	-27	103	110
ND<0	43	-43	103	111
28	43	-15	103	112
16	43	-27	103	113
ND<0	43	-43	103	114
9.3	43	-33.7	103	115
ND<0	43	-43	103	116
57	43	14	104	116
15	43	-28	104	117
30	43	-13	104	118
ND<0	43	-43	104	119
24	43	-19	104	120
10	43	-33	104	121
5.1	43	-37.9	104	122
ND<0	43	-43	104	123
ND<0	43	-43	104	124
85	43	42	105	124
ND<0	43	-43	105	125
16	23	-7	105	126
ND<0	23	-23	105	127
28	23	5	106	127
16	23	-7	106	128
ND<0	23	-23	106	129
9.3	23	-13.7	106	130
ND<0	23	-23	106	131
57	23	34	107	131
15	23	-8	107	132
30	23	7	108	132
ND<0	23	-23	108	133
24	23	1	109	133
10	23	-13	109	134
5.1	23	-17.9	109	135
ND<0	23	-23	109	136
ND<0	23	-23	109	137
85	23	62	110	137
ND<0	23	-23	110	138
ND<0	16	-16	110	139
28	16	12	111	139
16	16	0	111	139
ND<0	16	-16	111	140
9.3	16	-6.7	111	141
ND<0	16	-16	111	142
57	16	41	112	142
15	16	-1	112	143
30	16	14	113	143
ND<0	16	-16	113	144

24	16	8	114	144
10	16	-6	114	145
5.1	16	-10.9	114	146
ND<0	16	-16	114	147
ND<0	16	-16	114	148
85	16	69	115	148
ND<0	16	-16	115	149
28	ND<0	28	116	149
16	ND<0	16	117	149
ND<0	ND<0	0	117	149
9.3	ND<0	9.3	118	149
ND<0	ND<0	0	118	149
57	ND<0	57	119	149
15	ND<0	15	120	149
30	ND<0	30	121	149
ND<0	ND<0	0	121	149
24	ND<0	24	122	149
10	ND<0	10	123	149
5.1	ND<0	5.1	124	149
ND<0	ND<0	0	124	149
ND<0	ND<0	0	124	149
85	ND<0	85	125	149
ND<0	ND<0	0	125	149
16	28	-12	125	150
ND<0	28	-28	125	151
9.3	28	-18.7	125	152
ND<0	28	-28	125	153
57	28	29	126	153
15	28	-13	126	154
30	28	2	127	154
ND<0	28	-28	127	155
24	28	-4	127	156
10	28	-18	127	157
5.1	28	-22.9	127	158
ND<0	28	-28	127	159
ND<0	28	-28	127	160
85	28	57	128	160
ND<0	28	-28	128	161
ND<0	16	-16	128	162
9.3	16	-6.7	128	163
ND<0	16	-16	128	164
57	16	41	129	164
15	16	-1	129	165
30	16	14	130	165
ND<0	16	-16	130	166
24	16	8	131	166
10	16	-6	131	167
5.1	16	-10.9	131	168
ND<0	16	-16	131	169
ND<0	16	-16	131	170
85	16	69	132	170
ND<0	16	-16	132	171
9.3	ND<0	9.3	133	171

ND<0	ND<0	0	133	171
57	ND<0	57	134	171
15	ND<0	15	135	171
30	ND<0	30	136	171
ND<0	ND<0	0	136	171
24	ND<0	24	137	171
10	ND<0	10	138	171
5.1	ND<0	5.1	139	171
ND<0	ND<0	0	139	171
ND<0	ND<0	0	139	171
85	ND<0	85	140	171
ND<0	ND<0	0	140	171
ND<0	9.3	-9.3	140	172
57	9.3	47.7	141	172
15	9.3	5.7	142	172
30	9.3	20.7	143	172
ND<0	9.3	-9.3	143	173
24	9.3	14.7	144	173
10	9.3	0.7	145	173
5.1	9.3	-4.2	145	174
ND<0	9.3	-9.3	145	175
ND<0	9.3	-9.3	145	176
85	9.3	75.7	146	176
ND<0	9.3	-9.3	146	177
57	ND<0	57	147	177
15	ND<0	15	148	177
30	ND<0	30	149	177
ND<0	ND<0	0	149	177
24	ND<0	24	150	177
10	ND<0	10	151	177
5.1	ND<0	5.1	152	177
ND<0	ND<0	0	152	177
ND<0	ND<0	0	152	177
85	ND<0	85	153	177
ND<0	ND<0	0	153	177
15	57	-42	153	178
30	57	-27	153	179
ND<0	57	-57	153	180
24	57	-33	153	181
10	57	-47	153	182
5.1	57	-51.9	153	183
ND<0	57	-57	153	184
ND<0	57	-57	153	185
85	57	28	154	185
ND<0	57	-57	154	186
30	15	15	155	186
ND<0	15	-15	155	187
24	15	9	156	187
10	15	-5	156	188
5.1	15	-9.9	156	189
ND<0	15	-15	156	190
ND<0	15	-15	156	191
85	15	70	157	191

ND<0	15	-15	157	192
ND<0	30	-30	157	193
24	30	-6	157	194
10	30	-20	157	195
5.1	30	-24.9	157	196
ND<0	30	-30	157	197
ND<0	30	-30	157	198
85	30	55	158	198
ND<0	30	-30	158	199
24	ND<0	24	159	199
10	ND<0	10	160	199
5.1	ND<0	5.1	161	199
ND<0	ND<0	0	161	199
ND<0	ND<0	0	161	199
85	ND<0	85	162	199
ND<0	ND<0	0	162	199
10	24	-14	162	200
5.1	24	-18.9	162	201
ND<0	24	-24	162	202
ND<0	24	-24	162	203
85	24	61	163	203
ND<0	24	-24	163	204
5.1	10	-4.9	163	205
ND<0	10	-10	163	206
ND<0	10	-10	163	207
85	10	75	164	207
ND<0	10	-10	164	208
ND<0	5.1	-5.1	164	209
ND<0	5.1	-5.1	164	210
85	5.1	79.9	165	210
ND<0	5.1	-5.1	165	211
ND<0	ND<0	0	165	211
85	ND<0	85	166	211
ND<0	ND<0	0	166	211
85	ND<0	85	167	211
ND<0	ND<0	0	167	211
ND<0	85	Same Date	167	211

S Statistic = 167 - 211 = -44

Tied Group Value	Members
1	3
2	2
3	2
4	2
5	7

Time Period	Observations
-------------	--------------

2/1/2006	1
3/12/2008	1
5/12/2008	1
9/23/2008	1
12/3/2008	1
4/29/2009	1
5/15/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/15/2010	1
8/11/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	2

There are 1 time periods with multiple data

A = 918

B = 18

C = 216

D = 0

E = 54

F = 2

a = 51156

b = 197316

c = 1624

Group Variance = 2790.07

Z-Score = -0.814069

Comparison Level at 95% confidence level = 1.65463 (upward trend)

-0.814069 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: EPW-03D

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
91	34	57	1	0
39	34	5	2	0
35	34	1	3	0
36	34	2	4	0
35	34	1	5	0
33	34	-1	5	1
32	34	-2	5	2
31	34	-3	5	3
37	34	3	6	3
34	34	0	6	3
39	34	5	7	3
30	34	-4	7	4
30	34	-4	7	5
28	34	-6	7	6
28	34	-6	7	7
26	34	-8	7	8
25	34	-9	7	9
26	34	-8	7	10
27	34	-7	7	11
20	34	-14	7	12
35	34	1	8	12
25	34	-9	8	13
23	34	-11	8	14
39	91	-52	8	15
35	91	-56	8	16
36	91	-55	8	17
35	91	-56	8	18
33	91	-58	8	19
32	91	-59	8	20
31	91	-60	8	21
37	91	-54	8	22
34	91	-57	8	23
39	91	-52	8	24
30	91	-61	8	25
30	91	-61	8	26
28	91	-63	8	27
28	91	-63	8	28
26	91	-65	8	29
25	91	-66	8	30
26	91	-65	8	31
27	91	-64	8	32
20	91	-71	8	33
35	91	-56	8	34
25	91	-66	8	35
23	91	-68	8	36

35	39	-4	8	37
36	39	-3	8	38
35	39	-4	8	39
33	39	-6	8	40
32	39	-7	8	41
31	39	-8	8	42
37	39	-2	8	43
34	39	-5	8	44
39	39	0	8	44
30	39	-9	8	45
30	39	-9	8	46
28	39	-11	8	47
28	39	-11	8	48
26	39	-13	8	49
25	39	-14	8	50
26	39	-13	8	51
27	39	-12	8	52
20	39	-19	8	53
35	39	-4	8	54
25	39	-14	8	55
23	39	-16	8	56
36	35	1	9	56
35	35	0	9	56
33	35	-2	9	57
32	35	-3	9	58
31	35	-4	9	59
37	35	2	10	59
34	35	-1	10	60
39	35	4	11	60
30	35	-5	11	61
30	35	-5	11	62
28	35	-7	11	63
28	35	-7	11	64
26	35	-9	11	65
25	35	-10	11	66
26	35	-9	11	67
27	35	-8	11	68
20	35	-15	11	69
35	35	0	11	69
25	35	-10	11	70
23	35	-12	11	71
35	36	-1	11	72
33	36	-3	11	73
32	36	-4	11	74
31	36	-5	11	75
37	36	1	12	75
34	36	-2	12	76
39	36	3	13	76
30	36	-6	13	77
30	36	-6	13	78
28	36	-8	13	79
28	36	-8	13	80
26	36	-10	13	81
25	36	-11	13	82

26	36	-10	13	83
27	36	-9	13	84
20	36	-16	13	85
35	36	-1	13	86
25	36	-11	13	87
23	36	-13	13	88
33	35	-2	13	89
32	35	-3	13	90
31	35	-4	13	91
37	35	2	14	91
34	35	-1	14	92
39	35	4	15	92
30	35	-5	15	93
30	35	-5	15	94
28	35	-7	15	95
28	35	-7	15	96
26	35	-9	15	97
25	35	-10	15	98
26	35	-9	15	99
27	35	-8	15	100
20	35	-15	15	101
35	35	0	15	101
25	35	-10	15	102
23	35	-12	15	103
32	33	-1	15	104
31	33	-2	15	105
37	33	4	16	105
34	33	1	17	105
39	33	6	18	105
30	33	-3	18	106
30	33	-3	18	107
28	33	-5	18	108
28	33	-5	18	109
26	33	-7	18	110
25	33	-8	18	111
26	33	-7	18	112
27	33	-6	18	113
20	33	-13	18	114
35	33	2	19	114
25	33	-8	19	115
23	33	-10	19	116
31	32	-1	19	117
37	32	5	20	117
34	32	2	21	117
39	32	7	22	117
30	32	-2	22	118
30	32	-2	22	119
28	32	-4	22	120
28	32	-4	22	121
26	32	-6	22	122
25	32	-7	22	123
26	32	-6	22	124
27	32	-5	22	125
20	32	-12	22	126

35	32	3	23	126
25	32	-7	23	127
23	32	-9	23	128
37	31	6	24	128
34	31	3	25	128
39	31	8	26	128
30	31	-1	26	129
30	31	-1	26	130
28	31	-3	26	131
28	31	-3	26	132
26	31	-5	26	133
25	31	-6	26	134
26	31	-5	26	135
27	31	-4	26	136
20	31	-11	26	137
35	31	4	27	137
25	31	-6	27	138
23	31	-8	27	139
34	37	-3	27	140
39	37	2	28	140
30	37	-7	28	141
30	37	-7	28	142
28	37	-9	28	143
28	37	-9	28	144
26	37	-11	28	145
25	37	-12	28	146
26	37	-11	28	147
27	37	-10	28	148
20	37	-17	28	149
35	37	-2	28	150
25	37	-12	28	151
23	37	-14	28	152
39	34	5	29	152
30	34	-4	29	153
30	34	-4	29	154
28	34	-6	29	155
28	34	-6	29	156
26	34	-8	29	157
25	34	-9	29	158
26	34	-8	29	159
27	34	-7	29	160
20	34	-14	29	161
35	34	1	30	161
25	34	-9	30	162
23	34	-11	30	163
30	39	-9	30	164
30	39	-9	30	165
28	39	-11	30	166
28	39	-11	30	167
26	39	-13	30	168
25	39	-14	30	169
26	39	-13	30	170
27	39	-12	30	171

20	39	-19	30	172
35	39	-4	30	173
25	39	-14	30	174
23	39	-16	30	175
30	30	0	30	175
28	30	-2	30	176
28	30	-2	30	177
26	30	-4	30	178
25	30	-5	30	179
26	30	-4	30	180
27	30	-3	30	181
20	30	-10	30	182
35	30	5	31	182
25	30	-5	31	183
23	30	-7	31	184
28	30	-2	31	185
28	30	-2	31	186
26	30	-4	31	187
25	30	-5	31	188
26	30	-4	31	189
27	30	-3	31	190
20	30	-10	31	191
35	30	5	32	191
25	30	-5	32	192
23	30	-7	32	193
28	28	0	32	193
26	28	-2	32	194
25	28	-3	32	195
26	28	-2	32	196
27	28	-1	32	197
20	28	-8	32	198
35	28	7	33	198
25	28	-3	33	199
23	28	-5	33	200
26	28	-2	33	201
25	28	-3	33	202
26	28	-2	33	203
27	28	-1	33	204
20	28	-8	33	205
35	28	7	34	205
25	28	-3	34	206
23	28	-5	34	207
25	26	-1	34	208
26	26	0	34	208
27	26	1	35	208
20	26	-6	35	209
35	26	9	36	209
25	26	-1	36	210
23	26	-3	36	211
26	25	1	37	211
27	25	2	38	211

20	25	-5	38	212
35	25	10	39	212
25	25	0	39	212
23	25	-2	39	213
27	26	1	40	213
20	26	-6	40	214
35	26	9	41	214
25	26	-1	41	215
23	26	-3	41	216
20	27	-7	41	217
35	27	8	42	217
25	27	-2	42	218
23	27	-4	42	219
35	20	15	43	219
25	20	5	44	219
23	20	3	45	219
25	35	-10	45	220
23	35	-12	45	221
23	25	-2	45	222

S Statistic = 45 - 222 = -177

Tied Group Value	Members
1	34
2	39
3	35
4	30
5	28
6	26
7	25

Time Period	Observations
9/24/2008	1
10/29/2008	1
4/28/2009	1
5/15/2009	1
9/30/2009	1
12/9/2009	1
2/25/2010	1
4/15/2010	1
8/11/2010	1
3/8/2011	1
5/24/2011	1
8/31/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1

10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 174

B = 0

C = 6

D = 0

E = 18

F = 0

a = 29256

b = 109296

c = 1104

Group Variance = 1615.67

Z-Score = -4.37862

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-4.37862 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: GCW-01D

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
290	328	-38	0	1
358	328	30	1	1
699	328	371	2	1
480	328	152	3	1
350	328	22	4	1
300	328	-28	4	2
290	328	-38	4	3
260	328	-68	4	4
270	328	-58	4	5
260	328	-68	4	6
280	328	-48	4	7
280	328	-48	4	8
260	328	-68	4	9
260	328	-68	4	10
280	328	-48	4	11
290	328	-38	4	12
280	328	-48	4	13
250	328	-78	4	14
240	328	-88	4	15
230	328	-98	4	16
210	328	-118	4	17
220	328	-108	4	18
190	328	-138	4	19
190	328	-138	4	20
380	328	52	5	20
160	328	-168	5	21
358	290	68	6	21
699	290	409	7	21
480	290	190	8	21
350	290	60	9	21
300	290	10	10	21
290	290	0	10	21
260	290	-30	10	22
270	290	-20	10	23
260	290	-30	10	24
280	290	-10	10	25
280	290	-10	10	26
260	290	-30	10	27
260	290	-30	10	28
280	290	-10	10	29
290	290	0	10	29
280	290	-10	10	30
250	290	-40	10	31
240	290	-50	10	32
230	290	-60	10	33

210	290	-80	10	34
220	290	-70	10	35
190	290	-100	10	36
190	290	-100	10	37
380	290	90	11	37
160	290	-130	11	38
699	358	341	12	38
480	358	122	13	38
350	358	-8	13	39
300	358	-58	13	40
290	358	-68	13	41
260	358	-98	13	42
270	358	-88	13	43
260	358	-98	13	44
280	358	-78	13	45
280	358	-78	13	46
260	358	-98	13	47
260	358	-98	13	48
280	358	-78	13	49
290	358	-68	13	50
280	358	-78	13	51
250	358	-108	13	52
240	358	-118	13	53
230	358	-128	13	54
210	358	-148	13	55
220	358	-138	13	56
190	358	-168	13	57
190	358	-168	13	58
380	358	22	14	58
160	358	-198	14	59
480	699	-219	14	60
350	699	-349	14	61
300	699	-399	14	62
290	699	-409	14	63
260	699	-439	14	64
270	699	-429	14	65
260	699	-439	14	66
280	699	-419	14	67
280	699	-419	14	68
260	699	-439	14	69
260	699	-439	14	70
280	699	-419	14	71
290	699	-409	14	72
280	699	-419	14	73
250	699	-449	14	74
240	699	-459	14	75
230	699	-469	14	76
210	699	-489	14	77
220	699	-479	14	78
190	699	-509	14	79
190	699	-509	14	80
380	699	-319	14	81
160	699	-539	14	82
350	480	-130	14	83

300	480	-180	14	84
290	480	-190	14	85
260	480	-220	14	86
270	480	-210	14	87
260	480	-220	14	88
280	480	-200	14	89
280	480	-200	14	90
260	480	-220	14	91
260	480	-220	14	92
280	480	-200	14	93
290	480	-190	14	94
280	480	-200	14	95
250	480	-230	14	96
240	480	-240	14	97
230	480	-250	14	98
210	480	-270	14	99
220	480	-260	14	100
190	480	-290	14	101
190	480	-290	14	102
380	480	-100	14	103
160	480	-320	14	104
300	350	-50	14	105
290	350	-60	14	106
260	350	-90	14	107
270	350	-80	14	108
260	350	-90	14	109
280	350	-70	14	110
280	350	-70	14	111
260	350	-90	14	112
260	350	-90	14	113
280	350	-70	14	114
290	350	-60	14	115
280	350	-70	14	116
250	350	-100	14	117
240	350	-110	14	118
230	350	-120	14	119
210	350	-140	14	120
220	350	-130	14	121
190	350	-160	14	122
190	350	-160	14	123
380	350	30	15	123
160	350	-190	15	124
290	300	-10	15	125
260	300	-40	15	126
270	300	-30	15	127
260	300	-40	15	128
280	300	-20	15	129
280	300	-20	15	130
260	300	-40	15	131
260	300	-40	15	132
280	300	-20	15	133
290	300	-10	15	134
280	300	-20	15	135
250	300	-50	15	136
240	300	-60	15	137

230	300	-70	15	138
210	300	-90	15	139
220	300	-80	15	140
190	300	-110	15	141
190	300	-110	15	142
380	300	80	16	142
160	300	-140	16	143
260	290	-30	16	144
270	290	-20	16	145
260	290	-30	16	146
280	290	-10	16	147
280	290	-10	16	148
260	290	-30	16	149
260	290	-30	16	150
280	290	-10	16	151
290	290	0	16	151
280	290	-10	16	152
250	290	-40	16	153
240	290	-50	16	154
230	290	-60	16	155
210	290	-80	16	156
220	290	-70	16	157
190	290	-100	16	158
190	290	-100	16	159
380	290	90	17	159
160	290	-130	17	160
270	260	10	18	160
260	260	0	18	160
280	260	20	19	160
280	260	20	20	160
260	260	0	20	160
260	260	0	20	160
280	260	20	21	160
290	260	30	22	160
280	260	20	23	160
250	260	-10	23	161
240	260	-20	23	162
230	260	-30	23	163
210	260	-50	23	164
220	260	-40	23	165
190	260	-70	23	166
190	260	-70	23	167
380	260	120	24	167
160	260	-100	24	168
260	270	-10	24	169
280	270	10	25	169
280	270	10	26	169
260	270	-10	26	170
260	270	-10	26	171
280	270	10	27	171
290	270	20	28	171
280	270	10	29	171
250	270	-20	29	172
240	270	-30	29	173

230	270	-40	29	174
210	270	-60	29	175
220	270	-50	29	176
190	270	-80	29	177
190	270	-80	29	178
380	270	110	30	178
160	270	-110	30	179
280	260	20	31	179
280	260	20	32	179
260	260	0	32	179
260	260	0	32	179
280	260	20	33	179
290	260	30	34	179
280	260	20	35	179
250	260	-10	35	180
240	260	-20	35	181
230	260	-30	35	182
210	260	-50	35	183
220	260	-40	35	184
190	260	-70	35	185
190	260	-70	35	186
380	260	120	36	186
160	260	-100	36	187
280	280	0	36	187
260	280	-20	36	188
260	280	-20	36	189
280	280	0	36	189
290	280	10	37	189
280	280	0	37	189
250	280	-30	37	190
240	280	-40	37	191
230	280	-50	37	192
210	280	-70	37	193
220	280	-60	37	194
190	280	-90	37	195
190	280	-90	37	196
380	280	100	38	196
160	280	-120	38	197
260	280	-20	38	198
260	280	-20	38	199
280	280	0	38	199
290	280	10	39	199
280	280	0	39	199
250	280	-30	39	200
240	280	-40	39	201
230	280	-50	39	202
210	280	-70	39	203
220	280	-60	39	204
190	280	-90	39	205
190	280	-90	39	206
380	280	100	40	206
160	280	-120	40	207
260	260	0	40	207

280	260	20	41	207
290	260	30	42	207
280	260	20	43	207
250	260	-10	43	208
240	260	-20	43	209
230	260	-30	43	210
210	260	-50	43	211
220	260	-40	43	212
190	260	-70	43	213
190	260	-70	43	214
380	260	120	44	214
160	260	-100	44	215
280	260	20	45	215
290	260	30	46	215
280	260	20	47	215
250	260	-10	47	216
240	260	-20	47	217
230	260	-30	47	218
210	260	-50	47	219
220	260	-40	47	220
190	260	-70	47	221
190	260	-70	47	222
380	260	120	48	222
160	260	-100	48	223
290	280	10	49	223
280	280	0	49	223
250	280	-30	49	224
240	280	-40	49	225
230	280	-50	49	226
210	280	-70	49	227
220	280	-60	49	228
190	280	-90	49	229
190	280	-90	49	230
380	280	100	50	230
160	280	-120	50	231
280	290	-10	50	232
250	290	-40	50	233
240	290	-50	50	234
230	290	-60	50	235
210	290	-80	50	236
220	290	-70	50	237
190	290	-100	50	238
190	290	-100	50	239
380	290	90	51	239
160	290	-130	51	240
250	280	-30	51	241
240	280	-40	51	242
230	280	-50	51	243
210	280	-70	51	244
220	280	-60	51	245
190	280	-90	51	246
190	280	-90	51	247
380	280	100	52	247

160	280	-120	52	248
240	250	-10	52	249
230	250	-20	52	250
210	250	-40	52	251
220	250	-30	52	252
190	250	-60	52	253
190	250	-60	52	254
380	250	130	53	254
160	250	-90	53	255
230	240	-10	53	256
210	240	-30	53	257
220	240	-20	53	258
190	240	-50	53	259
190	240	-50	53	260
380	240	140	54	260
160	240	-80	54	261
210	230	-20	54	262
220	230	-10	54	263
190	230	-40	54	264
190	230	-40	54	265
380	230	150	55	265
160	230	-70	55	266
220	210	10	56	266
190	210	-20	56	267
190	210	-20	56	268
380	210	170	57	268
160	210	-50	57	269
190	220	-30	57	270
190	220	-30	57	271
380	220	160	58	271
160	220	-60	58	272
190	190	0	58	272
380	190	190	59	272
160	190	-30	59	273
380	190	190	60	273
160	190	-30	60	274
160	380	-220	60	275

S Statistic = 60 - 275 = -215

Tied Group Value	Members
1	290
2	260
3	280
4	190

Time Period	Observations
3/11/2008	1

5/13/2008	1
9/23/2008	1
10/29/2008	1
4/29/2009	1
5/13/2009	1
9/29/2009	1
12/9/2009	1
2/26/2010	1
4/15/2010	1
8/10/2010	1
11/22/2010	1
3/10/2011	1
5/25/2011	1
9/2/2011	1
4/12/2012	1
11/7/2012	1
4/23/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 396

B = 0

C = 54

D = 0

E = 32

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2279

Z-Score = -4.48272

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-4.48272 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: GCW-02D

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
2190	2980	-790	0	1
3140	2980	160	1	1
3030	2980	50	2	1
3000	2980	20	3	1
3600	2980	620	4	1
2200	2980	-780	4	2
4500	2980	1520	5	2
2100	2980	-880	5	3
2000	2980	-980	5	4
2100	2980	-880	5	5
1900	2980	-1080	5	6
2100	2980	-880	5	7
2200	2980	-780	5	8
2100	2980	-880	5	9
2300	2980	-680	5	10
2400	2980	-580	5	11
2500	2980	-480	5	12
2800	2980	-180	5	13
3000	2980	20	6	13
1900	2980	-1080	6	14
2000	2980	-980	6	15
2500	2980	-480	6	16
2400	2980	-580	6	17
3800	2980	820	7	17
1800	2980	-1180	7	18
1500	2980	-1480	7	19
3140	2190	950	8	19
3030	2190	840	9	19
3000	2190	810	10	19
3600	2190	1410	11	19
2200	2190	10	12	19
4500	2190	2310	13	19
2100	2190	-90	13	20
2000	2190	-190	13	21
2100	2190	-90	13	22
1900	2190	-290	13	23
2100	2190	-90	13	24
2200	2190	10	14	24
2100	2190	-90	14	25
2300	2190	110	15	25
2400	2190	210	16	25
2500	2190	310	17	25
2800	2190	610	18	25
3000	2190	810	19	25
1900	2190	-290	19	26

2000	2190	-190	19	27
2500	2190	310	20	27
2400	2190	210	21	27
3800	2190	1610	22	27
1800	2190	-390	22	28
1500	2190	-690	22	29
3030	3140	-110	22	30
3000	3140	-140	22	31
3600	3140	460	23	31
2200	3140	-940	23	32
4500	3140	1360	24	32
2100	3140	-1040	24	33
2000	3140	-1140	24	34
2100	3140	-1040	24	35
1900	3140	-1240	24	36
2100	3140	-1040	24	37
2200	3140	-940	24	38
2100	3140	-1040	24	39
2300	3140	-840	24	40
2400	3140	-740	24	41
2500	3140	-640	24	42
2800	3140	-340	24	43
3000	3140	-140	24	44
1900	3140	-1240	24	45
2000	3140	-1140	24	46
2500	3140	-640	24	47
2400	3140	-740	24	48
3800	3140	660	25	48
1800	3140	-1340	25	49
1500	3140	-1640	25	50
3000	3030	-30	25	51
3600	3030	570	26	51
2200	3030	-830	26	52
4500	3030	1470	27	52
2100	3030	-930	27	53
2000	3030	-1030	27	54
2100	3030	-930	27	55
1900	3030	-1130	27	56
2100	3030	-930	27	57
2200	3030	-830	27	58
2100	3030	-930	27	59
2300	3030	-730	27	60
2400	3030	-630	27	61
2500	3030	-530	27	62
2800	3030	-230	27	63
3000	3030	-30	27	64
1900	3030	-1130	27	65
2000	3030	-1030	27	66
2500	3030	-530	27	67
2400	3030	-630	27	68
3800	3030	770	28	68
1800	3030	-1230	28	69
1500	3030	-1530	28	70
3600	3000	600	29	70

2200	3000	-800	29	71
4500	3000	1500	30	71
2100	3000	-900	30	72
2000	3000	-1000	30	73
2100	3000	-900	30	74
1900	3000	-1100	30	75
2100	3000	-900	30	76
2200	3000	-800	30	77
2100	3000	-900	30	78
2300	3000	-700	30	79
2400	3000	-600	30	80
2500	3000	-500	30	81
2800	3000	-200	30	82
3000	3000	0	30	82
1900	3000	-1100	30	83
2000	3000	-1000	30	84
2500	3000	-500	30	85
2400	3000	-600	30	86
3800	3000	800	31	86
1800	3000	-1200	31	87
1500	3000	-1500	31	88
2200	3600	-1400	31	89
4500	3600	900	32	89
2100	3600	-1500	32	90
2000	3600	-1600	32	91
2100	3600	-1500	32	92
1900	3600	-1700	32	93
2100	3600	-1500	32	94
2200	3600	-1400	32	95
2100	3600	-1500	32	96
2300	3600	-1300	32	97
2400	3600	-1200	32	98
2500	3600	-1100	32	99
2800	3600	-800	32	100
3000	3600	-600	32	101
1900	3600	-1700	32	102
2000	3600	-1600	32	103
2500	3600	-1100	32	104
2400	3600	-1200	32	105
3800	3600	200	33	105
1800	3600	-1800	33	106
1500	3600	-2100	33	107
4500	2200	2300	34	107
2100	2200	-100	34	108
2000	2200	-200	34	109
2100	2200	-100	34	110
1900	2200	-300	34	111
2100	2200	-100	34	112
2200	2200	0	34	112
2100	2200	-100	34	113
2300	2200	100	35	113
2400	2200	200	36	113
2500	2200	300	37	113
2800	2200	600	38	113
3000	2200	800	39	113

1900	2200	-300	39	114
2000	2200	-200	39	115
2500	2200	300	40	115
2400	2200	200	41	115
3800	2200	1600	42	115
1800	2200	-400	42	116
1500	2200	-700	42	117
2100	4500	-2400	42	118
2000	4500	-2500	42	119
2100	4500	-2400	42	120
1900	4500	-2600	42	121
2100	4500	-2400	42	122
2200	4500	-2300	42	123
2100	4500	-2400	42	124
2300	4500	-2200	42	125
2400	4500	-2100	42	126
2500	4500	-2000	42	127
2800	4500	-1700	42	128
3000	4500	-1500	42	129
1900	4500	-2600	42	130
2000	4500	-2500	42	131
2500	4500	-2000	42	132
2400	4500	-2100	42	133
3800	4500	-700	42	134
1800	4500	-2700	42	135
1500	4500	-3000	42	136
2000	2100	-100	42	137
2100	2100	0	42	137
1900	2100	-200	42	138
2100	2100	0	42	138
2200	2100	100	43	138
2100	2100	0	43	138
2300	2100	200	44	138
2400	2100	300	45	138
2500	2100	400	46	138
2800	2100	700	47	138
3000	2100	900	48	138
1900	2100	-200	48	139
2000	2100	-100	48	140
2500	2100	400	49	140
2400	2100	300	50	140
3800	2100	1700	51	140
1800	2100	-300	51	141
1500	2100	-600	51	142
2100	2000	100	52	142
1900	2000	-100	52	143
2100	2000	100	53	143
2200	2000	200	54	143
2100	2000	100	55	143
2300	2000	300	56	143
2400	2000	400	57	143
2500	2000	500	58	143
2800	2000	800	59	143
3000	2000	1000	60	143

1900	2000	-100	60	144
2000	2000	0	60	144
2500	2000	500	61	144
2400	2000	400	62	144
3800	2000	1800	63	144
1800	2000	-200	63	145
1500	2000	-500	63	146
1900	2100	-200	63	147
2100	2100	0	63	147
2200	2100	100	64	147
2100	2100	0	64	147
2300	2100	200	65	147
2400	2100	300	66	147
2500	2100	400	67	147
2800	2100	700	68	147
3000	2100	900	69	147
1900	2100	-200	69	148
2000	2100	-100	69	149
2500	2100	400	70	149
2400	2100	300	71	149
3800	2100	1700	72	149
1800	2100	-300	72	150
1500	2100	-600	72	151
2100	1900	200	73	151
2200	1900	300	74	151
2100	1900	200	75	151
2300	1900	400	76	151
2400	1900	500	77	151
2500	1900	600	78	151
2800	1900	900	79	151
3000	1900	1100	80	151
1900	1900	0	80	151
2000	1900	100	81	151
2500	1900	600	82	151
2400	1900	500	83	151
3800	1900	1900	84	151
1800	1900	-100	84	152
1500	1900	-400	84	153
2200	2100	100	85	153
2100	2100	0	85	153
2300	2100	200	86	153
2400	2100	300	87	153
2500	2100	400	88	153
2800	2100	700	89	153
3000	2100	900	90	153
1900	2100	-200	90	154
2000	2100	-100	90	155
2500	2100	400	91	155
2400	2100	300	92	155
3800	2100	1700	93	155
1800	2100	-300	93	156
1500	2100	-600	93	157
2100	2200	-100	93	158

2300	2200	100	94	158
2400	2200	200	95	158
2500	2200	300	96	158
2800	2200	600	97	158
3000	2200	800	98	158
1900	2200	-300	98	159
2000	2200	-200	98	160
2500	2200	300	99	160
2400	2200	200	100	160
3800	2200	1600	101	160
1800	2200	-400	101	161
1500	2200	-700	101	162
2300	2100	200	102	162
2400	2100	300	103	162
2500	2100	400	104	162
2800	2100	700	105	162
3000	2100	900	106	162
1900	2100	-200	106	163
2000	2100	-100	106	164
2500	2100	400	107	164
2400	2100	300	108	164
3800	2100	1700	109	164
1800	2100	-300	109	165
1500	2100	-600	109	166
2400	2300	100	110	166
2500	2300	200	111	166
2800	2300	500	112	166
3000	2300	700	113	166
1900	2300	-400	113	167
2000	2300	-300	113	168
2500	2300	200	114	168
2400	2300	100	115	168
3800	2300	1500	116	168
1800	2300	-500	116	169
1500	2300	-800	116	170
2500	2400	100	117	170
2800	2400	400	118	170
3000	2400	600	119	170
1900	2400	-500	119	171
2000	2400	-400	119	172
2500	2400	100	120	172
2400	2400	0	120	172
3800	2400	1400	121	172
1800	2400	-600	121	173
1500	2400	-900	121	174
2800	2500	300	122	174
3000	2500	500	123	174
1900	2500	-600	123	175
2000	2500	-500	123	176
2500	2500	0	123	176
2400	2500	-100	123	177
3800	2500	1300	124	177
1800	2500	-700	124	178

1500	2500	-1000	124	179
3000	2800	200	125	179
1900	2800	-900	125	180
2000	2800	-800	125	181
2500	2800	-300	125	182
2400	2800	-400	125	183
3800	2800	1000	126	183
1800	2800	-1000	126	184
1500	2800	-1300	126	185
1900	3000	-1100	126	186
2000	3000	-1000	126	187
2500	3000	-500	126	188
2400	3000	-600	126	189
3800	3000	800	127	189
1800	3000	-1200	127	190
1500	3000	-1500	127	191
2000	1900	100	128	191
2500	1900	600	129	191
2400	1900	500	130	191
3800	1900	1900	131	191
1800	1900	-100	131	192
1500	1900	-400	131	193
2500	2000	500	132	193
2400	2000	400	133	193
3800	2000	1800	134	193
1800	2000	-200	134	194
1500	2000	-500	134	195
2400	2500	-100	134	196
3800	2500	1300	135	196
1800	2500	-700	135	197
1500	2500	-1000	135	198
3800	2400	1400	136	198
1800	2400	-600	136	199
1500	2400	-900	136	200
1800	3800	-2000	136	201
1500	3800	-2300	136	202
1500	1800	-300	136	203

S Statistic = 136 - 203 = -67

Tied Group Value	Members
1	3000
2	2200
3	2100
4	2000
5	1900
6	2400
7	2500

Time Period	Observations
3/12/2008	1
5/12/2008	1
9/23/2008	1
12/3/2008	1
4/28/2009	1
5/14/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/14/2010	1
8/12/2010	1
11/24/2010	1
3/8/2011	1
5/24/2011	1
9/1/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 264

B = 0

C = 24

D = 0

E = 24

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2286.33

Z-Score = -1.3803

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-1.3803 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: GCW-02D

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
2190	2980	-790	0	1
3140	2980	160	1	1
3030	2980	50	2	1
3000	2980	20	3	1
3600	2980	620	4	1
2200	2980	-780	4	2
4500	2980	1520	5	2
2100	2980	-880	5	3
2000	2980	-980	5	4
2100	2980	-880	5	5
1900	2980	-1080	5	6
2100	2980	-880	5	7
2200	2980	-780	5	8
2100	2980	-880	5	9
2300	2980	-680	5	10
2400	2980	-580	5	11
2500	2980	-480	5	12
2800	2980	-180	5	13
3000	2980	20	6	13
1900	2980	-1080	6	14
2000	2980	-980	6	15
2500	2980	-480	6	16
2400	2980	-580	6	17
3800	2980	820	7	17
1800	2980	-1180	7	18
1500	2980	-1480	7	19
3140	2190	950	8	19
3030	2190	840	9	19
3000	2190	810	10	19
3600	2190	1410	11	19
2200	2190	10	12	19
4500	2190	2310	13	19
2100	2190	-90	13	20
2000	2190	-190	13	21
2100	2190	-90	13	22
1900	2190	-290	13	23
2100	2190	-90	13	24
2200	2190	10	14	24
2100	2190	-90	14	25
2300	2190	110	15	25
2400	2190	210	16	25
2500	2190	310	17	25
2800	2190	610	18	25
3000	2190	810	19	25
1900	2190	-290	19	26

2000	2190	-190	19	27
2500	2190	310	20	27
2400	2190	210	21	27
3800	2190	1610	22	27
1800	2190	-390	22	28
1500	2190	-690	22	29
3030	3140	-110	22	30
3000	3140	-140	22	31
3600	3140	460	23	31
2200	3140	-940	23	32
4500	3140	1360	24	32
2100	3140	-1040	24	33
2000	3140	-1140	24	34
2100	3140	-1040	24	35
1900	3140	-1240	24	36
2100	3140	-1040	24	37
2200	3140	-940	24	38
2100	3140	-1040	24	39
2300	3140	-840	24	40
2400	3140	-740	24	41
2500	3140	-640	24	42
2800	3140	-340	24	43
3000	3140	-140	24	44
1900	3140	-1240	24	45
2000	3140	-1140	24	46
2500	3140	-640	24	47
2400	3140	-740	24	48
3800	3140	660	25	48
1800	3140	-1340	25	49
1500	3140	-1640	25	50
3000	3030	-30	25	51
3600	3030	570	26	51
2200	3030	-830	26	52
4500	3030	1470	27	52
2100	3030	-930	27	53
2000	3030	-1030	27	54
2100	3030	-930	27	55
1900	3030	-1130	27	56
2100	3030	-930	27	57
2200	3030	-830	27	58
2100	3030	-930	27	59
2300	3030	-730	27	60
2400	3030	-630	27	61
2500	3030	-530	27	62
2800	3030	-230	27	63
3000	3030	-30	27	64
1900	3030	-1130	27	65
2000	3030	-1030	27	66
2500	3030	-530	27	67
2400	3030	-630	27	68
3800	3030	770	28	68
1800	3030	-1230	28	69
1500	3030	-1530	28	70
3600	3000	600	29	70

2200	3000	-800	29	71
4500	3000	1500	30	71
2100	3000	-900	30	72
2000	3000	-1000	30	73
2100	3000	-900	30	74
1900	3000	-1100	30	75
2100	3000	-900	30	76
2200	3000	-800	30	77
2100	3000	-900	30	78
2300	3000	-700	30	79
2400	3000	-600	30	80
2500	3000	-500	30	81
2800	3000	-200	30	82
3000	3000	0	30	82
1900	3000	-1100	30	83
2000	3000	-1000	30	84
2500	3000	-500	30	85
2400	3000	-600	30	86
3800	3000	800	31	86
1800	3000	-1200	31	87
1500	3000	-1500	31	88
2200	3600	-1400	31	89
4500	3600	900	32	89
2100	3600	-1500	32	90
2000	3600	-1600	32	91
2100	3600	-1500	32	92
1900	3600	-1700	32	93
2100	3600	-1500	32	94
2200	3600	-1400	32	95
2100	3600	-1500	32	96
2300	3600	-1300	32	97
2400	3600	-1200	32	98
2500	3600	-1100	32	99
2800	3600	-800	32	100
3000	3600	-600	32	101
1900	3600	-1700	32	102
2000	3600	-1600	32	103
2500	3600	-1100	32	104
2400	3600	-1200	32	105
3800	3600	200	33	105
1800	3600	-1800	33	106
1500	3600	-2100	33	107
4500	2200	2300	34	107
2100	2200	-100	34	108
2000	2200	-200	34	109
2100	2200	-100	34	110
1900	2200	-300	34	111
2100	2200	-100	34	112
2200	2200	0	34	112
2100	2200	-100	34	113
2300	2200	100	35	113
2400	2200	200	36	113
2500	2200	300	37	113
2800	2200	600	38	113
3000	2200	800	39	113

1900	2200	-300	39	114
2000	2200	-200	39	115
2500	2200	300	40	115
2400	2200	200	41	115
3800	2200	1600	42	115
1800	2200	-400	42	116
1500	2200	-700	42	117
2100	4500	-2400	42	118
2000	4500	-2500	42	119
2100	4500	-2400	42	120
1900	4500	-2600	42	121
2100	4500	-2400	42	122
2200	4500	-2300	42	123
2100	4500	-2400	42	124
2300	4500	-2200	42	125
2400	4500	-2100	42	126
2500	4500	-2000	42	127
2800	4500	-1700	42	128
3000	4500	-1500	42	129
1900	4500	-2600	42	130
2000	4500	-2500	42	131
2500	4500	-2000	42	132
2400	4500	-2100	42	133
3800	4500	-700	42	134
1800	4500	-2700	42	135
1500	4500	-3000	42	136
2000	2100	-100	42	137
2100	2100	0	42	137
1900	2100	-200	42	138
2100	2100	0	42	138
2200	2100	100	43	138
2100	2100	0	43	138
2300	2100	200	44	138
2400	2100	300	45	138
2500	2100	400	46	138
2800	2100	700	47	138
3000	2100	900	48	138
1900	2100	-200	48	139
2000	2100	-100	48	140
2500	2100	400	49	140
2400	2100	300	50	140
3800	2100	1700	51	140
1800	2100	-300	51	141
1500	2100	-600	51	142
2100	2000	100	52	142
1900	2000	-100	52	143
2100	2000	100	53	143
2200	2000	200	54	143
2100	2000	100	55	143
2300	2000	300	56	143
2400	2000	400	57	143
2500	2000	500	58	143
2800	2000	800	59	143
3000	2000	1000	60	143

1900	2000	-100	60	144
2000	2000	0	60	144
2500	2000	500	61	144
2400	2000	400	62	144
3800	2000	1800	63	144
1800	2000	-200	63	145
1500	2000	-500	63	146
1900	2100	-200	63	147
2100	2100	0	63	147
2200	2100	100	64	147
2100	2100	0	64	147
2300	2100	200	65	147
2400	2100	300	66	147
2500	2100	400	67	147
2800	2100	700	68	147
3000	2100	900	69	147
1900	2100	-200	69	148
2000	2100	-100	69	149
2500	2100	400	70	149
2400	2100	300	71	149
3800	2100	1700	72	149
1800	2100	-300	72	150
1500	2100	-600	72	151
2100	1900	200	73	151
2200	1900	300	74	151
2100	1900	200	75	151
2300	1900	400	76	151
2400	1900	500	77	151
2500	1900	600	78	151
2800	1900	900	79	151
3000	1900	1100	80	151
1900	1900	0	80	151
2000	1900	100	81	151
2500	1900	600	82	151
2400	1900	500	83	151
3800	1900	1900	84	151
1800	1900	-100	84	152
1500	1900	-400	84	153
2200	2100	100	85	153
2100	2100	0	85	153
2300	2100	200	86	153
2400	2100	300	87	153
2500	2100	400	88	153
2800	2100	700	89	153
3000	2100	900	90	153
1900	2100	-200	90	154
2000	2100	-100	90	155
2500	2100	400	91	155
2400	2100	300	92	155
3800	2100	1700	93	155
1800	2100	-300	93	156
1500	2100	-600	93	157
2100	2200	-100	93	158

2300	2200	100	94	158
2400	2200	200	95	158
2500	2200	300	96	158
2800	2200	600	97	158
3000	2200	800	98	158
1900	2200	-300	98	159
2000	2200	-200	98	160
2500	2200	300	99	160
2400	2200	200	100	160
3800	2200	1600	101	160
1800	2200	-400	101	161
1500	2200	-700	101	162
2300	2100	200	102	162
2400	2100	300	103	162
2500	2100	400	104	162
2800	2100	700	105	162
3000	2100	900	106	162
1900	2100	-200	106	163
2000	2100	-100	106	164
2500	2100	400	107	164
2400	2100	300	108	164
3800	2100	1700	109	164
1800	2100	-300	109	165
1500	2100	-600	109	166
2400	2300	100	110	166
2500	2300	200	111	166
2800	2300	500	112	166
3000	2300	700	113	166
1900	2300	-400	113	167
2000	2300	-300	113	168
2500	2300	200	114	168
2400	2300	100	115	168
3800	2300	1500	116	168
1800	2300	-500	116	169
1500	2300	-800	116	170
2500	2400	100	117	170
2800	2400	400	118	170
3000	2400	600	119	170
1900	2400	-500	119	171
2000	2400	-400	119	172
2500	2400	100	120	172
2400	2400	0	120	172
3800	2400	1400	121	172
1800	2400	-600	121	173
1500	2400	-900	121	174
2800	2500	300	122	174
3000	2500	500	123	174
1900	2500	-600	123	175
2000	2500	-500	123	176
2500	2500	0	123	176
2400	2500	-100	123	177
3800	2500	1300	124	177
1800	2500	-700	124	178

1500	2500	-1000	124	179
3000	2800	200	125	179
1900	2800	-900	125	180
2000	2800	-800	125	181
2500	2800	-300	125	182
2400	2800	-400	125	183
3800	2800	1000	126	183
1800	2800	-1000	126	184
1500	2800	-1300	126	185
1900	3000	-1100	126	186
2000	3000	-1000	126	187
2500	3000	-500	126	188
2400	3000	-600	126	189
3800	3000	800	127	189
1800	3000	-1200	127	190
1500	3000	-1500	127	191
2000	1900	100	128	191
2500	1900	600	129	191
2400	1900	500	130	191
3800	1900	1900	131	191
1800	1900	-100	131	192
1500	1900	-400	131	193
2500	2000	500	132	193
2400	2000	400	133	193
3800	2000	1800	134	193
1800	2000	-200	134	194
1500	2000	-500	134	195
2400	2500	-100	134	196
3800	2500	1300	135	196
1800	2500	-700	135	197
1500	2500	-1000	135	198
3800	2400	1400	136	198
1800	2400	-600	136	199
1500	2400	-900	136	200
1800	3800	-2000	136	201
1500	3800	-2300	136	202
1500	1800	-300	136	203

S Statistic = 136 - 203 = -67

Tied Group Value	Members
1	3000
2	2200
3	2100
4	2000
5	1900
6	2400
7	2500

Time Period	Observations
3/12/2008	1
5/12/2008	1
9/23/2008	1
12/3/2008	1
4/28/2009	1
5/14/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/14/2010	1
8/12/2010	1
11/24/2010	1
3/8/2011	1
5/24/2011	1
9/1/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 264

B = 0

C = 24

D = 0

E = 24

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2286.33

Z-Score = -1.3803

Comparison Level at 95% confidence level = 1.65463 (upward trend)

-1.3803 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: GCW-03D

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
3960	4960	-1000	0	1
5680	4960	720	1	1
6620	4960	1660	2	1
7900	4960	2940	3	1
8600	4960	3640	4	1
4300	4960	-660	4	2
5300	4960	340	5	2
4400	4960	-560	5	3
4600	4960	-360	5	4
3800	4960	-1160	5	5
3500	4960	-1460	5	6
3600	4960	-1360	5	7
3700	4960	-1260	5	8
3500	4960	-1460	5	9
3500	4960	-1460	5	10
4000	4960	-960	5	11
3600	4960	-1360	5	12
3900	4960	-1060	5	13
4500	4960	-460	5	14
3300	4960	-1660	5	15
3800	4960	-1160	5	16
4400	4960	-560	5	17
4000	4960	-960	5	18
7000	4960	2040	6	18
3400	4960	-1560	6	19
2900	4960	-2060	6	20
5680	3960	1720	7	20
6620	3960	2660	8	20
7900	3960	3940	9	20
8600	3960	4640	10	20
4300	3960	340	11	20
5300	3960	1340	12	20
4400	3960	440	13	20
4600	3960	640	14	20
3800	3960	-160	14	21
3500	3960	-460	14	22
3600	3960	-360	14	23
3700	3960	-260	14	24
3500	3960	-460	14	25
3500	3960	-460	14	26
4000	3960	40	15	26
3600	3960	-360	15	27
3900	3960	-60	15	28
4500	3960	540	16	28
3300	3960	-660	16	29

3800	3960	-160	16	30
4400	3960	440	17	30
4000	3960	40	18	30
7000	3960	3040	19	30
3400	3960	-560	19	31
2900	3960	-1060	19	32
6620	5680	940	20	32
7900	5680	2220	21	32
8600	5680	2920	22	32
4300	5680	-1380	22	33
5300	5680	-380	22	34
4400	5680	-1280	22	35
4600	5680	-1080	22	36
3800	5680	-1880	22	37
3500	5680	-2180	22	38
3600	5680	-2080	22	39
3700	5680	-1980	22	40
3500	5680	-2180	22	41
3500	5680	-2180	22	42
4000	5680	-1680	22	43
3600	5680	-2080	22	44
3900	5680	-1780	22	45
4500	5680	-1180	22	46
3300	5680	-2380	22	47
3800	5680	-1880	22	48
4400	5680	-1280	22	49
4000	5680	-1680	22	50
7000	5680	1320	23	50
3400	5680	-2280	23	51
2900	5680	-2780	23	52
7900	6620	1280	24	52
8600	6620	1980	25	52
4300	6620	-2320	25	53
5300	6620	-1320	25	54
4400	6620	-2220	25	55
4600	6620	-2020	25	56
3800	6620	-2820	25	57
3500	6620	-3120	25	58
3600	6620	-3020	25	59
3700	6620	-2920	25	60
3500	6620	-3120	25	61
3500	6620	-3120	25	62
4000	6620	-2620	25	63
3600	6620	-3020	25	64
3900	6620	-2720	25	65
4500	6620	-2120	25	66
3300	6620	-3320	25	67
3800	6620	-2820	25	68
4400	6620	-2220	25	69
4000	6620	-2620	25	70
7000	6620	380	26	70
3400	6620	-3220	26	71
2900	6620	-3720	26	72
8600	7900	700	27	72

4300	7900	-3600	27	73
5300	7900	-2600	27	74
4400	7900	-3500	27	75
4600	7900	-3300	27	76
3800	7900	-4100	27	77
3500	7900	-4400	27	78
3600	7900	-4300	27	79
3700	7900	-4200	27	80
3500	7900	-4400	27	81
3500	7900	-4400	27	82
4000	7900	-3900	27	83
3600	7900	-4300	27	84
3900	7900	-4000	27	85
4500	7900	-3400	27	86
3300	7900	-4600	27	87
3800	7900	-4100	27	88
4400	7900	-3500	27	89
4000	7900	-3900	27	90
7000	7900	-900	27	91
3400	7900	-4500	27	92
2900	7900	-5000	27	93
4300	8600	-4300	27	94
5300	8600	-3300	27	95
4400	8600	-4200	27	96
4600	8600	-4000	27	97
3800	8600	-4800	27	98
3500	8600	-5100	27	99
3600	8600	-5000	27	100
3700	8600	-4900	27	101
3500	8600	-5100	27	102
3500	8600	-5100	27	103
4000	8600	-4600	27	104
3600	8600	-5000	27	105
3900	8600	-4700	27	106
4500	8600	-4100	27	107
3300	8600	-5300	27	108
3800	8600	-4800	27	109
4400	8600	-4200	27	110
4000	8600	-4600	27	111
7000	8600	-1600	27	112
3400	8600	-5200	27	113
2900	8600	-5700	27	114
5300	4300	1000	28	114
4400	4300	100	29	114
4600	4300	300	30	114
3800	4300	-500	30	115
3500	4300	-800	30	116
3600	4300	-700	30	117
3700	4300	-600	30	118
3500	4300	-800	30	119
3500	4300	-800	30	120
4000	4300	-300	30	121
3600	4300	-700	30	122
3900	4300	-400	30	123
4500	4300	200	31	123

3300	4300	-1000	31	124
3800	4300	-500	31	125
4400	4300	100	32	125
4000	4300	-300	32	126
7000	4300	2700	33	126
3400	4300	-900	33	127
2900	4300	-1400	33	128
4400	5300	-900	33	129
4600	5300	-700	33	130
3800	5300	-1500	33	131
3500	5300	-1800	33	132
3600	5300	-1700	33	133
3700	5300	-1600	33	134
3500	5300	-1800	33	135
3500	5300	-1800	33	136
4000	5300	-1300	33	137
3600	5300	-1700	33	138
3900	5300	-1400	33	139
4500	5300	-800	33	140
3300	5300	-2000	33	141
3800	5300	-1500	33	142
4400	5300	-900	33	143
4000	5300	-1300	33	144
7000	5300	1700	34	144
3400	5300	-1900	34	145
2900	5300	-2400	34	146
4600	4400	200	35	146
3800	4400	-600	35	147
3500	4400	-900	35	148
3600	4400	-800	35	149
3700	4400	-700	35	150
3500	4400	-900	35	151
3500	4400	-900	35	152
4000	4400	-400	35	153
3600	4400	-800	35	154
3900	4400	-500	35	155
4500	4400	100	36	155
3300	4400	-1100	36	156
3800	4400	-600	36	157
4400	4400	0	36	157
4000	4400	-400	36	158
7000	4400	2600	37	158
3400	4400	-1000	37	159
2900	4400	-1500	37	160
3800	4600	-800	37	161
3500	4600	-1100	37	162
3600	4600	-1000	37	163
3700	4600	-900	37	164
3500	4600	-1100	37	165
3500	4600	-1100	37	166
4000	4600	-600	37	167
3600	4600	-1000	37	168
3900	4600	-700	37	169
4500	4600	-100	37	170

3300	4600	-1300	37	171
3800	4600	-800	37	172
4400	4600	-200	37	173
4000	4600	-600	37	174
7000	4600	2400	38	174
3400	4600	-1200	38	175
2900	4600	-1700	38	176
3500	3800	-300	38	177
3600	3800	-200	38	178
3700	3800	-100	38	179
3500	3800	-300	38	180
3500	3800	-300	38	181
4000	3800	200	39	181
3600	3800	-200	39	182
3900	3800	100	40	182
4500	3800	700	41	182
3300	3800	-500	41	183
3800	3800	0	41	183
4400	3800	600	42	183
4000	3800	200	43	183
7000	3800	3200	44	183
3400	3800	-400	44	184
2900	3800	-900	44	185
3600	3500	100	45	185
3700	3500	200	46	185
3500	3500	0	46	185
3500	3500	0	46	185
4000	3500	500	47	185
3600	3500	100	48	185
3900	3500	400	49	185
4500	3500	1000	50	185
3300	3500	-200	50	186
3800	3500	300	51	186
4400	3500	900	52	186
4000	3500	500	53	186
7000	3500	3500	54	186
3400	3500	-100	54	187
2900	3500	-600	54	188
3700	3600	100	55	188
3500	3600	-100	55	189
3500	3600	-100	55	190
4000	3600	400	56	190
3600	3600	0	56	190
3900	3600	300	57	190
4500	3600	900	58	190
3300	3600	-300	58	191
3800	3600	200	59	191
4400	3600	800	60	191
4000	3600	400	61	191
7000	3600	3400	62	191
3400	3600	-200	62	192
2900	3600	-700	62	193
3500	3700	-200	62	194

3500	3700	-200	62	195
4000	3700	300	63	195
3600	3700	-100	63	196
3900	3700	200	64	196
4500	3700	800	65	196
3300	3700	-400	65	197
3800	3700	100	66	197
4400	3700	700	67	197
4000	3700	300	68	197
7000	3700	3300	69	197
3400	3700	-300	69	198
2900	3700	-800	69	199
3500	3500	0	69	199
4000	3500	500	70	199
3600	3500	100	71	199
3900	3500	400	72	199
4500	3500	1000	73	199
3300	3500	-200	73	200
3800	3500	300	74	200
4400	3500	900	75	200
4000	3500	500	76	200
7000	3500	3500	77	200
3400	3500	-100	77	201
2900	3500	-600	77	202
4000	3500	500	78	202
3600	3500	100	79	202
3900	3500	400	80	202
4500	3500	1000	81	202
3300	3500	-200	81	203
3800	3500	300	82	203
4400	3500	900	83	203
4000	3500	500	84	203
7000	3500	3500	85	203
3400	3500	-100	85	204
2900	3500	-600	85	205
3600	4000	-400	85	206
3900	4000	-100	85	207
4500	4000	500	86	207
3300	4000	-700	86	208
3800	4000	-200	86	209
4400	4000	400	87	209
4000	4000	0	87	209
7000	4000	3000	88	209
3400	4000	-600	88	210
2900	4000	-1100	88	211
3900	3600	300	89	211
4500	3600	900	90	211
3300	3600	-300	90	212
3800	3600	200	91	212
4400	3600	800	92	212
4000	3600	400	93	212
7000	3600	3400	94	212
3400	3600	-200	94	213

2900	3600	-700	94	214
4500	3900	600	95	214
3300	3900	-600	95	215
3800	3900	-100	95	216
4400	3900	500	96	216
4000	3900	100	97	216
7000	3900	3100	98	216
3400	3900	-500	98	217
2900	3900	-1000	98	218
3300	4500	-1200	98	219
3800	4500	-700	98	220
4400	4500	-100	98	221
4000	4500	-500	98	222
7000	4500	2500	99	222
3400	4500	-1100	99	223
2900	4500	-1600	99	224
3800	3300	500	100	224
4400	3300	1100	101	224
4000	3300	700	102	224
7000	3300	3700	103	224
3400	3300	100	104	224
2900	3300	-400	104	225
4400	3800	600	105	225
4000	3800	200	106	225
7000	3800	3200	107	225
3400	3800	-400	107	226
2900	3800	-900	107	227
4000	4400	-400	107	228
7000	4400	2600	108	228
3400	4400	-1000	108	229
2900	4400	-1500	108	230
7000	4000	3000	109	230
3400	4000	-600	109	231
2900	4000	-1100	109	232
3400	7000	-3600	109	233
2900	7000	-4100	109	234
2900	3400	-500	109	235

S Statistic = 109 - 235 = -126

Tied Group Value	Members
1	4400
2	3800
3	3500
4	3600
5	4000

Time Period	Observations
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3/12/2008	1
5/10/2008	1
9/22/2008	1
10/28/2008	1
4/28/2009	1
5/14/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/24/2011	1
9/1/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 138

B = 0

C = 6

D = 0

E = 14

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2293.33

Z-Score = -2.61022

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-2.61022 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: GCW-04D

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
4700	5110	-410	0	1
8000	5110	2890	1	1
7470	5110	2360	2	1
12000	5110	6890	3	1
13000	5110	7890	4	1
6500	5110	1390	5	1
7200	5110	2090	6	1
5900	5110	790	7	1
5000	5110	-110	7	2
4800	5110	-310	7	3
4200	5110	-910	7	4
3900	5110	-1210	7	5
4000	5110	-1110	7	6
3900	5110	-1210	7	7
3700	5110	-1410	7	8
3900	5110	-1210	7	9
5000	5110	-110	7	10
5500	5110	390	8	10
5400	5110	290	9	10
3000	5110	-2110	9	11
9.8	5110	-5100.2	9	12
30	5110	-5080	9	13
12	5110	-5098	9	14
4600	5110	-510	9	15
2800	5110	-2310	9	16
2100	5110	-3010	9	17
8000	4700	3300	10	17
7470	4700	2770	11	17
12000	4700	7300	12	17
13000	4700	8300	13	17
6500	4700	1800	14	17
7200	4700	2500	15	17
5900	4700	1200	16	17
5000	4700	300	17	17
4800	4700	100	18	17
4200	4700	-500	18	18
3900	4700	-800	18	19
4000	4700	-700	18	20
3900	4700	-800	18	21
3700	4700	-1000	18	22
3900	4700	-800	18	23
5000	4700	300	19	23
5500	4700	800	20	23
5400	4700	700	21	23
3000	4700	-1700	21	24

9.8	4700	-4690.2	21	25
30	4700	-4670	21	26
12	4700	-4688	21	27
4600	4700	-100	21	28
2800	4700	-1900	21	29
2100	4700	-2600	21	30
7470	8000	-530	21	31
12000	8000	4000	22	31
13000	8000	5000	23	31
6500	8000	-1500	23	32
7200	8000	-800	23	33
5900	8000	-2100	23	34
5000	8000	-3000	23	35
4800	8000	-3200	23	36
4200	8000	-3800	23	37
3900	8000	-4100	23	38
4000	8000	-4000	23	39
3900	8000	-4100	23	40
3700	8000	-4300	23	41
3900	8000	-4100	23	42
5000	8000	-3000	23	43
5500	8000	-2500	23	44
5400	8000	-2600	23	45
3000	8000	-5000	23	46
9.8	8000	-7990.2	23	47
30	8000	-7970	23	48
12	8000	-7988	23	49
4600	8000	-3400	23	50
2800	8000	-5200	23	51
2100	8000	-5900	23	52
12000	7470	4530	24	52
13000	7470	5530	25	52
6500	7470	-970	25	53
7200	7470	-270	25	54
5900	7470	-1570	25	55
5000	7470	-2470	25	56
4800	7470	-2670	25	57
4200	7470	-3270	25	58
3900	7470	-3570	25	59
4000	7470	-3470	25	60
3900	7470	-3570	25	61
3700	7470	-3770	25	62
3900	7470	-3570	25	63
5000	7470	-2470	25	64
5500	7470	-1970	25	65
5400	7470	-2070	25	66
3000	7470	-4470	25	67
9.8	7470	-7460.2	25	68
30	7470	-7440	25	69
12	7470	-7458	25	70
4600	7470	-2870	25	71
2800	7470	-4670	25	72
2100	7470	-5370	25	73
13000	12000	1000	26	73

6500	12000	-5500	26	74
7200	12000	-4800	26	75
5900	12000	-6100	26	76
5000	12000	-7000	26	77
4800	12000	-7200	26	78
4200	12000	-7800	26	79
3900	12000	-8100	26	80
4000	12000	-8000	26	81
3900	12000	-8100	26	82
3700	12000	-8300	26	83
3900	12000	-8100	26	84
5000	12000	-7000	26	85
5500	12000	-6500	26	86
5400	12000	-6600	26	87
3000	12000	-9000	26	88
9.8	12000	-11990.2	26	89
30	12000	-11970	26	90
12	12000	-11988	26	91
4600	12000	-7400	26	92
2800	12000	-9200	26	93
2100	12000	-9900	26	94
6500	13000	-6500	26	95
7200	13000	-5800	26	96
5900	13000	-7100	26	97
5000	13000	-8000	26	98
4800	13000	-8200	26	99
4200	13000	-8800	26	100
3900	13000	-9100	26	101
4000	13000	-9000	26	102
3900	13000	-9100	26	103
3700	13000	-9300	26	104
3900	13000	-9100	26	105
5000	13000	-8000	26	106
5500	13000	-7500	26	107
5400	13000	-7600	26	108
3000	13000	-10000	26	109
9.8	13000	-12990.2	26	110
30	13000	-12970	26	111
12	13000	-12988	26	112
4600	13000	-8400	26	113
2800	13000	-10200	26	114
2100	13000	-10900	26	115
7200	6500	700	27	115
5900	6500	-600	27	116
5000	6500	-1500	27	117
4800	6500	-1700	27	118
4200	6500	-2300	27	119
3900	6500	-2600	27	120
4000	6500	-2500	27	121
3900	6500	-2600	27	122
3700	6500	-2800	27	123
3900	6500	-2600	27	124
5000	6500	-1500	27	125
5500	6500	-1000	27	126
5400	6500	-1100	27	127

3000	6500	-3500	27	128
9.8	6500	-6490.2	27	129
30	6500	-6470	27	130
12	6500	-6488	27	131
4600	6500	-1900	27	132
2800	6500	-3700	27	133
2100	6500	-4400	27	134
5900	7200	-1300	27	135
5000	7200	-2200	27	136
4800	7200	-2400	27	137
4200	7200	-3000	27	138
3900	7200	-3300	27	139
4000	7200	-3200	27	140
3900	7200	-3300	27	141
3700	7200	-3500	27	142
3900	7200	-3300	27	143
5000	7200	-2200	27	144
5500	7200	-1700	27	145
5400	7200	-1800	27	146
3000	7200	-4200	27	147
9.8	7200	-7190.2	27	148
30	7200	-7170	27	149
12	7200	-7188	27	150
4600	7200	-2600	27	151
2800	7200	-4400	27	152
2100	7200	-5100	27	153
5000	5900	-900	27	154
4800	5900	-1100	27	155
4200	5900	-1700	27	156
3900	5900	-2000	27	157
4000	5900	-1900	27	158
3900	5900	-2000	27	159
3700	5900	-2200	27	160
3900	5900	-2000	27	161
5000	5900	-900	27	162
5500	5900	-400	27	163
5400	5900	-500	27	164
3000	5900	-2900	27	165
9.8	5900	-5890.2	27	166
30	5900	-5870	27	167
12	5900	-5888	27	168
4600	5900	-1300	27	169
2800	5900	-3100	27	170
2100	5900	-3800	27	171
4800	5000	-200	27	172
4200	5000	-800	27	173
3900	5000	-1100	27	174
4000	5000	-1000	27	175
3900	5000	-1100	27	176
3700	5000	-1300	27	177
3900	5000	-1100	27	178
5000	5000	0	27	178
5500	5000	500	28	178
5400	5000	400	29	178

3000	5000	-2000	29	179
9.8	5000	-4990.2	29	180
30	5000	-4970	29	181
12	5000	-4988	29	182
4600	5000	-400	29	183
2800	5000	-2200	29	184
2100	5000	-2900	29	185
4200	4800	-600	29	186
3900	4800	-900	29	187
4000	4800	-800	29	188
3900	4800	-900	29	189
3700	4800	-1100	29	190
3900	4800	-900	29	191
5000	4800	200	30	191
5500	4800	700	31	191
5400	4800	600	32	191
3000	4800	-1800	32	192
9.8	4800	-4790.2	32	193
30	4800	-4770	32	194
12	4800	-4788	32	195
4600	4800	-200	32	196
2800	4800	-2000	32	197
2100	4800	-2700	32	198
3900	4200	-300	32	199
4000	4200	-200	32	200
3900	4200	-300	32	201
3700	4200	-500	32	202
3900	4200	-300	32	203
5000	4200	800	33	203
5500	4200	1300	34	203
5400	4200	1200	35	203
3000	4200	-1200	35	204
9.8	4200	-4190.2	35	205
30	4200	-4170	35	206
12	4200	-4188	35	207
4600	4200	400	36	207
2800	4200	-1400	36	208
2100	4200	-2100	36	209
4000	3900	100	37	209
3900	3900	0	37	209
3700	3900	-200	37	210
3900	3900	0	37	210
5000	3900	1100	38	210
5500	3900	1600	39	210
5400	3900	1500	40	210
3000	3900	-900	40	211
9.8	3900	-3890.2	40	212
30	3900	-3870	40	213
12	3900	-3888	40	214
4600	3900	700	41	214
2800	3900	-1100	41	215
2100	3900	-1800	41	216
3900	4000	-100	41	217

3700	4000	-300	41	218
3900	4000	-100	41	219
5000	4000	1000	42	219
5500	4000	1500	43	219
5400	4000	1400	44	219
3000	4000	-1000	44	220
9.8	4000	-3990.2	44	221
30	4000	-3970	44	222
12	4000	-3988	44	223
4600	4000	600	45	223
2800	4000	-1200	45	224
2100	4000	-1900	45	225
3700	3900	-200	45	226
3900	3900	0	45	226
5000	3900	1100	46	226
5500	3900	1600	47	226
5400	3900	1500	48	226
3000	3900	-900	48	227
9.8	3900	-3890.2	48	228
30	3900	-3870	48	229
12	3900	-3888	48	230
4600	3900	700	49	230
2800	3900	-1100	49	231
2100	3900	-1800	49	232
3900	3700	200	50	232
5000	3700	1300	51	232
5500	3700	1800	52	232
5400	3700	1700	53	232
3000	3700	-700	53	233
9.8	3700	-3690.2	53	234
30	3700	-3670	53	235
12	3700	-3688	53	236
4600	3700	900	54	236
2800	3700	-900	54	237
2100	3700	-1600	54	238
5000	3900	1100	55	238
5500	3900	1600	56	238
5400	3900	1500	57	238
3000	3900	-900	57	239
9.8	3900	-3890.2	57	240
30	3900	-3870	57	241
12	3900	-3888	57	242
4600	3900	700	58	242
2800	3900	-1100	58	243
2100	3900	-1800	58	244
5500	5000	500	59	244
5400	5000	400	60	244
3000	5000	-2000	60	245
9.8	5000	-4990.2	60	246
30	5000	-4970	60	247
12	5000	-4988	60	248
4600	5000	-400	60	249
2800	5000	-2200	60	250

2100	5000	-2900	60	251
5400	5500	-100	60	252
3000	5500	-2500	60	253
9.8	5500	-5490.2	60	254
30	5500	-5470	60	255
12	5500	-5488	60	256
4600	5500	-900	60	257
2800	5500	-2700	60	258
2100	5500	-3400	60	259
3000	5400	-2400	60	260
9.8	5400	-5390.2	60	261
30	5400	-5370	60	262
12	5400	-5388	60	263
4600	5400	-800	60	264
2800	5400	-2600	60	265
2100	5400	-3300	60	266
9.8	3000	-2990.2	60	267
30	3000	-2970	60	268
12	3000	-2988	60	269
4600	3000	1600	61	269
2800	3000	-200	61	270
2100	3000	-900	61	271
30	9.8	20.2	62	271
12	9.8	2.2	63	271
4600	9.8	4590.2	64	271
2800	9.8	2790.2	65	271
2100	9.8	2090.2	66	271
12	30	-18	66	272
4600	30	4570	67	272
2800	30	2770	68	272
2100	30	2070	69	272
4600	12	4588	70	272
2800	12	2788	71	272
2100	12	2088	72	272
2800	4600	-1800	72	273
2100	4600	-2500	72	274
2100	2800	-700	72	275

S Statistic = 72 - 275 = -203

Tied Group Value	Members
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1	5000	2
2	3900	3

Time Period	Observations
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3/11/2008	1
5/10/2008	1
9/22/2008	1

12/3/2008	1
4/28/2009	1
5/15/2009	1
9/23/2009	1
12/7/2009	1
2/24/2010	1
4/16/2010	1
8/11/2010	1
11/22/2010	1
3/8/2011	1
5/23/2011	1
8/31/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/19/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 84

B = 0

C = 6

D = 0

E = 8

F = 0

a = 41418

b = 157950

c = 1404

Group Variance = 2296.33

Z-Score = -4.21535

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-4.21535 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: GCW-05

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
2600	2400	200	1	0
2600	2400	200	2	0
2500	2400	100	3	0
2500	2400	100	4	0
2500	2400	100	5	0
2600	2400	200	6	0
1400	2400	-1000	6	1
1700	2400	-700	6	2
1500	2400	-900	6	3
1100	2400	-1300	6	4
790	2400	-1610	6	5
640	2400	-1760	6	6
530	2400	-1870	6	7
460	2400	-1940	6	8
500	2400	-1900	6	9
500	2400	-1900	6	10
900	2400	-1500	6	11
1000	2400	-1400	6	12
2600	2600	0	6	12
2500	2600	-100	6	13
2500	2600	-100	6	14
2500	2600	-100	6	15
2600	2600	0	6	15
1400	2600	-1200	6	16
1700	2600	-900	6	17
1500	2600	-1100	6	18
1100	2600	-1500	6	19
790	2600	-1810	6	20
640	2600	-1960	6	21
530	2600	-2070	6	22
460	2600	-2140	6	23
500	2600	-2100	6	24
500	2600	-2100	6	25
900	2600	-1700	6	26
1000	2600	-1600	6	27
2500	2600	-100	6	28
2500	2600	-100	6	29
2500	2600	-100	6	30
2600	2600	0	6	30
1400	2600	-1200	6	31
1700	2600	-900	6	32
1500	2600	-1100	6	33
1100	2600	-1500	6	34
790	2600	-1810	6	35

640	2600	-1960	6	36
530	2600	-2070	6	37
460	2600	-2140	6	38
500	2600	-2100	6	39
500	2600	-2100	6	40
900	2600	-1700	6	41
1000	2600	-1600	6	42
2500	2500	0	6	42
2500	2500	0	6	42
2600	2500	100	7	42
1400	2500	-1100	7	43
1700	2500	-800	7	44
1500	2500	-1000	7	45
1100	2500	-1400	7	46
790	2500	-1710	7	47
640	2500	-1860	7	48
530	2500	-1970	7	49
460	2500	-2040	7	50
500	2500	-2000	7	51
500	2500	-2000	7	52
900	2500	-1600	7	53
1000	2500	-1500	7	54
2500	2500	0	7	54
2600	2500	100	8	54
1400	2500	-1100	8	55
1700	2500	-800	8	56
1500	2500	-1000	8	57
1100	2500	-1400	8	58
790	2500	-1710	8	59
640	2500	-1860	8	60
530	2500	-1970	8	61
460	2500	-2040	8	62
500	2500	-2000	8	63
500	2500	-2000	8	64
900	2500	-1600	8	65
1000	2500	-1500	8	66
2600	2500	100	9	66
1400	2500	-1100	9	67
1700	2500	-800	9	68
1500	2500	-1000	9	69
1100	2500	-1400	9	70
790	2500	-1710	9	71
640	2500	-1860	9	72
530	2500	-1970	9	73
460	2500	-2040	9	74
500	2500	-2000	9	75
500	2500	-2000	9	76
900	2500	-1600	9	77
1000	2500	-1500	9	78
1400	2600	-1200	9	79
1700	2600	-900	9	80
1500	2600	-1100	9	81
1100	2600	-1500	9	82

790	2600	-1810	9	83
640	2600	-1960	9	84
530	2600	-2070	9	85
460	2600	-2140	9	86
500	2600	-2100	9	87
500	2600	-2100	9	88
900	2600	-1700	9	89
1000	2600	-1600	9	90
1700	1400	300	10	90
1500	1400	100	11	90
1100	1400	-300	11	91
790	1400	-610	11	92
640	1400	-760	11	93
530	1400	-870	11	94
460	1400	-940	11	95
500	1400	-900	11	96
500	1400	-900	11	97
900	1400	-500	11	98
1000	1400	-400	11	99
1500	1700	-200	11	100
1100	1700	-600	11	101
790	1700	-910	11	102
640	1700	-1060	11	103
530	1700	-1170	11	104
460	1700	-1240	11	105
500	1700	-1200	11	106
500	1700	-1200	11	107
900	1700	-800	11	108
1000	1700	-700	11	109
1100	1500	-400	11	110
790	1500	-710	11	111
640	1500	-860	11	112
530	1500	-970	11	113
460	1500	-1040	11	114
500	1500	-1000	11	115
500	1500	-1000	11	116
900	1500	-600	11	117
1000	1500	-500	11	118
790	1100	-310	11	119
640	1100	-460	11	120
530	1100	-570	11	121
460	1100	-640	11	122
500	1100	-600	11	123
500	1100	-600	11	124
900	1100	-200	11	125
1000	1100	-100	11	126
640	790	-150	11	127
530	790	-260	11	128
460	790	-330	11	129
500	790	-290	11	130
500	790	-290	11	131
900	790	110	12	131

1000	790	210	13	131
530	640	-110	13	132
460	640	-180	13	133
500	640	-140	13	134
500	640	-140	13	135
900	640	260	14	135
1000	640	360	15	135
460	530	-70	15	136
500	530	-30	15	137
500	530	-30	15	138
900	530	370	16	138
1000	530	470	17	138
500	460	40	18	138
500	460	40	19	138
900	460	440	20	138
1000	460	540	21	138
500	500	0	21	138
900	500	400	22	138
1000	500	500	23	138
900	500	400	24	138
1000	500	500	25	138
1000	900	100	26	138

S Statistic = 26 - 138 = -112

Tied Group Value	Members
1	2600
2	2500
3	500

Time Period	Observations
2/26/2010	1
4/14/2010	1
8/12/2010	1
11/22/2010	1
3/10/2011	1
5/23/2011	1
8/31/2011	1
4/11/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/19/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 150

B = 0

C = 12

D = 0

E = 14

F = 0

a = 14706

b = 52326

c = 684

Group Variance = 808.667

Z-Score = -3.90336

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-3.90336 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: OW-01A

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
91	240	-149	0	1
81	240	-159	0	2
61	240	-179	0	3
52	240	-188	0	4
60	240	-180	0	5
118	240	-122	0	6
85	240	-155	0	7
61	240	-179	0	8
51	240	-189	0	9
60	240	-180	0	10
53	240	-187	0	11
55	240	-185	0	12
56	240	-184	0	13
55	240	-185	0	14
53	240	-187	0	15
55	240	-185	0	16
56	240	-184	0	17
56	240	-184	0	18
53	240	-187	0	19
51	240	-189	0	20
54	240	-186	0	21
47	240	-193	0	22
45	240	-195	0	23
55	240	-185	0	24
57	240	-183	0	25
50	240	-190	0	26
48	240	-192	0	27
44	240	-196	0	28
39	240	-201	0	29
81	91	-10	0	30
61	91	-30	0	31
52	91	-39	0	32
60	91	-31	0	33
118	91	27	1	33
85	91	-6	1	34
61	91	-30	1	35
51	91	-40	1	36
60	91	-31	1	37
53	91	-38	1	38
55	91	-36	1	39
56	91	-35	1	40
55	91	-36	1	41
53	91	-38	1	42
55	91	-36	1	43
56	91	-35	1	44

56	91	-35	1	45
53	91	-38	1	46
51	91	-40	1	47
54	91	-37	1	48
47	91	-44	1	49
45	91	-46	1	50
55	91	-36	1	51
57	91	-34	1	52
50	91	-41	1	53
48	91	-43	1	54
44	91	-47	1	55
39	91	-52	1	56
61	81	-20	1	57
52	81	-29	1	58
60	81	-21	1	59
118	81	37	2	59
85	81	4	3	59
61	81	-20	3	60
51	81	-30	3	61
60	81	-21	3	62
53	81	-28	3	63
55	81	-26	3	64
56	81	-25	3	65
55	81	-26	3	66
53	81	-28	3	67
55	81	-26	3	68
56	81	-25	3	69
56	81	-25	3	70
53	81	-28	3	71
51	81	-30	3	72
54	81	-27	3	73
47	81	-34	3	74
45	81	-36	3	75
55	81	-26	3	76
57	81	-24	3	77
50	81	-31	3	78
48	81	-33	3	79
44	81	-37	3	80
39	81	-42	3	81
52	61	-9	3	82
60	61	-1	3	83
118	61	57	4	83
85	61	24	5	83
61	61	0	5	83
51	61	-10	5	84
60	61	-1	5	85
53	61	-8	5	86
55	61	-6	5	87
56	61	-5	5	88
55	61	-6	5	89
53	61	-8	5	90
55	61	-6	5	91
56	61	-5	5	92
56	61	-5	5	93
53	61	-8	5	94

51	61	-10	5	95
54	61	-7	5	96
47	61	-14	5	97
45	61	-16	5	98
55	61	-6	5	99
57	61	-4	5	100
50	61	-11	5	101
48	61	-13	5	102
44	61	-17	5	103
39	61	-22	5	104
60	52	8	6	104
118	52	66	7	104
85	52	33	8	104
61	52	9	9	104
51	52	-1	9	105
60	52	8	10	105
53	52	1	11	105
55	52	3	12	105
56	52	4	13	105
55	52	3	14	105
53	52	1	15	105
55	52	3	16	105
56	52	4	17	105
56	52	4	18	105
53	52	1	19	105
51	52	-1	19	106
54	52	2	20	106
47	52	-5	20	107
45	52	-7	20	108
55	52	3	21	108
57	52	5	22	108
50	52	-2	22	109
48	52	-4	22	110
44	52	-8	22	111
39	52	-13	22	112
118	60	58	23	112
85	60	25	24	112
61	60	1	25	112
51	60	-9	25	113
60	60	0	25	113
53	60	-7	25	114
55	60	-5	25	115
56	60	-4	25	116
55	60	-5	25	117
53	60	-7	25	118
55	60	-5	25	119
56	60	-4	25	120
56	60	-4	25	121
53	60	-7	25	122
51	60	-9	25	123
54	60	-6	25	124
47	60	-13	25	125
45	60	-15	25	126
55	60	-5	25	127
57	60	-3	25	128

50	60	-10	25	129
48	60	-12	25	130
44	60	-16	25	131
39	60	-21	25	132
85	118	-33	25	133
61	118	-57	25	134
51	118	-67	25	135
60	118	-58	25	136
53	118	-65	25	137
55	118	-63	25	138
56	118	-62	25	139
55	118	-63	25	140
53	118	-65	25	141
55	118	-63	25	142
56	118	-62	25	143
56	118	-62	25	144
53	118	-65	25	145
51	118	-67	25	146
54	118	-64	25	147
47	118	-71	25	148
45	118	-73	25	149
55	118	-63	25	150
57	118	-61	25	151
50	118	-68	25	152
48	118	-70	25	153
44	118	-74	25	154
39	118	-79	25	155
61	85	-24	25	156
51	85	-34	25	157
60	85	-25	25	158
53	85	-32	25	159
55	85	-30	25	160
56	85	-29	25	161
55	85	-30	25	162
53	85	-32	25	163
55	85	-30	25	164
56	85	-29	25	165
56	85	-29	25	166
53	85	-32	25	167
51	85	-34	25	168
54	85	-31	25	169
47	85	-38	25	170
45	85	-40	25	171
55	85	-30	25	172
57	85	-28	25	173
50	85	-35	25	174
48	85	-37	25	175
44	85	-41	25	176
39	85	-46	25	177
51	61	-10	25	178
60	61	-1	25	179
53	61	-8	25	180
55	61	-6	25	181
56	61	-5	25	182

55	61	-6	25	183
53	61	-8	25	184
55	61	-6	25	185
56	61	-5	25	186
56	61	-5	25	187
53	61	-8	25	188
51	61	-10	25	189
54	61	-7	25	190
47	61	-14	25	191
45	61	-16	25	192
55	61	-6	25	193
57	61	-4	25	194
50	61	-11	25	195
48	61	-13	25	196
44	61	-17	25	197
39	61	-22	25	198
60	51	9	26	198
53	51	2	27	198
55	51	4	28	198
56	51	5	29	198
55	51	4	30	198
53	51	2	31	198
55	51	4	32	198
56	51	5	33	198
56	51	5	34	198
53	51	2	35	198
51	51	0	35	198
54	51	3	36	198
47	51	-4	36	199
45	51	-6	36	200
55	51	4	37	200
57	51	6	38	200
50	51	-1	38	201
48	51	-3	38	202
44	51	-7	38	203
39	51	-12	38	204
53	60	-7	38	205
55	60	-5	38	206
56	60	-4	38	207
55	60	-5	38	208
53	60	-7	38	209
55	60	-5	38	210
56	60	-4	38	211
56	60	-4	38	212
53	60	-7	38	213
51	60	-9	38	214
54	60	-6	38	215
47	60	-13	38	216
45	60	-15	38	217
55	60	-5	38	218
57	60	-3	38	219
50	60	-10	38	220
48	60	-12	38	221
44	60	-16	38	222
39	60	-21	38	223

55	53	2	39	223
56	53	3	40	223
55	53	2	41	223
53	53	0	41	223
55	53	2	42	223
56	53	3	43	223
56	53	3	44	223
53	53	0	44	223
51	53	-2	44	224
54	53	1	45	224
47	53	-6	45	225
45	53	-8	45	226
55	53	2	46	226
57	53	4	47	226
50	53	-3	47	227
48	53	-5	47	228
44	53	-9	47	229
39	53	-14	47	230
56	55	1	48	230
55	55	0	48	230
53	55	-2	48	231
55	55	0	48	231
56	55	1	49	231
56	55	1	50	231
53	55	-2	50	232
51	55	-4	50	233
54	55	-1	50	234
47	55	-8	50	235
45	55	-10	50	236
55	55	0	50	236
57	55	2	51	236
50	55	-5	51	237
48	55	-7	51	238
44	55	-11	51	239
39	55	-16	51	240
55	56	-1	51	241
53	56	-3	51	242
55	56	-1	51	243
56	56	0	51	243
56	56	0	51	243
53	56	-3	51	244
51	56	-5	51	245
54	56	-2	51	246
47	56	-9	51	247
45	56	-11	51	248
55	56	-1	51	249
57	56	1	52	249
50	56	-6	52	250
48	56	-8	52	251
44	56	-12	52	252
39	56	-17	52	253
53	55	-2	52	254
55	55	0	52	254

56	55	1	53	254
56	55	1	54	254
53	55	-2	54	255
51	55	-4	54	256
54	55	-1	54	257
47	55	-8	54	258
45	55	-10	54	259
55	55	0	54	259
57	55	2	55	259
50	55	-5	55	260
48	55	-7	55	261
44	55	-11	55	262
39	55	-16	55	263
55	53	2	56	263
56	53	3	57	263
56	53	3	58	263
53	53	0	58	263
51	53	-2	58	264
54	53	1	59	264
47	53	-6	59	265
45	53	-8	59	266
55	53	2	60	266
57	53	4	61	266
50	53	-3	61	267
48	53	-5	61	268
44	53	-9	61	269
39	53	-14	61	270
56	55	1	62	270
56	55	1	63	270
53	55	-2	63	271
51	55	-4	63	272
54	55	-1	63	273
47	55	-8	63	274
45	55	-10	63	275
55	55	0	63	275
57	55	2	64	275
50	55	-5	64	276
48	55	-7	64	277
44	55	-11	64	278
39	55	-16	64	279
56	56	0	64	279
53	56	-3	64	280
51	56	-5	64	281
54	56	-2	64	282
47	56	-9	64	283
45	56	-11	64	284
55	56	-1	64	285
57	56	1	65	285
50	56	-6	65	286
48	56	-8	65	287
44	56	-12	65	288
39	56	-17	65	289
53	56	-3	65	290

51	56	-5	65	291
54	56	-2	65	292
47	56	-9	65	293
45	56	-11	65	294
55	56	-1	65	295
57	56	1	66	295
50	56	-6	66	296
48	56	-8	66	297
44	56	-12	66	298
39	56	-17	66	299
51	53	-2	66	300
54	53	1	67	300
47	53	-6	67	301
45	53	-8	67	302
55	53	2	68	302
57	53	4	69	302
50	53	-3	69	303
48	53	-5	69	304
44	53	-9	69	305
39	53	-14	69	306
54	51	3	70	306
47	51	-4	70	307
45	51	-6	70	308
55	51	4	71	308
57	51	6	72	308
50	51	-1	72	309
48	51	-3	72	310
44	51	-7	72	311
39	51	-12	72	312
47	54	-7	72	313
45	54	-9	72	314
55	54	1	73	314
57	54	3	74	314
50	54	-4	74	315
48	54	-6	74	316
44	54	-10	74	317
39	54	-15	74	318
45	47	-2	74	319
55	47	8	75	319
57	47	10	76	319
50	47	3	77	319
48	47	1	78	319
44	47	-3	78	320
39	47	-8	78	321
55	45	10	79	321
57	45	12	80	321
50	45	5	81	321
48	45	3	82	321
44	45	-1	82	322
39	45	-6	82	323
57	55	2	83	323

50	55	-5	83	324
48	55	-7	83	325
44	55	-11	83	326
39	55	-16	83	327
50	57	-7	83	328
48	57	-9	83	329
44	57	-13	83	330
39	57	-18	83	331
48	50	-2	83	332
44	50	-6	83	333
39	50	-11	83	334
44	48	-4	83	335
39	48	-9	83	336
39	44	-5	83	337

S Statistic = 83 - 337 = -254

Tied Group Value	Members
1	61
2	60
3	51
4	53
5	55
6	56

Time Period	Observations
11/1/1998	1
6/1/2005	1
2/1/2006	1
3/12/2008	1
5/13/2008	1
9/23/2008	1
10/29/2008	1
4/29/2009	1
5/13/2009	1
9/29/2009	1
12/8/2009	1
2/26/2010	1
4/14/2010	1
8/12/2010	1
11/22/2010	1
3/10/2011	1
5/25/2011	1
9/2/2011	1
4/13/2012	1
11/9/2012	1
4/22/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1

5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 342

B = 0

C = 36

D = 0

E = 30

F = 0

a = 56550

b = 219240

c = 1740

Group Variance = 3122.67

Z-Score = -4.52749

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-4.52749 < -1.65463 indicating a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: SW-02

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
95.6	60	35.6	1	0
60.2	60	0.2	2	0
47.7	60	-12.3	2	1
86	60	26	3	1
69.4	60	9.4	4	1
95.2	60	35.2	5	1
52.5	60	-7.5	5	2
97.8	60	37.8	6	2
124	60	64	7	2
110	60	50	8	2
383	60	323	9	2
99.4	60	39.4	10	2
112	60	52	11	2
593	60	533	12	2
94.8	60	34.8	13	2
87	60	27	14	2
99	60	39	15	2
89.7	60	29.7	16	2
132	60	72	17	2
80.8	60	20.8	18	2
89.5	60	29.5	19	2
60.2	95.6	-35.4	19	3
47.7	95.6	-47.9	19	4
86	95.6	-9.6	19	5
69.4	95.6	-26.2	19	6
95.2	95.6	-0.4	19	7
52.5	95.6	-43.1	19	8
97.8	95.6	2.2	20	8
124	95.6	28.4	21	8
110	95.6	14.4	22	8
383	95.6	287.4	23	8
99.4	95.6	3.8	24	8
112	95.6	16.4	25	8
593	95.6	497.4	26	8
94.8	95.6	-0.8	26	9
87	95.6	-8.6	26	10
99	95.6	3.4	27	10
89.7	95.6	-5.9	27	11
132	95.6	36.4	28	11
80.8	95.6	-14.8	28	12
89.5	95.6	-6.1	28	13
47.7	60.2	-12.5	28	14
86	60.2	25.8	29	14
69.4	60.2	9.2	30	14

95.2	60.2	35	31	14
52.5	60.2	-7.7	31	15
97.8	60.2	37.6	32	15
124	60.2	63.8	33	15
110	60.2	49.8	34	15
383	60.2	322.8	35	15
99.4	60.2	39.2	36	15
112	60.2	51.8	37	15
593	60.2	532.8	38	15
94.8	60.2	34.6	39	15
87	60.2	26.8	40	15
99	60.2	38.8	41	15
89.7	60.2	29.5	42	15
132	60.2	71.8	43	15
80.8	60.2	20.6	44	15
89.5	60.2	29.3	45	15
86	47.7	38.3	46	15
69.4	47.7	21.7	47	15
95.2	47.7	47.5	48	15
52.5	47.7	4.8	49	15
97.8	47.7	50.1	50	15
124	47.7	76.3	51	15
110	47.7	62.3	52	15
383	47.7	335.3	53	15
99.4	47.7	51.7	54	15
112	47.7	64.3	55	15
593	47.7	545.3	56	15
94.8	47.7	47.1	57	15
87	47.7	39.3	58	15
99	47.7	51.3	59	15
89.7	47.7	42	60	15
132	47.7	84.3	61	15
80.8	47.7	33.1	62	15
89.5	47.7	41.8	63	15
69.4	86	-16.6	63	16
95.2	86	9.2	64	16
52.5	86	-33.5	64	17
97.8	86	11.8	65	17
124	86	38	66	17
110	86	24	67	17
383	86	297	68	17
99.4	86	13.4	69	17
112	86	26	70	17
593	86	507	71	17
94.8	86	8.8	72	17
87	86	1	73	17
99	86	13	74	17
89.7	86	3.7	75	17
132	86	46	76	17
80.8	86	-5.2	76	18
89.5	86	3.5	77	18
95.2	69.4	25.8	78	18
52.5	69.4	-16.9	78	19
97.8	69.4	28.4	79	19

124	69.4	54.6	80	19
110	69.4	40.6	81	19
383	69.4	313.6	82	19
99.4	69.4	30	83	19
112	69.4	42.6	84	19
593	69.4	523.6	85	19
94.8	69.4	25.4	86	19
87	69.4	17.6	87	19
99	69.4	29.6	88	19
89.7	69.4	20.3	89	19
132	69.4	62.6	90	19
80.8	69.4	11.4	91	19
89.5	69.4	20.1	92	19
52.5	95.2	-42.7	92	20
97.8	95.2	2.6	93	20
124	95.2	28.8	94	20
110	95.2	14.8	95	20
383	95.2	287.8	96	20
99.4	95.2	4.2	97	20
112	95.2	16.8	98	20
593	95.2	497.8	99	20
94.8	95.2	-0.4	99	21
87	95.2	-8.2	99	22
99	95.2	3.8	100	22
89.7	95.2	-5.5	100	23
132	95.2	36.8	101	23
80.8	95.2	-14.4	101	24
89.5	95.2	-5.7	101	25
97.8	52.5	45.3	102	25
124	52.5	71.5	103	25
110	52.5	57.5	104	25
383	52.5	330.5	105	25
99.4	52.5	46.9	106	25
112	52.5	59.5	107	25
593	52.5	540.5	108	25
94.8	52.5	42.3	109	25
87	52.5	34.5	110	25
99	52.5	46.5	111	25
89.7	52.5	37.2	112	25
132	52.5	79.5	113	25
80.8	52.5	28.3	114	25
89.5	52.5	37	115	25
124	97.8	26.2	116	25
110	97.8	12.2	117	25
383	97.8	285.2	118	25
99.4	97.8	1.6	119	25
112	97.8	14.2	120	25
593	97.8	495.2	121	25
94.8	97.8	-3	121	26
87	97.8	-10.8	121	27
99	97.8	1.2	122	27
89.7	97.8	-8.1	122	28
132	97.8	34.2	123	28
80.8	97.8	-17	123	29

89.5	97.8	-8.3	123	30
110	124	-14	123	31
383	124	259	124	31
99.4	124	-24.6	124	32
112	124	-12	124	33
593	124	469	125	33
94.8	124	-29.2	125	34
87	124	-37	125	35
99	124	-25	125	36
89.7	124	-34.3	125	37
132	124	8	126	37
80.8	124	-43.2	126	38
89.5	124	-34.5	126	39
383	110	273	127	39
99.4	110	-10.6	127	40
112	110	2	128	40
593	110	483	129	40
94.8	110	-15.2	129	41
87	110	-23	129	42
99	110	-11	129	43
89.7	110	-20.3	129	44
132	110	22	130	44
80.8	110	-29.2	130	45
89.5	110	-20.5	130	46
99.4	383	-283.6	130	47
112	383	-271	130	48
593	383	210	131	48
94.8	383	-288.2	131	49
87	383	-296	131	50
99	383	-284	131	51
89.7	383	-293.3	131	52
132	383	-251	131	53
80.8	383	-302.2	131	54
89.5	383	-293.5	131	55
112	99.4	12.6	132	55
593	99.4	493.6	133	55
94.8	99.4	-4.6	133	56
87	99.4	-12.4	133	57
99	99.4	-0.4	133	58
89.7	99.4	-9.7	133	59
132	99.4	32.6	134	59
80.8	99.4	-18.6	134	60
89.5	99.4	-9.9	134	61
593	112	481	135	61
94.8	112	-17.2	135	62
87	112	-25	135	63
99	112	-13	135	64
89.7	112	-22.3	135	65
132	112	20	136	65
80.8	112	-31.2	136	66
89.5	112	-22.5	136	67

94.8	593	-498.2	136	68
87	593	-506	136	69
99	593	-494	136	70
89.7	593	-503.3	136	71
132	593	-461	136	72
80.8	593	-512.2	136	73
89.5	593	-503.5	136	74
87	94.8	-7.8	136	75
99	94.8	4.2	137	75
89.7	94.8	-5.1	137	76
132	94.8	37.2	138	76
80.8	94.8	-14	138	77
89.5	94.8	-5.3	138	78
99	87	12	139	78
89.7	87	2.7	140	78
132	87	45	141	78
80.8	87	-6.2	141	79
89.5	87	2.5	142	79
89.7	99	-9.3	142	80
132	99	33	143	80
80.8	99	-18.2	143	81
89.5	99	-9.5	143	82
132	89.7	42.3	144	82
80.8	89.7	-8.9	144	83
89.5	89.7	-0.2	144	84
80.8	132	-51.2	144	85
89.5	132	-42.5	144	86
89.5	80.8	8.7	145	86

S Statistic = 145 - 86 = 59

Tied Group Value	Members
Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/16/2014	1
10/29/2014	1

3/16/2015	1
10/23/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 22638

b = 83160

c = 924

Group Variance = 1257.67

Z-Score = 1.63548

Comparison Level at 95% confidence level = -1.65463 (downward trend)

1.63548 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: SW-02

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
95.6	60	35.6	1	0
60.2	60	0.2	2	0
47.7	60	-12.3	2	1
86	60	26	3	1
69.4	60	9.4	4	1
95.2	60	35.2	5	1
52.5	60	-7.5	5	2
97.8	60	37.8	6	2
124	60	64	7	2
110	60	50	8	2
383	60	323	9	2
99.4	60	39.4	10	2
112	60	52	11	2
593	60	533	12	2
94.8	60	34.8	13	2
87	60	27	14	2
99	60	39	15	2
89.7	60	29.7	16	2
132	60	72	17	2
80.8	60	20.8	18	2
89.5	60	29.5	19	2
60.2	95.6	-35.4	19	3
47.7	95.6	-47.9	19	4
86	95.6	-9.6	19	5
69.4	95.6	-26.2	19	6
95.2	95.6	-0.4	19	7
52.5	95.6	-43.1	19	8
97.8	95.6	2.2	20	8
124	95.6	28.4	21	8
110	95.6	14.4	22	8
383	95.6	287.4	23	8
99.4	95.6	3.8	24	8
112	95.6	16.4	25	8
593	95.6	497.4	26	8
94.8	95.6	-0.8	26	9
87	95.6	-8.6	26	10
99	95.6	3.4	27	10
89.7	95.6	-5.9	27	11
132	95.6	36.4	28	11
80.8	95.6	-14.8	28	12
89.5	95.6	-6.1	28	13
47.7	60.2	-12.5	28	14
86	60.2	25.8	29	14
69.4	60.2	9.2	30	14

95.2	60.2	35	31	14
52.5	60.2	-7.7	31	15
97.8	60.2	37.6	32	15
124	60.2	63.8	33	15
110	60.2	49.8	34	15
383	60.2	322.8	35	15
99.4	60.2	39.2	36	15
112	60.2	51.8	37	15
593	60.2	532.8	38	15
94.8	60.2	34.6	39	15
87	60.2	26.8	40	15
99	60.2	38.8	41	15
89.7	60.2	29.5	42	15
132	60.2	71.8	43	15
80.8	60.2	20.6	44	15
89.5	60.2	29.3	45	15
86	47.7	38.3	46	15
69.4	47.7	21.7	47	15
95.2	47.7	47.5	48	15
52.5	47.7	4.8	49	15
97.8	47.7	50.1	50	15
124	47.7	76.3	51	15
110	47.7	62.3	52	15
383	47.7	335.3	53	15
99.4	47.7	51.7	54	15
112	47.7	64.3	55	15
593	47.7	545.3	56	15
94.8	47.7	47.1	57	15
87	47.7	39.3	58	15
99	47.7	51.3	59	15
89.7	47.7	42	60	15
132	47.7	84.3	61	15
80.8	47.7	33.1	62	15
89.5	47.7	41.8	63	15
69.4	86	-16.6	63	16
95.2	86	9.2	64	16
52.5	86	-33.5	64	17
97.8	86	11.8	65	17
124	86	38	66	17
110	86	24	67	17
383	86	297	68	17
99.4	86	13.4	69	17
112	86	26	70	17
593	86	507	71	17
94.8	86	8.8	72	17
87	86	1	73	17
99	86	13	74	17
89.7	86	3.7	75	17
132	86	46	76	17
80.8	86	-5.2	76	18
89.5	86	3.5	77	18
95.2	69.4	25.8	78	18
52.5	69.4	-16.9	78	19
97.8	69.4	28.4	79	19

124	69.4	54.6	80	19
110	69.4	40.6	81	19
383	69.4	313.6	82	19
99.4	69.4	30	83	19
112	69.4	42.6	84	19
593	69.4	523.6	85	19
94.8	69.4	25.4	86	19
87	69.4	17.6	87	19
99	69.4	29.6	88	19
89.7	69.4	20.3	89	19
132	69.4	62.6	90	19
80.8	69.4	11.4	91	19
89.5	69.4	20.1	92	19
52.5	95.2	-42.7	92	20
97.8	95.2	2.6	93	20
124	95.2	28.8	94	20
110	95.2	14.8	95	20
383	95.2	287.8	96	20
99.4	95.2	4.2	97	20
112	95.2	16.8	98	20
593	95.2	497.8	99	20
94.8	95.2	-0.4	99	21
87	95.2	-8.2	99	22
99	95.2	3.8	100	22
89.7	95.2	-5.5	100	23
132	95.2	36.8	101	23
80.8	95.2	-14.4	101	24
89.5	95.2	-5.7	101	25
97.8	52.5	45.3	102	25
124	52.5	71.5	103	25
110	52.5	57.5	104	25
383	52.5	330.5	105	25
99.4	52.5	46.9	106	25
112	52.5	59.5	107	25
593	52.5	540.5	108	25
94.8	52.5	42.3	109	25
87	52.5	34.5	110	25
99	52.5	46.5	111	25
89.7	52.5	37.2	112	25
132	52.5	79.5	113	25
80.8	52.5	28.3	114	25
89.5	52.5	37	115	25
124	97.8	26.2	116	25
110	97.8	12.2	117	25
383	97.8	285.2	118	25
99.4	97.8	1.6	119	25
112	97.8	14.2	120	25
593	97.8	495.2	121	25
94.8	97.8	-3	121	26
87	97.8	-10.8	121	27
99	97.8	1.2	122	27
89.7	97.8	-8.1	122	28
132	97.8	34.2	123	28
80.8	97.8	-17	123	29

89.5	97.8	-8.3	123	30
110	124	-14	123	31
383	124	259	124	31
99.4	124	-24.6	124	32
112	124	-12	124	33
593	124	469	125	33
94.8	124	-29.2	125	34
87	124	-37	125	35
99	124	-25	125	36
89.7	124	-34.3	125	37
132	124	8	126	37
80.8	124	-43.2	126	38
89.5	124	-34.5	126	39
383	110	273	127	39
99.4	110	-10.6	127	40
112	110	2	128	40
593	110	483	129	40
94.8	110	-15.2	129	41
87	110	-23	129	42
99	110	-11	129	43
89.7	110	-20.3	129	44
132	110	22	130	44
80.8	110	-29.2	130	45
89.5	110	-20.5	130	46
99.4	383	-283.6	130	47
112	383	-271	130	48
593	383	210	131	48
94.8	383	-288.2	131	49
87	383	-296	131	50
99	383	-284	131	51
89.7	383	-293.3	131	52
132	383	-251	131	53
80.8	383	-302.2	131	54
89.5	383	-293.5	131	55
112	99.4	12.6	132	55
593	99.4	493.6	133	55
94.8	99.4	-4.6	133	56
87	99.4	-12.4	133	57
99	99.4	-0.4	133	58
89.7	99.4	-9.7	133	59
132	99.4	32.6	134	59
80.8	99.4	-18.6	134	60
89.5	99.4	-9.9	134	61
593	112	481	135	61
94.8	112	-17.2	135	62
87	112	-25	135	63
99	112	-13	135	64
89.7	112	-22.3	135	65
132	112	20	136	65
80.8	112	-31.2	136	66
89.5	112	-22.5	136	67

94.8	593	-498.2	136	68
87	593	-506	136	69
99	593	-494	136	70
89.7	593	-503.3	136	71
132	593	-461	136	72
80.8	593	-512.2	136	73
89.5	593	-503.5	136	74
87	94.8	-7.8	136	75
99	94.8	4.2	137	75
89.7	94.8	-5.1	137	76
132	94.8	37.2	138	76
80.8	94.8	-14	138	77
89.5	94.8	-5.3	138	78
99	87	12	139	78
89.7	87	2.7	140	78
132	87	45	141	78
80.8	87	-6.2	141	79
89.5	87	2.5	142	79
89.7	99	-9.3	142	80
132	99	33	143	80
80.8	99	-18.2	143	81
89.5	99	-9.5	143	82
132	89.7	42.3	144	82
80.8	89.7	-8.9	144	83
89.5	89.7	-0.2	144	84
80.8	132	-51.2	144	85
89.5	132	-42.5	144	86
89.5	80.8	8.7	145	86

S Statistic = 145 - 86 = 59

Tied Group Value	Members
Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/16/2014	1
10/29/2014	1

3/16/2015	1
10/23/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 22638

b = 83160

c = 924

Group Variance = 1257.67

Z-Score = 1.63548

Comparison Level at 95% confidence level = 1.65463 (upward trend)

1.63548 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: SW-06

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
66.6	79	-12.4	0	1
60	79	-19	0	2
33.8	79	-45.2	0	3
185	79	106	1	3
99.1	79	20.1	2	3
134	79	55	3	3
76.3	79	-2.7	3	4
192	79	113	4	4
210	79	131	5	4
170	79	91	6	4
218	79	139	7	4
158	79	79	8	4
197	79	118	9	4
145	79	66	10	4
130	79	51	11	4
172	79	93	12	4
143	79	64	13	4
16.1	79	-62.9	13	5
234	79	155	14	5
158	79	79	15	5
191	79	112	16	5
60	66.6	-6.6	16	6
33.8	66.6	-32.8	16	7
185	66.6	118.4	17	7
99.1	66.6	32.5	18	7
134	66.6	67.4	19	7
76.3	66.6	9.7	20	7
192	66.6	125.4	21	7
210	66.6	143.4	22	7
170	66.6	103.4	23	7
218	66.6	151.4	24	7
158	66.6	91.4	25	7
197	66.6	130.4	26	7
145	66.6	78.4	27	7
130	66.6	63.4	28	7
172	66.6	105.4	29	7
143	66.6	76.4	30	7
16.1	66.6	-50.5	30	8
234	66.6	167.4	31	8
158	66.6	91.4	32	8
191	66.6	124.4	33	8
33.8	60	-26.2	33	9
185	60	125	34	9
99.1	60	39.1	35	9

134	60	74	36	9
76.3	60	16.3	37	9
192	60	132	38	9
210	60	150	39	9
170	60	110	40	9
218	60	158	41	9
158	60	98	42	9
197	60	137	43	9
145	60	85	44	9
130	60	70	45	9
172	60	112	46	9
143	60	83	47	9
16.1	60	-43.9	47	10
234	60	174	48	10
158	60	98	49	10
191	60	131	50	10
185	33.8	151.2	51	10
99.1	33.8	65.3	52	10
134	33.8	100.2	53	10
76.3	33.8	42.5	54	10
192	33.8	158.2	55	10
210	33.8	176.2	56	10
170	33.8	136.2	57	10
218	33.8	184.2	58	10
158	33.8	124.2	59	10
197	33.8	163.2	60	10
145	33.8	111.2	61	10
130	33.8	96.2	62	10
172	33.8	138.2	63	10
143	33.8	109.2	64	10
16.1	33.8	-17.7	64	11
234	33.8	200.2	65	11
158	33.8	124.2	66	11
191	33.8	157.2	67	11
99.1	185	-85.9	67	12
134	185	-51	67	13
76.3	185	-108.7	67	14
192	185	7	68	14
210	185	25	69	14
170	185	-15	69	15
218	185	33	70	15
158	185	-27	70	16
197	185	12	71	16
145	185	-40	71	17
130	185	-55	71	18
172	185	-13	71	19
143	185	-42	71	20
16.1	185	-168.9	71	21
234	185	49	72	21
158	185	-27	72	22
191	185	6	73	22
134	99.1	34.9	74	22
76.3	99.1	-22.8	74	23
192	99.1	92.9	75	23

210	99.1	110.9	76	23
170	99.1	70.9	77	23
218	99.1	118.9	78	23
158	99.1	58.9	79	23
197	99.1	97.9	80	23
145	99.1	45.9	81	23
130	99.1	30.9	82	23
172	99.1	72.9	83	23
143	99.1	43.9	84	23
16.1	99.1	-83	84	24
234	99.1	134.9	85	24
158	99.1	58.9	86	24
191	99.1	91.9	87	24
76.3	134	-57.7	87	25
192	134	58	88	25
210	134	76	89	25
170	134	36	90	25
218	134	84	91	25
158	134	24	92	25
197	134	63	93	25
145	134	11	94	25
130	134	-4	94	26
172	134	38	95	26
143	134	9	96	26
16.1	134	-117.9	96	27
234	134	100	97	27
158	134	24	98	27
191	134	57	99	27
192	76.3	115.7	100	27
210	76.3	133.7	101	27
170	76.3	93.7	102	27
218	76.3	141.7	103	27
158	76.3	81.7	104	27
197	76.3	120.7	105	27
145	76.3	68.7	106	27
130	76.3	53.7	107	27
172	76.3	95.7	108	27
143	76.3	66.7	109	27
16.1	76.3	-60.2	109	28
234	76.3	157.7	110	28
158	76.3	81.7	111	28
191	76.3	114.7	112	28
210	192	18	113	28
170	192	-22	113	29
218	192	26	114	29
158	192	-34	114	30
197	192	5	115	30
145	192	-47	115	31
130	192	-62	115	32
172	192	-20	115	33
143	192	-49	115	34
16.1	192	-175.9	115	35
234	192	42	116	35
158	192	-34	116	36

191	192	-1	116	37
170	210	-40	116	38
218	210	8	117	38
158	210	-52	117	39
197	210	-13	117	40
145	210	-65	117	41
130	210	-80	117	42
172	210	-38	117	43
143	210	-67	117	44
16.1	210	-193.9	117	45
234	210	24	118	45
158	210	-52	118	46
191	210	-19	118	47
218	170	48	119	47
158	170	-12	119	48
197	170	27	120	48
145	170	-25	120	49
130	170	-40	120	50
172	170	2	121	50
143	170	-27	121	51
16.1	170	-153.9	121	52
234	170	64	122	52
158	170	-12	122	53
191	170	21	123	53
158	218	-60	123	54
197	218	-21	123	55
145	218	-73	123	56
130	218	-88	123	57
172	218	-46	123	58
143	218	-75	123	59
16.1	218	-201.9	123	60
234	218	16	124	60
158	218	-60	124	61
191	218	-27	124	62
197	158	39	125	62
145	158	-13	125	63
130	158	-28	125	64
172	158	14	126	64
143	158	-15	126	65
16.1	158	-141.9	126	66
234	158	76	127	66
158	158	0	127	66
191	158	33	128	66
145	197	-52	128	67
130	197	-67	128	68
172	197	-25	128	69
143	197	-54	128	70
16.1	197	-180.9	128	71
234	197	37	129	71
158	197	-39	129	72
191	197	-6	129	73

130	145	-15	129	74
172	145	27	130	74
143	145	-2	130	75
16.1	145	-128.9	130	76
234	145	89	131	76
158	145	13	132	76
191	145	46	133	76
172	130	42	134	76
143	130	13	135	76
16.1	130	-113.9	135	77
234	130	104	136	77
158	130	28	137	77
191	130	61	138	77
143	172	-29	138	78
16.1	172	-155.9	138	79
234	172	62	139	79
158	172	-14	139	80
191	172	19	140	80
16.1	143	-126.9	140	81
234	143	91	141	81
158	143	15	142	81
191	143	48	143	81
234	16.1	217.9	144	81
158	16.1	141.9	145	81
191	16.1	174.9	146	81
158	234	-76	146	82
191	234	-43	146	83
191	158	33	147	83

S Statistic = 147 - 83 = 64

Tied Group Value	Members
1	158
<hr/>	
Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/16/2014	1

10/29/2014	1
3/16/2015	1
10/22/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 18

B = 0

C = 0

D = 0

E = 2

F = 0

a = 22638

b = 83160

c = 924

Group Variance = 1256.67

Z-Score = 1.77718

Comparison Level at 95% confidence level = 1.65463 (upward trend)

1.77718 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: SW-07

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
42.5	35	7.5	1	0
46.1	35	11.1	2	0
65.2	35	30.2	3	0
41.1	35	6.1	4	0
42.2	35	7.2	5	0
45.8	35	10.8	6	0
17.9	35	-17.1	6	1
41.5	35	6.5	7	1
18.8	35	-16.2	7	2
47.1	35	12.1	8	2
55	35	20	9	2
38.9	35	3.9	10	2
40.8	35	5.8	11	2
35.8	35	0.8	12	2
1.8	35	-33.2	12	3
87	35	52	13	3
41.6	35	6.6	14	3
36	35	1	15	3
40	35	5	16	3
42.4	35	7.4	17	3
43.5	35	8.5	18	3
46.1	42.5	3.6	19	3
65.2	42.5	22.7	20	3
41.1	42.5	-1.4	20	4
42.2	42.5	-0.3	20	5
45.8	42.5	3.3	21	5
17.9	42.5	-24.6	21	6
41.5	42.5	-1	21	7
18.8	42.5	-23.7	21	8
47.1	42.5	4.6	22	8
55	42.5	12.5	23	8
38.9	42.5	-3.6	23	9
40.8	42.5	-1.7	23	10
35.8	42.5	-6.7	23	11
1.8	42.5	-40.7	23	12
87	42.5	44.5	24	12
41.6	42.5	-0.9	24	13
36	42.5	-6.5	24	14
40	42.5	-2.5	24	15
42.4	42.5	-0.1	24	16
43.5	42.5	1	25	16
65.2	46.1	19.1	26	16
41.1	46.1	-5	26	17
42.2	46.1	-3.9	26	18

45.8	46.1	-0.3	26	19
17.9	46.1	-28.2	26	20
41.5	46.1	-4.6	26	21
18.8	46.1	-27.3	26	22
47.1	46.1	1	27	22
55	46.1	8.9	28	22
38.9	46.1	-7.2	28	23
40.8	46.1	-5.3	28	24
35.8	46.1	-10.3	28	25
1.8	46.1	-44.3	28	26
87	46.1	40.9	29	26
41.6	46.1	-4.5	29	27
36	46.1	-10.1	29	28
40	46.1	-6.1	29	29
42.4	46.1	-3.7	29	30
43.5	46.1	-2.6	29	31
41.1	65.2	-24.1	29	32
42.2	65.2	-23	29	33
45.8	65.2	-19.4	29	34
17.9	65.2	-47.3	29	35
41.5	65.2	-23.7	29	36
18.8	65.2	-46.4	29	37
47.1	65.2	-18.1	29	38
55	65.2	-10.2	29	39
38.9	65.2	-26.3	29	40
40.8	65.2	-24.4	29	41
35.8	65.2	-29.4	29	42
1.8	65.2	-63.4	29	43
87	65.2	21.8	30	43
41.6	65.2	-23.6	30	44
36	65.2	-29.2	30	45
40	65.2	-25.2	30	46
42.4	65.2	-22.8	30	47
43.5	65.2	-21.7	30	48
42.2	41.1	1.1	31	48
45.8	41.1	4.7	32	48
17.9	41.1	-23.2	32	49
41.5	41.1	0.4	33	49
18.8	41.1	-22.3	33	50
47.1	41.1	6	34	50
55	41.1	13.9	35	50
38.9	41.1	-2.2	35	51
40.8	41.1	-0.3	35	52
35.8	41.1	-5.3	35	53
1.8	41.1	-39.3	35	54
87	41.1	45.9	36	54
41.6	41.1	0.5	37	54
36	41.1	-5.1	37	55
40	41.1	-1.1	37	56
42.4	41.1	1.3	38	56
43.5	41.1	2.4	39	56
45.8	42.2	3.6	40	56
17.9	42.2	-24.3	40	57
41.5	42.2	-0.7	40	58

18.8	42.2	-23.4	40	59
47.1	42.2	4.9	41	59
55	42.2	12.8	42	59
38.9	42.2	-3.3	42	60
40.8	42.2	-1.4	42	61
35.8	42.2	-6.4	42	62
1.8	42.2	-40.4	42	63
87	42.2	44.8	43	63
41.6	42.2	-0.6	43	64
36	42.2	-6.2	43	65
40	42.2	-2.2	43	66
42.4	42.2	0.2	44	66
43.5	42.2	1.3	45	66
17.9	45.8	-27.9	45	67
41.5	45.8	-4.3	45	68
18.8	45.8	-27	45	69
47.1	45.8	1.3	46	69
55	45.8	9.2	47	69
38.9	45.8	-6.9	47	70
40.8	45.8	-5	47	71
35.8	45.8	-10	47	72
1.8	45.8	-44	47	73
87	45.8	41.2	48	73
41.6	45.8	-4.2	48	74
36	45.8	-9.8	48	75
40	45.8	-5.8	48	76
42.4	45.8	-3.4	48	77
43.5	45.8	-2.3	48	78
41.5	17.9	23.6	49	78
18.8	17.9	0.9	50	78
47.1	17.9	29.2	51	78
55	17.9	37.1	52	78
38.9	17.9	21	53	78
40.8	17.9	22.9	54	78
35.8	17.9	17.9	55	78
1.8	17.9	-16.1	55	79
87	17.9	69.1	56	79
41.6	17.9	23.7	57	79
36	17.9	18.1	58	79
40	17.9	22.1	59	79
42.4	17.9	24.5	60	79
43.5	17.9	25.6	61	79
18.8	41.5	-22.7	61	80
47.1	41.5	5.6	62	80
55	41.5	13.5	63	80
38.9	41.5	-2.6	63	81
40.8	41.5	-0.7	63	82
35.8	41.5	-5.7	63	83
1.8	41.5	-39.7	63	84
87	41.5	45.5	64	84
41.6	41.5	0.1	65	84
36	41.5	-5.5	65	85
40	41.5	-1.5	65	86
42.4	41.5	0.9	66	86

43.5	41.5	2	67	86
47.1	18.8	28.3	68	86
55	18.8	36.2	69	86
38.9	18.8	20.1	70	86
40.8	18.8	22	71	86
35.8	18.8	17	72	86
1.8	18.8	-17	72	87
87	18.8	68.2	73	87
41.6	18.8	22.8	74	87
36	18.8	17.2	75	87
40	18.8	21.2	76	87
42.4	18.8	23.6	77	87
43.5	18.8	24.7	78	87
55	47.1	7.9	79	87
38.9	47.1	-8.2	79	88
40.8	47.1	-6.3	79	89
35.8	47.1	-11.3	79	90
1.8	47.1	-45.3	79	91
87	47.1	39.9	80	91
41.6	47.1	-5.5	80	92
36	47.1	-11.1	80	93
40	47.1	-7.1	80	94
42.4	47.1	-4.7	80	95
43.5	47.1	-3.6	80	96
38.9	55	-16.1	80	97
40.8	55	-14.2	80	98
35.8	55	-19.2	80	99
1.8	55	-53.2	80	100
87	55	32	81	100
41.6	55	-13.4	81	101
36	55	-19	81	102
40	55	-15	81	103
42.4	55	-12.6	81	104
43.5	55	-11.5	81	105
40.8	38.9	1.9	82	105
35.8	38.9	-3.1	82	106
1.8	38.9	-37.1	82	107
87	38.9	48.1	83	107
41.6	38.9	2.7	84	107
36	38.9	-2.9	84	108
40	38.9	1.1	85	108
42.4	38.9	3.5	86	108
43.5	38.9	4.6	87	108
35.8	40.8	-5	87	109
1.8	40.8	-39	87	110
87	40.8	46.2	88	110
41.6	40.8	0.8	89	110
36	40.8	-4.8	89	111
40	40.8	-0.8	89	112
42.4	40.8	1.6	90	112
43.5	40.8	2.7	91	112

1.8	35.8	-34	91	113
87	35.8	51.2	92	113
41.6	35.8	5.8	93	113
36	35.8	0.2	94	113
40	35.8	4.2	95	113
42.4	35.8	6.6	96	113
43.5	35.8	7.7	97	113
87	1.8	85.2	98	113
41.6	1.8	39.8	99	113
36	1.8	34.2	100	113
40	1.8	38.2	101	113
42.4	1.8	40.6	102	113
43.5	1.8	41.7	103	113
41.6	87	-45.4	103	114
36	87	-51	103	115
40	87	-47	103	116
42.4	87	-44.6	103	117
43.5	87	-43.5	103	118
36	41.6	-5.6	103	119
40	41.6	-1.6	103	120
42.4	41.6	0.8	104	120
43.5	41.6	1.9	105	120
40	36	4	106	120
42.4	36	6.4	107	120
43.5	36	7.5	108	120
42.4	40	2.4	109	120
43.5	40	3.5	110	120
43.5	42.4	1.1	111	120

S Statistic = 111 - 120 = -9

Tied Group Value	Members
Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1
11/12/2013	1
4/16/2014	1
10/29/2014	1

3/16/2015	1
10/20/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 22638

b = 83160

c = 924

Group Variance = 1257.67

Z-Score = -0.225583

Comparison Level at 95% confidence level = -1.65463 (downward trend)

-0.225583 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: SW-07

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
42.5	35	7.5	1	0
46.1	35	11.1	2	0
65.2	35	30.2	3	0
41.1	35	6.1	4	0
42.2	35	7.2	5	0
45.8	35	10.8	6	0
17.9	35	-17.1	6	1
41.5	35	6.5	7	1
18.8	35	-16.2	7	2
47.1	35	12.1	8	2
55	35	20	9	2
38.9	35	3.9	10	2
40.8	35	5.8	11	2
35.8	35	0.8	12	2
1.8	35	-33.2	12	3
87	35	52	13	3
41.6	35	6.6	14	3
36	35	1	15	3
40	35	5	16	3
42.4	35	7.4	17	3
43.5	35	8.5	18	3
46.1	42.5	3.6	19	3
65.2	42.5	22.7	20	3
41.1	42.5	-1.4	20	4
42.2	42.5	-0.3	20	5
45.8	42.5	3.3	21	5
17.9	42.5	-24.6	21	6
41.5	42.5	-1	21	7
18.8	42.5	-23.7	21	8
47.1	42.5	4.6	22	8
55	42.5	12.5	23	8
38.9	42.5	-3.6	23	9
40.8	42.5	-1.7	23	10
35.8	42.5	-6.7	23	11
1.8	42.5	-40.7	23	12
87	42.5	44.5	24	12
41.6	42.5	-0.9	24	13
36	42.5	-6.5	24	14
40	42.5	-2.5	24	15
42.4	42.5	-0.1	24	16
43.5	42.5	1	25	16
65.2	46.1	19.1	26	16
41.1	46.1	-5	26	17
42.2	46.1	-3.9	26	18

45.8	46.1	-0.3	26	19
17.9	46.1	-28.2	26	20
41.5	46.1	-4.6	26	21
18.8	46.1	-27.3	26	22
47.1	46.1	1	27	22
55	46.1	8.9	28	22
38.9	46.1	-7.2	28	23
40.8	46.1	-5.3	28	24
35.8	46.1	-10.3	28	25
1.8	46.1	-44.3	28	26
87	46.1	40.9	29	26
41.6	46.1	-4.5	29	27
36	46.1	-10.1	29	28
40	46.1	-6.1	29	29
42.4	46.1	-3.7	29	30
43.5	46.1	-2.6	29	31
41.1	65.2	-24.1	29	32
42.2	65.2	-23	29	33
45.8	65.2	-19.4	29	34
17.9	65.2	-47.3	29	35
41.5	65.2	-23.7	29	36
18.8	65.2	-46.4	29	37
47.1	65.2	-18.1	29	38
55	65.2	-10.2	29	39
38.9	65.2	-26.3	29	40
40.8	65.2	-24.4	29	41
35.8	65.2	-29.4	29	42
1.8	65.2	-63.4	29	43
87	65.2	21.8	30	43
41.6	65.2	-23.6	30	44
36	65.2	-29.2	30	45
40	65.2	-25.2	30	46
42.4	65.2	-22.8	30	47
43.5	65.2	-21.7	30	48
42.2	41.1	1.1	31	48
45.8	41.1	4.7	32	48
17.9	41.1	-23.2	32	49
41.5	41.1	0.4	33	49
18.8	41.1	-22.3	33	50
47.1	41.1	6	34	50
55	41.1	13.9	35	50
38.9	41.1	-2.2	35	51
40.8	41.1	-0.3	35	52
35.8	41.1	-5.3	35	53
1.8	41.1	-39.3	35	54
87	41.1	45.9	36	54
41.6	41.1	0.5	37	54
36	41.1	-5.1	37	55
40	41.1	-1.1	37	56
42.4	41.1	1.3	38	56
43.5	41.1	2.4	39	56
45.8	42.2	3.6	40	56
17.9	42.2	-24.3	40	57
41.5	42.2	-0.7	40	58

18.8	42.2	-23.4	40	59
47.1	42.2	4.9	41	59
55	42.2	12.8	42	59
38.9	42.2	-3.3	42	60
40.8	42.2	-1.4	42	61
35.8	42.2	-6.4	42	62
1.8	42.2	-40.4	42	63
87	42.2	44.8	43	63
41.6	42.2	-0.6	43	64
36	42.2	-6.2	43	65
40	42.2	-2.2	43	66
42.4	42.2	0.2	44	66
43.5	42.2	1.3	45	66
17.9	45.8	-27.9	45	67
41.5	45.8	-4.3	45	68
18.8	45.8	-27	45	69
47.1	45.8	1.3	46	69
55	45.8	9.2	47	69
38.9	45.8	-6.9	47	70
40.8	45.8	-5	47	71
35.8	45.8	-10	47	72
1.8	45.8	-44	47	73
87	45.8	41.2	48	73
41.6	45.8	-4.2	48	74
36	45.8	-9.8	48	75
40	45.8	-5.8	48	76
42.4	45.8	-3.4	48	77
43.5	45.8	-2.3	48	78
41.5	17.9	23.6	49	78
18.8	17.9	0.9	50	78
47.1	17.9	29.2	51	78
55	17.9	37.1	52	78
38.9	17.9	21	53	78
40.8	17.9	22.9	54	78
35.8	17.9	17.9	55	78
1.8	17.9	-16.1	55	79
87	17.9	69.1	56	79
41.6	17.9	23.7	57	79
36	17.9	18.1	58	79
40	17.9	22.1	59	79
42.4	17.9	24.5	60	79
43.5	17.9	25.6	61	79
18.8	41.5	-22.7	61	80
47.1	41.5	5.6	62	80
55	41.5	13.5	63	80
38.9	41.5	-2.6	63	81
40.8	41.5	-0.7	63	82
35.8	41.5	-5.7	63	83
1.8	41.5	-39.7	63	84
87	41.5	45.5	64	84
41.6	41.5	0.1	65	84
36	41.5	-5.5	65	85
40	41.5	-1.5	65	86
42.4	41.5	0.9	66	86

43.5	41.5	2	67	86
47.1	18.8	28.3	68	86
55	18.8	36.2	69	86
38.9	18.8	20.1	70	86
40.8	18.8	22	71	86
35.8	18.8	17	72	86
1.8	18.8	-17	72	87
87	18.8	68.2	73	87
41.6	18.8	22.8	74	87
36	18.8	17.2	75	87
40	18.8	21.2	76	87
42.4	18.8	23.6	77	87
43.5	18.8	24.7	78	87
55	47.1	7.9	79	87
38.9	47.1	-8.2	79	88
40.8	47.1	-6.3	79	89
35.8	47.1	-11.3	79	90
1.8	47.1	-45.3	79	91
87	47.1	39.9	80	91
41.6	47.1	-5.5	80	92
36	47.1	-11.1	80	93
40	47.1	-7.1	80	94
42.4	47.1	-4.7	80	95
43.5	47.1	-3.6	80	96
38.9	55	-16.1	80	97
40.8	55	-14.2	80	98
35.8	55	-19.2	80	99
1.8	55	-53.2	80	100
87	55	32	81	100
41.6	55	-13.4	81	101
36	55	-19	81	102
40	55	-15	81	103
42.4	55	-12.6	81	104
43.5	55	-11.5	81	105
40.8	38.9	1.9	82	105
35.8	38.9	-3.1	82	106
1.8	38.9	-37.1	82	107
87	38.9	48.1	83	107
41.6	38.9	2.7	84	107
36	38.9	-2.9	84	108
40	38.9	1.1	85	108
42.4	38.9	3.5	86	108
43.5	38.9	4.6	87	108
35.8	40.8	-5	87	109
1.8	40.8	-39	87	110
87	40.8	46.2	88	110
41.6	40.8	0.8	89	110
36	40.8	-4.8	89	111
40	40.8	-0.8	89	112
42.4	40.8	1.6	90	112
43.5	40.8	2.7	91	112

1.8	35.8	-34	91	113
87	35.8	51.2	92	113
41.6	35.8	5.8	93	113
36	35.8	0.2	94	113
40	35.8	4.2	95	113
42.4	35.8	6.6	96	113
43.5	35.8	7.7	97	113
87	1.8	85.2	98	113
41.6	1.8	39.8	99	113
36	1.8	34.2	100	113
40	1.8	38.2	101	113
42.4	1.8	40.6	102	113
43.5	1.8	41.7	103	113
41.6	87	-45.4	103	114
36	87	-51	103	115
40	87	-47	103	116
42.4	87	-44.6	103	117
43.5	87	-43.5	103	118
36	41.6	-5.6	103	119
40	41.6	-1.6	103	120
42.4	41.6	0.8	104	120
43.5	41.6	1.9	105	120
40	36	4	106	120
42.4	36	6.4	107	120
43.5	36	7.5	108	120
42.4	40	2.4	109	120
43.5	40	3.5	110	120
43.5	42.4	1.1	111	120

S Statistic = 111 - 120 = -9

Tied Group Value	Members
Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1
11/12/2013	1
4/16/2014	1
10/29/2014	1

3/16/2015	1
10/20/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 0

B = 0

C = 0

D = 0

E = 0

F = 0

a = 22638

b = 83160

c = 924

Group Variance = 1257.67

Z-Score = -0.225583

Comparison Level at 95% confidence level = 1.65463 (upward trend)

-0.225583 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: SW-09

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

0.728	ND<0	0.728	38	0
ND<0	ND<0	0	38	0
0.1	ND<0	0.1	39	0
4.87	ND<0	4.87	40	0
ND<0	ND<0	0	40	0
2.24	ND<0	2.24	41	0
ND<0	ND<0	0	41	0
ND<0	ND<0	0	41	0
ND<0	ND<0	0	41	0
ND<0	ND<0	0	41	0
5.56	ND<0	5.56	42	0
ND<0	ND<0	0	42	0
ND<0	ND<0	0	42	0
1.13	ND<0	1.13	43	0
0.212	ND<0	0.212	44	0
0.728	ND<0	0.728	45	0
ND<0	ND<0	0	45	0
0.1	ND<0	0.1	46	0
4.87	ND<0	4.87	47	0
ND<0	ND<0	0	47	0
2.24	ND<0	2.24	48	0
ND<0	ND<0	0	48	0
ND<0	ND<0	0	48	0
ND<0	ND<0	0	48	0
5.56	ND<0	5.56	49	0
ND<0	ND<0	0	49	0
ND<0	ND<0	0	49	0
0.212	1.13	-0.918	49	1
0.728	1.13	-0.402	49	2
ND<0	1.13	-1.13	49	3
0.1	1.13	-1.03	49	4
4.87	1.13	3.74	50	4
ND<0	1.13	-1.13	50	5
2.24	1.13	1.11	51	5
ND<0	1.13	-1.13	51	6
ND<0	1.13	-1.13	51	7
ND<0	1.13	-1.13	51	8
ND<0	1.13	-1.13	51	9
5.56	1.13	4.43	52	9
ND<0	1.13	-1.13	52	10
ND<0	1.13	-1.13	52	11
0.728	0.212	0.516	53	11
ND<0	0.212	-0.212	53	12
0.1	0.212	-0.112	53	13
4.87	0.212	4.658	54	13
ND<0	0.212	-0.212	54	14
2.24	0.212	2.028	55	14
ND<0	0.212	-0.212	55	15
ND<0	0.212	-0.212	55	16
ND<0	0.212	-0.212	55	17
ND<0	0.212	-0.212	55	18
5.56	0.212	5.348	56	18
ND<0	0.212	-0.212	56	19

ND<0	0.212	-0.212	56	20
ND<0	0.728	-0.728	56	21
0.1	0.728	-0.628	56	22
4.87	0.728	4.142	57	22
ND<0	0.728	-0.728	57	23
2.24	0.728	1.512	58	23
ND<0	0.728	-0.728	58	24
ND<0	0.728	-0.728	58	25
ND<0	0.728	-0.728	58	26
ND<0	0.728	-0.728	58	27
5.56	0.728	4.832	59	27
ND<0	0.728	-0.728	59	28
ND<0	0.728	-0.728	59	29
0.1	ND<0	0.1	60	29
4.87	ND<0	4.87	61	29
ND<0	ND<0	0	61	29
2.24	ND<0	2.24	62	29
ND<0	ND<0	0	62	29
ND<0	ND<0	0	62	29
ND<0	ND<0	0	62	29
5.56	ND<0	5.56	63	29
ND<0	ND<0	0	63	29
ND<0	ND<0	0	63	29
4.87	0.1	4.77	64	29
ND<0	0.1	-0.1	64	30
2.24	0.1	2.14	65	30
ND<0	0.1	-0.1	65	31
ND<0	0.1	-0.1	65	32
ND<0	0.1	-0.1	65	33
ND<0	0.1	-0.1	65	34
5.56	0.1	5.46	66	34
ND<0	0.1	-0.1	66	35
ND<0	0.1	-0.1	66	36
ND<0	4.87	-4.87	66	37
2.24	4.87	-2.63	66	38
ND<0	4.87	-4.87	66	39
ND<0	4.87	-4.87	66	40
ND<0	4.87	-4.87	66	41
ND<0	4.87	-4.87	66	42
5.56	4.87	0.69	67	42
ND<0	4.87	-4.87	67	43
ND<0	4.87	-4.87	67	44
2.24	ND<0	2.24	68	44
ND<0	ND<0	0	68	44
ND<0	ND<0	0	68	44
ND<0	ND<0	0	68	44
5.56	ND<0	5.56	69	44
ND<0	ND<0	0	69	44
ND<0	ND<0	0	69	44

ND<0	2.24	-2.24	69	45
ND<0	2.24	-2.24	69	46
ND<0	2.24	-2.24	69	47
ND<0	2.24	-2.24	69	48
5.56	2.24	3.32	70	48
ND<0	2.24	-2.24	70	49
ND<0	2.24	-2.24	70	50
ND<0	ND<0	0	70	50
ND<0	ND<0	0	70	50
ND<0	ND<0	0	70	50
5.56	ND<0	5.56	71	50
ND<0	ND<0	0	71	50
ND<0	ND<0	0	71	50
ND<0	ND<0	0	71	50
ND<0	ND<0	0	71	50
ND<0	ND<0	0	71	50
ND<0	ND<0	0	71	50
ND<0	ND<0	0	72	50
5.56	ND<0	5.56	72	50
ND<0	ND<0	0	72	50
ND<0	ND<0	0	72	50
ND<0	ND<0	0	72	50
5.56	ND<0	5.56	73	50
ND<0	ND<0	0	73	50
ND<0	ND<0	0	73	50
5.56	ND<0	5.56	74	50
ND<0	ND<0	0	74	50
ND<0	ND<0	0	74	50
ND<0	5.56	-5.56	74	51
ND<0	5.56	-5.56	74	52
ND<0	ND<0	0	74	52

S Statistic = 74 - 52 = 22

Tied Group Value	Members
1	0

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/16/2014	1

10/29/2014	1
3/16/2015	1
10/21/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 7350

B = 0

C = 2730

D = 0

E = 210

F = 0

a = 22638

b = 83160

c = 924

Group Variance = 849.333

Z-Score = 0.720577

Comparison Level at 95% confidence level = -1.65463 (downward trend)

0.720577 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Aluminum

Location: SW-09

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

0.728	ND<0	0.728	38	0
ND<0	ND<0	0	38	0
0.1	ND<0	0.1	39	0
4.87	ND<0	4.87	40	0
ND<0	ND<0	0	40	0
2.24	ND<0	2.24	41	0
ND<0	ND<0	0	41	0
ND<0	ND<0	0	41	0
ND<0	ND<0	0	41	0
ND<0	ND<0	0	41	0
5.56	ND<0	5.56	42	0
ND<0	ND<0	0	42	0
ND<0	ND<0	0	42	0
1.13	ND<0	1.13	43	0
0.212	ND<0	0.212	44	0
0.728	ND<0	0.728	45	0
ND<0	ND<0	0	45	0
0.1	ND<0	0.1	46	0
4.87	ND<0	4.87	47	0
ND<0	ND<0	0	47	0
2.24	ND<0	2.24	48	0
ND<0	ND<0	0	48	0
ND<0	ND<0	0	48	0
ND<0	ND<0	0	48	0
5.56	ND<0	5.56	49	0
ND<0	ND<0	0	49	0
ND<0	ND<0	0	49	0
0.212	1.13	-0.918	49	1
0.728	1.13	-0.402	49	2
ND<0	1.13	-1.13	49	3
0.1	1.13	-1.03	49	4
4.87	1.13	3.74	50	4
ND<0	1.13	-1.13	50	5
2.24	1.13	1.11	51	5
ND<0	1.13	-1.13	51	6
ND<0	1.13	-1.13	51	7
ND<0	1.13	-1.13	51	8
ND<0	1.13	-1.13	51	9
5.56	1.13	4.43	52	9
ND<0	1.13	-1.13	52	10
ND<0	1.13	-1.13	52	11
0.728	0.212	0.516	53	11
ND<0	0.212	-0.212	53	12
0.1	0.212	-0.112	53	13
4.87	0.212	4.658	54	13
ND<0	0.212	-0.212	54	14
2.24	0.212	2.028	55	14
ND<0	0.212	-0.212	55	15
ND<0	0.212	-0.212	55	16
ND<0	0.212	-0.212	55	17
ND<0	0.212	-0.212	55	18
5.56	0.212	5.348	56	18
ND<0	0.212	-0.212	56	19

ND<0	0.212	-0.212	56	20
ND<0	0.728	-0.728	56	21
0.1	0.728	-0.628	56	22
4.87	0.728	4.142	57	22
ND<0	0.728	-0.728	57	23
2.24	0.728	1.512	58	23
ND<0	0.728	-0.728	58	24
ND<0	0.728	-0.728	58	25
ND<0	0.728	-0.728	58	26
ND<0	0.728	-0.728	58	27
5.56	0.728	4.832	59	27
ND<0	0.728	-0.728	59	28
ND<0	0.728	-0.728	59	29
0.1	ND<0	0.1	60	29
4.87	ND<0	4.87	61	29
ND<0	ND<0	0	61	29
2.24	ND<0	2.24	62	29
ND<0	ND<0	0	62	29
ND<0	ND<0	0	62	29
ND<0	ND<0	0	62	29
5.56	ND<0	5.56	63	29
ND<0	ND<0	0	63	29
ND<0	ND<0	0	63	29
4.87	0.1	4.77	64	29
ND<0	0.1	-0.1	64	30
2.24	0.1	2.14	65	30
ND<0	0.1	-0.1	65	31
ND<0	0.1	-0.1	65	32
ND<0	0.1	-0.1	65	33
ND<0	0.1	-0.1	65	34
5.56	0.1	5.46	66	34
ND<0	0.1	-0.1	66	35
ND<0	0.1	-0.1	66	36
ND<0	4.87	-4.87	66	37
2.24	4.87	-2.63	66	38
ND<0	4.87	-4.87	66	39
ND<0	4.87	-4.87	66	40
ND<0	4.87	-4.87	66	41
ND<0	4.87	-4.87	66	42
5.56	4.87	0.69	67	42
ND<0	4.87	-4.87	67	43
ND<0	4.87	-4.87	67	44
2.24	ND<0	2.24	68	44
ND<0	ND<0	0	68	44
ND<0	ND<0	0	68	44
ND<0	ND<0	0	68	44
5.56	ND<0	5.56	69	44
ND<0	ND<0	0	69	44
ND<0	ND<0	0	69	44

ND<0	2.24	-2.24	69	45
ND<0	2.24	-2.24	69	46
ND<0	2.24	-2.24	69	47
ND<0	2.24	-2.24	69	48
5.56	2.24	3.32	70	48
ND<0	2.24	-2.24	70	49
ND<0	2.24	-2.24	70	50
ND<0	ND<0	0	70	50
ND<0	ND<0	0	70	50
ND<0	ND<0	0	70	50
5.56	ND<0	5.56	71	50
ND<0	ND<0	0	71	50
ND<0	ND<0	0	71	50
ND<0	ND<0	0	71	50
ND<0	ND<0	0	71	50
ND<0	ND<0	0	71	50
ND<0	ND<0	0	71	50
ND<0	ND<0	0	72	50
5.56	ND<0	5.56	72	50
ND<0	ND<0	0	72	50
ND<0	ND<0	0	72	50
ND<0	ND<0	0	72	50
5.56	ND<0	5.56	73	50
ND<0	ND<0	0	73	50
ND<0	ND<0	0	73	50
5.56	ND<0	5.56	74	50
ND<0	ND<0	0	74	50
ND<0	ND<0	0	74	50
ND<0	5.56	-5.56	74	51
ND<0	5.56	-5.56	74	52
ND<0	ND<0	0	74	52

S Statistic = 74 - 52 = 22

Tied Group Value	Members
1	0

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1
11/13/2013	1
4/16/2014	1

10/29/2014	1
3/16/2015	1
10/21/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 7350

B = 0

C = 2730

D = 0

E = 210

F = 0

a = 22638

b = 83160

c = 924

Group Variance = 849.333

Z-Score = 0.720577

Comparison Level at 95% confidence level = 1.65463 (upward trend)

0.720577 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SW-02

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
1200	915	285	1	0
1000	915	85	2	0
930	915	15	3	0
900	915	-15	3	1
1100	915	185	4	1
1100	915	185	5	1
500	915	-415	5	2
1000	915	85	6	2
1300	915	385	7	2
1200	915	285	8	2
3100	915	2185	9	2
990	915	75	10	2
1500	915	585	11	2
7300	915	6385	12	2
1600	915	685	13	2
1400	915	485	14	2
1100	915	185	15	2
2200	915	1285	16	2
1100	915	185	17	2
840	915	-75	17	3
830	915	-85	17	4
1000	1200	-200	17	5
930	1200	-270	17	6
900	1200	-300	17	7
1100	1200	-100	17	8
1100	1200	-100	17	9
500	1200	-700	17	10
1000	1200	-200	17	11
1300	1200	100	18	11
1200	1200	0	18	11
3100	1200	1900	19	11
990	1200	-210	19	12
1500	1200	300	20	12
7300	1200	6100	21	12
1600	1200	400	22	12
1400	1200	200	23	12
1100	1200	-100	23	13
2200	1200	1000	24	13
1100	1200	-100	24	14
840	1200	-360	24	15
830	1200	-370	24	16
930	1000	-70	24	17
900	1000	-100	24	18
1100	1000	100	25	18

1100	1000	100	26	18
500	1000	-500	26	19
1000	1000	0	26	19
1300	1000	300	27	19
1200	1000	200	28	19
3100	1000	2100	29	19
990	1000	-10	29	20
1500	1000	500	30	20
7300	1000	6300	31	20
1600	1000	600	32	20
1400	1000	400	33	20
1100	1000	100	34	20
2200	1000	1200	35	20
1100	1000	100	36	20
840	1000	-160	36	21
830	1000	-170	36	22
900	930	-30	36	23
1100	930	170	37	23
1100	930	170	38	23
500	930	-430	38	24
1000	930	70	39	24
1300	930	370	40	24
1200	930	270	41	24
3100	930	2170	42	24
990	930	60	43	24
1500	930	570	44	24
7300	930	6370	45	24
1600	930	670	46	24
1400	930	470	47	24
1100	930	170	48	24
2200	930	1270	49	24
1100	930	170	50	24
840	930	-90	50	25
830	930	-100	50	26
1100	900	200	51	26
1100	900	200	52	26
500	900	-400	52	27
1000	900	100	53	27
1300	900	400	54	27
1200	900	300	55	27
3100	900	2200	56	27
990	900	90	57	27
1500	900	600	58	27
7300	900	6400	59	27
1600	900	700	60	27
1400	900	500	61	27
1100	900	200	62	27
2200	900	1300	63	27
1100	900	200	64	27
840	900	-60	64	28
830	900	-70	64	29
1100	1100	0	64	29
500	1100	-600	64	30
1000	1100	-100	64	31

1300	1100	200	65	31
1200	1100	100	66	31
3100	1100	2000	67	31
990	1100	-110	67	32
1500	1100	400	68	32
7300	1100	6200	69	32
1600	1100	500	70	32
1400	1100	300	71	32
1100	1100	0	71	32
2200	1100	1100	72	32
1100	1100	0	72	32
840	1100	-260	72	33
830	1100	-270	72	34
500	1100	-600	72	35
1000	1100	-100	72	36
1300	1100	200	73	36
1200	1100	100	74	36
3100	1100	2000	75	36
990	1100	-110	75	37
1500	1100	400	76	37
7300	1100	6200	77	37
1600	1100	500	78	37
1400	1100	300	79	37
1100	1100	0	79	37
2200	1100	1100	80	37
1100	1100	0	80	37
840	1100	-260	80	38
830	1100	-270	80	39
1000	500	500	81	39
1300	500	800	82	39
1200	500	700	83	39
3100	500	2600	84	39
990	500	490	85	39
1500	500	1000	86	39
7300	500	6800	87	39
1600	500	1100	88	39
1400	500	900	89	39
1100	500	600	90	39
2200	500	1700	91	39
1100	500	600	92	39
840	500	340	93	39
830	500	330	94	39
1300	1000	300	95	39
1200	1000	200	96	39
3100	1000	2100	97	39
990	1000	-10	97	40
1500	1000	500	98	40
7300	1000	6300	99	40
1600	1000	600	100	40
1400	1000	400	101	40
1100	1000	100	102	40
2200	1000	1200	103	40
1100	1000	100	104	40
840	1000	-160	104	41

830	1000	-170	104	42
1200	1300	-100	104	43
3100	1300	1800	105	43
990	1300	-310	105	44
1500	1300	200	106	44
7300	1300	6000	107	44
1600	1300	300	108	44
1400	1300	100	109	44
1100	1300	-200	109	45
2200	1300	900	110	45
1100	1300	-200	110	46
840	1300	-460	110	47
830	1300	-470	110	48
3100	1200	1900	111	48
990	1200	-210	111	49
1500	1200	300	112	49
7300	1200	6100	113	49
1600	1200	400	114	49
1400	1200	200	115	49
1100	1200	-100	115	50
2200	1200	1000	116	50
1100	1200	-100	116	51
840	1200	-360	116	52
830	1200	-370	116	53
990	3100	-2110	116	54
1500	3100	-1600	116	55
7300	3100	4200	117	55
1600	3100	-1500	117	56
1400	3100	-1700	117	57
1100	3100	-2000	117	58
2200	3100	-900	117	59
1100	3100	-2000	117	60
840	3100	-2260	117	61
830	3100	-2270	117	62
1500	990	510	118	62
7300	990	6310	119	62
1600	990	610	120	62
1400	990	410	121	62
1100	990	110	122	62
2200	990	1210	123	62
1100	990	110	124	62
840	990	-150	124	63
830	990	-160	124	64
7300	1500	5800	125	64
1600	1500	100	126	64
1400	1500	-100	126	65
1100	1500	-400	126	66
2200	1500	700	127	66
1100	1500	-400	127	67
840	1500	-660	127	68
830	1500	-670	127	69

1600	7300	-5700	127	70
1400	7300	-5900	127	71
1100	7300	-6200	127	72
2200	7300	-5100	127	73
1100	7300	-6200	127	74
840	7300	-6460	127	75
830	7300	-6470	127	76
1400	1600	-200	127	77
1100	1600	-500	127	78
2200	1600	600	128	78
1100	1600	-500	128	79
840	1600	-760	128	80
830	1600	-770	128	81
1100	1400	-300	128	82
2200	1400	800	129	82
1100	1400	-300	129	83
840	1400	-560	129	84
830	1400	-570	129	85
2200	1100	1100	130	85
1100	1100	0	130	85
840	1100	-260	130	86
830	1100	-270	130	87
1100	2200	-1100	130	88
840	2200	-1360	130	89
830	2200	-1370	130	90
840	1100	Same Date	130	90
830	1100	-270	130	91
830	840	-10	130	92

S Statistic = 130 - 92 = 38

Tied Group Value	Members
1	1200
2	1000
3	1100

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1

11/13/2013	1
4/17/2014	1
10/29/2014	1
10/23/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	2
10/5/2017	1

There are 1 time periods with multiple data

A = 192

B = 18

C = 24

D = 0

E = 16

F = 2

a = 22638

b = 83160

c = 924

Group Variance = 1246.03

Z-Score = 1.04818

Comparison Level at 95% confidence level = -1.65463 (downward trend)

1.04818 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SW-02

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
1200	915	285	1	0
1000	915	85	2	0
930	915	15	3	0
900	915	-15	3	1
1100	915	185	4	1
1100	915	185	5	1
500	915	-415	5	2
1000	915	85	6	2
1300	915	385	7	2
1200	915	285	8	2
3100	915	2185	9	2
990	915	75	10	2
1500	915	585	11	2
7300	915	6385	12	2
1600	915	685	13	2
1400	915	485	14	2
1100	915	185	15	2
2200	915	1285	16	2
1100	915	185	17	2
840	915	-75	17	3
830	915	-85	17	4
1000	1200	-200	17	5
930	1200	-270	17	6
900	1200	-300	17	7
1100	1200	-100	17	8
1100	1200	-100	17	9
500	1200	-700	17	10
1000	1200	-200	17	11
1300	1200	100	18	11
1200	1200	0	18	11
3100	1200	1900	19	11
990	1200	-210	19	12
1500	1200	300	20	12
7300	1200	6100	21	12
1600	1200	400	22	12
1400	1200	200	23	12
1100	1200	-100	23	13
2200	1200	1000	24	13
1100	1200	-100	24	14
840	1200	-360	24	15
830	1200	-370	24	16
930	1000	-70	24	17
900	1000	-100	24	18
1100	1000	100	25	18

1100	1000	100	26	18
500	1000	-500	26	19
1000	1000	0	26	19
1300	1000	300	27	19
1200	1000	200	28	19
3100	1000	2100	29	19
990	1000	-10	29	20
1500	1000	500	30	20
7300	1000	6300	31	20
1600	1000	600	32	20
1400	1000	400	33	20
1100	1000	100	34	20
2200	1000	1200	35	20
1100	1000	100	36	20
840	1000	-160	36	21
830	1000	-170	36	22
900	930	-30	36	23
1100	930	170	37	23
1100	930	170	38	23
500	930	-430	38	24
1000	930	70	39	24
1300	930	370	40	24
1200	930	270	41	24
3100	930	2170	42	24
990	930	60	43	24
1500	930	570	44	24
7300	930	6370	45	24
1600	930	670	46	24
1400	930	470	47	24
1100	930	170	48	24
2200	930	1270	49	24
1100	930	170	50	24
840	930	-90	50	25
830	930	-100	50	26
1100	900	200	51	26
1100	900	200	52	26
500	900	-400	52	27
1000	900	100	53	27
1300	900	400	54	27
1200	900	300	55	27
3100	900	2200	56	27
990	900	90	57	27
1500	900	600	58	27
7300	900	6400	59	27
1600	900	700	60	27
1400	900	500	61	27
1100	900	200	62	27
2200	900	1300	63	27
1100	900	200	64	27
840	900	-60	64	28
830	900	-70	64	29
1100	1100	0	64	29
500	1100	-600	64	30
1000	1100	-100	64	31

1300	1100	200	65	31
1200	1100	100	66	31
3100	1100	2000	67	31
990	1100	-110	67	32
1500	1100	400	68	32
7300	1100	6200	69	32
1600	1100	500	70	32
1400	1100	300	71	32
1100	1100	0	71	32
2200	1100	1100	72	32
1100	1100	0	72	32
840	1100	-260	72	33
830	1100	-270	72	34
500	1100	-600	72	35
1000	1100	-100	72	36
1300	1100	200	73	36
1200	1100	100	74	36
3100	1100	2000	75	36
990	1100	-110	75	37
1500	1100	400	76	37
7300	1100	6200	77	37
1600	1100	500	78	37
1400	1100	300	79	37
1100	1100	0	79	37
2200	1100	1100	80	37
1100	1100	0	80	37
840	1100	-260	80	38
830	1100	-270	80	39
1000	500	500	81	39
1300	500	800	82	39
1200	500	700	83	39
3100	500	2600	84	39
990	500	490	85	39
1500	500	1000	86	39
7300	500	6800	87	39
1600	500	1100	88	39
1400	500	900	89	39
1100	500	600	90	39
2200	500	1700	91	39
1100	500	600	92	39
840	500	340	93	39
830	500	330	94	39
1300	1000	300	95	39
1200	1000	200	96	39
3100	1000	2100	97	39
990	1000	-10	97	40
1500	1000	500	98	40
7300	1000	6300	99	40
1600	1000	600	100	40
1400	1000	400	101	40
1100	1000	100	102	40
2200	1000	1200	103	40
1100	1000	100	104	40
840	1000	-160	104	41

830	1000	-170	104	42
1200	1300	-100	104	43
3100	1300	1800	105	43
990	1300	-310	105	44
1500	1300	200	106	44
7300	1300	6000	107	44
1600	1300	300	108	44
1400	1300	100	109	44
1100	1300	-200	109	45
2200	1300	900	110	45
1100	1300	-200	110	46
840	1300	-460	110	47
830	1300	-470	110	48
3100	1200	1900	111	48
990	1200	-210	111	49
1500	1200	300	112	49
7300	1200	6100	113	49
1600	1200	400	114	49
1400	1200	200	115	49
1100	1200	-100	115	50
2200	1200	1000	116	50
1100	1200	-100	116	51
840	1200	-360	116	52
830	1200	-370	116	53
990	3100	-2110	116	54
1500	3100	-1600	116	55
7300	3100	4200	117	55
1600	3100	-1500	117	56
1400	3100	-1700	117	57
1100	3100	-2000	117	58
2200	3100	-900	117	59
1100	3100	-2000	117	60
840	3100	-2260	117	61
830	3100	-2270	117	62
1500	990	510	118	62
7300	990	6310	119	62
1600	990	610	120	62
1400	990	410	121	62
1100	990	110	122	62
2200	990	1210	123	62
1100	990	110	124	62
840	990	-150	124	63
830	990	-160	124	64
7300	1500	5800	125	64
1600	1500	100	126	64
1400	1500	-100	126	65
1100	1500	-400	126	66
2200	1500	700	127	66
1100	1500	-400	127	67
840	1500	-660	127	68
830	1500	-670	127	69

1600	7300	-5700	127	70
1400	7300	-5900	127	71
1100	7300	-6200	127	72
2200	7300	-5100	127	73
1100	7300	-6200	127	74
840	7300	-6460	127	75
830	7300	-6470	127	76
1400	1600	-200	127	77
1100	1600	-500	127	78
2200	1600	600	128	78
1100	1600	-500	128	79
840	1600	-760	128	80
830	1600	-770	128	81
1100	1400	-300	128	82
2200	1400	800	129	82
1100	1400	-300	129	83
840	1400	-560	129	84
830	1400	-570	129	85
2200	1100	1100	130	85
1100	1100	0	130	85
840	1100	-260	130	86
830	1100	-270	130	87
1100	2200	-1100	130	88
840	2200	-1360	130	89
830	2200	-1370	130	90
840	1100	Same Date	130	90
830	1100	-270	130	91
830	840	-10	130	92

S Statistic = 130 - 92 = 38

Tied Group Value	Members
1	1200
2	1000
3	1100

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/24/2010	1
4/15/2010	1
8/12/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/22/2013	1

11/13/2013	1
4/17/2014	1
10/29/2014	1
10/23/2015	1
5/4/2016	1
10/4/2016	1
4/13/2017	2
10/5/2017	1

There are 1 time periods with multiple data

A = 192

B = 18

C = 24

D = 0

E = 16

F = 2

a = 22638

b = 83160

c = 924

Group Variance = 1246.03

Z-Score = 1.04818

Comparison Level at 95% confidence level = 1.65463 (upward trend)

1.04818 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SW-06

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
1200	1490	-290	0	1
1600	1490	110	1	1
500	1490	-990	1	2
1600	1490	110	2	2
1800	1490	310	3	2
1600	1490	110	4	2
790	1490	-700	4	3
1700	1490	210	5	3
1800	1490	310	6	3
1700	1490	210	7	3
2100	1490	610	8	3
1700	1490	210	9	3
2200	1490	710	10	3
1900	1490	410	11	3
2200	1490	710	12	3
2000	1490	510	13	3
2000	1490	510	14	3
320	1490	-1170	14	4
4600	1490	3110	15	4
1500	1490	10	16	4
1900	1490	410	17	4
1600	1200	400	18	4
500	1200	-700	18	5
1600	1200	400	19	5
1800	1200	600	20	5
1600	1200	400	21	5
790	1200	-410	21	6
1700	1200	500	22	6
1800	1200	600	23	6
1700	1200	500	24	6
2100	1200	900	25	6
1700	1200	500	26	6
2200	1200	1000	27	6
1900	1200	700	28	6
2200	1200	1000	29	6
2000	1200	800	30	6
2000	1200	800	31	6
320	1200	-880	31	7
4600	1200	3400	32	7
1500	1200	300	33	7
1900	1200	700	34	7
500	1600	-1100	34	8
1600	1600	0	34	8
1800	1600	200	35	8

1600	1600	0	35	8
790	1600	-810	35	9
1700	1600	100	36	9
1800	1600	200	37	9
1700	1600	100	38	9
2100	1600	500	39	9
1700	1600	100	40	9
2200	1600	600	41	9
1900	1600	300	42	9
2200	1600	600	43	9
2000	1600	400	44	9
2000	1600	400	45	9
320	1600	-1280	45	10
4600	1600	3000	46	10
1500	1600	-100	46	11
1900	1600	300	47	11
1600	500	1100	48	11
1800	500	1300	49	11
1600	500	1100	50	11
790	500	290	51	11
1700	500	1200	52	11
1800	500	1300	53	11
1700	500	1200	54	11
2100	500	1600	55	11
1700	500	1200	56	11
2200	500	1700	57	11
1900	500	1400	58	11
2200	500	1700	59	11
2000	500	1500	60	11
2000	500	1500	61	11
320	500	-180	61	12
4600	500	4100	62	12
1500	500	1000	63	12
1900	500	1400	64	12
1800	1600	200	65	12
1600	1600	0	65	12
790	1600	-810	65	13
1700	1600	100	66	13
1800	1600	200	67	13
1700	1600	100	68	13
2100	1600	500	69	13
1700	1600	100	70	13
2200	1600	600	71	13
1900	1600	300	72	13
2200	1600	600	73	13
2000	1600	400	74	13
2000	1600	400	75	13
320	1600	-1280	75	14
4600	1600	3000	76	14
1500	1600	-100	76	15
1900	1600	300	77	15
1600	1800	-200	77	16
790	1800	-1010	77	17
1700	1800	-100	77	18

1800	1800	0	77	18
1700	1800	-100	77	19
2100	1800	300	78	19
1700	1800	-100	78	20
2200	1800	400	79	20
1900	1800	100	80	20
2200	1800	400	81	20
2000	1800	200	82	20
2000	1800	200	83	20
320	1800	-1480	83	21
4600	1800	2800	84	21
1500	1800	-300	84	22
1900	1800	100	85	22
790	1600	-810	85	23
1700	1600	100	86	23
1800	1600	200	87	23
1700	1600	100	88	23
2100	1600	500	89	23
1700	1600	100	90	23
2200	1600	600	91	23
1900	1600	300	92	23
2200	1600	600	93	23
2000	1600	400	94	23
2000	1600	400	95	23
320	1600	-1280	95	24
4600	1600	3000	96	24
1500	1600	-100	96	25
1900	1600	300	97	25
1700	790	910	98	25
1800	790	1010	99	25
1700	790	910	100	25
2100	790	1310	101	25
1700	790	910	102	25
2200	790	1410	103	25
1900	790	1110	104	25
2200	790	1410	105	25
2000	790	1210	106	25
2000	790	1210	107	25
320	790	-470	107	26
4600	790	3810	108	26
1500	790	710	109	26
1900	790	1110	110	26
1800	1700	100	111	26
1700	1700	0	111	26
2100	1700	400	112	26
1700	1700	0	112	26
2200	1700	500	113	26
1900	1700	200	114	26
2200	1700	500	115	26
2000	1700	300	116	26
2000	1700	300	117	26
320	1700	-1380	117	27
4600	1700	2900	118	27
1500	1700	-200	118	28

1900	1700	200	119	28
1700	1800	-100	119	29
2100	1800	300	120	29
1700	1800	-100	120	30
2200	1800	400	121	30
1900	1800	100	122	30
2200	1800	400	123	30
2000	1800	200	124	30
2000	1800	200	125	30
320	1800	-1480	125	31
4600	1800	2800	126	31
1500	1800	-300	126	32
1900	1800	100	127	32
2100	1700	400	128	32
1700	1700	0	128	32
2200	1700	500	129	32
1900	1700	200	130	32
2200	1700	500	131	32
2000	1700	300	132	32
2000	1700	300	133	32
320	1700	-1380	133	33
4600	1700	2900	134	33
1500	1700	-200	134	34
1900	1700	200	135	34
1700	2100	-400	135	35
2200	2100	100	136	35
1900	2100	-200	136	36
2200	2100	100	137	36
2000	2100	-100	137	37
2000	2100	-100	137	38
320	2100	-1780	137	39
4600	2100	2500	138	39
1500	2100	-600	138	40
1900	2100	-200	138	41
2200	1700	500	139	41
1900	1700	200	140	41
2200	1700	500	141	41
2000	1700	300	142	41
2000	1700	300	143	41
320	1700	-1380	143	42
4600	1700	2900	144	42
1500	1700	-200	144	43
1900	1700	200	145	43
1900	2200	-300	145	44
2200	2200	0	145	44
2000	2200	-200	145	45
2000	2200	-200	145	46
320	2200	-1880	145	47
4600	2200	2400	146	47
1500	2200	-700	146	48
1900	2200	-300	146	49

2200	1900	300	147	49
2000	1900	100	148	49
2000	1900	100	149	49
320	1900	-1580	149	50
4600	1900	2700	150	50
1500	1900	-400	150	51
1900	1900	0	150	51
2000	2200	-200	150	52
2000	2200	-200	150	53
320	2200	-1880	150	54
4600	2200	2400	151	54
1500	2200	-700	151	55
1900	2200	-300	151	56
2000	2000	0	151	56
320	2000	-1680	151	57
4600	2000	2600	152	57
1500	2000	-500	152	58
1900	2000	-100	152	59
320	2000	-1680	152	60
4600	2000	2600	153	60
1500	2000	-500	153	61
1900	2000	-100	153	62
4600	320	4280	154	62
1500	320	1180	155	62
1900	320	1580	156	62
1500	4600	-3100	156	63
1900	4600	-2700	156	64
1900	1500	400	157	64

S Statistic = 157 - 64 = 93

Tied Group Value	Members
1	1600
2	1800
3	1700
4	2200
5	1900
6	2000

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/26/2010	1
4/15/2010	1
8/10/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1

4/13/2012	1
11/8/2012	1
4/24/2013	1
11/13/2013	1
4/16/2014	1
10/29/2014	1
3/16/2015	1
10/22/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 204

B = 0

C = 12

D = 0

E = 20

F = 0

a = 22638

b = 83160

c = 924

Group Variance = 1246.33

Z-Score = 2.60598

Comparison Level at 95% confidence level = 1.65463 (upward trend)

2.60598 > 1.65463 indicating an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SW-07

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
490	436	54	1	0
590	436	154	2	0
200	436	-236	2	1
410	436	-26	2	2
490	436	54	3	2
480	436	44	4	2
190	436	-246	4	3
500	436	64	5	3
390	436	-46	5	4
570	436	134	6	4
590	436	154	7	4
510	436	74	8	4
540	436	104	9	4
440	436	4	10	4
98	436	-338	10	5
500	436	64	11	5
630	436	194	12	5
520	436	84	13	5
410	436	-26	13	6
450	436	14	14	6
450	436	14	15	6
590	490	100	16	6
200	490	-290	16	7
410	490	-80	16	8
490	490	0	16	8
480	490	-10	16	9
190	490	-300	16	10
500	490	10	17	10
390	490	-100	17	11
570	490	80	18	11
590	490	100	19	11
510	490	20	20	11
540	490	50	21	11
440	490	-50	21	12
98	490	-392	21	13
500	490	10	22	13
630	490	140	23	13
520	490	30	24	13
410	490	-80	24	14
450	490	-40	24	15
450	490	-40	24	16
200	590	-390	24	17
410	590	-180	24	18
490	590	-100	24	19

480	590	-110	24	20
190	590	-400	24	21
500	590	-90	24	22
390	590	-200	24	23
570	590	-20	24	24
590	590	0	24	24
510	590	-80	24	25
540	590	-50	24	26
440	590	-150	24	27
98	590	-492	24	28
500	590	-90	24	29
630	590	40	25	29
520	590	-70	25	30
410	590	-180	25	31
450	590	-140	25	32
450	590	-140	25	33
410	200	210	26	33
490	200	290	27	33
480	200	280	28	33
190	200	-10	28	34
500	200	300	29	34
390	200	190	30	34
570	200	370	31	34
590	200	390	32	34
510	200	310	33	34
540	200	340	34	34
440	200	240	35	34
98	200	-102	35	35
500	200	300	36	35
630	200	430	37	35
520	200	320	38	35
410	200	210	39	35
450	200	250	40	35
450	200	250	41	35
490	410	80	42	35
480	410	70	43	35
190	410	-220	43	36
500	410	90	44	36
390	410	-20	44	37
570	410	160	45	37
590	410	180	46	37
510	410	100	47	37
540	410	130	48	37
440	410	30	49	37
98	410	-312	49	38
500	410	90	50	38
630	410	220	51	38
520	410	110	52	38
410	410	0	52	38
450	410	40	53	38
450	410	40	54	38
480	490	-10	54	39
190	490	-300	54	40
500	490	10	55	40

390	490	-100	55	41
570	490	80	56	41
590	490	100	57	41
510	490	20	58	41
540	490	50	59	41
440	490	-50	59	42
98	490	-392	59	43
500	490	10	60	43
630	490	140	61	43
520	490	30	62	43
410	490	-80	62	44
450	490	-40	62	45
450	490	-40	62	46
190	480	-290	62	47
500	480	20	63	47
390	480	-90	63	48
570	480	90	64	48
590	480	110	65	48
510	480	30	66	48
540	480	60	67	48
440	480	-40	67	49
98	480	-382	67	50
500	480	20	68	50
630	480	150	69	50
520	480	40	70	50
410	480	-70	70	51
450	480	-30	70	52
450	480	-30	70	53
500	190	310	71	53
390	190	200	72	53
570	190	380	73	53
590	190	400	74	53
510	190	320	75	53
540	190	350	76	53
440	190	250	77	53
98	190	-92	77	54
500	190	310	78	54
630	190	440	79	54
520	190	330	80	54
410	190	220	81	54
450	190	260	82	54
450	190	260	83	54
390	500	-110	83	55
570	500	70	84	55
590	500	90	85	55
510	500	10	86	55
540	500	40	87	55
440	500	-60	87	56
98	500	-402	87	57
500	500	0	87	57
630	500	130	88	57
520	500	20	89	57
410	500	-90	89	58
450	500	-50	89	59

450	500	-50	89	60
570	390	180	90	60
590	390	200	91	60
510	390	120	92	60
540	390	150	93	60
440	390	50	94	60
98	390	-292	94	61
500	390	110	95	61
630	390	240	96	61
520	390	130	97	61
410	390	20	98	61
450	390	60	99	61
450	390	60	100	61
590	570	20	101	61
510	570	-60	101	62
540	570	-30	101	63
440	570	-130	101	64
98	570	-472	101	65
500	570	-70	101	66
630	570	60	102	66
520	570	-50	102	67
410	570	-160	102	68
450	570	-120	102	69
450	570	-120	102	70
510	590	-80	102	71
540	590	-50	102	72
440	590	-150	102	73
98	590	-492	102	74
500	590	-90	102	75
630	590	40	103	75
520	590	-70	103	76
410	590	-180	103	77
450	590	-140	103	78
450	590	-140	103	79
540	510	30	104	79
440	510	-70	104	80
98	510	-412	104	81
500	510	-10	104	82
630	510	120	105	82
520	510	10	106	82
410	510	-100	106	83
450	510	-60	106	84
450	510	-60	106	85
440	540	-100	106	86
98	540	-442	106	87
500	540	-40	106	88
630	540	90	107	88
520	540	-20	107	89
410	540	-130	107	90
450	540	-90	107	91
450	540	-90	107	92

98	440	-342	107	93
500	440	60	108	93
630	440	190	109	93
520	440	80	110	93
410	440	-30	110	94
450	440	10	111	94
450	440	10	112	94
500	98	402	113	94
630	98	532	114	94
520	98	422	115	94
410	98	312	116	94
450	98	352	117	94
450	98	352	118	94
630	500	130	119	94
520	500	20	120	94
410	500	-90	120	95
450	500	-50	120	96
450	500	-50	120	97
520	630	-110	120	98
410	630	-220	120	99
450	630	-180	120	100
450	630	-180	120	101
410	520	-110	120	102
450	520	-70	120	103
450	520	-70	120	104
450	410	40	121	104
450	410	40	122	104
450	450	0	122	104

S Statistic = 122 - 104 = 18

Tied Group Value	Members
1	490
2	590
3	410
4	500
5	450

Time Period	Observations
2/15/2009	1
9/23/2009	1
12/7/2009	1
2/24/2010	1
4/15/2010	1
8/10/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1

11/8/2012	1
4/24/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 90

B = 0

C = 0

D = 0

E = 10

F = 0

a = 22638

b = 83160

c = 924

Group Variance = 1252.67

Z-Score = 0.480321

Comparison Level at 95% confidence level = -1.65463 (downward trend)

0.480321 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SW-07

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

Xj	Xk	Xj - Xk	Positives	Negatives
490	436	54	1	0
590	436	154	2	0
200	436	-236	2	1
410	436	-26	2	2
490	436	54	3	2
480	436	44	4	2
190	436	-246	4	3
500	436	64	5	3
390	436	-46	5	4
570	436	134	6	4
590	436	154	7	4
510	436	74	8	4
540	436	104	9	4
440	436	4	10	4
98	436	-338	10	5
500	436	64	11	5
630	436	194	12	5
520	436	84	13	5
410	436	-26	13	6
450	436	14	14	6
450	436	14	15	6
590	490	100	16	6
200	490	-290	16	7
410	490	-80	16	8
490	490	0	16	8
480	490	-10	16	9
190	490	-300	16	10
500	490	10	17	10
390	490	-100	17	11
570	490	80	18	11
590	490	100	19	11
510	490	20	20	11
540	490	50	21	11
440	490	-50	21	12
98	490	-392	21	13
500	490	10	22	13
630	490	140	23	13
520	490	30	24	13
410	490	-80	24	14
450	490	-40	24	15
450	490	-40	24	16
200	590	-390	24	17
410	590	-180	24	18
490	590	-100	24	19

480	590	-110	24	20
190	590	-400	24	21
500	590	-90	24	22
390	590	-200	24	23
570	590	-20	24	24
590	590	0	24	24
510	590	-80	24	25
540	590	-50	24	26
440	590	-150	24	27
98	590	-492	24	28
500	590	-90	24	29
630	590	40	25	29
520	590	-70	25	30
410	590	-180	25	31
450	590	-140	25	32
450	590	-140	25	33
410	200	210	26	33
490	200	290	27	33
480	200	280	28	33
190	200	-10	28	34
500	200	300	29	34
390	200	190	30	34
570	200	370	31	34
590	200	390	32	34
510	200	310	33	34
540	200	340	34	34
440	200	240	35	34
98	200	-102	35	35
500	200	300	36	35
630	200	430	37	35
520	200	320	38	35
410	200	210	39	35
450	200	250	40	35
450	200	250	41	35
490	410	80	42	35
480	410	70	43	35
190	410	-220	43	36
500	410	90	44	36
390	410	-20	44	37
570	410	160	45	37
590	410	180	46	37
510	410	100	47	37
540	410	130	48	37
440	410	30	49	37
98	410	-312	49	38
500	410	90	50	38
630	410	220	51	38
520	410	110	52	38
410	410	0	52	38
450	410	40	53	38
450	410	40	54	38
480	490	-10	54	39
190	490	-300	54	40
500	490	10	55	40

390	490	-100	55	41
570	490	80	56	41
590	490	100	57	41
510	490	20	58	41
540	490	50	59	41
440	490	-50	59	42
98	490	-392	59	43
500	490	10	60	43
630	490	140	61	43
520	490	30	62	43
410	490	-80	62	44
450	490	-40	62	45
450	490	-40	62	46
190	480	-290	62	47
500	480	20	63	47
390	480	-90	63	48
570	480	90	64	48
590	480	110	65	48
510	480	30	66	48
540	480	60	67	48
440	480	-40	67	49
98	480	-382	67	50
500	480	20	68	50
630	480	150	69	50
520	480	40	70	50
410	480	-70	70	51
450	480	-30	70	52
450	480	-30	70	53
500	190	310	71	53
390	190	200	72	53
570	190	380	73	53
590	190	400	74	53
510	190	320	75	53
540	190	350	76	53
440	190	250	77	53
98	190	-92	77	54
500	190	310	78	54
630	190	440	79	54
520	190	330	80	54
410	190	220	81	54
450	190	260	82	54
450	190	260	83	54
390	500	-110	83	55
570	500	70	84	55
590	500	90	85	55
510	500	10	86	55
540	500	40	87	55
440	500	-60	87	56
98	500	-402	87	57
500	500	0	87	57
630	500	130	88	57
520	500	20	89	57
410	500	-90	89	58
450	500	-50	89	59

450	500	-50	89	60
570	390	180	90	60
590	390	200	91	60
510	390	120	92	60
540	390	150	93	60
440	390	50	94	60
98	390	-292	94	61
500	390	110	95	61
630	390	240	96	61
520	390	130	97	61
410	390	20	98	61
450	390	60	99	61
450	390	60	100	61
590	570	20	101	61
510	570	-60	101	62
540	570	-30	101	63
440	570	-130	101	64
98	570	-472	101	65
500	570	-70	101	66
630	570	60	102	66
520	570	-50	102	67
410	570	-160	102	68
450	570	-120	102	69
450	570	-120	102	70
510	590	-80	102	71
540	590	-50	102	72
440	590	-150	102	73
98	590	-492	102	74
500	590	-90	102	75
630	590	40	103	75
520	590	-70	103	76
410	590	-180	103	77
450	590	-140	103	78
450	590	-140	103	79
540	510	30	104	79
440	510	-70	104	80
98	510	-412	104	81
500	510	-10	104	82
630	510	120	105	82
520	510	10	106	82
410	510	-100	106	83
450	510	-60	106	84
450	510	-60	106	85
440	540	-100	106	86
98	540	-442	106	87
500	540	-40	106	88
630	540	90	107	88
520	540	-20	107	89
410	540	-130	107	90
450	540	-90	107	91
450	540	-90	107	92

98	440	-342	107	93
500	440	60	108	93
630	440	190	109	93
520	440	80	110	93
410	440	-30	110	94
450	440	10	111	94
450	440	10	112	94
500	98	402	113	94
630	98	532	114	94
520	98	422	115	94
410	98	312	116	94
450	98	352	117	94
450	98	352	118	94
630	500	130	119	94
520	500	20	120	94
410	500	-90	120	95
450	500	-50	120	96
450	500	-50	120	97
520	630	-110	120	98
410	630	-220	120	99
450	630	-180	120	100
450	630	-180	120	101
410	520	-110	120	102
450	520	-70	120	103
450	520	-70	120	104
450	410	40	121	104
450	410	40	122	104
450	450	0	122	104

S Statistic = 122 - 104 = 18

Tied Group Value	Members
1	490
2	590
3	410
4	500
5	450

Time Period	Observations
2/15/2009	1
9/23/2009	1
12/7/2009	1
2/24/2010	1
4/15/2010	1
8/10/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1

11/8/2012	1
4/24/2013	1
11/12/2013	1
4/14/2014	1
10/29/2014	1
3/16/2015	1
10/20/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 90

B = 0

C = 0

D = 0

E = 10

F = 0

a = 22638

b = 83160

c = 924

Group Variance = 1252.67

Z-Score = 0.480321

Comparison Level at 95% confidence level = 1.65463 (upward trend)

0.480321 <= 1.65463 indicating no evidence of an upward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SW-09

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
140	21	119	1	0
81	21	60	2	0
64	21	43	3	0
72	21	51	4	0
83	21	62	5	0
96	21	75	6	0
ND<0	21	-21	6	1
97	21	76	7	1
170	21	149	8	1
130	21	109	9	1
62	21	41	10	1
17	21	-4	10	2
92	21	71	11	2
ND<0	21	-21	11	3
110	21	89	12	3
67	21	46	13	3
74	21	53	14	3
64	21	43	15	3
180	21	159	16	3
81	21	60	17	3
77	21	56	18	3
81	140	-59	18	4
64	140	-76	18	5
72	140	-68	18	6
83	140	-57	18	7
96	140	-44	18	8
ND<0	140	-140	18	9
97	140	-43	18	10
170	140	30	19	10
130	140	-10	19	11
62	140	-78	19	12
17	140	-123	19	13
92	140	-48	19	14
ND<0	140	-140	19	15
110	140	-30	19	16
67	140	-73	19	17
74	140	-66	19	18
64	140	-76	19	19
180	140	40	20	19
81	140	-59	20	20
77	140	-63	20	21
64	81	-17	20	22
72	81	-9	20	23
83	81	2	21	23

96	81	15	22	23
ND<0	81	-81	22	24
97	81	16	23	24
170	81	89	24	24
130	81	49	25	24
62	81	-19	25	25
17	81	-64	25	26
92	81	11	26	26
ND<0	81	-81	26	27
110	81	29	27	27
67	81	-14	27	28
74	81	-7	27	29
64	81	-17	27	30
180	81	99	28	30
81	81	0	28	30
77	81	-4	28	31
72	64	8	29	31
83	64	19	30	31
96	64	32	31	31
ND<0	64	-64	31	32
97	64	33	32	32
170	64	106	33	32
130	64	66	34	32
62	64	-2	34	33
17	64	-47	34	34
92	64	28	35	34
ND<0	64	-64	35	35
110	64	46	36	35
67	64	3	37	35
74	64	10	38	35
64	64	0	38	35
180	64	116	39	35
81	64	17	40	35
77	64	13	41	35
83	72	11	42	35
96	72	24	43	35
ND<0	72	-72	43	36
97	72	25	44	36
170	72	98	45	36
130	72	58	46	36
62	72	-10	46	37
17	72	-55	46	38
92	72	20	47	38
ND<0	72	-72	47	39
110	72	38	48	39
67	72	-5	48	40
74	72	2	49	40
64	72	-8	49	41
180	72	108	50	41
81	72	9	51	41
77	72	5	52	41
96	83	13	53	41
ND<0	83	-83	53	42
97	83	14	54	42

170	83	87	55	42
130	83	47	56	42
62	83	-21	56	43
17	83	-66	56	44
92	83	9	57	44
ND<0	83	-83	57	45
110	83	27	58	45
67	83	-16	58	46
74	83	-9	58	47
64	83	-19	58	48
180	83	97	59	48
81	83	-2	59	49
77	83	-6	59	50
ND<0	96	-96	59	51
97	96	1	60	51
170	96	74	61	51
130	96	34	62	51
62	96	-34	62	52
17	96	-79	62	53
92	96	-4	62	54
ND<0	96	-96	62	55
110	96	14	63	55
67	96	-29	63	56
74	96	-22	63	57
64	96	-32	63	58
180	96	84	64	58
81	96	-15	64	59
77	96	-19	64	60
97	ND<0	97	65	60
170	ND<0	170	66	60
130	ND<0	130	67	60
62	ND<0	62	68	60
17	ND<0	17	69	60
92	ND<0	92	70	60
ND<0	ND<0	0	70	60
110	ND<0	110	71	60
67	ND<0	67	72	60
74	ND<0	74	73	60
64	ND<0	64	74	60
180	ND<0	180	75	60
81	ND<0	81	76	60
77	ND<0	77	77	60
170	97	73	78	60
130	97	33	79	60
62	97	-35	79	61
17	97	-80	79	62
92	97	-5	79	63
ND<0	97	-97	79	64
110	97	13	80	64
67	97	-30	80	65
74	97	-23	80	66
64	97	-33	80	67
180	97	83	81	67
81	97	-16	81	68

77	97	-20	81	69
130	170	-40	81	70
62	170	-108	81	71
17	170	-153	81	72
92	170	-78	81	73
ND<0	170	-170	81	74
110	170	-60	81	75
67	170	-103	81	76
74	170	-96	81	77
64	170	-106	81	78
180	170	10	82	78
81	170	-89	82	79
77	170	-93	82	80
62	130	-68	82	81
17	130	-113	82	82
92	130	-38	82	83
ND<0	130	-130	82	84
110	130	-20	82	85
67	130	-63	82	86
74	130	-56	82	87
64	130	-66	82	88
180	130	50	83	88
81	130	-49	83	89
77	130	-53	83	90
17	62	-45	83	91
92	62	30	84	91
ND<0	62	-62	84	92
110	62	48	85	92
67	62	5	86	92
74	62	12	87	92
64	62	2	88	92
180	62	118	89	92
81	62	19	90	92
77	62	15	91	92
92	17	75	92	92
ND<0	17	-17	92	93
110	17	93	93	93
67	17	50	94	93
74	17	57	95	93
64	17	47	96	93
180	17	163	97	93
81	17	64	98	93
77	17	60	99	93
ND<0	92	-92	99	94
110	92	18	100	94
67	92	-25	100	95
74	92	-18	100	96
64	92	-28	100	97
180	92	88	101	97
81	92	-11	101	98
77	92	-15	101	99

110	ND<0	110	102	99
67	ND<0	67	103	99
74	ND<0	74	104	99
64	ND<0	64	105	99
180	ND<0	180	106	99
81	ND<0	81	107	99
77	ND<0	77	108	99
67	110	-43	108	100
74	110	-36	108	101
64	110	-46	108	102
180	110	70	109	102
81	110	-29	109	103
77	110	-33	109	104
74	67	7	110	104
64	67	-3	110	105
180	67	113	111	105
81	67	14	112	105
77	67	10	113	105
64	74	-10	113	106
180	74	106	114	106
81	74	7	115	106
77	74	3	116	106
180	64	116	117	106
81	64	17	118	106
77	64	13	119	106
81	180	-99	119	107
77	180	-103	119	108
77	81	-4	119	109

S Statistic = 119 - 109 = 10

Tied Group Value	Members
1	81
2	64
3	0

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/15/2010	1
8/10/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/24/2013	1

11/13/2013	1
4/15/2014	1
10/29/2014	1
3/16/2015	1
10/21/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 54

B = 0

C = 0

D = 0

E = 6

F = 0

a = 22638

b = 83160

c = 924

Group Variance = 1254.67

Z-Score = 0.254085

Comparison Level at 95% confidence level = -1.65463 (downward trend)

0.254085 >= -1.65463 indicating no evidence of a downward trend

Mann-Kendall Trend Analysis

Parameter: Sulfate

Location: SW-09

Original Data (Not Transformed)

Non-Detects Replaced with 0

95% Confidence Level

X _j	X _k	X _j - X _k	Positives	Negatives
140	21	119	1	0
81	21	60	2	0
64	21	43	3	0
72	21	51	4	0
83	21	62	5	0
96	21	75	6	0
ND<0	21	-21	6	1
97	21	76	7	1
170	21	149	8	1
130	21	109	9	1
62	21	41	10	1
17	21	-4	10	2
92	21	71	11	2
ND<0	21	-21	11	3
110	21	89	12	3
67	21	46	13	3
74	21	53	14	3
64	21	43	15	3
180	21	159	16	3
81	21	60	17	3
77	21	56	18	3
81	140	-59	18	4
64	140	-76	18	5
72	140	-68	18	6
83	140	-57	18	7
96	140	-44	18	8
ND<0	140	-140	18	9
97	140	-43	18	10
170	140	30	19	10
130	140	-10	19	11
62	140	-78	19	12
17	140	-123	19	13
92	140	-48	19	14
ND<0	140	-140	19	15
110	140	-30	19	16
67	140	-73	19	17
74	140	-66	19	18
64	140	-76	19	19
180	140	40	20	19
81	140	-59	20	20
77	140	-63	20	21
64	81	-17	20	22
72	81	-9	20	23
83	81	2	21	23

96	81	15	22	23
ND<0	81	-81	22	24
97	81	16	23	24
170	81	89	24	24
130	81	49	25	24
62	81	-19	25	25
17	81	-64	25	26
92	81	11	26	26
ND<0	81	-81	26	27
110	81	29	27	27
67	81	-14	27	28
74	81	-7	27	29
64	81	-17	27	30
180	81	99	28	30
81	81	0	28	30
77	81	-4	28	31
72	64	8	29	31
83	64	19	30	31
96	64	32	31	31
ND<0	64	-64	31	32
97	64	33	32	32
170	64	106	33	32
130	64	66	34	32
62	64	-2	34	33
17	64	-47	34	34
92	64	28	35	34
ND<0	64	-64	35	35
110	64	46	36	35
67	64	3	37	35
74	64	10	38	35
64	64	0	38	35
180	64	116	39	35
81	64	17	40	35
77	64	13	41	35
83	72	11	42	35
96	72	24	43	35
ND<0	72	-72	43	36
97	72	25	44	36
170	72	98	45	36
130	72	58	46	36
62	72	-10	46	37
17	72	-55	46	38
92	72	20	47	38
ND<0	72	-72	47	39
110	72	38	48	39
67	72	-5	48	40
74	72	2	49	40
64	72	-8	49	41
180	72	108	50	41
81	72	9	51	41
77	72	5	52	41
96	83	13	53	41
ND<0	83	-83	53	42
97	83	14	54	42

170	83	87	55	42
130	83	47	56	42
62	83	-21	56	43
17	83	-66	56	44
92	83	9	57	44
ND<0	83	-83	57	45
110	83	27	58	45
67	83	-16	58	46
74	83	-9	58	47
64	83	-19	58	48
180	83	97	59	48
81	83	-2	59	49
77	83	-6	59	50
ND<0	96	-96	59	51
97	96	1	60	51
170	96	74	61	51
130	96	34	62	51
62	96	-34	62	52
17	96	-79	62	53
92	96	-4	62	54
ND<0	96	-96	62	55
110	96	14	63	55
67	96	-29	63	56
74	96	-22	63	57
64	96	-32	63	58
180	96	84	64	58
81	96	-15	64	59
77	96	-19	64	60
97	ND<0	97	65	60
170	ND<0	170	66	60
130	ND<0	130	67	60
62	ND<0	62	68	60
17	ND<0	17	69	60
92	ND<0	92	70	60
ND<0	ND<0	0	70	60
110	ND<0	110	71	60
67	ND<0	67	72	60
74	ND<0	74	73	60
64	ND<0	64	74	60
180	ND<0	180	75	60
81	ND<0	81	76	60
77	ND<0	77	77	60
170	97	73	78	60
130	97	33	79	60
62	97	-35	79	61
17	97	-80	79	62
92	97	-5	79	63
ND<0	97	-97	79	64
110	97	13	80	64
67	97	-30	80	65
74	97	-23	80	66
64	97	-33	80	67
180	97	83	81	67
81	97	-16	81	68

77	97	-20	81	69
130	170	-40	81	70
62	170	-108	81	71
17	170	-153	81	72
92	170	-78	81	73
ND<0	170	-170	81	74
110	170	-60	81	75
67	170	-103	81	76
74	170	-96	81	77
64	170	-106	81	78
180	170	10	82	78
81	170	-89	82	79
77	170	-93	82	80
62	130	-68	82	81
17	130	-113	82	82
92	130	-38	82	83
ND<0	130	-130	82	84
110	130	-20	82	85
67	130	-63	82	86
74	130	-56	82	87
64	130	-66	82	88
180	130	50	83	88
81	130	-49	83	89
77	130	-53	83	90
17	62	-45	83	91
92	62	30	84	91
ND<0	62	-62	84	92
110	62	48	85	92
67	62	5	86	92
74	62	12	87	92
64	62	2	88	92
180	62	118	89	92
81	62	19	90	92
77	62	15	91	92
92	17	75	92	92
ND<0	17	-17	92	93
110	17	93	93	93
67	17	50	94	93
74	17	57	95	93
64	17	47	96	93
180	17	163	97	93
81	17	64	98	93
77	17	60	99	93
ND<0	92	-92	99	94
110	92	18	100	94
67	92	-25	100	95
74	92	-18	100	96
64	92	-28	100	97
180	92	88	101	97
81	92	-11	101	98
77	92	-15	101	99

110	ND<0	110	102	99
67	ND<0	67	103	99
74	ND<0	74	104	99
64	ND<0	64	105	99
180	ND<0	180	106	99
81	ND<0	81	107	99
77	ND<0	77	108	99
67	110	-43	108	100
74	110	-36	108	101
64	110	-46	108	102
180	110	70	109	102
81	110	-29	109	103
77	110	-33	109	104
74	67	7	110	104
64	67	-3	110	105
180	67	113	111	105
81	67	14	112	105
77	67	10	113	105
64	74	-10	113	106
180	74	106	114	106
81	74	7	115	106
77	74	3	116	106
180	64	116	117	106
81	64	17	118	106
77	64	13	119	106
81	180	-99	119	107
77	180	-103	119	108
77	81	-4	119	109

S Statistic = 119 - 109 = 10

Tied Group Value	Members
1	81
2	64
3	0

Time Period	Observations
2/15/2009	1
9/24/2009	1
12/8/2009	1
2/25/2010	1
4/15/2010	1
8/10/2010	1
11/23/2010	1
3/10/2011	1
5/25/2011	1
9/1/2011	1
4/13/2012	1
11/8/2012	1
4/24/2013	1

11/13/2013	1
4/15/2014	1
10/29/2014	1
3/16/2015	1
10/21/2015	1
5/5/2016	1
10/4/2016	1
4/13/2017	1
10/5/2017	1

There are 0 time periods with multiple data

A = 54

B = 0

C = 0

D = 0

E = 6

F = 0

a = 22638

b = 83160

c = 924

Group Variance = 1254.67

Z-Score = 0.254085

Comparison Level at 95% confidence level = 1.65463 (upward trend)

0.254085 <= 1.65463 indicating no evidence of an upward trend



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EAST POINT GEORGIA HSI#10498**

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