



Kestrel Horizons, LLC  
As Trustee for the  
Pinewood Site Custodial Trust  
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April 15, 2013

Ms. Cynde Devlin, Hydrogeologist  
Division of Hydrogeology  
Bureau of Land and Waste Management  
South Carolina Department of Health and Environmental Control  
2600 Bull Street  
Columbia, SC 29201

RE: Pinewood Site  
Baseline Water Quality Technical Memorandum  
SCD 070 375 985

Dear Ms. Devlin:

Please find enclosed two (2) copies of the Baseline Water Quality Technical Memorandum. AECOM prepared the memorandum on behalf of the Pinewood Site Custodial Trust. The report is being submitted in a reduced paper form and complete electronic form.

Please contact us at (864) 288-6353 if you have any questions or comments.

Sincerely,

A handwritten signature in blue ink that reads "Christopher J. Suttell".

Christopher J. Suttell  
Kestrel Horizons, LLC, as Trustee for the Pinewood Site Custodial Trust

Enclosures

cc: Mr. Brian Burgess, STC (Pinewood Site File)  
PSCT 06.26 (letter and report)  
PSCT 03.80 (letter)

**FINAL**  
**TECHNICAL MEMORANDUM**

**TO:** Kestrel Horizons, LLC, as the Trustee for the Pinewood Site Custodial Trust

**FROM:** John R. Haramut, P.G., AECOM  
Anne Lewis-Russ, PhD, AECOM  
Thomas Fogg, PhD, AECOM  
Tom Champion, P.G., AECOM  
Leslee Alexander, P.G., AECOM

**COPY:** AECOM Project File 60271027

**RE:** Baseline Water Quality Technical Memorandum  
Pinewood, South Carolina  
AECOM Project Number 60271027

**DATE:** April 15, 2013

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B	Laboratory Analytical Data
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This Technical Memorandum has been prepared to summarize and interpret the elemental, cation, anion, and isotope data for groundwater collected during September 2012, at the Pinewood Landfill (the Site). These data were obtained to evaluate natural water quality conditions in each water-bearing unit below the Opaline Claystone (OC), define background groundwater quality characteristics, and identify any similarities or differences between the types of water within the various water-bearing zones.

## INTRODUCTION

As water contacts minerals within an aquifer matrix, changes occur in its chemical composition due to dissolution and precipitation reactions. These reactions occur as the chemistry of the water comes into equilibrium with the composition of the aquifer matrix. These water soluble weathering products can be identified and quantified, then compared to levels of chemical elements found in other water-bearing units to aid in determining groundwater flow patterns and to aid in understanding the mixing of water within the paleo-channel from various water-bearing units.

Chemical and isotopic data were collected for use in evaluating the hydrogeologic conditions, groundwater flow, and overall water quality. Three data sets were collected: elements, major ions, and isotopes. The elemental analyses consisted of a comprehensive set of 70 naturally occurring elements analyzed in groundwater samples from 57 monitoring wells. These analyses provide an indication of groundwater composition. The major ion and isotope analyses (19 samples) provide indications of groundwater movement, provenance, recharge, and mixing. Specifically, these analyses are useful for evaluating potential water mixing below the Site and within the paleo-channel beneath the eastern portion of the Site. The radioactive isotope tritium provides a relative ‘age’ date for groundwater, indicating whether the aquifers have received recent recharge. These data can therefore assist in establishing an optimal monitoring program by aiding in defining groundwater flow paths.

Groundwater in five aquifer zones underlying the OC was sampled: Transitional Lang Syne (TLS) including the TLS paleo-channel, Secondary Sawdust Landing (SSDL), Primary Sawdust Landing (PSDL), Upper Black Creek-A (UBC-A), and Upper Black Creek-B (UBC-B). Figure 1 illustrates the hydrostratigraphy underlying the Site.

A total of 62 monitoring wells were sampled for groundwater parameters (Figure 2). Fifty-seven wells were sampled for 70 elements; 14 of those wells and five other wells were sampled for major ions and isotopes. Groundwater sampling occurred between September 4 and 14, 2012. Water samples were collected using Grundfos pumps or well wizards, which are dedicated pump systems. During sample collection, on average about 49 gallons were purged from each well (ranging from 3 to 153 gallons; median of 31 gallons). About 27 percent of the sampled wells were pumped dry during sampling; purged volume in these wells ranged from 3 to 38 gallons. Field parameters of pH, specific conductance, temperature, and turbidity were collected at sampled wells (Table 1). Field-parameter results are discussed below in the major ion analysis section and field forms are presented in Attachment A.

Major cations (calcium, magnesium, potassium, sodium), major anions (bicarbonate/carbonate, chloride, and sulfate), and natural isotopes [deuterium/hydrogen isotope ratios ( $\delta\text{D/H}$ ), oxygen-18/oxygen-16 isotope ratios ( $\delta^{18}\text{O}/^{16}\text{O}$ ), and tritium] were analyzed in 19 groundwater samples collected from wells shown on Figure 2. These included two wells in the southeast part of the Site within the paleo-channel and four groups of wells along a transect starting from the west side of Landfill Section I, extending across the paleo-channel, and ending toward the eastern property boundary.

This memorandum summarizes the data collected during September 2012, describes the data analysis techniques used to evaluate the data, includes conclusions based on the data analyses, and provides options for recommended future studies. To streamline review of the most pertinent information, the findings and recommendations for further work are presented first, followed by descriptions of the analytical data and data evaluation. The interpretations herein take into account the observations presented in the Hydrologic Monitoring Technical Memorandum, submitted by AECOM on March 8, 2013.

## FINDINGS

1. The current sampling method resulted in measureable turbidity in almost half of the elemental groundwater samples, which limited the amount of data available for elemental differentiation among aquifer units.
2. Groundwater sample elemental analysis indicated antimony, calcium, iron, magnesium, and silicon provide some means of differentiating aquifer units. Ratios from elemental analysis that indicated different aquifer units included iron to bromine, lithium, magnesium, manganese, potassium, silicon, and sulfur; manganese to silicon; magnesium to cesium, potassium, and rubidium; and sodium to potassium and rubidium. Most differentiation observed was between the TLS and other monitoring zones or between the UBC-A and other monitoring zones. These differentiations are tenuous, however, due to effects of turbidity which limited useable data.
3. Based on major ions, groundwater is uniformly calcium-bicarbonate/carbonate type. Variations in major ion data were not significant enough to differentiate groundwater within the tested aquifer zones.
4. Chloride concentrations and calculated total dissolved solids (TDS) were small and indicative of natural water unaffected by landfill activities. Since chloride and TDS are typically found in landfill leachate, these data indicate that landfill leachate is not affecting groundwater in aquifer units below the OC.
5. Background tritium values in rain are typically approximately 4 tritium units (TU). Isotopic results showed tritium values in groundwater at the Site beneath the OC were all <1 TU. These results indicate little to no communication exists between the water table and deeper water-bearing zones beneath the OC at the Site.
6. Isotopic ratio  $\delta\text{D/H}$  and  $\delta^{18}\text{O}/^{16}\text{O}$  results reflect natural or anthropogenic hydraulic processes, with no apparent effect from landfill leachate.

7. Together, the results from the major ion and isotopic analyses indicate that no leachate is present below the OC in the wells sampled during this study.

### ***RECOMMENDATIONS FOR FUTURE STUDIES AND EVALUATIONS***

1. Consider changes to the groundwater sampling methodology, such as low flow purging, so that analytical results will be representative of groundwater conditions rather than reflective of temporary turbidity effects.
2. Obtain samples of shallow aquifer water for comparison with results presented herein, particularly analyzing water samples for isotopes and major ions, to improve understanding of the potential for communication between these units from a groundwater discharge location (seep) between the Site and Lake Marion, leachate from single-lined Landfill Sections I and II A/B, and from French Drain 1. These data can be evaluated to further constrain the hydrogeologic history at the Site and optimize the environmental monitoring program.
3. Reduce the current analytical parameter list and focus future monitoring on indicator constituents, such as chloride, 1,4-dioxane and TDS.
4. Utilize information from the baseline groundwater quality investigation along with that from the above referenced Hydrologic Monitoring Technical Memorandum to update the Conceptual Site Model.

### ***ELEMENTAL ANALYSIS AND STATISTICAL EVALUATION***

Table 2 lists the results of the elemental analysis. Elemental analyses were performed by Acme Analytical Laboratories, Ltd., Vancouver, Canada, by inductively coupled plasma - mass spectrometry (ICP-MS) after digestion using the ultratrace aqua regia digestion method. The laboratory data packages are presented in Attachment B and the quality assurance/quality control (QA/QC) information is provided in Attachment C.

Of the 70 elements analyzed, six (mercury, palladium, gold, platinum, tantalum, tellurium) were not detected in any well. Low-flow pumping methods were not used to collect water samples; 17 wells went dry during the sampling process. Turbidity readings were as high as 1,100 nephelometric turbidity units (ntu) and samples were not filtered. As a result, elemental concentrations in many samples reflect particulate rather than dissolved fractions of elements. Turbidities, and therefore, total elemental concentrations can vary greatly for different sampling events.

Data were evaluated using summary statistics and comparing ranges (minimum and maximum), averages, and median concentrations. Prior to the summary statistics evaluation, concentrations most obviously impacted by turbidity were removed (Attachment D). In general, relatively lower elemental concentrations were detected in TLS paleo-channel groundwater than those detected in TLS and UBC-A monitoring zone groundwater. The largest differences among maximum elemental concentrations were

for aluminum, bromine, and cesium. Summary statistics for these elements are shown in Table 3. However, even for these elements, there was little or no difference for average or median values among the different aquifer zones. Thus, summary statistics of individual analytes did not separate groundwater in different zones.

To further evaluate possible differences in chemistry, multivariate analysis was performed on the elemental data for groundwater in the five aquifer zones. This analysis is described in detail in Attachment D and summarized below.

Principal Component Analysis (PCA) was used to identify factors that accounted for the most variance among aquifer zones. After numerous iterations, only parameters with at least 90 percent detected concentrations were retained. Also, the influence of turbidity ( $>0$  ntu) impacted some of the results rendering the data inconclusive. Therefore, samples with detectable turbidities were eliminated<sup>1</sup> from the statistical analysis. The remaining data set consisted of 18 constituents sampled in groundwater within the five aquifer zones:

1. TLS – 5 of a total of 14 sample locations;
2. SSDL – 6 of a total of 11 sample locations;
3. PSDL – 6 of a total of 11 sample locations;
4. UBC-A – 10 of a total of 17 sample locations; and
5. TLS paleo-channel, part of the TLS, and cross-cutting the other three aquifer zones – 1 of a total of 4 sample locations.

The results of the PCA indicated that distinctions may exist among aquifer zones and further review of the data was warranted. Therefore, focused analysis on the parameters was performed to determine if the data would yield distinctions in the profiles of the aquifer zones.

The chemical results for the hydrogeological zones were compared using box plots (see Figure 3). These plots indicate data sets for groundwater from each aquifer zone. When the data represented by the box plot do not overlap, the constituent, or relation between constituents, may distinguish aquifer zones. Box plots enclose 50 percent of the data for each aquifer by showing the 25<sup>th</sup> and 75<sup>th</sup> percentiles (also known as the lower and upper quartiles). The median is shown as a straight line through the box plot. The lines extending from the top and bottom of the boxes mark the statistically “acceptable” range of data for the dataset. Points outside these lines are outliers and deviate markedly from other data points in the set and are shown on the plots as separate points. Only samples with non-detectable values of turbidity were used. Elements plotted individually included those with detection frequencies of 33 percent or greater, with non-detect values plotted at half the method detection limit.

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<sup>1</sup> The elimination of samples with detectable turbidities was based on results of this iterative statistical evaluation. Typically, small turbidities in the range of 0 to 20 ntu are not considered to have a large influence on analytical results.

Box plots of individual elements with greatest differences among aquifer zones include:

- Silicon: the TLS box does not overlap with the other units
- Antimony: the TLS box does not overlap with the other units, except for the one sample from TLS paleo-channel. Antimony has low detection frequencies (30-50 percent) in PSDL, SSDL, and UBC-A, but was detected in all the samples from TLS.
- Calcium: higher concentrations were detected for TLS but they overlap with those of PSDL.
- Iron: lower concentrations were detected in TLS but they overlap with those of PSDL.
- Magnesium: UBC-A has significantly lower concentrations of magnesium, except for the one sample from TLS paleo-channel.

For other elements graphed, considerable overlap occurs among the aquifer zones.

Figures 4a and 4b provides box plots of ratios of elements with greatest differences among aquifer zones. The ratio analysis focused on elements with high detection frequencies to avoid introducing uncertainties about actual concentrations. Figure 4a depicts elemental variations significant to the TLS and Figure 4b depicts elemental variations significant to the UBC-A. Variations are considered to be significant when the box for a specific aquifer does not overlap with boxes for other aquifers. A summary of data interpretation is provided below.

- Ratios of iron to bromine, lithium, magnesium, manganese, potassium, silicon, and sulfur were significantly different for TLS concentrations.
- Ratio of manganese to silicon: TLS had significantly different ratios from other units
- Ratios of magnesium to cesium, potassium and rubidium: significantly different for UBC-A, with the exception of the one ratio for TLS paleo-channel.
- Ratios of sodium to potassium and sodium to rubidium: significantly different for UBC-A.

These elements and element ratios must be used with caution due to the small number of data points for each aquifer zone. Also, the data were only collected during a single sampling event and there is no information regarding the concentrations over time or possible variability that may occur since changes in groundwater flow direction due to off-Site groundwater withdrawal may make groundwater conditions transient. These limitations make it difficult to ascertain if the distinctions found actually represent consistent differences in the aquifer zones or are just found in these select samples. Prior to using these elements or ratios definitively, sampling for these elements at an expanded number of locations would need to be done to assure that the relations are consistent over the broader data set. This evaluation is helpful for significantly narrowing the parameters that may differentiate groundwater in the different aquifer zones.

There is not evidence to indicate groundwater is affected by leachate or other landfill activities, so the elemental data collected is indicative of background conditions. The potential for leachate impacts is evaluated in the following two sections.

### **GROUNDWATER PARAMETERS, MAJOR ION ANALYSIS, AND GRAPHIC EVALUATION**

Table 1 lists groundwater parameter measurements, including the median value and range for each parameter (last two rows of table). Purge volume and turbidity were discussed earlier in this memorandum. Both exhibit large variability (as indicated by ranges), due in large part to sampling methods. Temperature variability is small. The range of pH (almost 5 units) results primarily from three elevated pH measurements of 10.40 (MW078T, TLS), 10.66 (MW072P, PSDL), and 10.88 (MW077P, PSDL). These unusual pH measurements may indicate a problem with well completion, such as contact of sampled water by cement or bentonite. Analytical results from these wells should be evaluated with caution. The range of specific conductivity values is large (31 to 488 microMhos per centimeter [ $\mu\text{mho}/\text{cm}$ ]). As shown in Figure 5, the largest range of values occurs for PSDL groundwater. The small range for TLS paleo-channel groundwater (168 to 182  $\mu\text{mho}/\text{cm}$ ) may result from effective mixing of water in the paleo-channel. This interpretation is supported by the median specific conductivity for the groundwater samples of 168.5  $\mu\text{mho}/\text{cm}$ .

As water contacts minerals within an aquifer matrix, changes can occur in its chemical composition, which in turn can be used to differentiate between aquifer zones or processes, such as generation of landfill leachate. These changes can be particularly apparent for major ions, which make up the bulk of the TDS in water. Thus, comparison of major ions among the water-bearing zones can be helpful for determining groundwater flow patterns and whether this flow is separated for different zones.

Major ion analysis was performed by Shealy Environmental Services, Inc., West Columbia, South Carolina. Cations were analyzed by inductively coupled plasma – atomic emission spectrometry (Method 6010C), alkalinity by titration (Method 2320B), and chloride and sulfate by ion chromatography (Method 300.0). Laboratory data packages are included in Attachment B and QA/QC information is provided in Attachment C. Charge balance for major ions was calculated as part of the QA/QC process (See Attachment C).

Results for major ion analysis are provided in Table 4. The Piper diagram (Figure 6) and Stiff diagrams (Figures 7 through 11) were prepared using major ion compositions to evaluate the differences in water type throughout the water column. These diagrams are helpful to visually distinguish major ion composition of water from different samples.

As indicated by the Piper and Stiff diagrams, water in the aquifer zones is calcium-bicarbonate/carbonate type. There is no distinction in major ion composition among the groundwater samples based on their aquifer zone, as indicated by the clustering of points on the Piper diagram. There also is no distinction

based on their location west, east, or within the paleo-channel. All of the Stiff diagrams have similar shapes, so do not indicate different water types among aquifer units.

TDS of water samples is indicated by the size of Stiff diagrams. There is no systematic difference in size evident among Stiff diagrams of different monitoring zones. Therefore, TDS values were calculated<sup>2</sup> to determine if there were any discernible trends. Calculated TDS ranged from 60 to 147 milligrams per liter (mg/L). Average and median TDS for each aquifer unit (Table 5) decrease with depth, from 117 and 114 mg/L, respectively for TLS, to 86 and 83 mg/L, respectively for UBC-A (the single UBC-B sample had a calculated TDS of 71 mg/L). These TDS values are relatively small. Also, chloride concentrations were small, ranging from 0.13 to 3.0 mg/L. TDS and chloride are usually elevated in landfill leachate. For example, chloride concentrations in primary sump leachate ranged from 394 to 19,800 mg/L (May 2010 data), which is orders of magnitude greater than in the aquifer units beneath the OC. Therefore, the low concentrations in the aquifer water are an indication that landfill leachate is not impacting groundwater in aquifer units below the OC.

### **ISOTOPE ANALYSIS AND EVALUATION**

Naturally occurring variations in the oxygen and hydrogen stable isotopic composition of water can be used to differentiate separate sources of groundwater, recharge areas, or hydrologic processes. Because the stable isotopic composition of precipitation is affected by the distance from the ocean (the ultimate source of precipitation), stable isotopes ratios of δD/H and δ<sup>18</sup>O/δ<sup>16</sup>O can be used to differentiate the relative proportions of local groundwater affected by recharge or affected by imported groundwater. Tritium, a radioactive isotope of hydrogen that is both naturally occurring and man-made, can be used in a qualitative manner to identify the separation between younger and older waters, and can be useful for evaluating whether lower permeability zones, such as silt lenses, are effective aquitards. If this is the case, the characteristics of the groundwater in upper and lower zones, both in δD/H and δ<sup>18</sup>O/δ<sup>16</sup>O and in tritium, should be different. The advantage to using stable isotopes of water is that they are conservative and not affected by dilution, while radioactive tritium can provide a qualitative 'age' of the water.

Conclusions from the Hydrologic Monitoring Technical Memorandum (AECOM, March 8, 2013) for Pinewood form a basis for interpretation of the isotopic results. The OC acts hydraulically as a low permeability confining bed, reducing or preventing recharge from precipitation above from entering the aquifers below. Groundwater flow directions within the monitoring zones underlying the OC are affected by off-Site pumping, and in most cases the groundwater flow has reversed. Groundwater flow is now to the east within the monitoring zones below the OC except the TLS, which is a reversal of the natural flow direction (Figure 1).

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<sup>2</sup> TDS calculated based on the sum of major ion concentrations; bicarbonate and carbonate alkalinity concentrations are divided by two prior to addition to account for presence in gas phase. Note that correlation of total dissolved solids and specific conductivity was good with the exception of the sample from PSDL well MW072. Charge balance was also not as good for major ion analysis at this well (11 percent excess of cations), and pH was unusually elevated (10.66).

Of the aquifers underlying the OC, the TLS is the least affected by off-Site groundwater withdrawal. Under natural conditions there is a groundwater flow divide within the TLS beneath Landfill Section I trending southeast / northwest extending beneath Section II. This divide is still present within the TLS and groundwater on the west of the divide flows to the west, while on the east of the divide, flow is to the east.

The effects of off-Site groundwater withdrawal on flow in the SSDL vary by location. On the west side of Landfill Sections I and II, there is little drawdown. Beneath the landfill, drawdown is on the order of 5 to 10 feet, while on the east side of the property, in the TLS paleo-channel, heads have declined by as much as 20 feet (measured in November, 2011) at wells screened at similar depths as the SSDL wells.

Groundwater flow in the PSDL is generally to the east, and along with the UBC-A, the PSDL is most affected by off-Site groundwater withdrawal. Based on the hydrologic assessment, the natural groundwater flow direction in the PSDL and UBC-A aquifers was primarily west toward Lake Marion. Detailed analyses of historical groundwater data collected during quarterly groundwater monitoring events have shown that the flow direction within these aquifers had been altered, so that during the winter months (beginning in October) the flow was reversed and then restored to natural conditions during the summer months. However, as shown by recent data collected during the hydraulic study, this cyclic flow direction trend is no longer observed, and the predominant flow direction is now east throughout the year.

Isotope analysis was performed by Isotech Laboratories, Inc., Champaign, Illinois. Cavity ring-down spectroscopy was used for analysis of  $\delta^{18}\text{O}/\delta^{16}\text{O}$  and  $\delta\text{D/H}$ , and tritium was analyzed by radiometric measurement. Results for isotope analyses are provided in Table 6. Laboratory data are presented in Attachment B and QA/QC information is provided in Attachment C.

Although tritium was released to the atmosphere in a number of nuclear tests, with the world-wide acceptance of the nuclear test ban treaty, inputs of tritium to the atmosphere largely ceased by 1962. With a radioactive half-life of about 12.5 years, coupled with rapid removal from the atmosphere via rain, most tritium values today in rain are about 2 to 4 TU. As described by Clark and Fritz (1997)<sup>3</sup>, for measurements made in continental regions, concentrations of tritium less than approximately 0.8 TU suggest sub-modern water, recharged prior to about 1952. Concentrations between 0.8 TU and about 4 TU suggest a mixture of water between sub-modern and recent recharge. All tritium results measured in this round of sampling were less than the method detection limit of 1 TU, indicating that either the water in the zones is greater than 50 years old or recent water may be present but is diluted with sub-modern water. This result can be interpreted as showing little to no communication between shallow groundwater above the OC and deeper groundwater monitored below the OC.

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<sup>3</sup> Clark, I.D., and P. Fritz, 1997. *Environmental Isotopes in Hydrogeology*. Lewis Publishers, New York, 228pp.

Figure 12 is a plot of the stable isotope ratio results for  $\delta^{18}\text{O}/\delta^{16}\text{O}$  and  $\delta\text{D}/\text{H}$ , along with the Local Meteoric Water Line (LMWL) derived from rainfall measurements collected from the closest available monitoring stations at Hatteras, North Carolina and Tuscaloosa, Alabama reported in the IAEA database (IAEA, 2013)<sup>4</sup> and a meteoric water line defined by regional results from river water. The river meteoric water line (RMWL) shown on the figure integrates results from river water in the southeastern United States (Kendall and Coplen, 2001)<sup>5</sup>. These authors conclude that because groundwater is probably the dominant source of streamflow in most basins, the river water isotopes provide information on the isotopic composition of waters that have infiltrated soils to recharge the groundwater system.

The points plotted in Figure 12 are color coded to represent the various aquifer zones. Error bars shown represent the general analytical measurement uncertainty (one standard deviation) reported by the laboratory, as no duplicate analyses were made.

In general, the results for all samples, with the exception of samples from wells MW035S, MW010, and MW041T, cluster closely along the RMWL, suggesting that the origin of the water in these zones, and the processes affecting groundwater in these zones, are similar. There is no apparent effect on groundwater from landfill leachate, which would be expected to exhibit a much different isotopic signature than water and be reflective of disposed waste.

Groundwater plotting along the RMWL results from precipitation that has entered the vadose zone and then been subject to some evaporative loss and further mixing with precipitation in the upper areas of the vadose zone, such as in the root zone. In a relative sense, the most variation in results plotting along the RMWL is seen in the samples from wells screened in the TLS formation, and the least variation in wells screened in the PSDL formation. Samples from wells MW035S, MW010, and MW041T located in the area of the landfill near Section I plot along the LMWL, as defined by precipitation, suggesting groundwater in these locations was not subject to as much vadose zone evaporation.

Figure 13 presents plots of the stable isotope ratio results for  $\delta^{18}\text{O}/\delta^{16}\text{O}$  and  $\delta\text{D}/\text{H}$  versus depth. Colors indicate geographic location within, west, or east of the paleo-channel, and shapes indicate aquifer unit (same shapes as used on Figure 12). In general, the trend in the isotopic composition becomes more negative (lighter) with depth, probably reflecting relatively older water recharged under relatively cooler climatic conditions. These results also undoubtedly reflect pumping effects, which are more pronounced in the UBC-A and PSDL than in the SSDL and TLS aquifer units. In general, flow in all units was to the west, but has been reversed by pumping and is now generally to the east, with the exception of the area to the west of the groundwater divide beneath Landfill Section I.

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<sup>4</sup> International Atomic Energy Agency (IAEA); [http://www-naweb.iaea.org/napc/ih/IHS\\_resources\\_isohis.html](http://www-naweb.iaea.org/napc/ih/IHS_resources_isohis.html))

<sup>5</sup> Kendall, C., and T. B. Coplen, 2001. Distribution of oxygen-18 and deuterium in river waters across the United States. *Hydrol. Process.*, 15, 1363-1393.

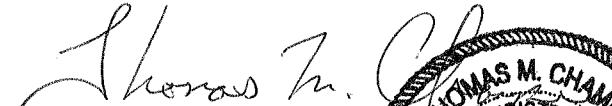
The hydrogeologic evaluation summarized on Figure 13 indicates that TLS aquifer water (diamond symbols) is not affected by off-Site groundwater withdrawal. Isotopes for TLS water have the most variation and are heavier (more positive) east of the paleo-channel the difference between  $\delta D$  for MW041T and MW073T is within the error of the method). In the next deeper unit, SSDL (square symbols), isotopes are similar to TLS, except for wells east of the paleo-channel. However, in that (red) group, the SSDL sediments are reworked within the paleo-channel; thus, the SSDL wells within the paleo-channel may be more affected by off-Site pumping and mixing with water in the deeper units (PSDL and UBC-A). There is less variation in stable isotopes in the deeper units, particularly for  $\delta^{18}O/\delta^{16}O$ , which also may be an indication that groundwater mixing induced by pumping has resulted in more homogeneous water than seen in the upper units.

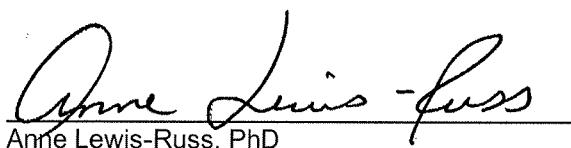
**CERTIFICATION PAGE**  
**Baseline Water Quality Technical Memorandum**  
**Pinewood Site Improvement Projects**  
**Pinewood, South Carolina**

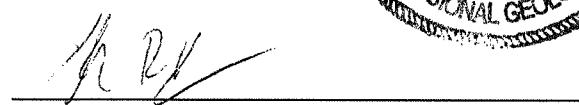
The undersigned certify that they have reviewed the attached document and that the document is in material compliance with the requirements of the *Agreement between Owner and Engineer for Professional Services* dated October 25, 2010 between Kestrel and AECOM. To the best of our knowledge, this Technical Memorandum is also in material compliance with applicable state and federal regulations. The data presentations contained herein are consistent with Consultant standards and generally accepted practices in the environmental profession.

*Prepared by:*

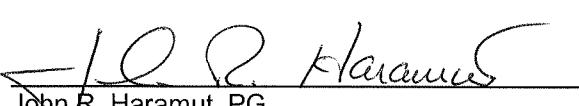
*Prepared by:*

  
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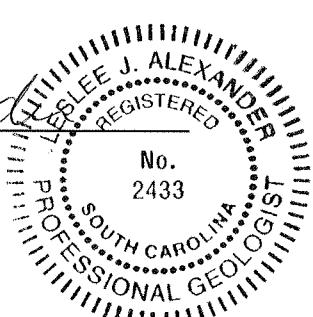
  
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Senior Geochemist  
April 15, 2013

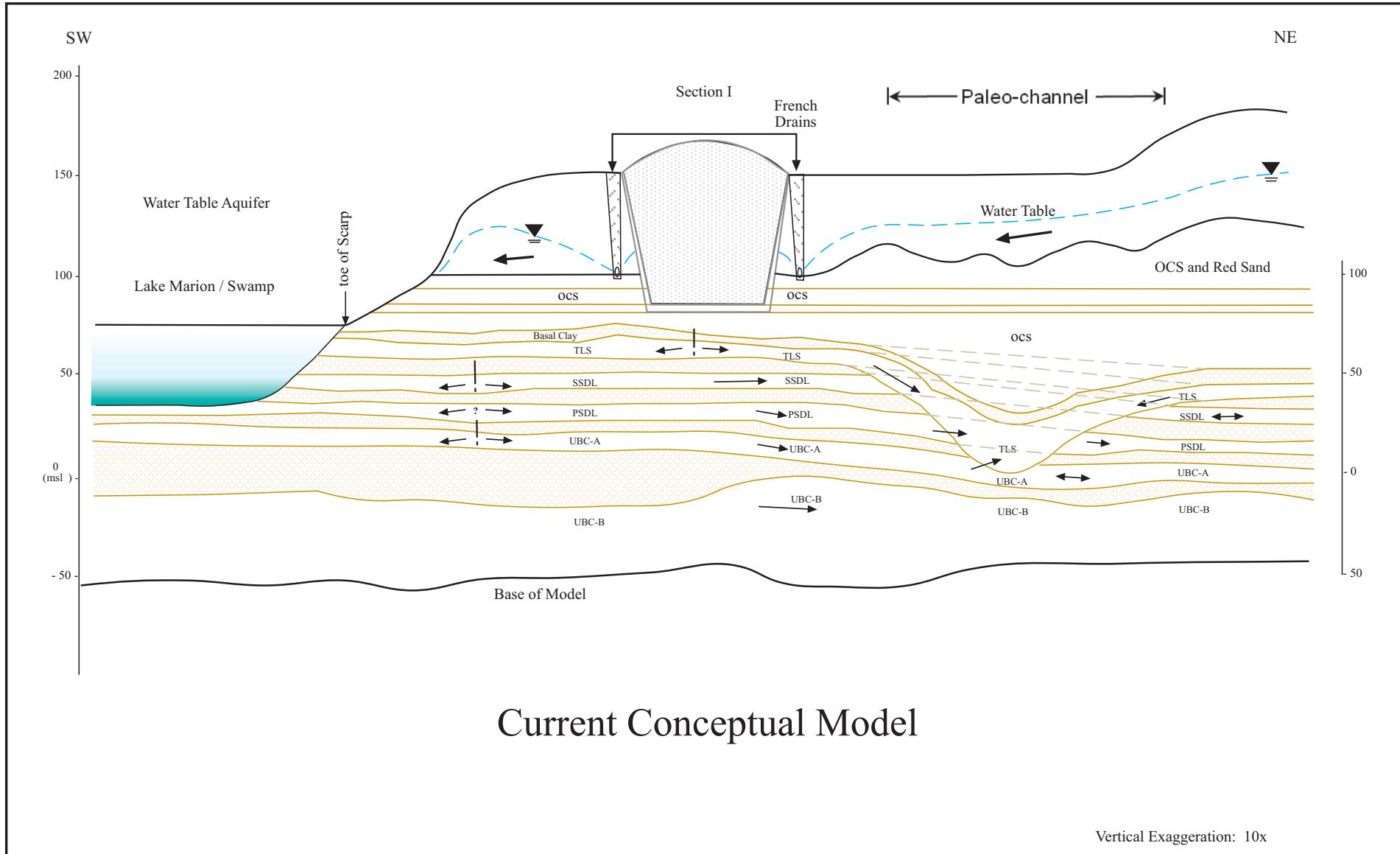
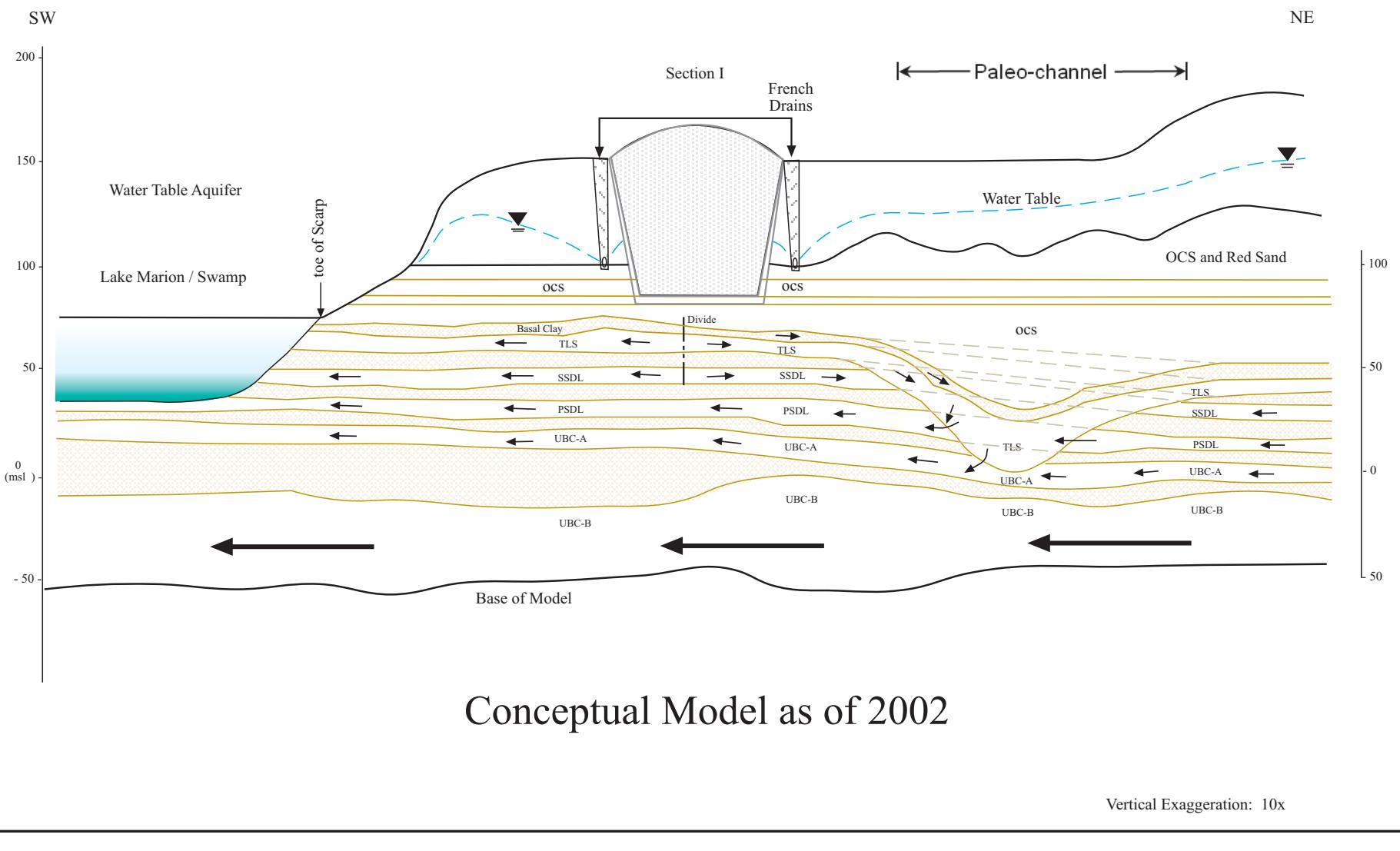
*Reviewed by:*

  
John R. Haramut, PG  
South Carolina PG No. 1136  
April 15, 2013

  
Leslee J. Alexander, PG  
South Carolina PG No. 2433  
April 15, 2013



## **FIGURES**



#### Legend

OCS	Opaline Claystone
TLS	Transitional Lang Syne Aquifer Zone
SSDL	Secondary Sawdust Landing Aquifer Zone
PSDL	Primary Sawdust Landing Aquifer Zone
UBC-A	Upper Black Creek - A Aquifer Zone
UBC-B	Upper Black Creek - B Aquifer Zone
→	Flow Direction - 2002 (Approximate)
—	Confining Unit
- - -	Extension of Layer
— —	Divide

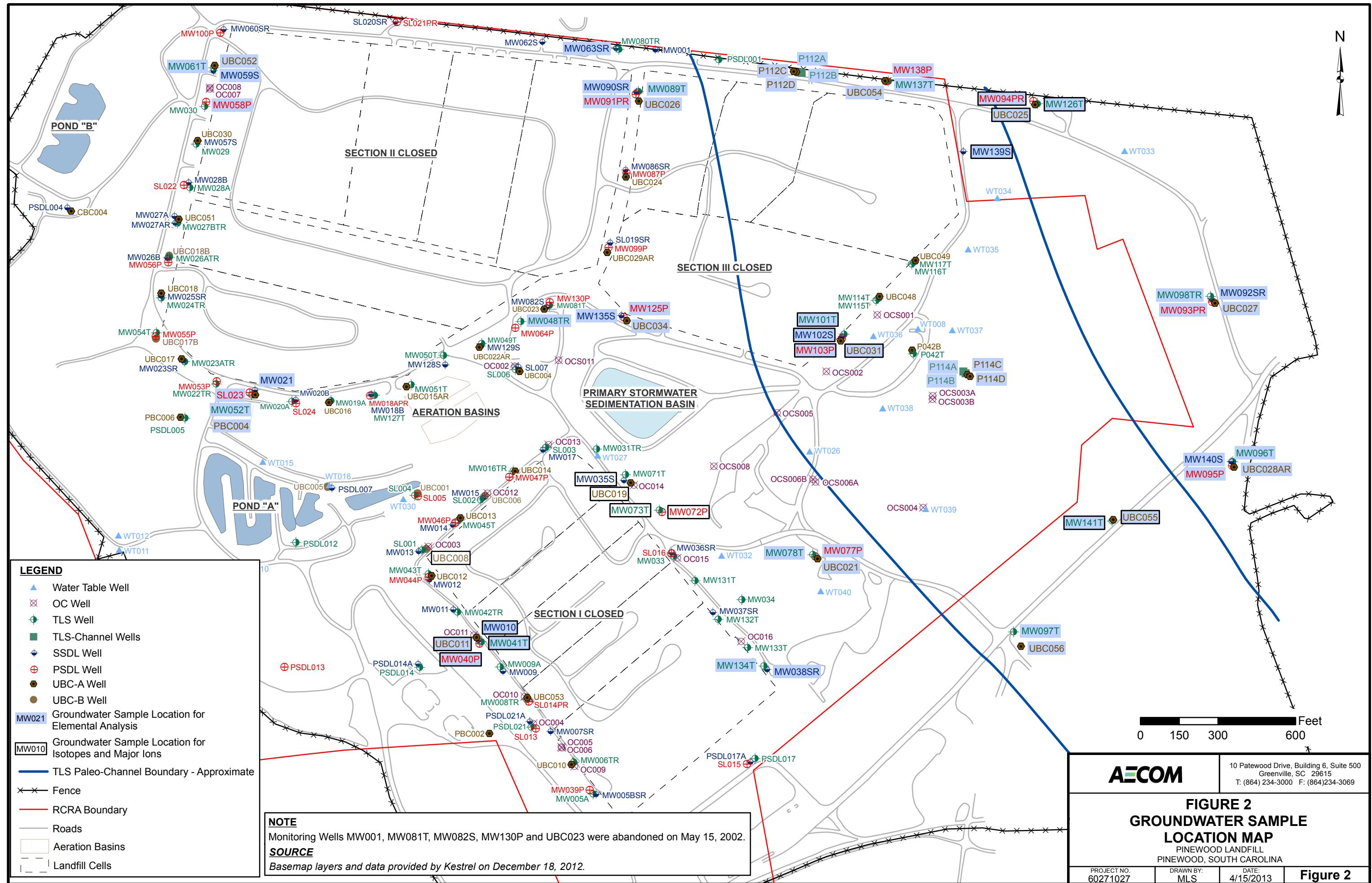
#### Notes:

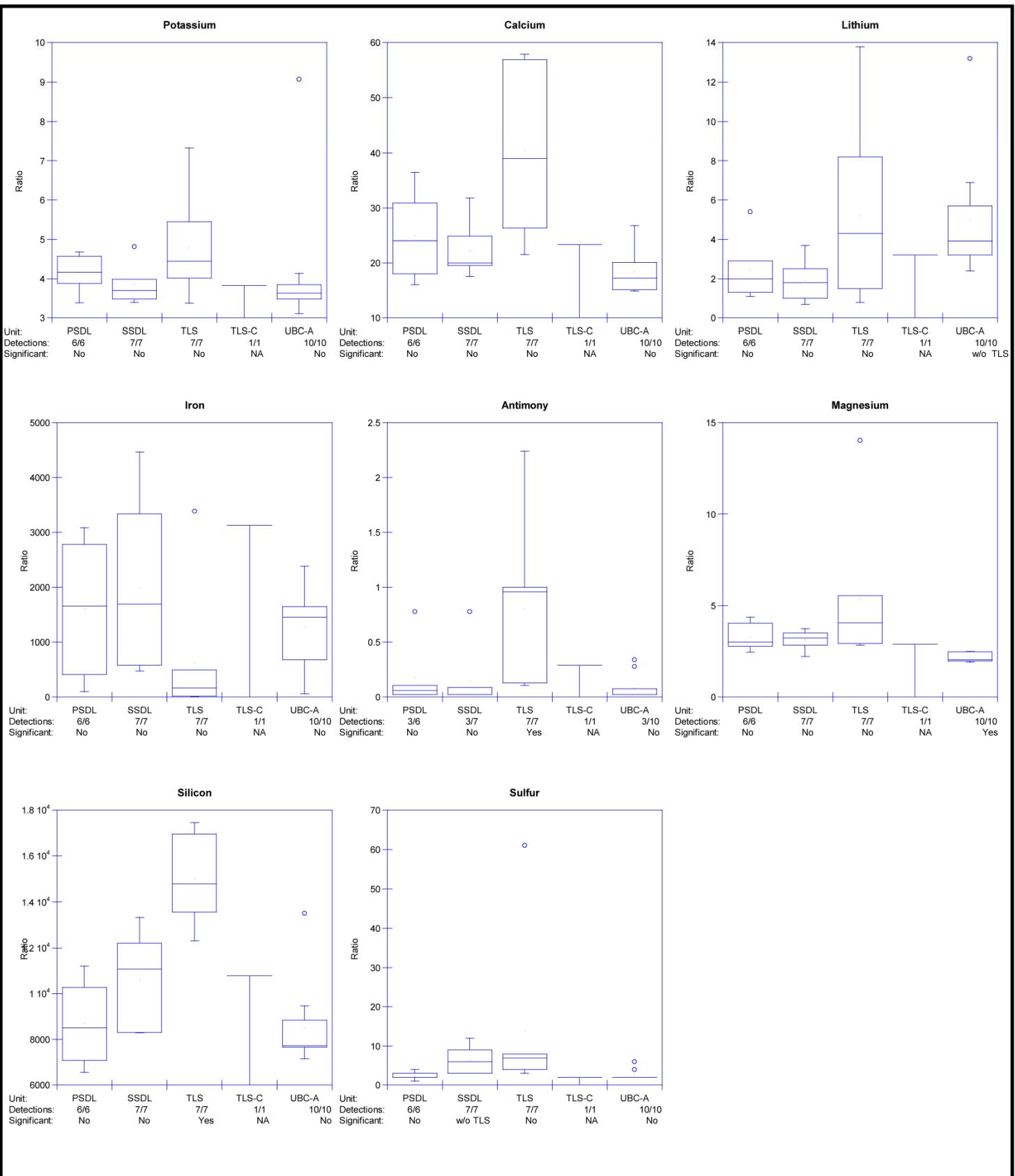
- This figure is a conceptual, schematic cross-section that extends from Lake Marion to the southwest, through Landfill Section I and to the northeast. It was designed to show general relationship between aquifers, confining units and related groundwater flow directions but was not meant to depict the actual specifics of aquifer geometry beneath the Site.

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**Figure 1**  
**Conceptual Model**  
Pinewood Landfill  
Pinewood, South Carolina





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**Figure 3**  
**Box Plots of Elemental Variations**

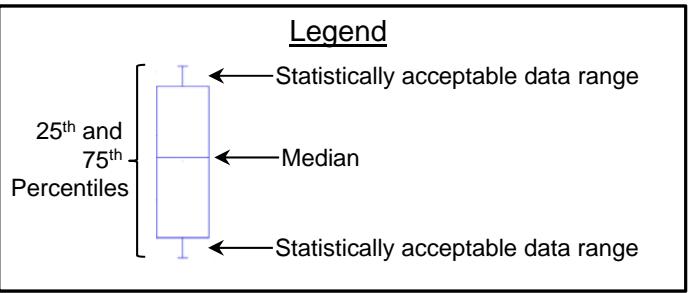
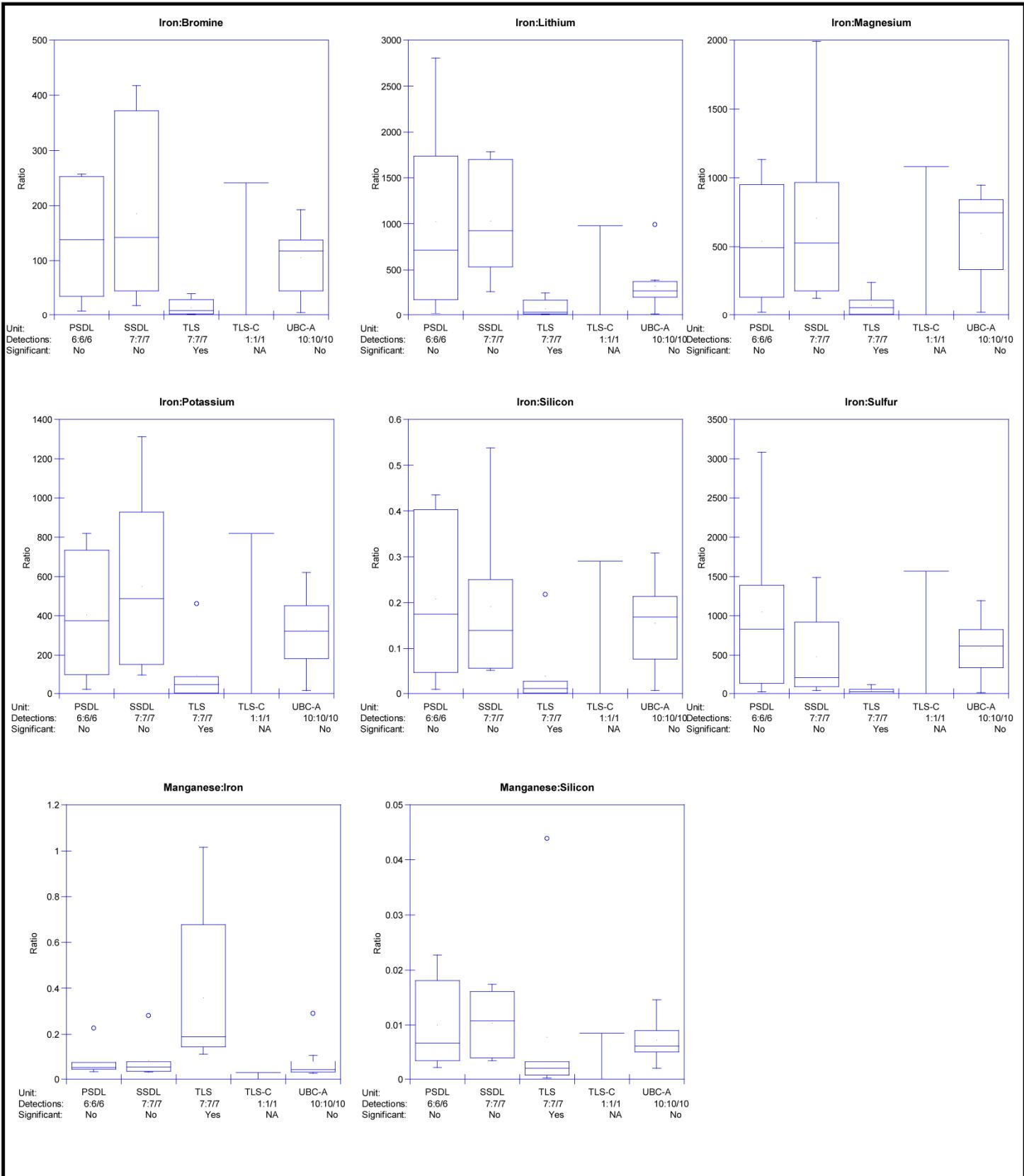
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**Figure 3**



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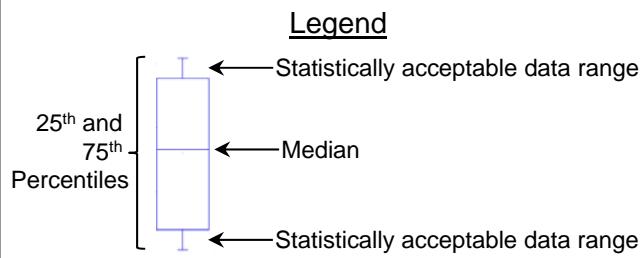
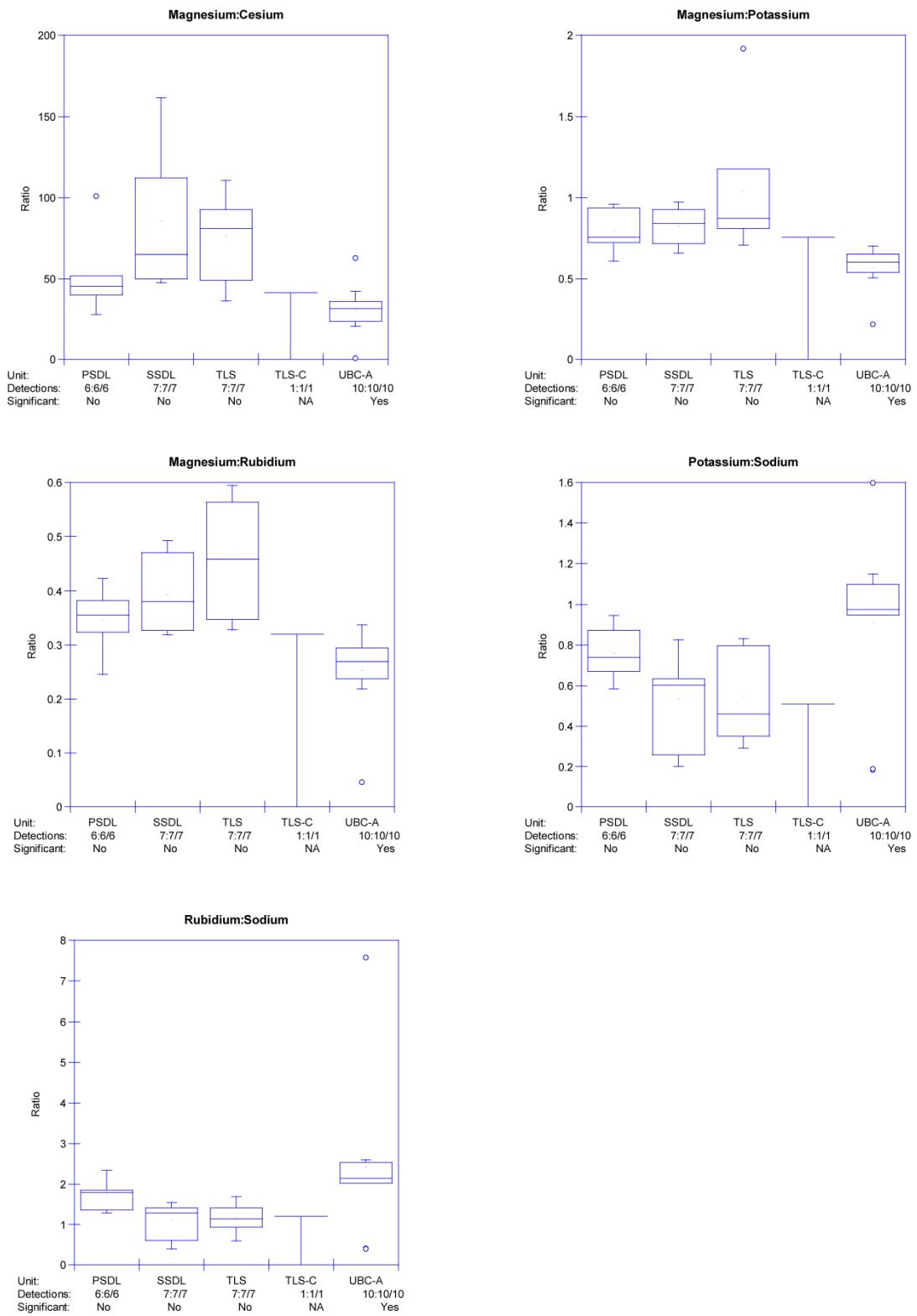
**Figure 4a**  
**Box Plots of Elemental Ratio Variations Significant to the TLS**  
Pinewood Landfill  
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**Figure 4a**



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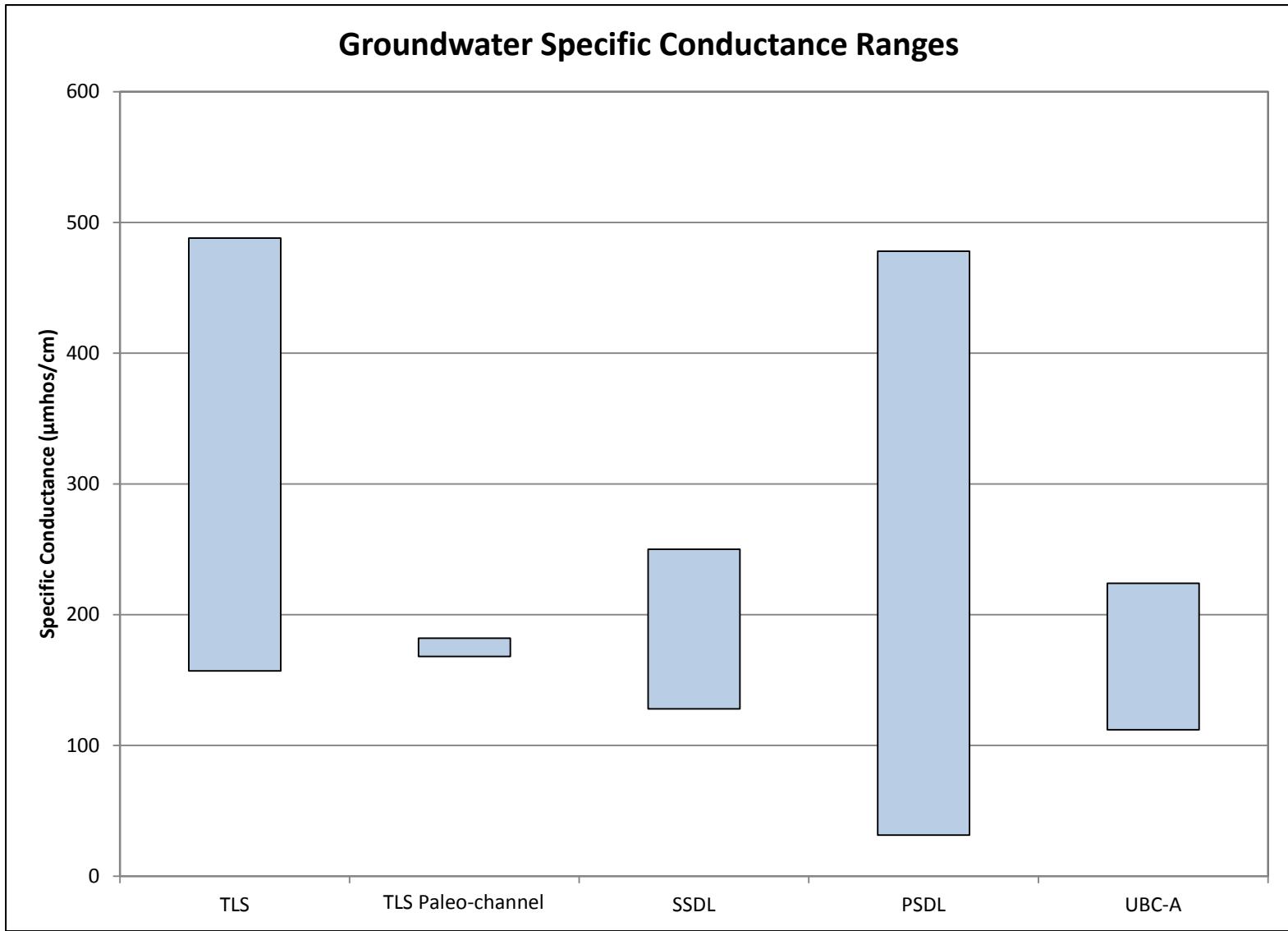
**Figure 4b**  
**Box Plots of Elemental Ratio Variations Significant to the UBC-A**  
Pinewood Landfill  
Pinewood, South Carolina

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**Figure 4b**



Notes:

μmhos/cm – micro-mhos per centimeter



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**Figure 5**  
**Groundwater Specific Conductance Ranges**

**Pinewood Landfill**  
**Pinewood, South Carolina**

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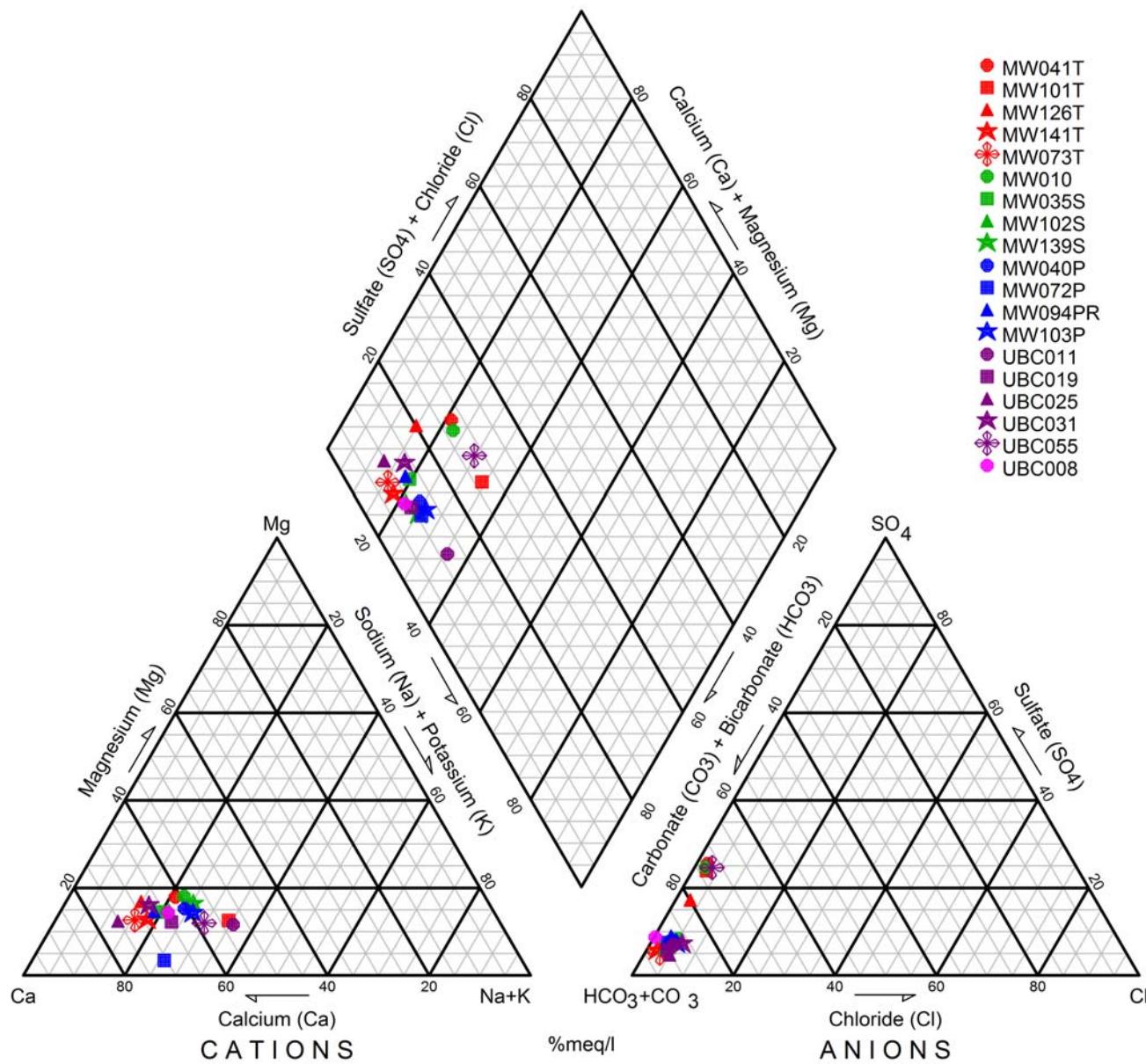
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**Figure 5**

## Piper Diagram - September 2012 Data from Select Wells

Pinewood Site - 2012 Improvement Projects



### Note:

Sample locations are color coded by aquifer zone as follows:

- Red - Transitional Lang Syne (TLS)
- Green - Secondary Sawdust Landing (SSDL)
- Blue - Primary Sawdust Landing (PSDL)
- Violet - Upper Black Creek-A (UBC-A)
- Magenta - Upper Black Creek-B (UBC-B)



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**Figure 6**  
**Piper Diagram - September 2012**

Pinewood Landfill  
Pinewood, South Carolina

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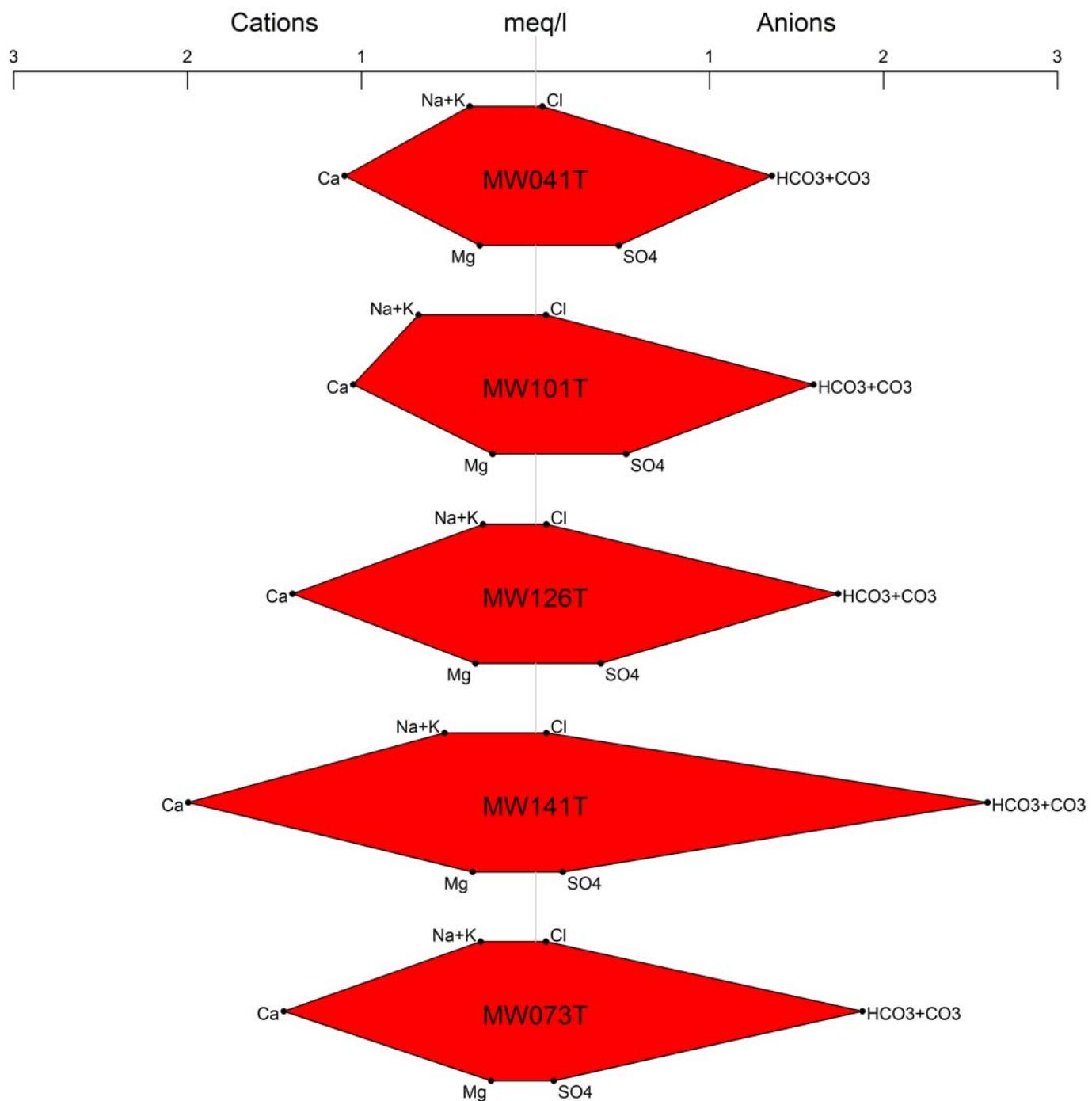
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**Figure 6**

# Stiff Diagram - Select TLS Wells - September 2012

Pinewood Site - 2012 Improvement Projects



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**Figure 7**  
**Stiff Diagrams for Select Transitional Lang Syne (TLS) Wells - September 2012**

Pinewood Landfill  
Pinewood, South Carolina

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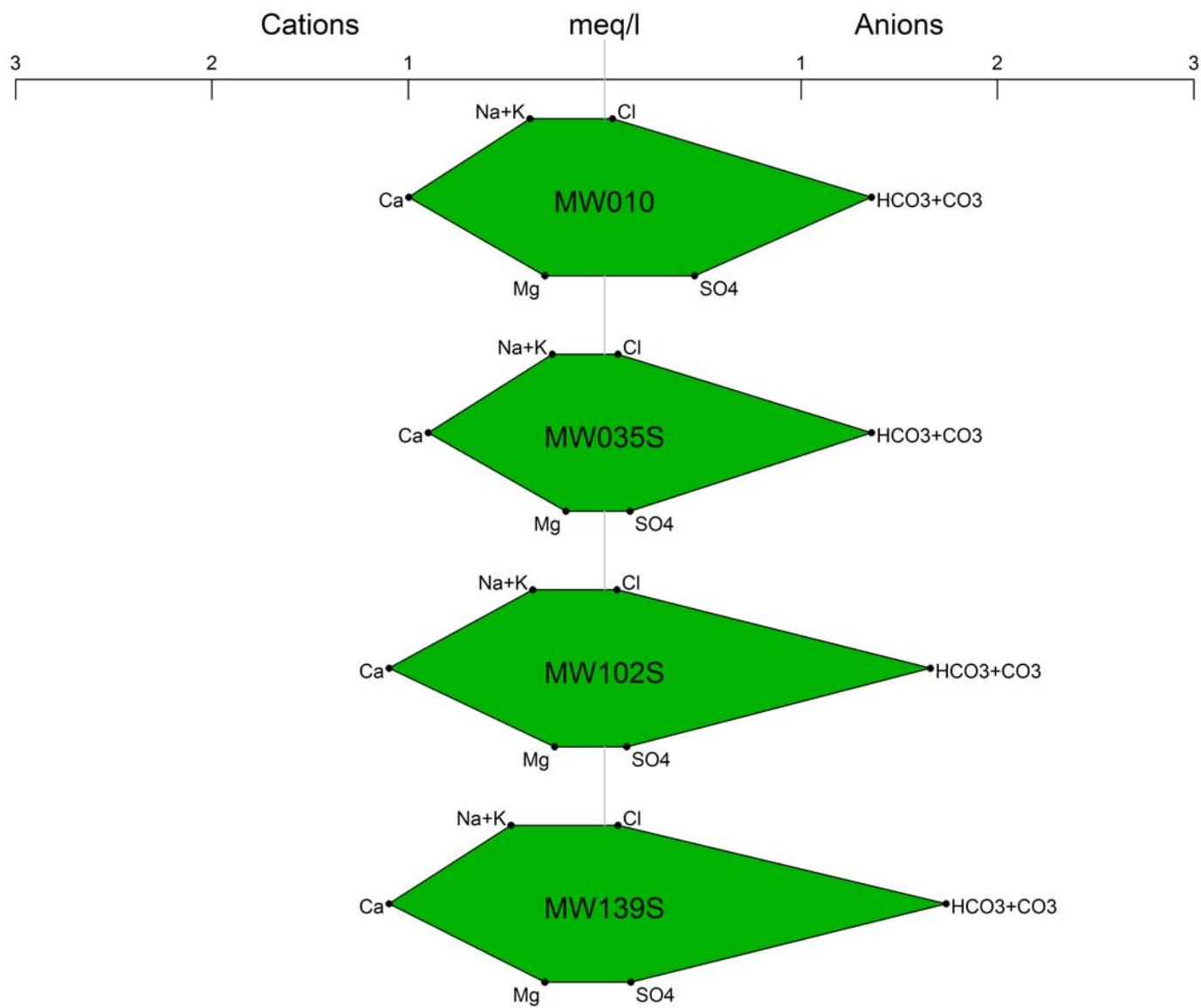
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**Figure 7**

# Stiff Diagram - Select SSDL Wells - September 2012

Pinewood Site - 2012 Improvement Projects



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**Figure 8**  
**Stiff Diagrams for Select Secondary Sawdust Landing (SSDL) Wells - September 2012**

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Pinewood, South Carolina

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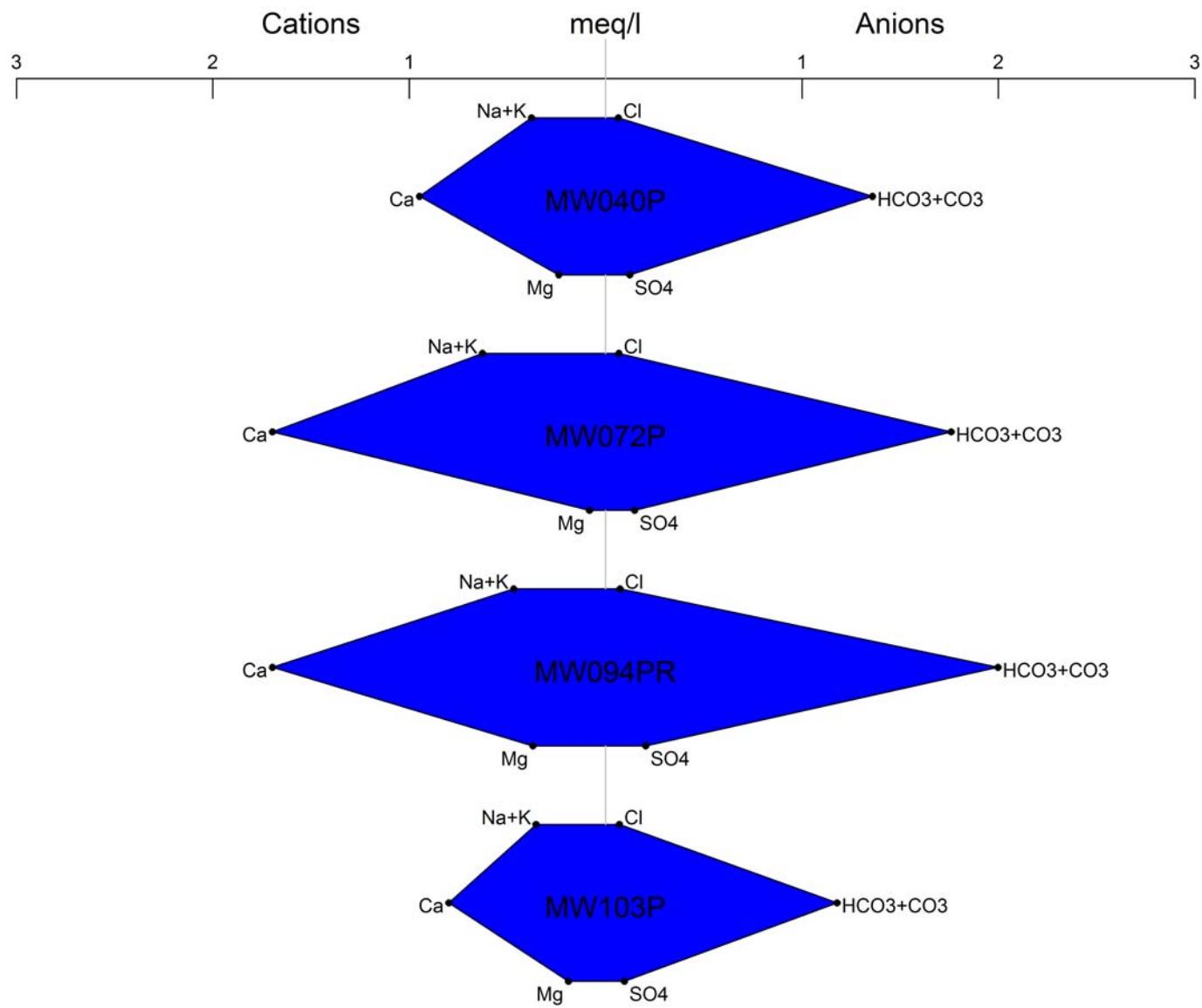
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**Figure 8**

# Stiff Diagram - Select PSDL Wells - September 2012

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**Figure 9**  
**Stiff Diagrams for Select Primary Sawdust Landing (PSDL) Wells - September 2012**

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Pinewood, South Carolina

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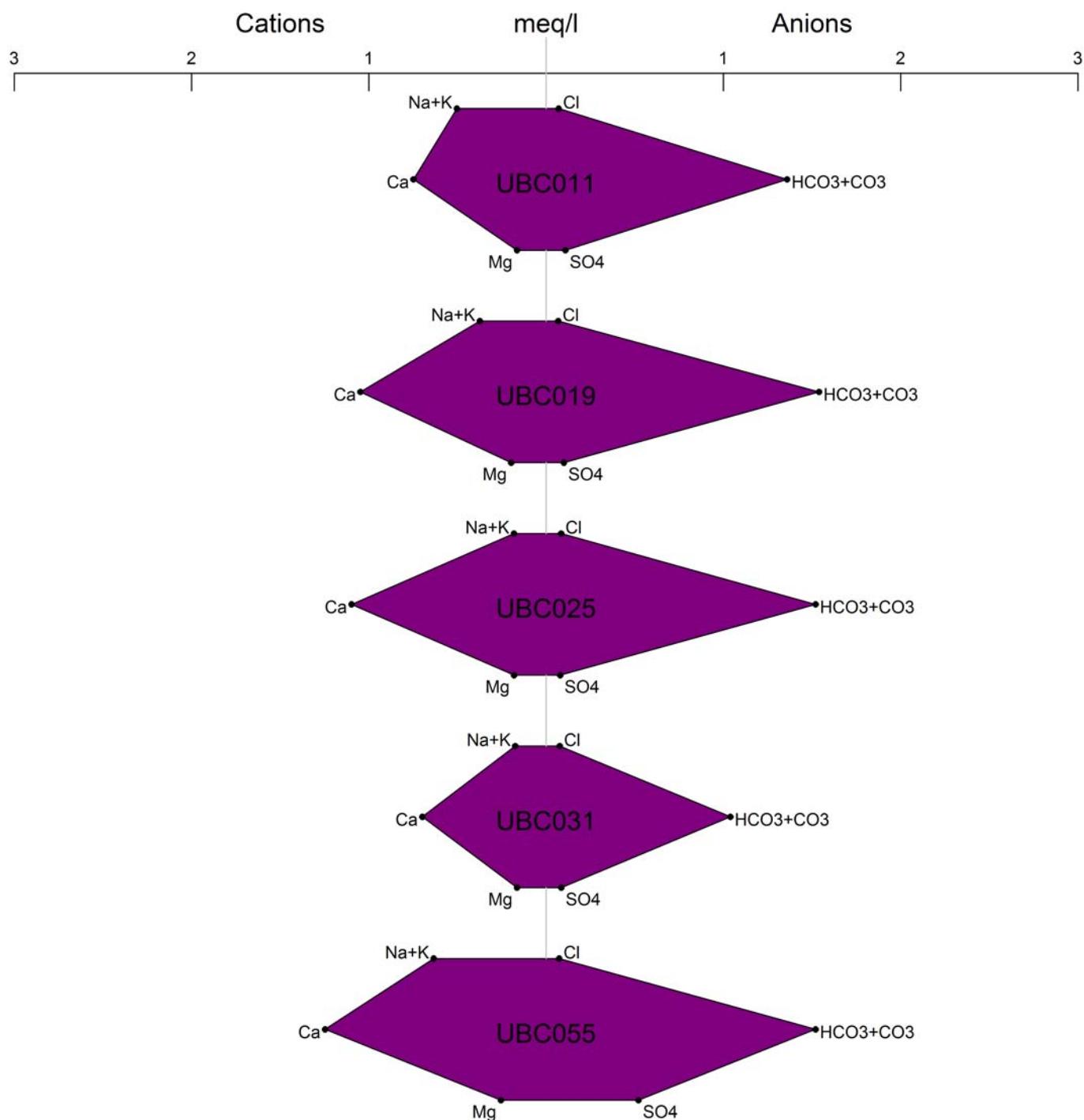
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**Figure 9**

# Stiff Diagram - Select UBC-A Wells - September 2012

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**Figure 10**  
**Stiff Diagrams for Select Upper Black Creek-A (UBC-A) Wells - September 2012**

Pinewood Landfill  
Pinewood, South Carolina

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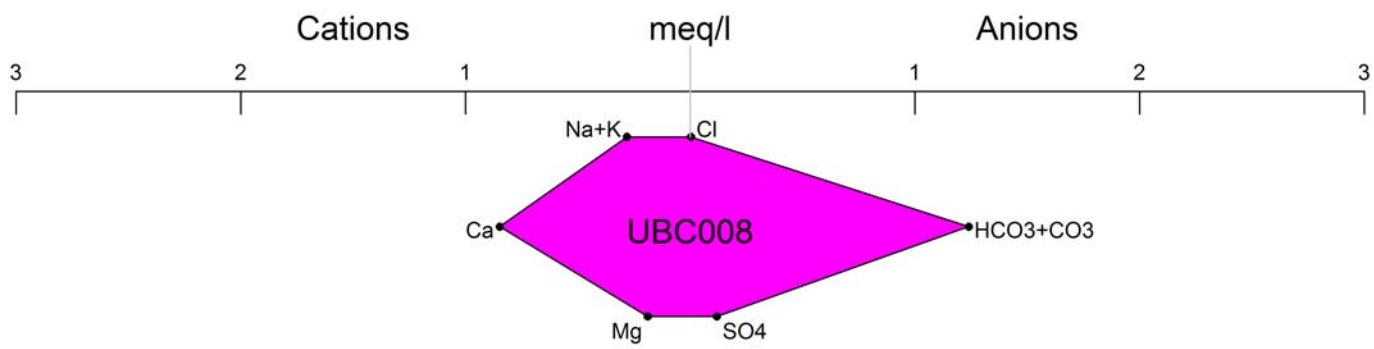
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**Figure 10**

## Stiff Diagram - Select UBC-B Wells - September 2012

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**Figure 11**  
**Stiff Diagrams for Select Upper Black Creek-B**  
**(UBC-B) Wells - September 2012**

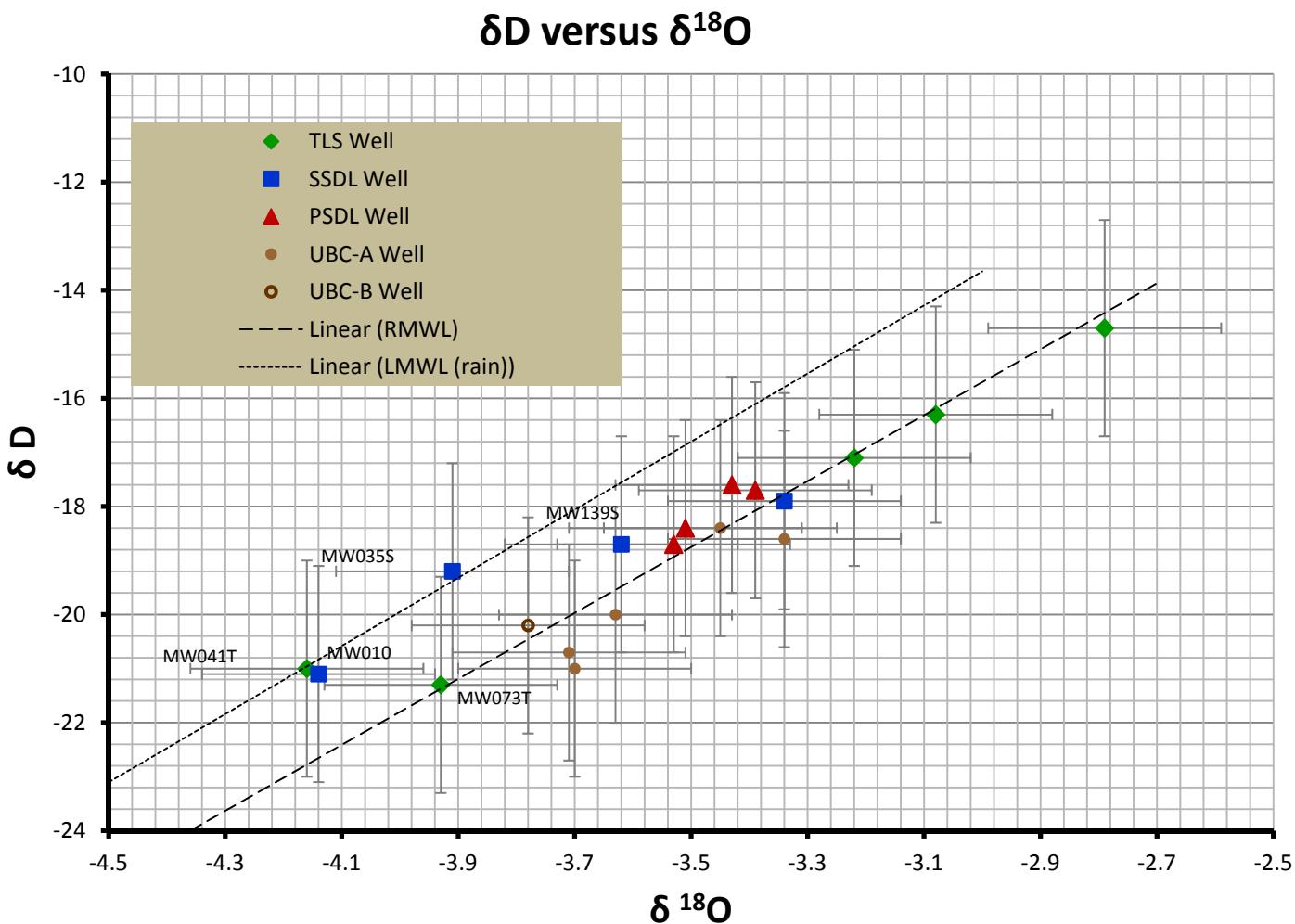
Pinewood Landfill  
Pinewood, South Carolina

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**Figure 11**



Notes:

LMWL – Local Meteoric Water Line

RMWL – River Meteoric Water Line

Error bars represent general analytical measurements uncertainty (one standard deviation)



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**Figure 12**  
 **$\delta D$  Versus  $\delta^{18}\text{O}$  – Pinewood by Aquifer Unit**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

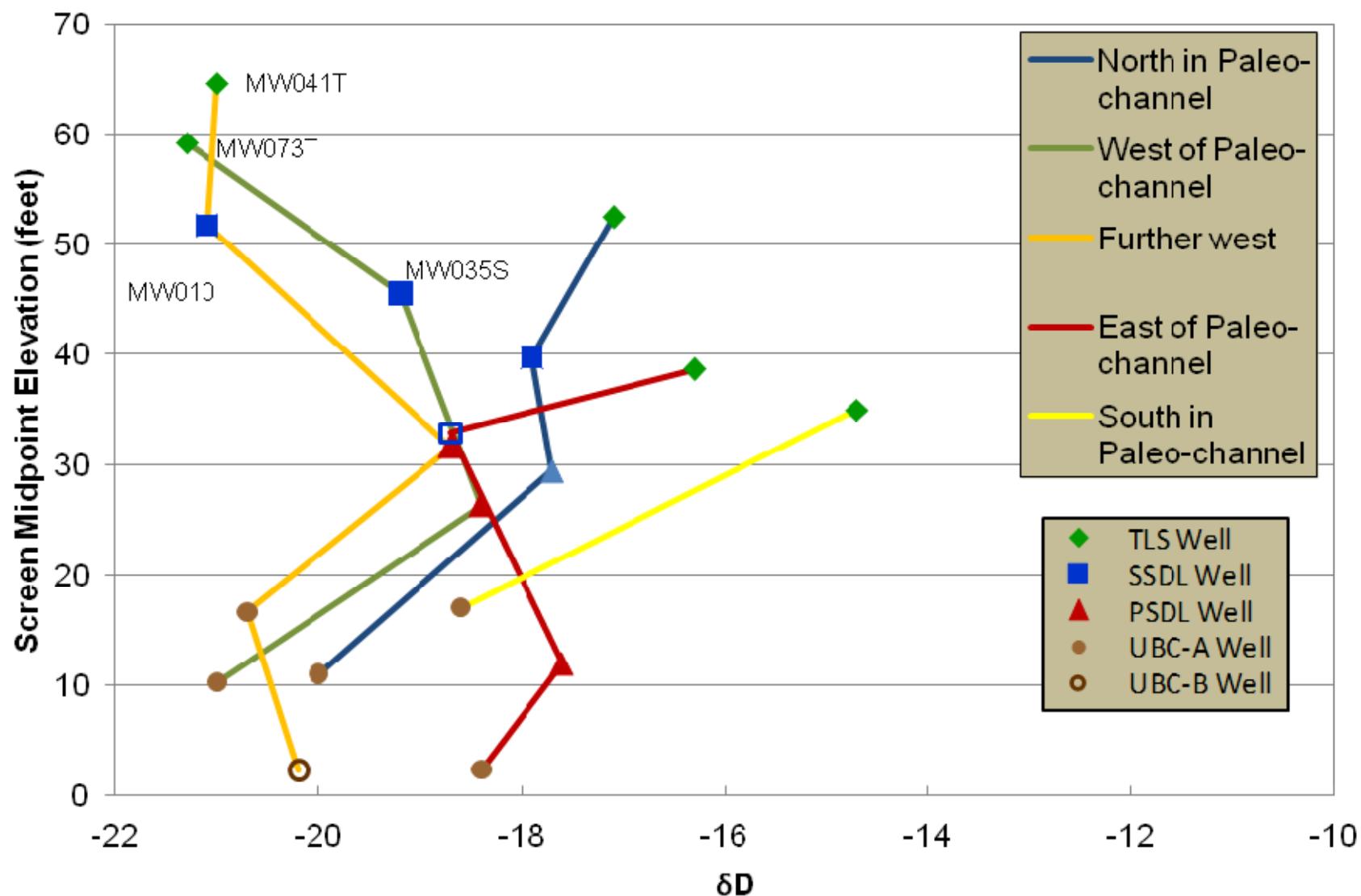
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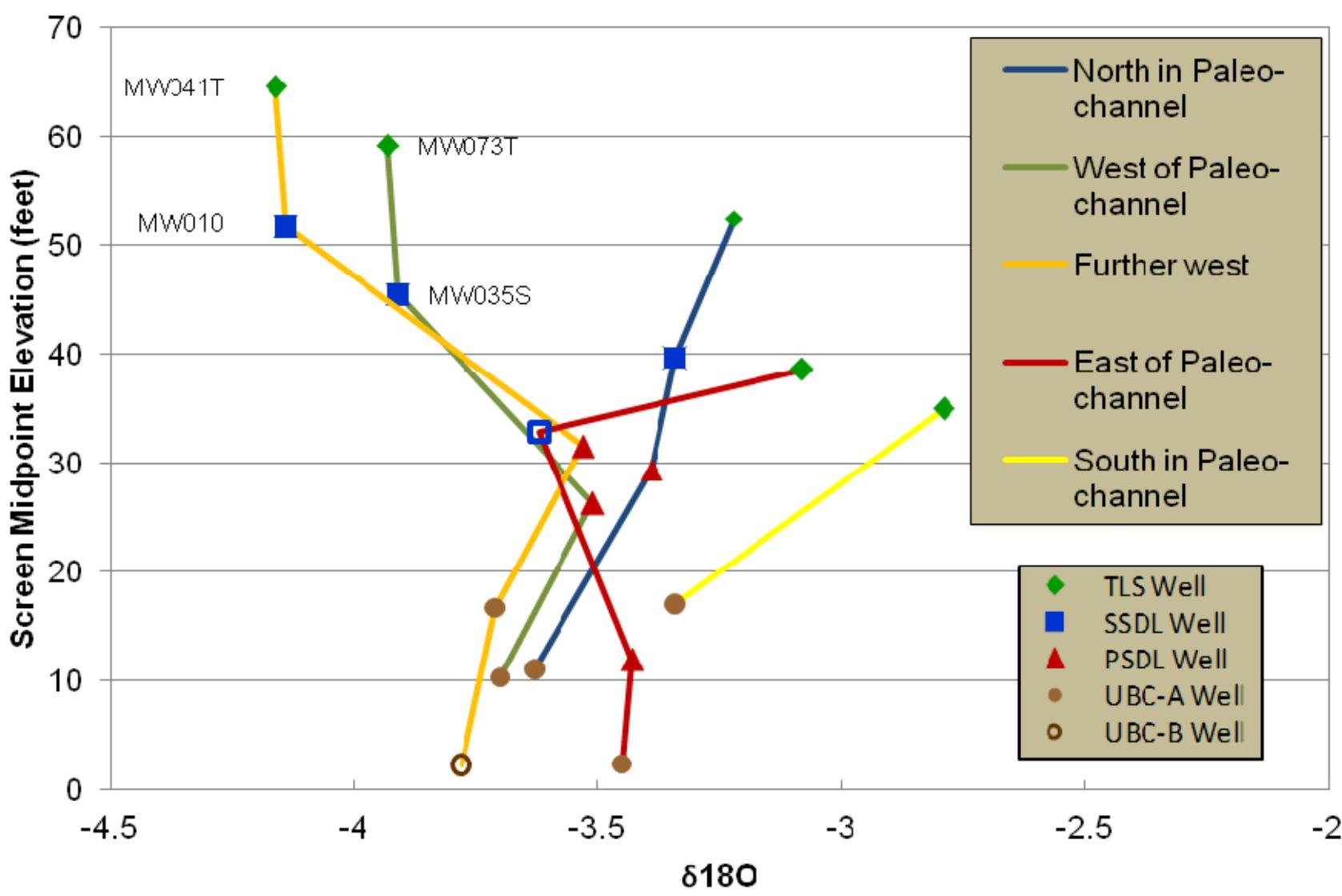
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**Figure 12**

**Figure 13b:  $\delta D$  Versus Screen Elevation**



**Figure 13a: 818O Versus Screen Elevation**



## Notes:

- Notes:

  1. Symbol shape and color for each aquifer unit corresponds to symbols/colors in Figure 12; open square represents monitoring well MW139S, which is within paleo-channel and located on east side of the paleo-channel.
  2. The vertical Datum at the Site is a Site-specific datum that is 1.9 feet higher than the North American Vertical Datum of 1988 (NAVD88).



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**Figure 13**  
 **$\delta D$  and  $\delta^{18}O$  Versus Screen  
Midpoint Elevation**

**Pinewood Landfill  
Pinewood, South Carolina**

## **TABLES**

**Table 1**  
**Field Parameters Collected During Groundwater Sampling**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

Sample Identification	Formation	Volume Purged (gallons)	Water Temperature (°C)	pH	SpC (umhos/cm)	Turbidity (ntu)	Purge Method	Comments
MW040P	PSDL	90	20.09	6.59	135	0	WW	--
MW058P	PSDL	63	20.80	6.85	169	0	WW	--
MW072P	PSDL	98	23.47	10.66	31.4	0	WW	--
MW077P	PSDL	35	20.19	10.88	478	>1100	Grundfos	--
MW091PR	PSDL	84	20.62	6.41	125	0	WW	--
MW093PR	PSDL	114	19.91	6.85	194	0	WW	--
MW094PR	PSDL	32	21.83	7.08	205	0	WW	dry
MW095P	PSDL	36	20.91	7.23	175	0	WW	dry
MW103P	PSDL	90	21.35	6.23	134	3.04	WW	--
MW125P	PSDL	120	20.26	6.63	134	0.17	WW	--
MW138P	PSDL	36	20.58	6.34	138	14.3	Grundfos	--
SL-023	PSDL	75	19.91	6.45	131	0.58	WW	--
MW010	SSDL	18	20.22	7.20	166	0	WW	--
MW021	SSDL	3	24.65	6.47	244	6.17	WW	dry
MW035S	SSDL	25	21.19	6.78	128	6.76	WW	dry
MW038SR	SSDL	21	21.57	7.38	160	2.62	WW	--
MW059S	SSDL	24	22.37	8.25	241	0	WW	dry
MW090SR	SSDL	25	21.97	7.63	207	0	WW	--
MW092SR	SSDL	96	19.94	6.79	198	0	WW	--
MW102S	SSDL	72	20.47	6.60	164	0	WW	--
MW135S	SSDL	78	20.17	6.89	141	0	WW	--
MW139S	SSDL	8	20.85	7.10	186	20.5	Grundfos	dry
MW140S	SSDL	9	20.96	8.27	250	136	Grundfos	dry
MW63SR	SSDL	21	20.80	6.78	150	--	WW	dry
MW041T	TLS	15	21.26	7.14	170	8.37	WW	dry
MW048TR	TLS	15	21.71	7.27	170	6.93	WW	--
MW052T	TLS	7	20.70	7.11	291	5.54	WW	dry
MW061T	TLS	18	20.78	7.02	488	0	WW	--
MW073T	TLS	18	20.62	6.98	180	0	WW	--
MW078T	TLS	17	20.19	10.40	382	1.99	Grundfos	--
MW089T	TLS	15	21.52	6.88	164	0	WW	--
MW096T	TLS	42	20.22	6.69	236	0	WW	--
MW097T	TLS	38	21.04	7.46	181	2.74	WW	dry
MW098TR	TLS	22	20.52	7.60	335	0	WW	--
MW101T	TLS	17	21.30	6.21	187	0	WW	--
MW126T	TLS	24	22.16	6.53	195	--	WW	--
MW134T	TLS	25	20.22	7.25	293	0	WW	--
MW137T	TLS	8	20.10	6.50	157	15.6	Grundfos	dry
MW141T	TLS	7	19.92	6.95	253	31.1	Grundfos	dry
P112A	TLS-Channel	10	20.32	6.32	175	52.3	Grundfos	--
P112B	TLS-Channel	11	19.86	6.10	168	74.2	Grundfos	--
P114A	TLS-Channel	9	19.49	6.00	179	37.7	Grundfos	dry
P114B	TLS-Channel	25	20.95	6.44	182	0	Grundfos	dry
P112C	UBC-A	42	21.15	6.53	124	3.68	Grundfos	--
P112D	UBC-A	20	19.36	6.96	123	4.11	Grundfos	dry
P114C	UBC-A	45	20.32	6.04	112	0	Grundfos	--
P114D	UBC-A	51	20.35	6.23	113	0	Grundfos	--
PBC004	UBC-A	27	19.50	6.37	127	0	WW	--

**Table 1**  
**Field Parameters Collected During Groundwater Sampling**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

Sample Identification	Formation	Volume Purged (gallons)	Water Temperature (°C )	pH	SpC (umhos/cm)	Turbidity (ntu)	Purge Method	Comments
UBC011	UBC-A	114	19.88	6.62	132	0	WW	--
UBC019	UBC-A	129	22.72	6.70	149	0	WW	--
UBC021	UBC-A	153	22.73	6.00	120	123	Grundfos	--
UBC025	UBC-A	141	20.52	6.87	144	0	WW	--
UBC026	UBC-A	95	19.91	7.56	163	0	WW	--
UBC027	UBC-A	147	20.22	6.75	136	0	WW	--
UBC028AR	UBC-A	45	20.89	6.50	202	0	WW	--
UBC031	UBC-A	126	19.92	6.39	112	0	WW	--
UBC034	UBC-A	141	20.61	6.52	181	0	WW	--
UBC052	UBC-A	25	22.97	7.07	123	2.68	WW	--
UBC054	UBC-A	39	20.78	6.13	131	135	Grundfos	--
UBC055	UBC-A	30	21.04	6.54	211	83.7	Grundfos	--
UBC056	UBC-A	11	20.09	7.80	224	218	Grundfos	dry
UBC008	UBC-B	50	20.08	6.51	121	8.31	WW	--
Median	--	31	20.62	6.78	168.5	0	--	--
Range	--	150	5.29	4.88	456.6	218	--	--

**Notes:**

-- = data not collected or no comment recorded

> = greater than

°C = degrees Celsius

ntu = nephelometric turbidity units

SpC umhos/cm = specific conductivity as micromhos per centimeter

WW = well wizard dedicated pumping system

Grundfos = Submersible adjustable pumping system.

TLS = Transitional Lang Syne Aquifer Zone

SSDL = Secondary Sawdust Landing Aquifer Zone

PSDL = Primary Sawdust Landing Aquifer Zone

UBC-A = Upper Black Creek-A Aquifer Zone

UBC-B = Upper Black Creek-B Aquifer Zone

Dry = Well purged dry during purging process.

**Table 2**  
**Summary of Elemental Analysis**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

Sample ID	MW010 09/05/12 VAN12004563	MW021 09/07/12 VAN12004563	MW038SR 09/05/12 VAN12004563	MW040P 09/04/12 VAN12004563	MW041T 09/05/12 VAN12004563	MW048TR 09/06/12 VAN12004563	MW052T 09/07/12 VAN12004563	MW058P 09/07/12 VAN12004563
<b>Elemental Analysis (ug/L)</b>								
Aluminum	1	8	1	10	2	3	3	1
Antimony	< 0.05	0.05	0.4	0.1	0.56	0.26	< 0.05	< 0.05
Arsenic	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Barium	66.06	52.84	115.55	67.94	68.56	122.34	34.5	64.4
Beryllium	0.06	< 0.05	< 0.05	< 0.05	< 0.05	0.07	< 0.05	0.06
Bismuth	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Boron	19	31	15	19	31	27	30	16
Bromine	8	18	14	12	11	9	22	12
Cadmium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Cerium	< 0.01	0.16	0.09	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cesium	0.07	0.09	0.05	0.1	0.04	0.1	0.09	0.04
Chromium	< 0.5	1.4	< 0.5	< 0.5	< 0.5	2	< 0.5	< 0.5
Cobalt	< 0.02	0.1	< 0.02	< 0.02	< 0.02	0.09	< 0.02	< 0.02
Copper	0.2	0.7	0.2	< 0.1	0.6	0.3	0.5	< 0.1
Dysprosium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Erbium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Europium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Gadolinium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Gallium	< 0.05	< 0.05	< 0.05	0.06	< 0.05	0.07	< 0.05	< 0.05
Germanium	0.05	0.05	< 0.05	< 0.05	< 0.05	0.06	0.1	< 0.05
Gold	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hafnium	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Holmium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	3340	1458	909	2648	198	2334	7835	3086
Lanthanum	< 0.01	0.08	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lead	< 0.1	0.2	0.1	< 0.1	0.2	< 0.1	0.6	< 0.1
Lithium	3.7	7.8	2.1	2.9	5	8.3	9.8	1.1
Lutetium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	167.36	228.76	92.61	118.89	85.14	244.08	332.79	160.94
Mercury	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	< 0.1	0.6	< 0.1	0.1	2.3	0.2	0.2	0.2
Neodymium	< 0.01	0.07	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Nickel	< 0.2	0.5	< 0.2	< 0.2	0.4	1.6	< 0.2	< 0.2
Niobium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Palladium	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Phosphorus	194	89	113	283	56	357	369	500
Platinum	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Praseodymium	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Rhenium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Rhodium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Rubidium	9.2	15.71	8.84	11.3	10.85	11.76	16.17	10.58
Ruthenium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Samarium	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Scandium	3	3	3	2	4	3	3	1
Selenium	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Silicon	13327	17628	12562	6566	18514	17180	18472	7084
Silver	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Strontium	92.44	141.21	158.12	127.47	115.44	222.75	140.46	118.02
Tantalum	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Tellurium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Terbium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Thallium	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Thorium	< 0.05	< 0.05	< 0.05	0.08	< 0.05	< 0.05	< 0.05	< 0.05
Thulium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tin	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Tungsten	< 0.02	< 0.02	< 0.02	0.05	< 0.02	< 0.02	< 0.02	0.03
Uranium	< 0.02	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Vanadium	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Ytterbium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Yttrium	< 0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Zinc	0.8	4.7	1	< 0.5	4.3	3.6	2.8	< 0.5
Zirconium	< 0.02	0.07	< 0.02	< 0.02	< 0.02	< 0.02	0.02	< 0.02
<b>Elemental Analysis (mg/L)</b>								
Calcium	19.52	41.08	25.45	18.01	27.61	26.58	41.33	21.13
Chlorine	2	3	3	3	2	2	4	2
Magnesium	3.5	8.33	2.55	2.78	4.52	4.63	8.92	4.04
Potassium	3.6	5.93	3.46	4.57	4.43	4.94	5.85	4.21
Sodium	5.98	12.35	4.06	4.83	8.3	10.07	15.11	5.91
Sulfur	8	26	2	2	9	9	25	1

**Table 2**  
**Summary of Elemental Analysis**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

Sample ID	MW059S	MW061T	MW063SR	MW077P	MW078T	MW089T	MW090SR	MW091PR
Date Collected	09/06/12	09/06/12	09/07/12	09/12/12	09/14/12	09/06/12	09/06/12	09/07/12
Laboratory ID	VAN12004563							
<b>Elemental Analysis (ug/L)</b>								
Aluminum	22	28	2	3234	24	13	1	2
Antimony	< 0.05	0.11	0.09	0.3	0.99	0.96	0.78	< 0.05
Arsenic	0.6	< 0.5	< 0.5	3.4	0.5	< 0.5	0.5	< 0.5
Barium	38.51	20.76	81.52	222.01	74.77	163.09	108.76	90.94
Beryllium	< 0.05	0.06	0.06	2.7	< 0.05	< 0.05	0.06	0.13
Bismuth	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Boron	28	52	13	17	16	18	14	15
Bromine	26	85	13	12	13	17	12	11
Cadmium	< 0.05	< 0.05	< 0.05	0.15	1.23	< 0.05	< 0.05	< 0.05
Cerium	< 0.01	0.11	0.01	88.42	0.05	0.05	< 0.01	< 0.01
Cesium	0.07	0.39	0.02	0.97	0.02	0.04	0.03	0.05
Chromium	< 0.5	0.7	< 0.5	34.2	1	< 0.5	< 0.5	< 0.5
Cobalt	< 0.02	0.38	0.05	6.28	2.29	< 0.02	0.03	< 0.02
Copper	0.4	1.1	0.1	21.2	1.2	0.4	0.2	< 0.1
Dysprosium	< 0.01	< 0.01	< 0.01	4.2	< 0.01	< 0.01	< 0.01	< 0.01
Erbium	< 0.01	< 0.01	< 0.01	1.76	< 0.01	< 0.01	< 0.01	< 0.01
Europium	< 0.01	< 0.01	< 0.01	1.93	< 0.01	< 0.01	< 0.01	< 0.01
Gadolinium	< 0.01	< 0.01	< 0.01	6.83	< 0.01	< 0.01	< 0.01	< 0.01
Gallium	0.18	< 0.05	< 0.05	2.38	0.32	< 0.05	< 0.05	< 0.05
Germanium	< 0.05	0.18	< 0.05	0.06	< 0.05	0.05	< 0.05	< 0.05
Gold	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hafnium	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Holmium	< 0.01	< 0.01	< 0.01	0.7	< 0.01	< 0.01	< 0.01	< 0.01
Indium	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	475	3389	583	5936	14	499	1700	2779
Lanthanum	< 0.01	0.08	< 0.01	39.94	0.02	0.01	< 0.01	< 0.01
Lead	< 0.1	0.4	< 0.1	10.5	0.3	< 0.1	< 0.1	< 0.1
Lithium	1.8	13.8	1.1	426.7	12.7	2.9	1	1.6
Lutetium	< 0.01	< 0.01	< 0.01	0.17	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	134.09	683.04	45.16	60.82	1.32	56.84	131.12	94.89
Mercury	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	1.9	0.5	0.6	4.1	1.7	0.7	1.1	0.1
Neodymium	< 0.01	0.03	< 0.01	44.5	0.04	0.02	< 0.01	< 0.01
Nickel	< 0.2	5.9	< 0.2	24.8	1.7	0.8	1	< 0.2
Niobium	< 0.01	< 0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.01	< 0.01
Palladium	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Phosphorus	130	116	106	626	17	67	99	180
Platinum	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Praseodymium	< 0.01	< 0.01	< 0.01	10.94	< 0.01	< 0.01	< 0.01	< 0.01
Rhenium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Rhodium	< 0.01	< 0.01	< 0.01	0.07	0.02	< 0.01	< 0.01	< 0.01
Rubidium	11.33	23.61	6.56	64.8	5.52	9.44	6.85	7.19
Ruthenium	< 0.05	< 0.05	< 0.05	0.09	< 0.05	< 0.05	< 0.05	< 0.05
Samarium	< 0.02	< 0.02	< 0.02	8.27	< 0.02	< 0.02	< 0.02	< 0.02
Scandium	2	3	2	11	6	3	2	2
Selenium	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Silicon	8323	15540	11078	15432	14020	17453	12207	10274
Silver	< 0.05	< 0.05	< 0.05	0.11	< 0.05	< 0.05	< 0.05	< 0.05
Strontium	122.2	135.35	126.5	1699	444.03	186.58	140.06	128.95
Tantalum	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Tellurium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Terbium	< 0.01	< 0.01	< 0.01	0.88	< 0.01	< 0.01	< 0.01	< 0.01
Thallium	< 0.01	< 0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.01	< 0.01
Thorium	< 0.05	< 0.05	< 0.05	4.92	< 0.05	< 0.05	< 0.05	< 0.05
Thulium	< 0.01	< 0.01	< 0.01	0.2	< 0.01	< 0.01	< 0.01	< 0.01
Tin	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	< 10	< 10	< 10	53	< 10	< 10	< 10	< 10
Tungsten	0.34	< 0.02	0.24	0.09	5.33	< 0.02	0.04	0.02
Uranium	0.06	< 0.02	< 0.02	2.57	< 0.02	< 0.02	< 0.02	< 0.02
Vanadium	< 0.2	< 0.2	< 0.2	13.1	2.9	< 0.2	< 0.2	< 0.2
Ytterbium	< 0.01	< 0.01	< 0.01	1.31	< 0.01	< 0.01	< 0.01	< 0.01
Yttrium	< 0.01	< 0.01	< 0.01	14.48	0.02	< 0.01	< 0.01	< 0.01
Zinc	0.7	3.3	1.2	102	4.6	27.8	14.7	3.5
Zirconium	< 0.02	< 0.02	< 0.02	0.66	< 0.02	< 0.02	< 0.02	< 0.02
<b>Elemental Analysis (mg/L)</b>								
Calcium	24.89	56.9	20.02	82.82	38.22	26.29	20.03	16.03
Chlorine	7	15	2	< 1	< 1	3	2	2
Magnesium	3.74	14.05	3.23	1.54	0.27	4.42	3.22	2.45
Potassium	4.82	7.32	3.84	34.74	2.56	5.45	3.48	3.39
Sodium	18.75	20.62	4.65	40.39	5.84	6.84	17.21	3.88
Sulfur	12	61	6	18	5	4	9	2

**Table 2**  
**Summary of Elemental Analysis**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

Sample ID	MW092SR 09/12/12 VAN12004563	MW093PR 09/12/12 VAN12004563	MW094PR 09/11/12 VAN12004563	MW095P 09/12/12 VAN12004563	MW095P Rep 09/12/12 VAN12004563	MW096T 09/11/12 VAN12004563	MW097T 09/14/12 VAN12004563	MW098TR 09/12/12 VAN12004563
<b>Elemental Analysis (ug/L)</b>								
Aluminum	6	3	9	1	< 1	1	4	2
Antimony	0.09	< 0.05	0.78	0.11	0.11	1	0.27	2.24
Arsenic	< 0.5	< 0.5	0.6	< 0.5	< 0.5	0.6	< 0.5	0.8
Barium	143.89	128.13	111.54	158.47	156.73	195.08	202.79	307.87
Beryllium	0.07	< 0.05	< 0.05	0.05	0.05	< 0.05	< 0.05	0.05
Bismuth	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Boron	16	16	14	15	16	18	15	12
Bromine	12	12	12	12	12	14	11	19
Cadmium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Cerium	0.39	0.03	0.12	< 0.01	< 0.01	< 0.01	0.07	< 0.01
Cesium	0.05	0.06	0.11	0.07	0.07	0.04	0.05	0.06
Chromium	< 0.5	< 0.5	4.5	< 0.5	< 0.5	1.5	0.9	4.3
Cobalt	0.19	0.09	0.09	< 0.02	< 0.02	< 0.02	0.02	0.04
Copper	< 0.1	< 0.1	1	0.2	0.1	< 0.1	0.4	1.1
Dysprosium	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Erbium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Europium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Gadolinium	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Gallium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Germanium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gold	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hafnium	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Holmium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	646	419	104	665	652	26	1942	10
Lanthanum	0.17	0.01	0.06	< 0.01	< 0.01	< 0.01	0.03	< 0.01
Lead	0.2	0.2	0.2	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Lithium	0.7	2.4	5.4	1.3	0.9	8.2	2.9	0.8
Lutetium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	34.02	31.08	23.73	34.46	34.25	3.76	80.52	10.16
Mercury	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	1.2	0.6	1.6	0.2	0.2	3	0.8	9.4
Neodymium	0.19	0.01	0.05	< 0.01	< 0.01	< 0.01	0.03	< 0.01
Nickel	< 0.2	< 0.2	2.2	< 0.2	< 0.2	< 0.2	0.5	1.2
Niobium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Palladium	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Phosphorus	117	92	2439	83	97	19	78	358
Platinum	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Praseodymium	0.04	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Rhenium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Rhodium	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	0.01	0.02
Rubidium	7.45	8.38	10.34	9.03	8.76	7.81	9.63	9.86
Ruthenium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.11
Samarium	0.04	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Scandium	2	2	2	4	4	3	5	6
Selenium	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Silicon	9624	8752	11218	8273	8153	16961	11237	13562
Silver	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Strontium	216.51	225.17	258.94	221.38	219.16	256.57	209.58	443.76
Tantalum	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Tellurium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Terbium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Thallium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Thorium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Thulium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tin	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Tungsten	0.18	0.09	0.1	0.09	0.08	0.13	0.08	1.19
Uranium	0.02	< 0.02	0.02	< 0.02	< 0.02	0.03	< 0.02	0.05
Vanadium	< 0.2	< 0.2	0.3	< 0.2	< 0.2	2.7	< 0.2	< 0.2
Ytterbium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Yttrium	0.07	< 0.01	0.04	< 0.01	< 0.01	< 0.01	0.02	< 0.01
Zinc	1.1	0.6	3.2	0.8	0.5	1.4	1.6	0.9
Zirconium	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
<b>Elemental Analysis (mg/L)</b>								
Calcium	31.81	30.92	36.46	27.01	26.74	38.96	26.65	57.85
Chlorine	2	2	3	< 1	< 1	3	< 1	< 1
Magnesium	3.24	3.11	4.38	2.92	2.95	3.58	3.21	5.56
Potassium	3.7	4.11	4.68	3.88	3.87	4.15	3.96	4.73
Sodium	5.85	6.13	8	5.06	5.12	5.55	4.7	10.26
Sulfur	3	3	4	2	2	3	2	8

**Table 2**  
**Summary of Elemental Analysis**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

Sample ID	MW101T 09/11/12	MW102S 09/10/12	MW103P 09/11/12	MW125P 09/05/12	MW126T 09/10/12	MW134T 09/05/12	MW135S 09/05/12
Date Collected	VAN12004563						
Laboratory ID							
<b>Elemental Analysis (ug/L)</b>							
Aluminum	< 1	< 1	2	4	2	6	2
Antimony	<b>0.24</b>	< 0.05	<b>0.35</b>	< 0.05	<b>0.97</b>	<b>0.13</b>	< 0.05
Arsenic	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Barium	<b>41.22</b>	<b>132.46</b>	<b>87.63</b>	<b>93.59</b>	<b>216.69</b>	<b>60.2</b>	<b>104.75</b>
Beryllium	< 0.05	< 0.05	< 0.05	< 0.05	<b>0.06</b>	< 0.05	< 0.05
Bismuth	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Boron	<b>22</b>	<b>15</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>20</b>	<b>14</b>
Bromine	<b>11</b>	<b>11</b>	<b>12</b>	<b>14</b>	<b>11</b>	<b>18</b>	<b>12</b>
Cadmium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Cerium	< 0.01	< 0.01	<b>0.02</b>	< 0.01	< 0.01	<b>0.05</b>	< 0.01
Cesium	<b>0.04</b>	<b>0.06</b>	<b>0.06</b>	<b>0.1</b>	<b>0.05</b>	<b>0.06</b>	<b>0.02</b>
Chromium	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Cobalt	< 0.02	< 0.02	<b>0.14</b>	< 0.02	<b>0.02</b>	< 0.02	< 0.02
Copper	< 0.1	< 0.1	< 0.1	<b>0.2</b>	< 0.1	<b>0.3</b>	< 0.1
Dysprosium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Erbium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Europium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Gadolinium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Gallium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Germanium	<b>0.05</b>	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gold	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hafnium	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Holmium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	<b>245</b>	<b>2756</b>	<b>1780</b>	<b>2865</b>	<b>17</b>	<b>170</b>	<b>4464</b>
Lanthanum	< 0.01	< 0.01	<b>0.01</b>	< 0.01	< 0.01	<b>0.03</b>	< 0.01
Lead	< 0.1	< 0.1	<b>0.5</b>	<b>0.1</b>	<b>0.2</b>	<b>0.7</b>	<b>0.1</b>
Lithium	<b>5</b>	<b>2.5</b>	<b>3.7</b>	<b>6.3</b>	<b>1.5</b>	<b>4.3</b>	<b>2.5</b>
Lutetium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	<b>46.34</b>	<b>97.01</b>	<b>79.24</b>	<b>97.57</b>	<b>11.51</b>	<b>29.85</b>	<b>144.58</b>
Mercury	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	<b>1</b>	<b>0.4</b>	<b>0.4</b>	<b>0.2</b>	<b>1.1</b>	<b>0.6</b>	<b>0.2</b>
Neodymium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<b>0.04</b>	< 0.01
Nickel	<b>0.7</b>	< 0.2	< 0.2	< 0.2	<b>0.3</b>	< 0.2	< 0.2
Niobium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Palladium	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Phosphorus	<b>1890</b>	<b>143</b>	<b>639</b>	<b>5287</b>	<b>51</b>	<b>2688</b>	<b>263</b>
Platinum	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Praseodymium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Rhenium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Rhodium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Rubidium	<b>8.17</b>	<b>8.72</b>	<b>8.19</b>	<b>9.55</b>	<b>9.06</b>	<b>8.95</b>	<b>7.02</b>
Ruthenium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Samarium	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Scandium	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>
Selenium	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Silicon	<b>14272</b>	<b>11529</b>	<b>8434</b>	<b>9664</b>	<b>12308</b>	<b>14793</b>	<b>8294</b>
Silver	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Strontium	<b>148.13</b>	<b>164.91</b>	<b>132.79</b>	<b>177.85</b>	<b>222.54</b>	<b>196.1</b>	<b>123.18</b>
Tantalum	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Tellurium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Terbium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Thallium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Thorium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Thulium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tin	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	< 10	< 10	< 10	<b>15</b>	< 10	<b>10</b>	< 10
Tungsten	<b>0.75</b>	<b>1.01</b>	<b>0.1</b>	<b>0.08</b>	<b>0.05</b>	<b>0.06</b>	<b>0.15</b>
Uranium	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Vanadium	<b>0.3</b>	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Ytterbium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Yttrium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<b>0.03</b>	< 0.01
Zinc	< 0.5	< 0.5	<b>1</b>	<b>0.7</b>	<b>2.1</b>	<b>3.1</b>	<b>1</b>
Zirconium	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
<b>Elemental Analysis (mg/L)</b>							
Calcium	<b>21.49</b>	<b>21.9</b>	<b>15.98</b>	<b>22.81</b>	<b>29.05</b>	<b>52.46</b>	<b>17.54</b>
Chlorine	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>
Magnesium	<b>2.84</b>	<b>2.85</b>	<b>2.25</b>	<b>2.91</b>	<b>4.05</b>	<b>2.94</b>	<b>2.24</b>
Potassium	<b>4.02</b>	<b>3.98</b>	<b>3.81</b>	<b>4.54</b>	<b>4.44</b>	<b>3.38</b>	<b>3.4</b>
Sodium	<b>13.8</b>	<b>6.78</b>	<b>6.59</b>	<b>7.13</b>	<b>5.34</b>	<b>9.65</b>	<b>5.4</b>
Sulfur	<b>6</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>7</b>	<b>7</b>	<b>3</b>

**Table 2**  
**Summary of Elemental Analysis**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

Sample ID	MW137T 09/13/12	MW138P 09/13/12	MW139S 09/13/12	MW140S 09/14/12	MW141T 09/13/12	P112A 09/11/12	P112B 09/11/12
Date Collected	VAN12004563	VAN12004563	VAN12004563	VAN12004563	VAN12004563	VAN12004563	VAN12004563
<b>Elemental Analysis (ug/L)</b>							
Aluminum	76	341	66	832	131	103	208
Antimony	3.13	0.07	1.81	6.88	2.31	3.78	16.25
Arsenic	0.9	< 0.5	< 0.5	2.6	0.8	0.9	1.3
Barium	131.22	105.87	177.46	102.05	187.25	115.95	110.64
Beryllium	< 0.05	0.23	< 0.05	0.19	0.09	0.07	0.07
Bismuth	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Boron	13	13	18	24	13	21	21
Bromine	20	13	15	18	13	15	18
Cadmium	0.16	< 0.05	0.11	0.07	< 0.05	54.33	19.57
Cerium	1.05	2.35	1.29	42.34	7.23	1.2	2.25
Cesium	0.07	0.12	0.1	0.4	0.12	0.09	0.14
Chromium	1.7	1	1.6	12.1	2.1	10.6	9.8
Cobalt	0.23	0.18	0.48	1.64	0.72	233.17	155.59
Copper	0.7	0.2	0.9	4.3	1	2.9	4.9
Dysprosium	0.11	0.09	0.13	2.51	0.4	0.13	0.22
Erbium	0.06	0.06	0.08	1.08	0.19	0.07	0.12
Europium	0.03	0.05	0.03	0.96	0.15	0.02	0.04
Gadolinium	0.13	0.18	0.16	4.09	0.57	0.13	0.24
Gallium	< 0.05	0.12	< 0.05	0.36	< 0.05	< 0.05	0.08
Germanium	< 0.05	< 0.05	0.07	0.1	< 0.05	< 0.05	0.05
Gold	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hafnium	< 0.02	< 0.02	< 0.02	0.03	< 0.02	< 0.02	< 0.02
Holmium	0.02	0.01	0.03	0.43	0.07	0.02	0.04
Indium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	2105	2321	2899	3637	1737	6384	4401
Lanthanum	0.69	0.94	0.83	21.03	3.58	0.68	1.21
Lead	3.7	0.2	0.4	2.2	0.5	0.8	7.8
Lithium	2.6	3.4	1	1.9	2.8	5.5	6.1
Lutetium	< 0.01	< 0.01	< 0.01	0.08	0.01	< 0.01	0.01
Manganese	128.1	102	98.51	132.79	73.75	263.83	433.25
Mercury	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	6.2	1.6	6	29.7	1.7	4.5	4.3
Neodymium	0.65	1.13	0.83	21.01	3.91	0.71	1.3
Nickel	3.2	0.3	5.4	20.1	2.5	15.2	17.2
Niobium	0.01	0.03	< 0.01	0.12	< 0.01	0.03	0.01
Palladium	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Phosphorus	358	341	466	1297	605	409	529
Platinum	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Praseodymium	0.16	0.27	0.19	5.12	0.89	0.16	0.3
Rhenium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Rhodium	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01
Rubidium	7.39	8.01	9.19	14.31	8.5	8.86	8.73
Ruthenium	< 0.05	< 0.05	< 0.05	< 0.05	0.06	< 0.05	< 0.05
Samarium	0.14	0.2	0.17	3.97	0.65	0.14	0.27
Scandium	5	4	5	4	7	3	2
Selenium	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Silicon	10543	8470	10378	8892	14934	13556	10167
Silver	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.25
Strontium	124.94	163.79	184.35	168.81	253.61	163.39	145.15
Tantalum	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Tellurium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Terbium	0.02	0.02	0.02	0.53	0.08	0.02	0.04
Thallium	0.01	< 0.01	0.02	0.03	0.02	< 0.01	0.04
Thorium	0.19	0.39	0.17	0.68	0.09	0.1	0.09
Thulium	< 0.01	< 0.01	< 0.01	0.11	0.02	< 0.01	0.01
Tin	0.08	< 0.05	0.19	0.47	0.16	0.12	0.76
Titanium	< 10	14	< 10	26	12	< 10	< 10
Tungsten	0.34	0.09	0.67	3.67	0.54	17.56	16.57
Uranium	0.59	0.07	0.52	1.14	0.67	0.18	0.51
Vanadium	0.7	1.1	0.7	3.7	1.1	0.4	1.3
Ytterbium	0.05	0.03	0.06	0.78	0.13	0.06	0.1
Yttrium	0.81	0.44	1.04	10.39	1.97	0.83	1.44
Zinc	13.3	0.6	4.8	15.9	3.5	24.2	29.9
Zirconium	0.12	0.14	0.03	0.71	0.11	0.08	0.12
<b>Elemental Analysis (mg/L)</b>							
Calcium	15.75	17.48	22.92	26.4	38.85	20.74	19.3
Chlorine	1	< 1	< 1	1	< 1	3	3
Magnesium	2.63	2.32	3.46	2.73	3.99	3.41	2.79
Potassium	3.58	3.3	4.52	6.29	3.95	4.27	3.87
Sodium	6.12	5.79	9.15	21.95	9.96	7.05	15.18
Sulfur	5	2	3	8	3	4	4

**Table 2**  
**Summary of Elemental Analysis**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

Sample ID	P112C 09/12/12	P112D 09/12/12	P114A 09/12/12	P114B 09/12/12	P114C 09/12/12	P114D 09/12/12	PBC004 09/10/12
Date Collected	VAN12004563						
Laboratory ID							
<b>Elemental Analysis (ug/L)</b>							
Aluminum	47	35	207	5	6	8	1
Antimony	0.08	0.68	1.82	0.29	< 0.05	< 0.05	< 0.05
Arsenic	< 0.5	< 0.5	0.8	< 0.5	< 0.5	< 0.5	< 0.5
Barium	89.31	84.39	210.76	146.1	70.99	70.41	56.85
Beryllium	< 0.05	< 0.05	0.1	< 0.05	< 0.05	< 0.05	0.06
Bismuth	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Boron	14	14	15	16	12	16	12
Bromine	15	14	14	13	12	13	13
Cadmium	< 0.05	< 0.05	5.38	< 0.05	< 0.05	< 0.05	< 0.05
Cerium	1.11	1.05	2.37	0.09	0.15	0.11	0.02
Cesium	0.09	0.08	0.14	0.07	0.08	0.08	0.04
Chromium	0.9	0.6	9.8	< 0.5	< 0.5	< 0.5	< 0.5
Cobalt	0.12	0.32	24.69	0.19	0.02	< 0.02	0.28
Copper	0.4	0.6	4.2	0.2	0.1	0.1	< 0.1
Dysprosium	0.08	0.05	0.26	< 0.01	< 0.01	< 0.01	< 0.01
Erbium	0.04	0.03	0.17	< 0.01	< 0.01	< 0.01	< 0.01
Europium	0.03	0.02	0.07	< 0.01	< 0.01	< 0.01	< 0.01
Gadolinium	0.13	0.11	0.37	0.01	0.01	< 0.01	< 0.01
Gallium	< 0.05	< 0.05	0.08	< 0.05	< 0.05	< 0.05	< 0.05
Germanium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gold	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hafnium	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Holmium	0.01	0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01
Indium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	1346	1014	9243	3132	1653	1401	2384
Lanthanum	0.58	0.56	1.42	0.05	0.07	0.04	< 0.01
Lead	0.9	1.1	1.8	< 0.1	< 0.1	0.2	0.3
Lithium	3.2	3.3	3.8	3.2	4.6	3.6	2.4
Lutetium	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	41.17	75.03	215.16	92.07	42.27	39.51	112.8
Mercury	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	0.2	0.2	3.1	0.5	< 0.1	< 0.1	< 0.1
Neodymium	0.64	0.49	1.55	0.04	0.1	0.04	< 0.01
Nickel	0.6	1.1	17.3	0.4	< 0.2	< 0.2	0.3
Niobium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Palladium	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Phosphorus	448	421	1231	143	610	602	277
Platinum	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Praseodymium	0.13	0.13	0.36	< 0.01	0.01	< 0.01	< 0.01
Rhenium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Rhodium	0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Rubidium	7.68	7.5	9.53	9.03	8.24	8.65	9.38
Ruthenium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Samarium	0.11	0.09	0.31	< 0.02	< 0.02	< 0.02	< 0.02
Scandium	4	4	6	5	4	4	2
Selenium	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Silicon	8222	8200	12139	10784	7733	7698	7734
Silver	< 0.05	< 0.05	0.68	0.05	< 0.05	< 0.05	< 0.05
Strontium	169.81	160.91	205.54	193.58	143.01	158.65	120.93
Tantalum	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Tellurium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Terbium	0.02	< 0.01	0.05	< 0.01	< 0.01	< 0.01	< 0.01
Thallium	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01
Thorium	0.08	0.06	0.29	< 0.05	< 0.05	< 0.05	< 0.05
Thulium	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01
Tin	< 0.05	0.15	0.72	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	< 10	< 10	13	< 10	< 10	< 10	< 10
Tungsten	0.22	0.48	3.35	0.44	0.03	0.06	< 0.02
Uranium	0.08	0.06	0.36	< 0.02	< 0.02	< 0.02	< 0.02
Vanadium	0.2	< 0.2	0.8	< 0.2	< 0.2	< 0.2	< 0.2
Ytterbium	0.02	0.02	0.14	< 0.01	< 0.01	< 0.01	< 0.01
Yttrium	0.5	0.36	1.87	0.05	0.06	0.03	< 0.01
Zinc	3.2	5.8	28.6	1.3	0.6	1.5	1.3
Zirconium	0.02	0.03	< 0.02	< 0.02	< 0.02	0.02	< 0.02
<b>Elemental Analysis (mg/L)</b>							
Calcium	18.27	17.17	26.47	23.34	14.93	15.16	16.87
Chlorine	< 1	< 1	< 1	< 1	< 1	< 1	3
Magnesium	2.15	2.1	3.08	2.89	1.96	1.9	2.51
Potassium	3.19	3.11	3.78	3.82	3.65	3.76	3.84
Sodium	3.29	3.25	5.34	7.5	3.17	3.42	3.98
Sulfur	2	1	3	2	2	2	2

**Table 2**  
**Summary of Elemental Analysis**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

Sample ID	SL023 09/07/12	UBC011 09/04/12	UBC021 09/10/12	UBC021 Rep 09/10/12	UBC025 09/13/12	UBC026 09/10/12	UBC027 09/12/12
Date Collected	VAN12004563	VAN12004563	VAN12004563	VAN12004563	VAN12004563	VAN12004563	VAN12004563
Laboratory ID							
<b>Elemental Analysis (ug/L)</b>							
Aluminum	27	13	393	416	2	83	5
Antimony	0.09	0.28	< 0.05	< 0.05	< 0.05	0.08	< 0.05
Arsenic	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Barium	64.31	72.56	83.54	85.33	83.02	74.46	79.11
Beryllium	0.06	< 0.05	0.25	0.16	< 0.05	< 0.05	< 0.05
Bismuth	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Boron	14	18	15	15	13	13	12
Bromine	12	12	12	12	15	12	12
Cadmium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Cerium	0.43	0.05	19.87	19.92	0.02	< 0.01	0.01
Cesium	0.2	2.48	0.3	0.32	0.06	0.05	0.07
Chromium	< 0.5	< 0.5	8.3	8.7	< 0.5	< 0.5	< 0.5
Cobalt	0.18	0.06	1.37	1.43	< 0.02	< 0.02	< 0.02
Copper	1.2	0.1	2.8	2.9	0.2	< 0.1	0.2
Dysprosium	0.02	< 0.01	0.94	1.05	< 0.01	< 0.01	< 0.01
Erbium	< 0.01	< 0.01	0.4	0.39	< 0.01	< 0.01	< 0.01
Europium	< 0.01	< 0.01	0.39	0.37	< 0.01	< 0.01	< 0.01
Gadolinium	0.03	< 0.01	1.49	1.52	< 0.01	< 0.01	< 0.01
Gallium	< 0.05	0.08	0.26	0.26	< 0.05	0.49	< 0.05
Germanium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Gold	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hafnium	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Holmium	< 0.01	< 0.01	0.16	0.16	< 0.01	< 0.01	< 0.01
Indium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	3891	1647	2321	2368	680	523	860
Lanthanum	0.17	0.03	6.9	7.05	< 0.01	< 0.01	< 0.01
Lead	0.4	0.1	0.9	1	0.1	< 0.1	0.9
Lithium	3.7	13.2	7.2	6.8	3.2	2.6	3.7
Lutetium	< 0.01	< 0.01	0.03	0.04	< 0.01	< 0.01	< 0.01
Manganese	148.41	64.76	47.08	48.01	55.43	56.98	33.29
Mercury	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	< 0.1	0.4	0.5	0.5	< 0.1	0.4	< 0.1
Neodymium	0.15	0.02	9.9	10.04	< 0.01	< 0.01	0.01
Nickel	1	< 0.2	9.7	9.5	< 0.2	< 0.2	< 0.2
Niobium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Palladium	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Phosphorus	456	254	591	600	339	261	414
Platinum	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Praseodymium	0.05	< 0.01	2.34	2.35	< 0.01	< 0.01	< 0.01
Rhenium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Rhodium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Rubidium	11.92	43.01	10.09	10.18	6.63	7.18	7.12
Ruthenium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Samarium	0.03	< 0.02	1.83	1.9	< 0.02	< 0.02	< 0.02
Scandium	2	2	3	3	4	2	4
Selenium	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Silicon	7230	7167	7933	8143	8844	7162	8111
Silver	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Strontium	103.95	222.94	141.46	141.92	186.24	193.08	161.17
Tantalum	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Tellurium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Terbium	< 0.01	< 0.01	0.19	0.21	< 0.01	< 0.01	< 0.01
Thallium	< 0.01	< 0.01	0.01	0.01	< 0.01	< 0.01	< 0.01
Thorium	< 0.05	< 0.05	0.91	1.02	< 0.05	< 0.05	< 0.05
Thulium	< 0.01	< 0.01	0.05	0.05	< 0.01	< 0.01	< 0.01
Tin	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	< 10	< 10	17	18	< 10	< 10	< 10
Tungsten	< 0.02	0.08	< 0.02	< 0.02	0.15	0.06	0.08
Uranium	< 0.02	0.05	0.31	0.32	< 0.02	< 0.02	< 0.02
Vanadium	< 0.2	0.4	2.5	2.7	< 0.2	0.9	< 0.2
Ytterbium	< 0.01	< 0.01	0.28	0.3	< 0.01	< 0.01	< 0.01
Yttrium	0.08	0.01	3.69	3.7	< 0.01	< 0.01	< 0.01
Zinc	4.2	0.5	8.1	8.2	1.9	< 0.5	2.7
Zirconium	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
<b>Elemental Analysis (mg/L)</b>							
Calcium	16.11	15.39	16.65	16.69	22.4	26.75	20.08
Chlorine	3	3	3	3	< 1	3	< 1
Magnesium	2.75	1.97	2.16	2.22	2.03	2.11	2.07
Potassium	4.32	9.07	3.79	3.82	3.11	3.48	3.17
Sodium	4.55	5.68	3.72	3.77	3.19	3.56	3.34
Sulfur	3	2	2	2	2	2	2

**Table 2**  
**Summary of Elemental Analysis**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

Sample ID	UBC028AR 09/11/12	UBC031 09/10/12	UBC034 09/05/12	UBC052 09/06/12	UBC054 09/13/12	UBC055 09/13/12	UBC056 09/14/12
Date Collected	VAN12004563	VAN12004563	VAN12004563	VAN12004563	VAN12004563	VAN12004563	VAN12004563
Laboratory ID							
<b>Elemental Analysis (ug/L)</b>							
Aluminum	1	1	3	11	615	379	956
Antimony	0.34	< 0.05	< 0.05	1.5	0.14	0.18	5.84
Arsenic	0.6	< 0.5	0.8	< 0.5	0.7	< 0.5	4.5
Barium	35.28	60.3	15.96	65.97	98.43	102.26	120.78
Beryllium	< 0.05	0.19	0.06	< 0.05	0.72	0.27	0.96
Bismuth	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.4	< 0.05
Boron	17	13	15	20	14	15	23
Bromine	11	12	11	15	13	24	17
Cadmium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.42
Cerium	0.02	0.03	< 0.01	0.23	36.75	6.21	14.54
Cesium	0.12	0.06	0.07	0.08	0.34	0.18	0.4
Chromium	< 0.5	< 0.5	< 0.5	< 0.5	4	1.8	18.3
Cobalt	0.04	< 0.02	0.34	0.04	0.6	0.32	2.85
Copper	< 0.1	< 0.1	< 0.1	0.2	1.5	1.3	3
Dysprosium	< 0.01	< 0.01	< 0.01	< 0.01	2.16	0.29	0.99
Erbium	< 0.01	< 0.01	< 0.01	< 0.01	0.95	0.13	0.51
Europium	< 0.01	< 0.01	< 0.01	< 0.01	0.79	0.16	0.3
Gadolinium	< 0.01	< 0.01	< 0.01	0.02	3.37	0.52	1.35
Gallium	< 0.05	< 0.05	0.06	< 0.05	0.29	0.21	0.34
Germanium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.06
Gold	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Hafnium	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.02
Holmium	< 0.01	< 0.01	< 0.01	< 0.01	0.39	0.06	0.18
Indium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Iron	65	1520	2118	1522	2915	2470	3344
Lanthanum	< 0.01	0.02	< 0.01	0.09	15.82	2.73	7.49
Lead	< 0.1	< 0.1	< 0.1	< 0.1	2.1	1.2	3
Lithium	5.7	4.1	6.9	5.1	4.2	2.6	4.3
Lutetium	< 0.01	< 0.01	< 0.01	< 0.01	0.1	< 0.01	0.05
Manganese	18.94	47.17	156.92	86.42	55.05	78.97	94.71
Mercury	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Molybdenum	1.7	< 0.1	0.8	0.4	0.9	2.4	19.3
Neodymium	< 0.01	< 0.01	< 0.01	0.09	18.04	3.13	7.92
Nickel	0.5	< 0.2	1	1.1	2.6	0.8	14.7
Niobium	< 0.01	< 0.01	< 0.01	< 0.01	0.04	0.03	0.06
Palladium	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Phosphorus	3572	550	15351	231	527	179	1972
Platinum	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Praseodymium	< 0.01	< 0.01	< 0.01	0.02	4.24	0.78	1.95
Rhenium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01
Rhodium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01
Rubidium	9.12	7.75	7.42	10.48	9.78	9.49	9.15
Ruthenium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Samarium	< 0.02	< 0.02	< 0.02	< 0.02	3.39	0.58	1.52
Scandium	2	2	3	2	5	4	6
Selenium	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	1
Silicon	9469	7671	13517	8923	8701	7838	11454
Silver	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.08	< 0.05
Strontium	143.65	130.96	144.58	163.12	165.16	188.24	145.22
Tantalum	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Tellurium	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Terbium	< 0.01	< 0.01	< 0.01	< 0.01	0.42	0.06	0.18
Thallium	< 0.01	< 0.01	< 0.01	< 0.01	0.02	0.03	0.06
Thorium	< 0.05	0.05	< 0.05	< 0.05	1.82	1.11	2.12
Thulium	< 0.01	< 0.01	< 0.01	< 0.01	0.13	0.01	0.06
Tin	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.15	0.11
Titanium	11	< 10	42	< 10	22	19	23
Tungsten	0.35	0.63	0.11	< 0.02	0.07	0.05	1.09
Uranium	< 0.02	< 0.02	< 0.02	< 0.02	0.87	0.24	3.24
Vanadium	0.3	< 0.2	< 0.2	< 0.2	4.6	2.1	8.1
Ytterbium	< 0.01	< 0.01	< 0.01	< 0.01	0.86	0.07	0.39
Yttrium	< 0.01	< 0.01	< 0.01	0.02	9.38	1.35	5.79
Zinc	1.2	1.3	0.7	0.9	5.6	2.5	24.5
Zirconium	< 0.02	< 0.02	< 0.02	< 0.02	0.09	0.08	0.8
<b>Elemental Analysis (mg/L)</b>							
Calcium	19.33	15.1	17.69	20.13	18.45	23.17	20.52
Chlorine	3	3	2	3	< 1	< 1	< 1
Magnesium	2.47	2.01	2.5	3.33	2.3	2.62	2.12
Potassium	4.13	3.62	3.57	4.9	3.22	3.79	3.35
Sodium	22.4	3.59	18.99	5.03	4.86	11.52	30.41
Sulfur	6	2	4	3	3	8	2

**Notes:**

mg/L - milligrams per liter (parts per million)

ug/L - micrograms per liter (parts per billion)

Bold and shading indicate detected concentrations.

**Table 3**  
**Summary Statistics for Elements with the Largest Concentration Ranges**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

Element	TLS	TLS-Channel	SSDL	PSDL	UBC-A
<b>Average</b>					
Aluminum	7.4	5	11	6	17
Bromine	20	15	14	12	14
Cesium	0.084	0.11	0.087	0.16	0.27
<b>Median</b>					
Aluminum	3	5	2	2.5	6
Bromine	13.5	14.5	13	12	12.5
Cesium	0.055	0.12	0.06	0.085	0.08
<b>Minimum</b>					
	TLS	TLS-Channel	SSDL	PSDL	UBC-A
Aluminum	1	5	1	1	1
Bromine	9	13	8	11	11
Cesium	0.02	0.07	0.02	0.04	0.04
<b>Maximum</b>					
	TLS	TLS-Channel	SSDL	PSDL	UBC-A
Aluminum	28	5	66	27	83
Bromine	85	18	26	14	24
Cesium	0.39	0.14	0.4	0.97	2.48
<b>Standard Deviation</b>					
	TLS	TLS-Channel	SSDL	PSDL	UBC-A
Aluminum	9.3	na	20	8.1	na
Bromine	19	2.2	4.8	0.7	16
Cesium	0.092	0.036	0.11	0.26	0.38

**Notes:**

Concentrations in micrograms per liter.

Green highlighting indicates low maximum value.

Orange highlighting indicates high maximum value.

na = not applicable because insufficient data points to calculate.

TLS = Transitional Lang Syne Aquifer Zone

TLS Channel = Paleo-Channel

SSDL = Secondary Sawdust Landing Aquifer Zone

PSDL = Primary Sawdust Landing Aquifer Zone

UBC-A = Upper Black Creek-A Aquifer Zone

**Table 4**  
**Summary of Major Ion Analysis**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

Sample ID	MW010	MW035S	MW040P	MW041T	MW072P	MW073T	MW094PR	MW101T	MW102S	MW103P
Date Collected	09/05/12	09/05/12	09/04/12	09/05/12	09/06/12	09/04/12	09/11/12	09/11/12	09/10/12	09/11/12
Laboratory ID	NI07081-005	NI07081-006	NI07081-003	NI07081-007	NI07081-008	NI07081-001	NI13083-006	NI13083-004	NI13083-001	NI13083-005
<b>Cations by USEPA Method 6010C (mg/L)</b>										
Calcium	20	18	19	22	34	29	34	21	22	16
Magnesium	3.7 J//	2.4 J//	2.9 J//	3.9 J//	< 5	3.1 J//	4.5 J//	3 J//	3.1 J//	2.3 J//
Potassium	4 J//	3.3 J//	4.9 J//	3.9 J//	9.4	3.5 J//	4.7 J//	4.2 J//	4.1 J//	3.8 J//
Sodium	6.4	4.2 J//	5.8	6.4	8.9	5.2	8	13	6	5.9
<b>Alkalinity by USEPA Method SM2320B (mg/L)</b>										
Alkalinity	68	68	68	68	130	94	100	80	83	59
Bicarbonate Alkalinity	68	68	68	68	11	94	100	80	83	59
Carbonate Alkalinity	< 10	< 10	< 10	< 10	77	< 10	< 10	< 10	< 10	< 10
<b>Anions by USEPA Method 300 (mg/L)</b>										
Chloride	1.4	2.4	2.3	1.4	2.4	2.1	2.6	2.1	2.2	2.5
Sulfate	22	6.2	5.9	23	7.1	5	9.8	25	5.4	4.6

Sample ID	MW126T	MW139S	MW141T	UBC008	UBC011	UBC019	UBC025	UBC031	UBC055
Date Collected	09/10/12	09/13/12	09/13/12	09/04/12	09/04/12	09/07/12	09/13/12	09/10/12	09/13/12
Laboratory ID	NI13083-002	NI13083-007	NI13083-008	NI07081-002	NI07081-004	NI07081-009	NI13083-009	NI13083-003	NI13083-010
<b>Cations by USEPA Method 6010C (mg/L)</b>									
Calcium	28	22	40	17	15	21	22	14	25
Magnesium	4.2 J//	3.7 J//	4.4 J//	2.3 J//	2 J//	2.4 J//	2.2 J//	2 J//	3.1 J//
Potassium	4.5 J//	4.7 J//	4.3 J//	4.4 J//	10	5.1	3.2 J//	3.6 J//	4.4 J//
Sodium	4.3 J//	8.2	9.5	3.9 J//	5.7	5.6	2.3 J//	1.9 J//	12
<b>Alkalinity by USEPA Method SM2320B (mg/L)</b>									
Alkalinity	87	87	130	62	68	77	76	52	76
Bicarbonate Alkalinity	87	87	130	62	68	77	76	52	76
Carbonate Alkalinity	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
<b>Anions by USEPA Method 300 (mg/L)</b>									
Chloride	2.2	2.4	2.2	0.13 JS//	2.5	2.4	3	2.7	2.6
Sulfate	18	6.4	7.5	5.7	5.2	4.8	3.8	4.1	25

**Notes:**

mg/L - milligrams per liter

USEPA - United States Environmental Protection Agency

Bold and shading indicate detected concentrations.

**Table 5**  
**Summary of Major Ion Total Dissolved Solids**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

Well Identification	Screened Aquifer Zone	Calculated TDS	Average	Median
MW041T	TLS	102	117	114
MW101T	TLS	117		
MW126T	TLS	114		
MW141T	TLS	147		
MW073T	TLS	105		
MW010	SSDL	99	93	96
MW035S	SSDL	78		
MW102S	SSDL	93		
MW139S	SSDL	100		
MW040P	PSDL	82	93	87
MW072P	PSDL	93		
MW094PR	PSDL	125		
MW103P	PSDL	71		
UBC011	UBC-A	82	86	83
UBC019	UBC-A	88		
UBC025	UBC-A	83		
UBC031	UBC-A	60		
UBC055	UBC-A	118		
UBC008	UBC-B	71	na	na

**Notes:**

Concentrations as milligrams per liter.

na = not applicable; only one data point.

TDS = total dissolved solids calculated as the sum of major ions;

bicarbonate and carbonate concentrations are divided in half  
prior to summing to account for presence as gases.

TLS = Transitional Lang Syne Aquifer Zone

SSDL = Secondary Sawdust Landing Aquifer Zone

PSDL = Primary Sawdust Landing Aquifer Zone

UBC-A = Upper Black Creek-A Aquifer Zone

UBC-B = Upper Black Creek-B Aquifer Zone

**Table 6**  
**Summary of Isotopic Analysis**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

Well Identification	Geographic Location	Screened Aquifer Zone	dD VSMOW	d18O VSMOW	Tritium TU
UBC008	NW corner of Section I	UBC-B	-20.2	-3.78	<1
MW041T	SW of Section I, west of Paleo-Channel	TLS	-21	-4.16	<1
MW010		SSDL	-21.1	-4.14	<1
MW040P		PSDL	-18.7	-3.53	<1
UBC011		UBC-A	-20.7	-3.71	<1
MW073T	NE of Section I, west of Paleo-Channel	TLS	-21.3	-3.93	<1
MW035S		SSDL	-19.2	-3.91	<1
MW072P		PSDL	-18.4	-3.51	<1
UBC019		UBC-A	-21	-3.7	<1
MW101T	SE Section III in Paleo-Channel	TLS	-17.1	-3.22	<1
MW102S		SSDL	-17.9	-3.34	<1
MW103P		PSDL	-17.7	-3.39	<1
UBC031		UBC-A	-20	-3.63	<1
MW139S	NE of Section III in Paleo-Channel	SSDL	-18.7	-3.62	<1
MW126T	NE of Section III, east of Paleo-Channel	TLS	-16.3	-3.08	<1
MW094PR		PSDL	-17.6	-3.43	<1
UBC025		UBC-A	-18.4	-3.45	<1
MW141T	SE part of Site in Paleo-Channel	TLS	-14.7	-2.79	<1
UBC055		UBC-A	-18.6	-3.34	<1

**Notes:**

dD = ratio of deuterium to hydrogen; measured relative to Vienna Standard

Mean Ocean Water (VSMOW).

d18O = ratio of oxygen-18 to oxygen-16; measured relative to VSMOW

Tritium measured in tritium units (TU).

TLS = Transitional Lang Syne Zone

SSDL = Secondary Sawdust Landing Zone

PSDL = Primary Sawdust Landing Zone

UBC-A = Upper Black Creek-A Zone

UBC-B = Upper Black Creek-B Zone

**ATTACHMENT A**

**FIELD FORMS**

4

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MV - 073 T  
 Field Personnel B R 3 JL  
 Weather Conditions Rain  
 Total Depth (ft.) 68 (from well log)  $\Delta h = 25.93$   
 Depth to Static Water Surface (ft.) 42.07  
 Calculated Well Volume (1 casing volume) (gal.) 17  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 85  
 Measured Flow Rate (gal/min) .5 GPM  
 Calculated Pumping Time (length of time in minutes) 34  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time 1341  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purguing (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH 9.41.12 Date

Purge Start Time	<u>1313</u>	Purge Stop Time	<u>15:00</u>
Purge Date	<u>9/4/12</u>	Total Gallons Purged	<u>18</u>
Purge Method	<u>WW</u>		

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—			18		
Time	-	<u>1313</u>	<del>1313</del>	<del>1313</del>	<u>17:20</u>		
Temperature	°C	<u>22.07</u>			<u>20.62</u>		
pH	Std. units	<u>6.89</u>			<u>6.98</u>		
Conductivity	µmhos/cm	<u>208</u>			<u>180</u>		
Turbidity	NTUs	—			<u>0</u>		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)		

2 "

## PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID UBC 068 Sample Time 15:20  
 Field Personnel BR, JL Sample Date 9. 4.12  
 Weather Conditions Rain, Cloudy Air Temperature (°F) 88  
 Total Depth (ft.) 120 (from well log) Water = 73.62  
 Depth to Static Water Surface (ft.) 46.37  
 Calculated Well Volume (1 casing volume) (gal.) 13  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 65  
 Measured Flow Rate (gal/min) 5 Spm  
 Calculated Pumping Time (length of time in minutes)  
 Actual Pumping Time (length of time in minutes) 26  
 Check-back Time 1:15  
 Recovery Time (if needed) 0  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 7.6/7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 7.0/7.0 pH Date 9. 4.12

Purge Start Time 12:45  
 Purge Date 9. 4. 12  
 Purge Method WW

Purge Stop Time 15:20  
 Total Gallons Purged 50

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	Gal.	—	13	26	50		
Time	-	12:46	13:20	13:50	15:15		
Temperature	°C	22.72	20.90	20.02	20.08		
pH	Std. units	7.91	7.32	6.34	6.51		
Conductivity	µmhos/cm	133	130	117	121		
Turbidity	NTUs	—	—	—	8.31		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 0408 Sample Time 16:35  
 Field Personnel BR, JL Sample Date 9.4.12  
 Weather Conditions Rain, clouds Air Temperature (°F) 87  
 Total Depth (ft.) 93 (from well log)  
 Depth to Static Water Surface (ft.) 49.81 LwIC 43.19  
 Calculated Well Volume (1 casing volume) (gal.) 29  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 145  
 Measured Flow Rate (gal/min) 1 GPM  
 Calculated Pumping Time (length of time in minutes) 29  
 Actual Pumping Time (length of time in minutes) 14:00  
 Check-back Time 14:22  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH 9.4.12 Date

Purge Start Time 13:30  
 Purge Date 9/4/12  
 Purge Method WW

Purge Stop Time 16:35  
 Total Gallons Purged 90

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	29	58	87		
Time	-	1331	14:15	15:	16 "	<16.25	
Temperature	°C	26.94	26.02	26.30	26.09		
pH	Std. units	7.63	6.65	6.79	6.59		
Conductivity	µmhos/cm	170	138	139	135		
Turbidity	NTUs	—	—	—	0.0		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

BT

## PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID VBC 011 Sample Time 17:15  
 Field Personnel BR, JL Sample Date 9.4.12  
 Weather Conditions Rain Air Temperature (°F) 87  
 Total Depth (ft.) 108 (from well log) LWC = 57.79  
 Depth to Static Water Surface (ft.) 50.21  
 Calculated Well Volume (1 casing volume) (gal.) 38  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 190  
 Measured Flow Rate (gal/min) 5 gpm  
 Calculated Pumping Time (length of time in minutes) 76 min  
 Actual Pumping Time (length of time in minutes) -  
 Check-back Time 14:56  
 Recovery Time (if needed) -  
 pH Calibration During Purgung (4, 7, 10) (circle two) Actual Reading 4.6 / 7.6 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.6 / 7.6 pH 9.4.12 Date

Purge Start Time 13:40  
 Purge Date 9.4.12  
 Purge Method RV

Purge Stop Time 17:05  
 Total Gallons Purged 114

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	-	38	76	114		
Time	-	1342	14:50	1600	17:05		
Temperature	°C	26.79	19.67	20.05	19.88		
pH	Std. units	7.69	6.65	6.68	6.62		
Conductivity	µmhos/cm	136	139	135	132		
Turbidity	NTUs	-	-	-	0.0		

Additional Notes:

### PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW - 10 Sample Time 14:44  
 Field Personnel BR, JC Sample Date 9-5-12  
 Weather Conditions Sunny Air Temperature (°F) 88  
 Total Depth (ft.) 75 (from well log) CWC = 31,42  
 Depth to Static Water Surface (ft.) 43.58  
 Calculated Well Volume (1 casing volume) (gal.) 6  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 30  
 Measured Flow Rate (gal/min) .5 3 pm  
 Calculated Pumping Time (length of time in minutes) 12  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time 13:42  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.6/7.6 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH 9/5/12 Date

Purge Start Time 13:20  
 Purge Date 9-5-12  
 Purge Method WW

Purge Stop Time 14:45  
 Total Gallons Purged 18

	Well Volume	Initial	1	2	3	4	5
Volume Purged	Units	gal.	—	6	12	18	
Time	-	13:25	13:52	14:12	14:44		
Temperature	°C	20.63	20.18	21.01	20.22		
pH	Std. units	7.01	6.93	7.10	7.20		
Conductivity	µmhos/cm	121	167	169	166		
Turbidity	NTUs	—	—	—	0.0		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID	<u>UBC 034</u>	Sample Time	<u>17:00</u>
Field Personnel	<u>BL, JL</u>	Sample Date	<u>9-5-12</u>
Weather Conditions	<u>SUNNY</u>	Air Temperature (°F)	<u>87</u>
Total Depth (ft.)	<u>132</u>	(from well log)	<u>71.95 LWT</u>
Depth to Static Water Surface (ft.)	<u>60.05</u>		
Calculated Well Volume (1 casing volume) (gal.)	<u>47</u>		
Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.)	<u>235</u>		
Measured Flow Rate (gal/min)	<u>5</u>		
Calculated Pumping Time (length of time in minutes)	<u>94</u>		
Actual Pumping Time (length of time in minutes)			
Check-back Time	<u>12:24</u>		
Recovery Time (if needed)	<u>—</u>		
pH Calibration During Purging (4, 7, 10) (circle two)	<u>4, 7</u>	Actual Reading	<u>4.0 / 7.0</u> pH
pH Calibration During Sampling (4, 7, 10) (circle two)	<u>4, 7</u>	Actual Reading	<u>4.0 / 7.0</u> pH
		Date	<u>9-5-12</u>
Purge Start Time	<u>10:50</u>	Purge Stop Time	<u>17:00</u>
Purge Date	<u>9-5-12</u>	Total Gallons Purged	<u>141</u>
Purge Method	<u>VW</u>		

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	<u>—</u>	<u>47</u>	<u>94</u>	<u>141</u>		
Time	-	<u>10:55</u>	<u>13:43</u>	<u>15:00</u>	<u>17:00</u>		
Temperature	°C	<u>20.27</u>	<u>20.22</u>	<u>20.58</u>	<u>20.61</u>		
pH	Std. units	<u>6.73</u>	<u>6.58</u>	<u>6.59</u>	<u>6.52</u>		
Conductivity	µmhos/cm	<u>191</u>	<u>191</u>	<u>184</u>	<u>181</u>		
Turbidity	NTUs	<u>—</u>	<u>—</u>	<u>—</u>	<u>0.0</u>		

Additional Notes:

## PRESERVATION:

- |                               |   |                                       |   |
|-------------------------------|---|---------------------------------------|---|
| Samples Iced In Field (>45°F) | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> | Sulfide (Zn acetate and NaOH)         | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| VOC                           | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | Cyanide (NaOH)                        | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| Metals (HNO <sub>3</sub> )    | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | Dioxins / Furans (sodium thiosulfate) | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| Rinsate Blank                 | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | Field Blank                           | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| Metals verified (<2 pH)       | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | (10% of samples verified per SAP)     |   |

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW-1355 Sample Time 1510  
 Field Personnel BR, JL Sample Date 9/5/12  
 Weather Conditions Sunny Air Temperature (°F) 87°  
 Total Depth (ft.) 97 (from well log)  
 Depth to Static Water Surface (ft.) 57.57 LWC = 39.4  
 Calculated Well Volume (1 casing volume) (gal.) 26  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 130  
 Measured Flow Rate (gal/min) 15 GPM  
 Calculated Pumping Time (length of time in minutes) 52  
 Actual Pumping Time (length of time in minutes) -  
 Check-back Time 10:28  
 Recovery Time (if needed) -  
 pH Calibration During Purguing (4, 7, 10) (circle two) Actual Reading 4.6/7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.6/7.0 pH 9/5/12 Date  
 Purge Start Time 9-5-12 Purge Stop Time 1510  
 Purge Date 9:35 Total Gallons Purged 78  
 Purge Method WW

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	26	52	78		
Time	-	0938	10:43	13:36	1510		
Temperature	°C	21.52	19.83	20.31	20.17		
pH	Std. units	8.0	6.78	7.11	6.89		
Conductivity	µmhos/cm	138	162	154	141		
Turbidity	NTUs	—	—	—	0.0		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 125 P Sample Time 1615  
 Field Personnel BF SL Sample Date 9/5/12  
 Weather Conditions Sunny Air Temperature (°F) 88  
 Total Depth (ft.) 119 (from well log)  
 Depth to Static Water Surface (ft.) 58.84 LWC = 60.16  
 Calculated Well Volume (1 casing volume) (gal.) 40  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 200  
 Measured Flow Rate (gal/min) .5 GPM  
 Calculated Pumping Time (length of time in minutes) 80  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time 16:40,  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.6 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4 / 7 pH 9/5/12 Date

Purge Start Time	<u>9:25</u>	Purge Stop Time	<u>1615</u>
Purge Date	<u>9-5-12</u>	Total Gallons Purged	<u>120</u>
Purge Method	<u>WW</u>		

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	<u>—</u>	<u>40</u>	<u>80</u>	<u>120</u>		
Time	-	<u>0922</u>	<u>10:42</u>	<u>13:38</u>	<u>1615</u>		
Temperature	°C	<u>20.83</u>	<u>19.80</u>	<u>20.42</u>	<u>20.26</u>		
pH	Std. units	<u>7.83</u>	<u>6.84</u>	<u>6.55</u>	<u>6.63</u>		
Conductivity	µmhos/cm	<u>120</u>	<u>138</u>	<u>136</u>	<u>134</u>		
Turbidity	NTUs	<u>—</u>	<u>—</u>	<u>—</u>	<u>0.17</u>		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals ( $\text{HNO}_3$ )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 038 SR Sample Time 17.18  
 Field Personnel BR, JL Sample Date 9-5-12  
 Weather Conditions \_\_\_\_\_ Air Temperature (°F) \_\_\_\_\_  
 Total Depth (ft.) 85 (from well log) LWC = 30.83  
 Depth to Static Water Surface (ft.) 54.17  
 Calculated Well Volume (1 casing volume) (gal.) 21  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 105  
 Measured Flow Rate (gal/min) .5 GPM  
 Calculated Pumping Time (length of time in minutes) \_\_\_\_\_  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time \_\_\_\_\_  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.6 / 7.8 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.6 / 7.0 pH 9.5.12 Date

Purge Start Time	<u>9-5-12</u>	Purge Stop Time	<u>10:28</u>
Purge Date	<u>9.10</u>	Total Gallons Purged	<u>21</u>
Purge Method	<u>WW</u>		

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—	0 sample				
Time	-	8910	17:18				
Temperature	°C	20.72	21.57				
pH	Std. units	7.22	7.38				
Conductivity	µmhos/cm	161	160				
Turbidity	NTUs	—	2.62				

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID M W O 41 T Sample Time 1545  
 A" Field Personnel BR, JL Sample Date 9/5/12  
 Weather Conditions Sunny Air Temperature (°F) 88  
 Total Depth (ft.) 63.0 (from well log)  
 Depth to Static Water Surface (ft.) 40.77 LWC = 22.23  
 Calculated Well Volume (1 casing volume) (gal.) 15  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 75  
 Measured Flow Rate (gal/min) -5 50 ~  
 Calculated Pumping Time (length of time in minutes) 30  
 Actual Pumping Time (length of time in minutes) 40  
 Check-back Time 16:40  
 Recovery Time (if needed) 24  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4 / 7 pH 9/5/12 Date

Purge Start Time 16:10  
 Purge Date 9. 4. 12  
 Purge Method WW

Purge Stop Time 16:55  
 Total Gallons Purged 0.24 (15)

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—	15	30	45	0 Sample	—
Time	-	16:10	16:56				1548
Temperature	°C	20.77	20.68				21.24
pH	Std. units	6.80	6.70				7.14
Conductivity	µmhos/cm	160	160				170
Turbidity	NTUs	—	—				8.37

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 0355 Sample Time 15:30  
 Field Personnel BR JL Sample Date 9-5-12  
 Weather Conditions Sunny Air Temperature (°F) 68  
 Total Depth (ft.) 83 (from well log) CWC = 32.8'  
 Depth to Static Water Surface (ft.) 50.19  
 Calculated Well Volume (1 casing volume) (gal.) 22  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 110  
 Measured Flow Rate (gal/min) 5 gpm  
 Calculated Pumping Time (length of time in minutes) 44  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time 15:44  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH 9.5.12 Date

Purge Start Time 15:00  
 Purge Date 9-4-12  
 Purge Method WW

Purge Stop Time 17:20  
 Total Gallons Purged 25 (DRY)

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	22	—	0 sample	—	—
Time	-	15:05	15:44	—	15:30	—	—
Temperature	°C	20.57	26.07	—	21.19	—	—
pH	Std. units	6.65	6.70	—	6.78	—	—
Conductivity	µmhos/cm	120	120	—	128	—	—
Turbidity	NTUs	—	—	—	6.76	—	—

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW - 134T  
 Field Personnel BR JL  
 Weather Conditions Sunny  
 Total Depth (ft.) 74  
 Depth to Static Water Surface (ft.) 41.13  
 Calculated Well Volume (1 casing volume) (gal.) 22  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 110  
 Measured Flow Rate (gal/min) 5 GPM  
 Calculated Pumping Time (length of time in minutes)  
 Actual Pumping Time (length of time in minutes)  
 Check-back Time 9:50  
 Recovery Time (if needed)  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.6/2.6 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.6/7.0 pH Date 9.5.12

Purge Start Time

9:05

Purge Stop Time

10:28

Purge Date

9-5-12

Total Gallons Purged

25

Purge Method

WW

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	22	44	65 sample		
Time	-	9:05			17:25		
Temperature	°C	18.62			20.22		
pH	Std. units	7.22			7.25		
Conductivity	µmhos/cm	319			293		
Turbidity	NTUs	—			0.0		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F) Yes  No   
 VOC Yes  No   
 Metals (HNO<sub>3</sub>) Yes  No   
 Rinsate Blank Yes  No   
 Metals verified (<2 pH) Yes  No

Sulfide (Zn acetate and NaOH)

Yes  No

Cyanide (NaOH)

Yes  No

Dioxins / Furans (sodium thiosulfate)

Yes  No

Field Blank

Yes  No

(10% of samples verified per SAP)

< pH

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW C 81T Sample Time 1605  
 Field Personnel BK, JL Sample Date 9/6/12  
 Weather Conditions P. Cloudy Air Temperature (°F) 85  
 Total Depth (ft.) 98 (from well log)  
 Depth to Static Water Surface (ft.) 82.57  $LWC = 15.43$   
 Calculated Well Volume (1 casing volume) (gal.) 11  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 55  
 Measured Flow Rate (gal/min) 0.30 GPM  
 Calculated Pumping Time (length of time in minutes) 33  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time 11:20  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH 9/6/12 Date

Purge Start Time 1248  
 Purge Date 9-6-12  
 Purge Method WW

Purge Stop Time 1212  
 Total Gallons Purged 11.5

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	11	22	Csample		
Time	-	1052	11:24	1607			
Temperature	°C	20.69	19.99	21.52			
pH	Std. units	8.33	6.99	6.88			
Conductivity	µmhos/cm	161	159	164			
Turbidity	NTUs	—	—	0.0			

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 90 SR Sample Time 1555

Field Personnel BL JL Sample Date 9/6/12

Weather Conditions P. Cloudy Air Temperature (°F) 85

Total Depth (ft.) 116 (from well log)

Depth to Static Water Surface (ft.) 84.21 CWC = 31.79

Calculated Well Volume (1 casing volume) (gal.) 21

Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 105

Measured Flow Rate (gal/min) 0.30 GPM

Calculated Pumping Time (length of time in minutes) 35

Actual Pumping Time (length of time in minutes) ~

Check-back Time -

Recovery Time (if needed) -

pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH

pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4 / 7 pH 9/6/12 Date

Purge Start Time	<u>10:44</u>
Purge Date	<u>9-6-12</u>
Purge Method	<u>VW</u>

Purge Stop Time 1319  
Total Gallons Purged 25

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—	21	42	Csample		
Time	—	1055	1215	1557			
Temperature	°C	19.93	20.64	21.97			
pH	Std. units	7.08	7.75	7.63			
Conductivity	µmhos/cm	210	203	207			
Turbidity	NTUs	—	—	0.0			

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)		

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID M6-0595 Sample Time 14:12  
 Field Personnel BL JL Sample Date 9-6-12  
 Weather Conditions Cloudy Air Temperature (°F) 83  
 Total Depth (ft.) 79 (from well log) LWC = 16.0  
 Depth to Static Water Surface (ft.) 62.91  
 Calculated Well Volume (1 casing volume) (gal.) 11  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 55  
 Measured Flow Rate (gal/min) 0.30 GPM  
 Calculated Pumping Time (length of time in minutes) 33  
 Actual Pumping Time (length of time in minutes) 180 min  
 Check-back Time —  
 Recovery Time (if needed) —  
 pH Calibration During Purgung (4, 7, 10) (circle two) Actual Reading 4.6/7.6 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.6/7.0 pH 9-6-12 Date

Purge Start Time	<u>10:00</u>	Purge Stop Time	<u>13:12</u>
Purge Date	<u>9-6-12</u>	Total Gallons Purged	<u>24 OR 1</u>
Purge Method	<u>WW</u>		

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	11	22	<u>Sample</u>	—	—
Time	-	<u>1003</u>	<u>11:18</u>	<u>1228</u>	<u>1312</u>	—	—
Temperature	°C	<u>20.18</u>	<u>20.58</u>	<u>20.87</u>	<u>22.37</u>	—	—
pH	Std. units	<u>10.24</u>	<u>9.27</u>	<u>8.44</u>	<u>8.25</u>	—	—
Conductivity	µmhos/cm	<u>175</u>	<u>215</u>	<u>233</u>	<u>241</u>	—	—
Turbidity	NTUs	—	—	—	<u>0.0</u>	—	—

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID UBC - 052 Sample Time 14:20  
 Field Personnel BR, JL Sample Date 9-6-12  
 Weather Conditions Cloudy Air Temperature (°F) 83  
 Total Depth (ft.) 118 (from well log)  
 Depth to Static Water Surface (ft.) 66.03  $LWC = 51.97$   
 Calculated Well Volume (1 casing volume) (gal.) 34  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 170  
 Measured Flow Rate (gal/min) 0.5 GPM  
 Calculated Pumping Time (length of time in minutes) 6.8  
 Actual Pumping Time (length of time in minutes) 240 + min  
 Check-back Time \_\_\_\_\_  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.6 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.6 / 7.0 pH 9-6-12 Date

Purge Start Time 9:59  
 Purge Date 9-6-12  
 Purge Method WW

Purge Stop Time 1232  
 Total Gallons Purged 25

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	34	68	103		
Time	-	1004	1422				
Temperature	°C	24.83	22.97				
pH	Std. units	8.73	7.07				
Conductivity	µmhos/cm	122	123				
Turbidity	NTUs	—	2.68				

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID M W C 4 8 TR Sample Time 14:40  
 Field Personnel BR, JL Sample Date 9-6-12  
 Weather Conditions Cloudy Air Temperature (°F) 82  
 Total Depth (ft.) 65 (from well log)  
 Depth to Static Water Surface (ft.) 42.19 CW<sub>22</sub>. 81  
 Calculated Well Volume (1 casing volume) (gal.) 15  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 75  
 Measured Flow Rate (gal/min) .5 rpm  
 Calculated Pumping Time (length of time in minutes) 30  
 Actual Pumping Time (length of time in minutes)    
 Check-back Time 17:23  
 Recovery Time (if needed) 24  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH Date 9-6-12

Purge Start Time 16:53  
 Purge Date 9-5-12  
 Purge Method WW

Purge Stop Time 17:44  
 Total Gallons Purged 15

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—			① sample		
Time	-	16:53			14:40		
Temperature	°C	20.25			21.71		
pH	Std. units	7.19			7.27		
Conductivity	µmhos/cm	187			170		
Turbidity	NTUs	—			6.93		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

4 Well / Sample ID MW - 072 F Sample Time 15:00  
 Field Personnel BL, JL Sample Date 9-6-12  
 Weather Conditions Cloudy Air Temperature (°F) 82  
 Total Depth (ft.) 101 (from well log)  
 Depth to Static Water Surface (ft.) 55.98 (SWL = 45.02)  
 Calculated Well Volume (1 casing volume) (gal.) 24  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 120  
 Measured Flow Rate (gal/min) 5 gpm  
 Calculated Pumping Time (length of time in minutes)  
 Actual Pumping Time (length of time in minutes) 48  
 Check-back Time 16:20  
 Recovery Time (if needed)  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH 9/6/12 Date  

Purge Start Time	<u>9:35</u>	Purge Stop Time	<u>15:00</u>
Purge Date	<u>9-6-12</u>	Total Gallons Purged	<u>98</u>
Purge Method	<u>Grundfos</u>		

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—	24	48	82	96	
Time	-	9:39	11:06	11:57	13:04	14:48	
Temperature	°C	20.54	22.71	23.57	23.56	23.47	
pH	Std. units	11.96	11.47	11.68	11.11	10.66	
Conductivity	µmhos/cm	2005	577	786	380	319	
Turbidity	NTUs	—	—	—	0.0	0.0	

Additional Notes:

## PRESERVATION:

- |                               |   |                                       |   |
|-------------------------------|---|---------------------------------------|---|
| Samples Iced In Field (>45°F) | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> | Sulfide (Zn acetate and NaOH)         | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| VOC                           | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | Cyanide (NaOH)                        | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| Metals (HNO <sub>3</sub> )    | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | Dioxins / Furans (sodium thiosulfate) | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| Rinsate Blank                 | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | Field Blank                           | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| Metals verified (<2 pH)       | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | (10% of samples verified per SAP)     |   |

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 061T Sample Time 1240  
 Field Personnel BR JL Sample Date 7/6/12  
 Weather Conditions P. Cloudy Air Temperature (°F) 81°  
 Total Depth (ft.) 60 (from well log) LWC = 19.73  
 Depth to Static Water Surface (ft.) 40.27  
 Calculated Well Volume (1 casing volume) (gal.) 13  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 65  
 Measured Flow Rate (gal/min) .5 SPM  
 Calculated Pumping Time (length of time in minutes) 26  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time 17:02  
 Recovery Time (if needed) 24  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH 9/6/12 Date

Purge Start Time	<u>9-5-12</u>	Purge Stop Time	<u>17:36</u>
Purge Date	<u>16:36</u>	Total Gallons Purged	<u>18</u>
Purge Method	<u>WW</u>		

	Well Volume	Initial	1	2	3	4	5
	Units				C Sample		
Volume Purged	gal.	<u>—</u>	<u>13</u>	<u>26</u>	<u>4</u>		
Time	-17:12	<del>20-11</del>			<u>1240</u>		
Temperature	°C	<u>20.11</u>	<del>22.11</del>		<u>20.78</u>		
pH	Std. units	<u>7.15</u>	<u>7.47</u>		<u>7.02</u>		
Conductivity	µmhos/cm	<u>506</u>	<del>577</del>		<u>488</u>		
Turbidity	NTUs	<u>—</u>			<u>0.0</u>		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID SL-023 Sample Time 1540  
 Field Personnel BR, JC Sample Date 9/7/12  
 Weather Conditions Sunny Air Temperature (°F) 83°  
 Total Depth (ft.) 92 (from well log)  
 Depth to Static Water Surface (ft.) 54.67  $LW C = 37.37$   
 Calculated Well Volume (1 casing volume) (gal.) 25  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 125  
 Measured Flow Rate (gal/min) .75 50m  
 Calculated Pumping Time (length of time in minutes) 28  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time 11:42  
 Recovery Time (if needed) \_\_\_\_\_

pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.6 / 7.4 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.1 / 7 pH 9/7/12 Date

Purge Start Time	<u>11:14</u>	Purge Stop Time	<u>1540</u>
Purge Date	<u>9-7-12</u>	Total Gallons Purged	<u>75</u>
Purge Method	<u>WW</u>		

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	<u>—</u>	<u>25</u>	<u>50</u>	<u>75</u>		
Time	-	<u>11:15</u>	<u>13:30</u>	<u>14:39</u>	<u>15:32</u>		
Temperature	°C	<u>20.36</u>	<u>20.15</u>	<u>20.32</u>	<u>19.91</u>		
pH	Std. units	<u>6.22</u>	<u>7.28</u>	<u>6.54</u>	<u>6.45</u>		
Conductivity	µmhos/cm	<u>151</u>	<u>132</u>	<u>132</u>	<u>131</u>		
Turbidity	NTUs	<u>—</u>	<u>—</u>	<u>—</u>	<u>0.58</u>		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 058P Sample Time 15:15  
 Field Personnel BR, JL Sample Date 9-7-12  
 Weather Conditions Sunny Air Temperature (°F) 83  
 Total Depth (ft.) 95 (from well log)  
 Depth to Static Water Surface (ft.) 63.26  $c_w c = 31.74$   
 Calculated Well Volume (1 casing volume) (gal.) 21  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 105  
 Measured Flow Rate (gal/min) .5 spm  
 Calculated Pumping Time (length of time in minutes) 42  
 Actual Pumping Time (length of time in minutes) 41:30  
 Check-back Time 11:30  
 Recovery Time (if needed) 1  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.6/7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH 9.7-12 Date

Purge Start Time 10:50  
 Purge Date 9-7-12  
 Purge Method WW

Purge Stop Time 15:15  
 Total Gallons Purged 63

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	22	42	63		
Time	-	1052	11:40	14:30	15:15		
Temperature	°C	21.00	21.46	20.83	20.80		
pH	Std. units	6.79	6.50	6.75	6.85		
Conductivity	µmhos/cm	161	172	170	169		
Turbidity	NTUs	—	—	—	0.0		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals ( $\text{HNO}_3$ )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 091 PR Sample Time 16:30  
 Field Personnel BF, JL Sample Date 9-7-12  
 Weather Conditions SUNNY Air Temperature (°F) 82

Total Depth (ft.) 127 (from well log)

Depth to Static Water Surface (ft.) 84.33

$$LWC = 42.67$$

Calculated Well Volume (1 casing volume) (gal.) 28

Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 140

Measured Flow Rate (gal/min) 1.0 GPM

Calculated Pumping Time (length of time in minutes) 28

Actual Pumping Time (length of time in minutes) -

Check-back Time 11:06

Recovery Time (if needed) -

pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH

pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH 9-7-12 Date

Purge Start Time 10:15  
 Purge Date 9-7-12  
 Purge Method UV

Purge Stop Time 16:30  
 Total Gallons Purged 84

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—	28	56	84		
Time	-	10:20	1325	1458	1630		
Temperature	°C	21.83	20.66	20.38	20.62		
pH	Std. units	6.40	6.53	6.49	6.41		
Conductivity	µmhos/cm	118	128	126	125		
Turbidity	NTUs	—	—	—	0.0		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW - 63 SR Sample Time 9-7-12  
 Field Personnel BR, JL Sample Date 13:35  
 Weather Conditions Sunny Air Temperature (°F) 83  
 Total Depth (ft.) 86.58 118 (from well log)  
 Depth to Static Water Surface (ft.) 86.58 CWC = 31.42  
 Calculated Well Volume (1 casing volume) (gal.) 21  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 105  
 Measured Flow Rate (gal/min) 0.55 GPM  
 Calculated Pumping Time (length of time in minutes) 42  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time 10:38  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH Date 9-7-12  
 Purge Start Time 9:51 Purge Stop Time 11:44  
 Purge Date 9-7-12 Total Gallons Purged 21 (OK)  
 Purge Method VV

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	<u>—</u>	<u>21</u>	<u>(0)</u> sample			
Time	-	<u>2955</u>	<u>44</u>	<u>13:35</u>			
Temperature	°C	<u>19.79</u>	<u>22.92</u>	<u>20.80</u>			
pH	Std. units	<u>6.54</u>	<u>6.62</u>	<u>6.78</u>			
Conductivity	µmhos/cm	<u>172</u>	<u>149</u>	<u>150</u>			
Turbidity	NTUs	<u>—</u>	<u>—</u>				

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID JBC 019 Sample Time 14:00  
 Field Personnel BR, JL Sample Date 9-7-12  
 Weather Conditions SUNNY Air Temperature (°F) 94  
 Total Depth (ft.) 121.76 (from well log)  
 Depth to Static Water Surface (ft.) 56.64 LWC = 65.06  
 Calculated Well Volume (1 casing volume) (gal.) 43  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 215  
 Measured Flow Rate (gal/min) 1.9 pm  
 Calculated Pumping Time (length of time in minutes) 43  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time 10:00  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH 9-7-12 Date

Purge Start Time	<u>9:00</u>	Purge Stop Time	<u>14:00</u>
Purge Date	<u>9-7-12</u>	Total Gallons Purged	<u>129</u>
Purge Method	<u>Grundfos</u>		

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—	43	86	129		
Time	-	9.35	1033	1150	14:00		
Temperature	°C	21.66	22.38	22.92	22.72		
pH	Std. units	6.27	6.58	6.62	6.70		
Conductivity	µmhos/cm	147	149	149	149		
Turbidity	NTUs	—	—	—	0.0		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 052T Sample Time 1535  
 Field Personnel BR, JL Sample Date 9/1/12  
 Weather Conditions Sunny Air Temperature (°F) 83°  
 Total Depth (ft.) 55 (from well log)  
 Depth to Static Water Surface (ft.) 45.50 CWC = 9.5  
 Calculated Well Volume (1 casing volume) (gal.) 7  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 35  
 Measured Flow Rate (gal/min) .3 gpm  
 Calculated Pumping Time (length of time in minutes) 21  
 Actual Pumping Time (length of time in minutes) —  
 Check-back Time —  
 Recovery Time (if needed) —  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0 / 2.6 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4 / 1.7 pH 9/1/12 Date

Purge Start Time 1334  
 Purge Date 9/1/12  
 Purge Method WW

Purge Stop Time 15:15  
 Total Gallons Purged 7 (DRY)

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—	7	—	Sample		
Time	-	13:36	15:14	15:39			
Temperature	°C	21.28	21.91	20.70			
pH	Std. units	7.55	7.62	7.11			
Conductivity	µmhos/cm	277	293	291			
Turbidity	NTUs	—	—	5.34			

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals ( $\text{HNO}_3$ )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 021 Sample Time 9-7-12  
 Field Personnel BR, JL Sample Date 15:20  
 Weather Conditions Sunny Air Temperature (°F) 83  
 Total Depth (ft.) 64 (from well log) LWC = 16.79  
 Depth to Static Water Surface (ft.) 47.21  
 Calculated Well Volume (1 casing volume) (gal.) 3  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 15  
 Measured Flow Rate (gal/min) 25 gpm  
 Calculated Pumping Time (length of time in minutes) 12  
 Actual Pumping Time (length of time in minutes)  
 Check-back Time 13:43,  
 Recovery Time (if needed)  
 pH Calibration During Purguing (4, 7, 10) (circle two) Actual Reading 4.0/7.6 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0/7.6 pH 9-7-12 Date

Purge Start Time 13:31  
 Purge Date 9-6-12  
 Purge Method w w

Purge Stop Time 15:13  
 Total Gallons Purged 3 (DRY)

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—	3		(6) Sample		
Time	-	13:31			15:20		
Temperature	°C	21.75			24.65		
pH	Std. units	7.95			6.41		
Conductivity	µmhos/cm	211			244		
Turbidity	NTUs	—			6.17		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	(10% of samples verified per SAP)	

< pH

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 102 S Sample Time 1546  
 Field Personnel B R, JL Sample Date 9/10/12  
 Weather Conditions Sunny Air Temperature (°F) 82°  
 Total Depth (ft.) 127 (from well log)  
 Depth to Static Water Surface (ft.) 91.72  $l_w C = 35.28$   
 Calculated Well Volume (1 casing volume) (gal.) 24  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 120  
 Measured Flow Rate (gal/min) 5.25 Gpm  
 Calculated Pumping Time (length of time in minutes)  
 Actual Pumping Time (length of time in minutes)  
 Check-back Time  
 Recovery Time (if needed)  
 pH Calibration During Purguing (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4/7 pH 9/10/12 Date

Purge Start Time 1012  
 Purge Date 9-10-12  
 Purge Method WW

Purge Stop Time 1545  
 Total Gallons Purged 72

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	24	48	72		
Time	-	1014	1015	1310	1545		
Temperature	°C	20.83	20.02	20.29	20.47		
pH	Std. units	7.11	6.76	6.73	6.60		
Conductivity	µmhos/cm	155	167	167	164		
Turbidity	NTUs	—	—	—	0.0		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals ( $HNO_3$ )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 126 T Sample Time 8/16:20

Field Personnel BR JL Sample Date 9-16-12

Weather Conditions SUNNY Air Temperature (°F) 83

Total Depth (ft.) 138 (from well log)

Depth to Static Water Surface (ft.) 102.68 CLC = 35.32

Calculated Well Volume (1 casing volume) (gal.) 24

Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 120

Measured Flow Rate (gal/min) .5 9pm

Calculated Pumping Time (length of time in minutes) 48

Actual Pumping Time (length of time in minutes) 14:38

Check-back Time -

Recovery Time (if needed) 24

pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH

pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 11.0/1.0 pH

9/16/12 Date

Purge Start Time 13:56 Purge Stop Time 16:20

Purge Date 9-16-12 Total Gallons Purged 24

Purge Method NV

	Well Volume Units	Initial	1	2	3	4	5
			1	2	3	4	5
Volume Purged	gal.	—	24				
Time	-	13:56	15:00		16:20		
Temperature	°C	21.86	20.95		22.14		
pH	Std. units	6.94	7.23		6.53		
Conductivity	µmhos/cm	199	193		195		
Turbidity	NTUs	—	—				

Additional Notes:

## PRESERVATION:

- |                               |   |                                       |   |
|-------------------------------|---|---------------------------------------|---|
| Samples Iced In Field (>45°F) | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> | Sulfide (Zn acetate and NaOH)         | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| VOC                           | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | Cyanide (NaOH)                        | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| Metals (HNO <sub>3</sub> )    | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | Dioxins / Furans (sodium thiosulfate) | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| Rinsate Blank                 | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | Field Blank                           | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| Metals verified (<2 pH)       | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | (10% of samples verified per SAP)     |   |

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID UBC-821 Sample Time 1440  
 Field Personnel BR, JL Sample Date 9-10-12  
 Weather Conditions Sunny Air Temperature (°F) 63°  
 Total Depth (ft.) 150 (from well log) LWC = 78.8  
 Depth to Static Water Surface (ft.) 71.19  
 Calculated Well Volume (1 casing volume) (gal.) 51  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 255  
 Measured Flow Rate (gal/min) 1 GPM  
 Calculated Pumping Time (length of time in minutes) 51 min  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time 10:05  
 Recovery Time (if needed) —  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0 | 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0 | 7.0 pH 9-10-12 Date  
 Purge Start Time 9-10-12 ↪ Purge Stop Time 14:35  
 Purge Date 0912 ↪ Total Gallons Purged 153  
 Purge Method Ground fas

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	51	102	153		
Time	-	0919	1200	1325	1435		
Temperature	°C	20.49	22.95	22.64	22.73		
pH	Std. units	6.14	6.23	5.85	6.00		
Conductivity	µmhos/cm	122	124	120	120		
Turbidity	NTUs	—	—	—	123		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID JBC - 031 Sample Time 15:40  
 Field Personnel BL, JL Sample Date 9-16-12  
 Weather Conditions Sunny Air Temperature (°F) 82  
 Total Depth (ft.) 155 (from well log)  
 Depth to Static Water Surface (ft.) 92.21 (WC = 62.75)  
 Calculated Well Volume (1 casing volume) (gal.) 42  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 210  
 Measured Flow Rate (gal/min) 5.33 GPM  
 Calculated Pumping Time (length of time in minutes) 84  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time \_\_\_\_\_  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purguing (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH  
 pH Calibration During Sampling (4) (10) (circle two) Actual Reading 4.1/7 pH 9/10/12 Date  
 Purge Start Time 10:05 Purge Stop Time 15:35  
 Purge Date 9-16-12 Total Gallons Purged 126  
 Purge Method WW

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	42	84	126		
Time	-	10:06	11:06	1320	1542		
Temperature	°C	21.43	21.00	20.05	19.92		
pH	Std. units	6.85	6.69	6.55	6.39		
Conductivity	µmhos/cm	104	114	112	112		
Turbidity	NTUs	—	—	—	0.0		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID VBC 026 Sample Time 9-16-12  
 Field Personnel BR JC Sample Date 13:15  
 Weather Conditions Sunny Air Temperature (°F) 83  
 Total Depth (ft.) 133 (from well log)  
 Depth to Static Water Surface (ft.) 85.63 CWC 47.37  
 Calculated Well Volume (1 casing volume) (gal.) 31  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 155  
 Measured Flow Rate (gal/min) .5 5pm  
 Calculated Pumping Time (length of time in minutes) 62  
 Actual Pumping Time (length of time in minutes) 196  
 Check-back Time 10:50  
 Recovery Time (if needed) —  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH 9.16.12 Date

Purge Start Time 9:46  
 Purge Date 9-16-12  
 Purge Method WW

Purge Stop Time

1302

Total Gallons Purged

95

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	31	62	93		
Time	-	0950	1053	11:48	1300		
Temperature	°C	20.19	19.43	19.94	19.91		
pH	Std. units	7.21	7.40	7.51	7.54		
Conductivity	µmhos/cm	159	157	160	163		
Turbidity	NTUs	—	—	—	0.0		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F) Yes  No   
 VOC Yes  No   
 Metals ( $\text{HNO}_3$ ) Yes  No   
 Rinsate Blank Yes  No   
 Metals verified (<2 pH) Yes  No

Sulfide (Zn acetate and NaOH)

Cyanide (NaOH)

Dioxins / Furans (sodium thiosulfate)

Field Blank

(10% of samples verified per SAP)

Yes  No

Yes  No

Yes  No

Yes  No

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID PBC 004 Sample Time 11:29  
 Field Personnel BR JC Sample Date 9-10-12  
 Weather Conditions Sunny, breezy Air Temperature (°F) 82  
 Total Depth (ft.) 105 (from well log)  
 Depth to Static Water Surface (ft.) 54.73 LWC = 50.2  
 Calculated Well Volume (1 casing volume) (gal.) 9  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 45  
 Measured Flow Rate (gal/min) .5 1pm  
 Calculated Pumping Time (length of time in minutes) 18  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time 9:50, 11:51  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH 9-10-12 Date

Purge Start Time 0931  
 Purge Date 9-10-12  
 Purge Method nv

Purge Stop Time 11:29  
 Total Gallons Purged 27

	Well Volume	Initial	1	2	3	4	5
	Units		10:16				
Volume Purged	gal.	—	459	18	27		
Time	-	0933	10:16	10:45	11:29		
Temperature	°C	19.96	19.60	19.44	19.50		
pH	Std. units	6.80	6.20	6.46	6.37		
Conductivity	µmhos/cm	121	128	128	127		
Turbidity	NTUs	—	—	—	0.6		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	(10% of samples verified per SAP)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>

<2 pH

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID JBC 028 AR Sample Time 1455  
 Field Personnel BR / JL Sample Date 9/11/12  
 Weather Conditions \_\_\_\_\_ Air Temperature (°F) \_\_\_\_\_  
 Total Depth (ft.) 167 (from well log)  
 Depth to Static Water Surface (ft.) 100.89  $LWC = 66.11$   
 Calculated Well Volume (1 casing volume) (gal.) 44  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 220  
 Measured Flow Rate (gal/min) 0.56 GPM  
 Calculated Pumping Time (length of time in minutes) —  
 Actual Pumping Time (length of time in minutes) —  
 Check-back Time —  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH 9.11.12 Date  
 Purge Start Time 10:00 Purge Stop Time 1425  
 Purge Date 9-11-12 Total Gallons Purged 45  
 Purge Method WW

	Well Volume Units	Initial	1 Sample	2	3	4	5
Volume Purged	gal.	<u>400</u>	<u>—</u>				
Time	-	<u>1014</u>	<u>1456</u>				
Temperature	°C	<u>20.40</u>	<u>20.89</u>				
pH	Std. units	<u>6.64</u>	<u>6.50</u>				
Conductivity	µmhos/cm	<u>216</u>	<u>202</u>				
Turbidity	NTUs	<u>—</u>	<u>0.0</u>				

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals ( $HNO_3$ )	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 103P Sample Time 14:30  
 Field Personnel BR JL Sample Date 9-11-12  
 Weather Conditions Sunny Air Temperature (°F) 83  
 Total Depth (ft.) 137 (from well log)  
 Depth to Static Water Surface (ft.) 91.86 LWC - 45.14  
 Calculated Well Volume (1 casing volume) (gal.) 30  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 150  
 Measured Flow Rate (gal/min) .5 gpm  
 Calculated Pumping Time (length of time in minutes) 60  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time 10:13, 11:13, 12:13  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH 9-11-12 Date

Purge Start Time 0913  
 Purge Date 9/11/12  
 Purge Method WW

Purge Stop Time 14:30  
 Total Gallons Purged 90

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	30	60	90		
Time	-	0915	10:41	12:50	14:30		
Temperature	°C	19.76	19.99	20.03	21.35		
pH	Std. units	6.01	6.25	6.24	6.23		
Conductivity	µmhos/cm	124	133	132	134		
Turbidity	NTUs	—	—	—	3.04		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 101 T Sample Time 1445  
 Field Personnel BL JL Sample Date 9/11/12  
 Weather Conditions \_\_\_\_\_ Air Temperature (°F) \_\_\_\_\_  
 Total Depth (ft.) 117 (from well log) C = 25.92  
 Depth to Static Water Surface (ft.) 91.68  
 Calculated Well Volume (1 casing volume) (gal.) 17  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 85  
 Measured Flow Rate (gal/min) .5  
 Calculated Pumping Time (length of time in minutes) 35  
 Actual Pumping Time (length of time in minutes) 50  
 Check-back Time \_\_\_\_\_  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purguing (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4 / 7 pH 9/11/12 Date

Purge Start Time	<u>15:50</u>
Purge Date	<u>9-10-12</u>
Purge Method	<u>WW</u>

Purge Stop Time	<u>1741</u>
Total Gallons Purged	<u>17</u>

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	<u>—</u>			<u>6</u> sample		
Time	-	<u>1556</u>			<u>14:43</u>		
Temperature	°C	<u>21.12</u>			<u>21.30</u>		
pH	Std. units	<u>6.21</u>			<u>6.21</u>		
Conductivity	µmhos/cm	<u>200</u>			<u>187</u>		
Turbidity	NTUs	<u>—</u>			<u>0.0</u>		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)		

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 0 96T Sample Time 16:15  
 Field Personnel BR, JL Sample Date 9-11-12  
 Weather Conditions Sunny Air Temperature (°F) 83  
 Total Depth (ft.) 134 (from well log) CWC = 64.19  
 Depth to Static Water Surface (ft.) 69.81  
 Calculated Well Volume (1 casing volume) (gal.) 42  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 210  
 Measured Flow Rate (gal/min) 5 rpm  
 Calculated Pumping Time (length of time in minutes) 84  
 Actual Pumping Time (length of time in minutes) 84  
 Check-back Time 13:20  
 Recovery Time (if needed) 24  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0 / 2.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0 / 1.0 pH Date 9/11/12

Purge Start Time 9-10-12  
 Purge Date 11:50  
 Purge Method WW

Purge Stop Time 13:40  
 Total Gallons Purged 42

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	42	84	(2 samples)		
Time	-	11:55	11:55		16:15		
Temperature	°C	18.84			20.22		
pH	Std. units	6.41			6.69		
Conductivity	µmhos/cm	220			236		
Turbidity	NTUs	—			0.0		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 094 PR Sample Time 1600  
 Field Personnel BR JL Sample Date 9-11-12  
 Weather Conditions Sunny Air Temperature (°F) 83°  
 Total Depth (ft.) 165 (from well log)  
 Depth to Static Water Surface (ft.) 117.19  $c_w = 47.81$   
 Calculated Well Volume (1 casing volume) (gal.) 32  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 160  
 Measured Flow Rate (gal/min) 0.5 GPM  
 Calculated Pumping Time (length of time in minutes) 180  
 Actual Pumping Time (length of time in minutes) 180  
 Check-back Time 16:06  
 Recovery Time (if needed) 24

pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.1 / 7.1 pH 9/11/12 Date

Purge Start Time 13:40  
 Purge Date 9-10-12  
 Purge Method WW

Purge Stop Time 16:15  
 Total Gallons Purged DRY (32)

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—	32	64	96	60 sample	1602
Time	-	1358					
Temperature	°C	20.69					
pH	Std. units	6.99					
Conductivity	µmhos/cm	208					
Turbidity	NTUs	—					

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	(10% of samples verified per SAP)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>

<2 pH

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID P112 B Sample Time 16:45  
 Field Personnel BR JL Sample Date 9-11-12  
 Weather Conditions Sunny Air Temperature (°F) 82  
 Total Depth (ft.) 143 (from well log)  
 Depth to Static Water Surface (ft.) 77.93  
 Calculated Well Volume (1 casing volume) (gal.) 11  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 55  
 Measured Flow Rate (gal/min) .73 gpm  
 Calculated Pumping Time (length of time in minutes) 15  
 Actual Pumping Time (length of time in minutes) 15  
 Check-back Time —  
 Recovery Time (if needed) 180 mins  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH 9-11-12 Date

Purge Start Time	<u>13:43</u>	Purge Stop Time	<u>14:00</u>
Purge Date	<u>9-11-12</u>	Total Gallons Purged	<u>11 gals</u>
Purge Method	<u>Ground Flows</u>		

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—			<u>⑥ Sample</u>		
Time	-	<u>13:43</u>			<u>16:45</u>		
Temperature	°C	<u>20.80</u>			<u>19.86</u>		
pH	Std. units	<u>6.49</u>			<u>6.10</u>		
Conductivity	µmhos/cm	<u>203</u>			<u>168</u>		
Turbidity	NTUs	—			<u>74.2</u>		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID P 112 A Sample Time 16:35  
 Field Personnel BR, JL Sample Date 9.11.12  
 Weather Conditions Sunny Air Temperature (°F) 82  
 Total Depth (ft.) 134 (from well log)  
 Depth to Static Water Surface (ft.) 76.43  
 Calculated Well Volume (1 casing volume) (gal.) 10  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 50  
 Measured Flow Rate (gal/min) 1.5 pm  
 Calculated Pumping Time (length of time in minutes) 10  
 Actual Pumping Time (length of time in minutes) 10  
 Check-back Time —  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH 9.11.12 Date

Purge Start Time	<u>13:00</u>	Purge Stop Time	<u>16:35</u> <u>13:25</u>
Purge Date	<u>9.11.12</u>	Total Gallons Purged	<u>10</u>
Purge Method	<u>Groundfus</u>		

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	10	—	Sample	—	—
Time	-	13:00	13:25	—	16:35	—	—
Temperature	°C	21.37	22.05	—	20.32	—	—
pH	Std. units	6.10	6.28	—	6.32	—	—
Conductivity	µmhos/cm	180	166	—	175	—	—
Turbidity	NTUs	—	—	—	32.5	—	—

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID P112 C  
 Field Personnel BR, JL  
 Weather Conditions Sunny  
 Total Depth (ft.) 160.75  
 Depth to Static Water Surface (ft.) 79.45  
 Calculated Well Volume (1 casing volume) (gal.) 14  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 70  
 Measured Flow Rate (gal/min) 1 GPM  
 Calculated Pumping Time (length of time in minutes) 24  
 Actual Pumping Time (length of time in minutes) 42  
 Check-back Time C  
 Recovery Time (if needed) —  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.17, 0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.10, 2, 0 pH Date 9.12.12

Purge Start Time 1047  
 Purge Date 9-12-12  
 Purge Method Groundros

Purge Stop Time 1120  
 Total Gallons Purged 42

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	14	28	42		
Time	-	1049	1055	1102	1119		
Temperature	°C	20.30	21.27	21.24	21.15		
pH	Std. units	6.52	6.61	6.68	6.53		
Conductivity	µmhos/cm	126	125	124	124		
Turbidity	NTUs	—	—	—	3.68		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals ( $\text{HNO}_3$ )	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID P112D Sample Time 1700  
 Field Personnel BR, JL Sample Date 9-12-12  
 Weather Conditions Sunny Air Temperature (°F) 82°  
 Total Depth (ft.) 172.76 (from well log) 93.39  
cu.  
 Depth to Static Water Surface (ft.) 79.37  
 Calculated Well Volume (1 casing volume) (gal.) 16  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 80  
 Measured Flow Rate (gal/min) 1 GPM  
 Calculated Pumping Time (length of time in minutes) 16  
 Actual Pumping Time (length of time in minutes) 16  
 Check-back Time \_\_\_\_\_  
 Recovery Time (if needed) —  
 pH Calibration During Purguing (4, 7, 10) (circle two) Actual Reading 7.0 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading \_\_\_\_\_ pH \_\_\_\_\_ Date \_\_\_\_\_

Purge Start Time 1012  
 Purge Date 9-12-12  
 Purge Method Groundflow

Purge Stop Time 1022  
 Total Gallons Purged 20 (dry)

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—	16	—			
Time	-	1014	1020	1702			
Temperature	°C	20.18	21.37	19.36			
pH	Std. units	6.66	6.46	6.98			
Conductivity	µmhos/cm	122	122	123			
Turbidity	NTUs	—	—	4.11			

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals ( $\text{HNO}_3$ )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID JBC 027 Sample Time 1625  
 Field Personnel BR JL Sample Date 9-12-12  
 Weather Conditions Sunny Air Temperature (°F) 82°  
 Total Depth (ft.) 177 (from well log)  
 Depth to Static Water Surface (ft.) 102.81 CWL = 74.14  
 Calculated Well Volume (1 casing volume) (gal.) 49  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 245  
 Measured Flow Rate (gal/min) 0.5 GPM  
 Calculated Pumping Time (length of time in minutes) 98  
 Actual Pumping Time (length of time in minutes) -  
 Check-back Time -  
 Recovery Time (if needed) -  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.6 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.7 pH Date 9-12-12

Purge Start Time 0852  
 Purge Date 9-12-12  
 Purge Method VVV

Purge Stop Time 16.24  
 Total Gallons Purged 147

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	49	98	147		
Time	—	2852	1115	1446	1624		
Temperature	°C	19.50	20.24	20.31	20.22		
pH	Std. units	6.50	6.48	6.74	6.75		
Conductivity	µmhos/cm	157	138	138	136		
Turbidity	NTUs	—	—	—	0.0		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW093 PR Sample Time 1456  
 Field Personnel BR, JL Sample Date 9-12-12  
 Weather Conditions Sunny Air Temperature (°F) 83  
 Total Depth (ft.) 161 (from well log)  
 Depth to Static Water Surface (ft.) 102.91  $LWC = 58.09$   
 Calculated Well Volume (1 casing volume) (gal.) 7638  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 38190  
 Measured Flow Rate (gal/min) 0.5 GPM  
 Calculated Pumping Time (length of time in minutes) 76  
 Actual Pumping Time (length of time in minutes) —  
 Check-back Time —  
 Recovery Time (if needed) —  
 pH Calibration During Purgung (4, 7, 10) (circle two) Actual Reading 6.17 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.17 pH 9-12-12 Date

Purge Start Time	<u>0853</u>	Purge Stop Time	<u>1457</u>
Purge Date	<u>9/12/12</u>	Total Gallons Purged	<u>114</u>
Purge Method	<u>WW</u>		

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	<u>—</u>	<u>38</u>	<u>76</u>	<u>114</u>		
Time	-	<u>0900</u>	<u>1055</u>	<u>1305</u>	<u>1449</u>		
Temperature	°C	<u>19.50</u>	<u>19.88</u>	<u>20.21</u>	<u>19.91</u>		
pH	Std. units	<u>6.77</u>	<u>6.72</u>	<u>6.75</u>	<u>6.85</u>		
Conductivity	µmhos/cm	<u>205</u>	<u>193</u>	<u>195</u>	<u>194</u>		
Turbidity	NTUs	<u>—</u>	<u>—</u>	<u>—</u>	<u>0.0</u>		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals ( $HNO_3$ )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 092 SR Sample Time 1450  
 Field Personnel BIR TL Sample Date 9-12-12  
 Weather Conditions Sunny Air Temperature (°F) 83°  
 Total Depth (ft.) 151 (from well log)  
 Depth to Static Water Surface (ft.) 103.34 103.34  $c_w c = 476$   
 Calculated Well Volume (1 casing volume) (gal.) 32  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 160  
 Measured Flow Rate (gal/min) 1.0 GPM  
 Calculated Pumping Time (length of time in minutes) 32  
 Actual Pumping Time (length of time in minutes) 32  
 Check-back Time —  
 Recovery Time (if needed) —  
 pH Calibration During Purgging (4, 7, 10) (circle two) Actual Reading 4/7 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4/7 pH 9/12/12 Date

Purge Start Time 0935  
 Purge Date 9-12-12  
 Purge Method WW

Purge Stop Time 1453  
 Total Gallons Purged 96

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—	32	64	96		
Time	-	0937	1120	1304	1453		
Temperature	°C	20.28	19.83	19.89	19.94		
pH	Std. units	6.86	6.59	6.77	6.79		
Conductivity	µmhos/cm	210	219	204	198		
Turbidity	NTUs	—	—	—	0.0		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals ( $\text{HNO}_3$ )	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 077 P Sample Time 4:30 1800  
 Field Personnel BR JL Sample Date 9/12/12  
 Weather Conditions Sunny Air Temperature (°F) 82°  
 Total Depth (ft.) 123 (from well log) LW < = 52.56  
 Depth to Static Water Surface (ft.) 70.44  
 Calculated Well Volume (1 casing volume) (gal.) 35  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 175  
 Measured Flow Rate (gal/min) 1.5 GPM  
 Calculated Pumping Time (length of time in minutes) 35  
 Actual Pumping Time (length of time in minutes) 35  
 Check-back Time —  
 Recovery Time (if needed) —  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.6 | 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.7 pH 9-12-12 Date

Purge Start Time	<u>1035</u>	Purge Stop Time	<u>1130</u>
Purge Date	<u>9-11-12</u>	Total Gallons Purged	<u>35</u>
Purge Method	<u>Ground fns</u>		

	Well Volume	Initial	1	2	3	4	5
	Units		<u>35</u>	<u>70</u>	<u>105</u>	<u>—</u>	<u>—</u>
Volume Purged	gal.	<u>—</u>	<u>35</u>	<u>70</u>	<u>105</u>	<u>—</u>	<u>—</u>
Time	-		<u>18-1</u>				
Temperature	°C		<u>20.19</u>				
pH	Std. units		<u>10.88</u>				
Conductivity	µmhos/cm		<u>478</u>				
Turbidity	NTUs	<u>—</u>	<u>1106&lt;</u>				

Additional Notes:

DTW = 116   6 11:47   0 35   sdt

## PRESERVATION:

- |                               |   |  |                                       |                              |  |
|-------------------------------|---|--|---------------------------------------|------------------------------|--|
| Samples Iced In Field (>45°F) | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            | Sulfide (Zn acetate and NaOH)         | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> |
| VOC                           | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> | Cyanide (NaOH)                        | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> |
| Metals (HNO <sub>3</sub> )    | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> | Dioxins / Furans (sodium thiosulfate) | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> |
| Rinsate Blank                 | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> | Field Blank                           | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> |
| Metals verified (<2 pH)       | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> | (10% of samples verified per SAP)     |                              |  |

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID	<u>MWS-098TR</u>	Sample Time	<u>16:35</u>
Field Personnel	<u>BR</u> , <u>JL</u>	Sample Date	<u>9-12-12</u>
Weather Conditions	<u>Sunny</u>	Air Temperature (°F)	<u>82°</u>
Total Depth (ft.)	<u>136</u>	(from well log)	
Depth to Static Water Surface (ft.)	<u>102.58</u>	<u>LWC = 33.42</u>	
Calculated Well Volume (1 casing volume) (gal.)	<u>22</u>		
Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.)	<u>110</u>		
Measured Flow Rate (gal/min)	<u>5</u>		
Calculated Pumping Time (length of time in minutes)	<u>44</u>		
Actual Pumping Time (length of time in minutes)	<u>120</u>		
Check-back Time	<u>—</u>		
Recovery Time (if needed)	<u>—</u>		
pH Calibration During Purging (4, 7, 10) (circle two)	<u>4, 10</u>	Actual Reading	<u>9.0 / 7.20</u> pH
pH Calibration During Sampling (4, 7, 10) (circle two)	<u>4, 7</u>	Actual Reading	<u>4.17</u> pH <u>9/12/12</u> Date
Purge Start Time	<u>9:25</u>	Purge Stop Time	<u>11:20</u>
Purge Date	<u>9-11-12</u>	Total Gallons Purged	<u>22</u>
Purge Method	<u>WW</u>		

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	<u>—</u>	<u>22</u>				
Time	-	<u>0928</u>	<u>1636</u>				
Temperature	°C	<u>20.0</u>	<u>20.52</u>				
pH	Std. units	<u>6.72</u>	<u>7.00</u>				
Conductivity	µmhos/cm	<u>341</u>	<u>335</u>				
Turbidity	NTUs	<u>—</u>	<u>0.0</u>				

Additional Notes:

## PRESERVATION:

- |                               |   |  |                                       |                              |  |
|-------------------------------|---|--|---------------------------------------|------------------------------|--|
| Samples Iced In Field (>45°F) | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            | Sulfide (Zn acetate and NaOH)         | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> |
| VOC                           | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> | Cyanide (NaOH)                        | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> |
| Metals (HNO <sub>3</sub> )    | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> | Dioxins / Furans (sodium thiosulfate) | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> |
| Rinsate Blank                 | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> | Field Blank                           | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> |
| Metals verified (<2 pH)       | Yes <input type="checkbox"/>            | No <input type="checkbox"/>            | (10% of samples verified per SAP)     | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> |

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW C 95 P Sample Time 1645  
 Field Personnel BR, JL Sample Date 9-12-12  
 Weather Conditions Sunny Air Temperature (°F) 82°  
 Total Depth (ft.) 156 (from well log)  
 Depth to Static Water Surface (ft.) 101.11  $z_w c = 54.89$   
 Calculated Well Volume (1 casing volume) (gal.) 36  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 180  
 Measured Flow Rate (gal/min) 45 gpm  
 Calculated Pumping Time (length of time in minutes) 72  
 Actual Pumping Time (length of time in minutes) 210 mins  
 Check-back Time —  
 Recovery Time (if needed) \* 3  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0 / 2.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.1 pH 9-12-12 Date

Purge Start Time	<u>0945</u>	Purge Stop Time	<u>13.11</u>
Purge Date	<u>9-12-12</u>	Total Gallons Purged	<u>36 dry</u>
Purge Method	<u>WW</u>		

	Well Volume	Initial	1	2	3	4	5
	Units		Csample				
Volume Purged	gal.	—	—				
Time	-	0947	1646				
Temperature	°C	20.84	20.91				
pH	Std. units	7.04	7.23				
Conductivity	µmhos/cm	169	175				
Turbidity	NTUs	—	0.0				

Additional Notes:

## PRESERVATION:

- |                               |   |  |                                       |                              |  |
|-------------------------------|---|--|---------------------------------------|------------------------------|--|
| Samples Iced In Field (>45°F) | Yes <input checked="" type="checkbox"/> | No <input type="checkbox"/>            | Sulfide (Zn acetate and NaOH)         | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> |
| VOC                           | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> | Cyanide (NaOH)                        | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> |
| Metals (HNO <sub>3</sub> )    | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> | Dioxins / Furans (sodium thiosulfate) | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> |
| Rinsate Blank                 | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> | Field Blank                           | Yes <input type="checkbox"/> | No <input checked="" type="checkbox"/> |
| Metals verified (<2 pH)       | Yes <input type="checkbox"/>            | No <input checked="" type="checkbox"/> | (10% of samples verified per SAP)     |                              |  |

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID P114 A Sample Time 15:00  
 Field Personnel BR, JL Sample Date 9-12-12  
 Weather Conditions Sunny Air Temperature (°F) 82  
 Total Depth (ft.) 123.27 (from well log) LWC = 49.80  
 Depth to Static Water Surface (ft.) 13.90  
 Calculated Well Volume (1 casing volume) (gal.) 9  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 45  
 Measured Flow Rate (gal/min) 1 gpm  
 Calculated Pumping Time (length of time in minutes) 9 min  
 Actual Pumping Time (length of time in minutes) 12 min  
 Check-back Time —  
 Recovery Time (if needed) 6  
 pH Calibration During Purgung (4, 7, 10) (circle two) Actual Reading 7.0/7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 7.0 pH 9-12-12 Date

Purge Start Time 1414  
 Purge Date 9-12-12  
 Purge Method GraNDFos

Purge Stop Time 1420  
 Total Gallons Purged 9 dry

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—	5	Sample			
Time	-	1415		15:00			
Temperature	°C	21.93		19.49			
pH	Std. units	6.59		6.66			
Conductivity	µmhos/cm	189		179			
Turbidity	NTUs	—		37.7			

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals ( $\text{HNO}_3$ )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID P114 B Sample Time 1520  
 Field Personnel BL JL Sample Date 9/12/12  
 Weather Conditions Sunny Air Temperature (°F) 83°  
 Total Depth (ft.) 138.42 (from well log) C = 64.61  
 Depth to Static Water Surface (ft.) 73.81  
 Calculated Well Volume (1 casing volume) (gal.) 11  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 55  
 Measured Flow Rate (gal/min) 1  
 Calculated Pumping Time (length of time in minutes) 11  
 Actual Pumping Time (length of time in minutes) —  
 Check-back Time —  
 Recovery Time (if needed) —  
 pH Calibration During Purgging (4, 7, 10) (circle two) Actual Reading 4/7 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4/7 pH \_\_\_\_\_ Date

Purge Start Time	<u>1415</u>	Purge Stop Time	<u>1435</u>
Purge Date	<u>9-12-12</u>	Total Gallons Purged	<u>25 Day</u>
Purge Method	<u>Groundros</u>		

	Well Volume	Initial	1	2	3	4	5
	Units	(30)			Sample		
Volume Purged	gal.	<u>1417</u>	<u>11</u>	<u>22</u>	<u>—</u>		
Time	-	<u>1417</u>	<u>1421</u>	<u>1430</u>	<u>1521</u>		
Temperature	°C	<u>20.14</u>	<u>20.68</u>	<u>21.20</u>	<u>20.95</u>		
pH	Std. units	<u>6.61</u>	<u>6.11</u>	<u>6.25</u>	<u>6.44</u>		
Conductivity	µmhos/cm	<u>186</u>	<u>181</u>	<u>181</u>	<u>182</u>		
Turbidity	NTUs	<u>—</u>	<u>—</u>	<u>—</u>	<u>0.0</u>		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals ( $\text{HNO}_3$ )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID P11 4C Sample Time 1605  
 Field Personnel BR, JL Sample Date 9-12-12  
 Weather Conditions Sunny Air Temperature (°F) 83  
 Total Depth (ft.) 139.50 (from well log)  
 Depth to Static Water Surface (ft.) 73.23  $L_w = 86.27$   
 Calculated Well Volume (1 casing volume) (gal.) 15  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 75  
 Measured Flow Rate (gal/min) 1.5 spm  
 Calculated Pumping Time (length of time in minutes) 7.5  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time —  
 Recovery Time (if needed) —  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.6 / 7.6 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.6 / 7.6 pH 9/12/12 Date  
 Purge Start Time 1545 Purge Stop Time 1606  
 Purge Date 9-12-12 Total Gallons Purged 45  
 Purge Method Groundless

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—	15	38	45		
Time	-	1546	1553	1559	1604		
Temperature	°C	20.45	20.50	20.31	20.32		
pH	Std. units	6.84	6.10	6.02	6.04		
Conductivity	µmhos/cm	119	112	112	112		
Turbidity	NTUs	—	—	—	0.0		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID P114 D Sample Time 1750  
 Field Personnel BR, JL Sample Date 9-12-12  
 Weather Conditions Sunny Air Temperature (°F) 82°  
 Total Depth (ft.) 171.99 (from well log) CWC = 99.29  
 Depth to Static Water Surface (ft.) 72.70  
 Calculated Well Volume (1 casing volume) (gal.) 17  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 85  
 Measured Flow Rate (gal/min) 1  
 Calculated Pumping Time (length of time in minutes) 17  
 Actual Pumping Time (length of time in minutes) 51  
 Check-back Time —  
 Recovery Time (if needed) —  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.6/7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.17 pH 9-12-12 Date

Purge Start Time	<u>17:15</u>	Purge Stop Time	<u>1751</u>
Purge Date	<u>9-12-12</u>	Total Gallons Purged	<u>51</u>
Purge Method	<u>Grundth's</u>		

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.		17	34	51		
Time	-	<u>1716</u>	<u>1724</u>	<u>1733</u>	<u>1745</u>		
Temperature	°C	<u>19.73</u>	<u>20.28</u>	<u>20.30</u>	<u>20.35</u>		
pH	Std. units	<u>6.93</u>	<u>6.16</u>	<u>6.26</u>	<u>6.23</u>		
Conductivity	µmhos/cm	<u>112</u>	<u>112</u>	<u>112</u>	<u>113</u>		
Turbidity	NTUs	<u>—</u>	<u>—</u>	<u>—</u>	<u>0.0</u>		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals ( $\text{HNO}_3$ )	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	(10% of samples verified per SAP)		

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID VBC 025 Sample Time 1525  
 Field Personnel BR, JL Sample Date 9-13-12  
 Weather Conditions Sunny Air Temperature (°F) 82°  
 Total Depth (ft.) 174.5 (from well log) CWC = 71.08  
 Depth to Static Water Surface (ft.) 103.42  
 Calculated Well Volume (1 casing volume) (gal.) 47 gal  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 235  
 Measured Flow Rate (gal/min) 5 spm  
 Calculated Pumping Time (length of time in minutes) 94 min  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time 10:00  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purguing (4, 7, 10) (circle two) Actual Reading 4.6 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.7 pH 9-13-12 Date

Purge Start Time	<u>8:24</u>	Purge Stop Time	<u>1525</u>
Purge Date	<u>9-13-12</u>	Total Gallons Purged	<u>141</u>
Purge Method	<u>WW</u>		

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	<u>—</u>	<u>47</u>	<u>94</u>	<u>141</u>		
Time	-	<u>8:31</u>	<u>1055</u>	<u>1330</u>	<u>1520</u>		
Temperature	°C	<u>19.74</u>	<u>21.20</u>	<u>20.12</u>	<u>20.52</u>		
pH	Std. units	<u>6.06</u>	<u>6.53</u>	<u>6.69</u>	<u>6.87</u>		
Conductivity	µmhos/cm	<u>160</u>	<u>145</u>	<u>143</u>	<u>144</u>		
Turbidity	NTUs	<u>—</u>	<u>—</u>	<u>—</u>	<u>0.0</u>		

Additional Notes:

## PRESERVATION:

- |                               |   |                                       |   |
|-------------------------------|---|---------------------------------------|---|
| Samples Iced In Field (>45°F) | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> | Sulfide (Zn acetate and NaOH)         | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| VOC                           | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | Cyanide (NaOH)                        | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| Metals ( $\text{HNO}_3$ )     | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | Dioxins / Furans (sodium thiosulfate) | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| Rinsate Blank                 | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> | Field Blank                           | Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> |
| Metals verified (<2 pH)       | Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> | (10% of samples verified per SAP)     |   |

<2 pH

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID UBC-55 Sample Time 1400  
 Field Personnel DR JL Sample Date 9-13-12  
 Weather Conditions Sunny Air Temperature (°F) 82  
 Total Depth (ft.) 144.98 (from well log) CVC = 60.71  
 Depth to Static Water Surface (ft.) 84.27  
 Calculated Well Volume (1 casing volume) (gal.) 10  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 50  
 Measured Flow Rate (gal/min) 2 GPM  
 Calculated Pumping Time (length of time in minutes) 5  
 Actual Pumping Time (length of time in minutes) 16  
 Check-back Time \_\_\_\_\_  
 Recovery Time (if needed) —  
 pH Calibration During Purguing (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH Date 9-13-12

Purge Start Time	<u>1339</u>	Purge Stop Time	<u>1400</u>
Purge Date	<u>9-13-12</u>	Total Gallons Purged	<u>30</u>
Purge Method	<u>Groundfoss</u>		

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	Gal.	—	10	20	30		
Time	-	<u>1340</u>	<u>1345</u>	<u>1350</u>	<u>1356</u>		
Temperature	°C	<u>20.04</u>	<u>20.66</u>	<u>20.86</u>	<u>21.04</u>		
pH	Std. units	<u>6.76</u>	<u>6.50</u>	<u>6.42</u>	<u>6.54</u>		
Conductivity	µmhos/cm	<u>677</u>	<u>395</u>	<u>263</u>	<u>211</u>		
Turbidity	NTUs	—	—	—	<u>83.7</u>		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	(10% of samples verified per SAP)	

12 pH

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW-141T Sample Time 1540  
 Field Personnel BR, JL Sample Date 9-13-12  
 Weather Conditions Sunny Air Temperature (°F) 82  
 Total Depth (ft.) 126.5 (from well log)  
 Depth to Static Water Surface (ft.) 81.79 ~~44.71~~  
 Calculated Well Volume (1 casing volume) (gal.) 1 ~~44.71~~  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 35  
 Measured Flow Rate (gal/min) 1  
 Calculated Pumping Time (length of time in minutes) 7  
 Actual Pumping Time (length of time in minutes) —  
 Check-back Time —  
 Recovery Time (if needed) —  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.1 pH 9-13-12 Date

Purge Start Time	<u>1318</u>	Purge Stop Time	<u>1322</u>
Purge Date	<u>9-13-12</u>	Total Gallons Purged	<u>7 dry</u>
Purge Method	<u>Groundfus</u>		

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—	7		Q Sample		
Time	-	<u>1319</u>	<u>1321</u>		<u>1541</u>		
Temperature	°C	<u>20.55</u>	<u>20.82</u>		<u>19.92</u>		
pH	Std. units	<u>6.95</u>	<u>6.78</u>		<u>6.95</u>		
Conductivity	μmhos/cm	<u>251</u>	<u>249</u>		<u>253</u>		
Turbidity	NTUs	—	—		<u>31.1</u>		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID UBC 054 Sample Time 1202  
 Field Personnel BR, JL Sample Date 9-13-12  
 Weather Conditions Sunny Air Temperature (°F) \_\_\_\_\_  
 Total Depth (ft.) 158.44 (from well log)  
 Depth to Static Water Surface (ft.) 83.05 WC = 75.38  
 Calculated Well Volume (1 casing volume) (gal.) 13  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 65  
 Measured Flow Rate (gal/min) 2  
 Calculated Pumping Time (length of time in minutes) 6  
 Actual Pumping Time (length of time in minutes) 15  
 Check-back Time \_\_\_\_\_  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.1/7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.1/7.0 pH 9/13/12 Date  
 Purge Start Time 1145 Purge Stop Time 1202  
 Purge Date 9-13-12 Total Gallons Purged 39  
 Purge Method Groundless

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—	13	26	39		
Time	-	1147	1152		12.02		
Temperature	°C	20.45	20.70	20.63	20.78		
pH	Std. units	7.11	6.27	6.13	6.13		
Conductivity	µmhos/cm	206	134	132	131		
Turbidity	NTUs	—	—	—	135		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)		

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 138 P Sample Time 1110  
 Field Personnel BR, JL Sample Date 9-13-12  
 Weather Conditions \_\_\_\_\_ Air Temperature (°F) \_\_\_\_\_  
 Total Depth (ft.) 150.55 (from well log) Circ = 67.69  
 Depth to Static Water Surface (ft.) 82.86  
 Calculated Well Volume (1 casing volume) (gal.) 12  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 60  
 Measured Flow Rate (gal/min) 1.5 gpm  
 Calculated Pumping Time (length of time in minutes) 18  
 Actual Pumping Time (length of time in minutes) 36 mins  
 Check-back Time \_\_\_\_\_  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4/7 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4/7 pH 9-13-12 Date

Purge Start Time 10:41  
 Purge Date 9.13.12  
 Purge Method Ground for

Purge Stop Time 1110  
 Total Gallons Purged 36

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	<u>4</u>	<u>12</u>	<u>24</u>	<u>36</u>		
Time	-	<u>10:42</u>	<u>10:50</u>	<u>10:59</u>	<u>11:08</u>		
Temperature	°C	<u>20.24</u>	<u>20.06</u>	<u>20.70</u>	<u>20.58</u>		
pH	Std. units	<u>6.62</u>	<u>6.55</u>	<u>6.40</u>	<u>6.34</u>		
Conductivity	µmhos/cm	<u>143</u>	<u>143</u>	<u>138</u>	<u>138</u>		
Turbidity	NTUs	<u>—</u>	<u>—</u>	<u>—</u>	<u>14.3</u>		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 139 S Sample Time 1455  
 Field Personnel RF JL Sample Date 9-13-12  
 Weather Conditions Sunny Air Temperature (°F) 82°  
 Total Depth (ft.) 133.90 (from well log) LWC = 45.05  
 Depth to Static Water Surface (ft.) 88.85  
 Calculated Well Volume (1 casing volume) (gal.) 8  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 40  
 Measured Flow Rate (gal/min) 1.0 min  
 Calculated Pumping Time (length of time in minutes) — 8 mins  
 Actual Pumping Time (length of time in minutes) 8 mins  
 Check-back Time —  
 Recovery Time (if needed) 120  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.6 / 7.6 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH 9.13.12 Date  
  
 Purge Start Time 0923 Purge Stop Time 0932  
 Purge Date 9.13.12 Total Gallons Purged 8 (dry)  
 Purge Method Ground flow

	Well Volume	Initial	1	2	3	4	5
	Units						
Volume Purged	gal.	—			0.5 sample		
Time	—	0925			1455		
Temperature	°C	20.64			20.85		
pH	Std. units	8.00			7.10		
Conductivity	µmhos/cm	197			184		
Turbidity	NTUs	—			20.5		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F) Yes  No   
 VOC Yes  No   
 Metals (HNO<sub>3</sub>) Yes  No   
 Rinsate Blank Yes  No   
 Metals verified (<2 pH) Yes  No

Sulfide (Zn acetate and NaOH)

Cyanide (NaOH)

Dioxins / Furans (sodium thiosulfate)

Field Blank

(10% of samples verified per SAP)

Yes  No

Yes  No

Yes  No

Yes  No

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 137 T  
 Field Personnel BR, JL  
 Weather Conditions SUNNY  
 Total Depth (ft.) 130 (from well log) LWC = 47.91  
 Depth to Static Water Surface (ft.) 82.09  
 Calculated Well Volume (1 casing volume) (gal.) 8  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 40  
 Measured Flow Rate (gal/min) 1 gpm  
 Calculated Pumping Time (length of time in minutes) 8  
 Actual Pumping Time (length of time in minutes) 9  
 Check-back Time ~  
 Recovery Time (if needed) ~  
 pH Calibration During Purguing (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0 / 7.0 pH 9/13/12 Date

Purge Start Time 10:10  
 Purge Date 9.13.12  
 Purge Method Groundfus

Purge Stop Time 10:19  
 Total Gallons Purged 8 dry

	Well Volume Units	Initial	1	2	3	4	5
Volume Purged	gal.	—	8		<u>@ Sample</u>		
Time	-	1012	1018		1511		
Temperature	°C	20.00	21.20		22.10		
pH	Std. units	6.84	6.30		6.5		
Conductivity	µmhos/cm	174	139		157		
Turbidity	NTUs	—	—		15.6		

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F) Yes  No   
 VOC Yes  No   
 Metals (HNO<sub>3</sub>) Yes  No   
 Rinsate Blank Yes  No   
 Metals verified (<2 pH) Yes  No

Sulfide (Zn acetate and NaOH)  
 Cyanide (NaOH)  
 Dioxins / Furans (sodium thiosulfate)  
 Field Blank  
 (10% of samples verified per SAP)

Yes  No   
 Yes  No   
 Yes  No   
 Yes  No

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 07 8T Sample Time 1035  
 Field Personnel BR, JL Sample Date 9-14-12  
 Weather Conditions P. Cloudy Air Temperature (°F) 78°  
 Total Depth (ft.) 89 (from well log) LWC = 25.66  
 Depth to Static Water Surface (ft.) 63.34  
 Calculated Well Volume (1 casing volume) (gal.) 17  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 85  
 Measured Flow Rate (gal/min) 2 SPN  
 Calculated Pumping Time (length of time in minutes) 8.5  
 Actual Pumping Time (length of time in minutes) —  
 Check-back Time —  
 Recovery Time (if needed) —  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4/7 pH 9-14-12 Date

Purge Start Time	<u>8:50</u>	Purge Stop Time	<u>9:02</u>
Purge Date	<u>9-13-12</u>	Total Gallons Purged	<u>17</u>
Purge Method	<u>Grndfls</u>		

	Well Volume Units	Initial	1	2 @Sample	3	4	5
Volume Purged	gal.	—	17	34			
Time	-	8:50	8:50	10:35			
Temperature	°C	20.34	21.32	20.19			
pH	Std. units	10.70	10.67	10.40			
Conductivity	µmhos/cm	639	294	382			
Turbidity	NTUs	—	—	1.99			

Additional Notes:

875. at 14:30, will sample on 9/14/12

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MWS - 140 S Sample Time 1055  
 Field Personnel BR, JL Sample Date 9-14-12  
 Weather Conditions P. Cloudy Air Temperature (°F) 79°  
 Total Depth (ft.) 151.30 (from well log)  
 Depth to Static Water Surface (ft.) 101.39  
 Calculated Well Volume (1 casing volume) (gal.) 9  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 45  
 Measured Flow Rate (gal/min) 1 gpm  
 Calculated Pumping Time (length of time in minutes) 9  
 Actual Pumping Time (length of time in minutes) 9  
 Check-back Time 6 —  
 Recovery Time (if needed) —  
 pH Calibration During Purgging (4, 7, 10) (circle two) Actual Reading 4/7 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4/7 pH 8/14/12 Date

Purge Start Time	<u>0955</u>	Purge Stop Time	<u>0959</u>
Purge Date	<u>9-14-12</u>	Total Gallons Purged	<u>9 dry</u>
Purge Method	<u>Groundwater</u>		

	Well Volume	Initial	1	2	3	4	5
	Units		<u>@ Sample</u>				
Volume Purged	Gal.	<u>—</u>	<u>—</u>				
Time	-	<u>0950</u>	<u>1056</u>				
Temperature	°C	<u>20.22</u>	<u>20.94</u>				
pH	Std. units	<u>6.64</u>	<u>8.27</u>				
Conductivity	µmhos/cm	<u>294</u>	<u>250</u>				
Turbidity	NTUs	<u>—</u>	<u>136</u>				

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F) Yes  No   
 VOC Yes  No   
 Metals (HNO<sub>3</sub>) Yes  No   
 Rinsate Blank Yes  No   
 Metals verified (<2 pH) Yes  No  (10% of samples verified per SAP)

Sulfide (Zn acetate and NaOH)

Yes  No

Cyanide (NaOH)

Yes  No

Dioxins / Furans (sodium thiosulfate)

Yes  No

Field Blank

Yes  No

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID JBC 056 Sample Time 1110  
 Field Personnel BR, JL Sample Date 9-14-12  
 Weather Conditions P. Cloudy Air Temperature (°F) 78°  
 Total Depth (ft.) 151 (from well log)  
 Depth to Static Water Surface (ft.) 88.52  
 Calculated Well Volume (1 casing volume) (gal.) 11  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 55  
 Measured Flow Rate (gal/min) 1 gpm  
 Calculated Pumping Time (length of time in minutes) 11  
 Actual Pumping Time (length of time in minutes) —  
 Check-back Time —  
 Recovery Time (if needed) —  
 pH Calibration During Purging (4, 7, 10) (circle two) Actual Reading 9.6 / 2.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4 / 7 pH 4-14-12 Date

Purge Start Time	<u>0859</u>	Purge Stop Time	<u>9:07</u>
Purge Date	<u>9-14-12</u>	Total Gallons Purged	<u>11 gal</u>
Purge Method	<u>Groundfus</u>		

	Well Volume	Initial	1	2	3	4	5
	Units		(Sample)				
Volume Purged	Gal.	—	—				
Time	-	09:00	11:11				
Temperature	°C	19.99	20.09				
pH	Std. units	6.36	7.80				
Conductivity	µmhos/cm	212	224				
Turbidity	NTUs	—	218				

Additional Notes:

$\Delta TW = 144.70 \text{ } (9:07)$

$\Delta TW = 142.1 \text{ } (9:30)$

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals ( $HNO_3$ )	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)		

# PINEWOOD SITE GROUNDWATER SAMPLING LOG

Well / Sample ID MW 047 T Sample Time 1130  
 Field Personnel BR, JL Sample Date 9-14-12  
 Weather Conditions P. Cloudy Air Temperature (°F) 74°  
 Total Depth (ft.) 145 (from well log)  
 Depth to Static Water Surface (ft.) 87.35  $L_w c = 57.65$   
 Calculated Well Volume (1 casing volume) (gal.) 745 38  
 Calculated Maximum Volume of Water to be Purged (5 casing volumes) (gal.) 190  
 Measured Flow Rate (gal/min) 5 gpm  
 Calculated Pumping Time (length of time in minutes) 76  
 Actual Pumping Time (length of time in minutes) \_\_\_\_\_  
 Check-back Time 10:06  
 Recovery Time (if needed) \_\_\_\_\_  
 pH Calibration During Purguing (4, 7, 10) (circle two) Actual Reading 4.0/2.0 pH  
 pH Calibration During Sampling (4, 7, 10) (circle two) Actual Reading 4.0/7.0 pH 9.14.12 Date

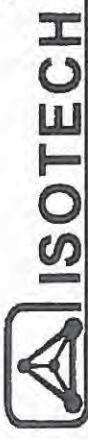
Purge Start Time	<u>0855</u>	Purge Stop Time	<u>10:45</u>
Purge Date	<u>9-14-12</u>	Total Gallons Purged	<u>38 (DRY)</u>
Purge Method	<u>WW</u>		

	Well Volume	Initial	1	2	3	4	5
	Units		Csample				
Volume Purged	Gal.	—	—				
Time	-	0858	1132				
Temperature	°C	19.61	21.64				
pH	Std. units	6.05	7.46				
Conductivity	μmhos/cm	185	181				
Turbidity	NTUs	—	2.74				

Additional Notes:

## PRESERVATION:

Samples Iced In Field (>45°F)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Sulfide (Zn acetate and NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
VOC	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Cyanide (NaOH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals (HNO <sub>3</sub> )	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Dioxins / Furans (sodium thiosulfate)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Rinsate Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Field Blank	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Metals verified (<2 pH)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	(10% of samples verified per SAP)	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>



## Send Data and Invoice to

Name: Doria Cullom  
 Company: AECOM  
 Address: 10 Patterson Dr. Ste 500  
Greeley, SC 89228  
 Phone: 864 234 8928  
 Fax: \_\_\_\_\_  
 Email: Doria.Cullom@AECOM.com

Project: Project To Determine Project Isotech Laboratories, Inc.Location: Project Location, SCSampled by: Brett Bassam, James Leppla

Phone: 217-398-3490

Fax: 217-398-3493

www.isotechlabs.com

mail@isotechlabs.com

## Sample Description

Container Number	Sample Identification	Date Sampled	Comments
1	MU-073T	9/4/12	X X X
1	UBC-008	9/4/12	X X
1	MU-040P	9/4/12	X X
1	UBC-511	9/4/12	X X
1	MU-010	9/5/12	X X
1	MU-035	9/5/12	X X
1	MU-041T	9/5/12	X X
1	MU-072P	9/6/12	X X

Fed Ex Tracking #  
898753107834

## Chain-of-Custody Record

Relinquished by	Signature	Company	Date	Time
Received by	<u>AECOM</u>	<u>AECOM</u>	<u>9/6/12</u>	<u>1820</u>
Relinquished by				
Received by				
Relinquished by				
Received by				

**Send Data and Invoice to**

Doria Cullom

Name:

AECOM

Company:

10 Patterson Dr  
Greenville, SC 29602

Address:

Phone: 864 234 8928

Fax:

Email: Doria.Cullom@AECOM.com

Project: Project Name

Location:

1308 Parkland Court

Champaign, IL 61821

Phone: 217-398-3490

Fax: 217-398-3493

www.isotechlabs.com

mail@isotechlabs.com

Analyses Requested

Date Sampled

Comments

**Sample Description**

Container Number	Sample Identification	Date Sampled	Comments
1	UBC - 019	9/7/12	X X X X
1	MW - 1025	9/10/12	X X X X
1	MW - 1247	9/10/12	X X X X
1	UBC - 031	9/10/12	X X X X
1	MW - 1017	9/10/12	X X X X
1	MW - 1037	9/10/12	X X X X
1	MW - 094PR	9/11/12	X X X X
1	MW - 1395	9/13/12	X X X X
1	MW - 1417	9/13/12	X X X X
1	UBC - 023	9/13/12	X X X X
1	UBC - 055	9/13/12	X X X X

**Chain-of-Custody Record**

Signature	Company	Date /	Time
J. Dreyfuss	AECOM	9/13/12	1800
Received by			
Relinquished by			
Received by			
Relinquished by			
Received by			



## Chain of Custody Record

Shealy Environmental Services, Inc.

106 Vantage Point Drive

West Columbia, South Carolina 29172

Telephone No. (803) 791-9700 Fax No. (803) 791-9111

[www.shealylab.com](http://www.shealylab.com)

Number 15226

Client <b>ACOM</b>		Report to Contact <b>Brett Dawson</b>		Sampler (Printed Name) <b>Brett Dawson, Jules Langford</b>		Quote No. <b>15229</b>	
Address <b>16 PINEWOOD DR.</b>		Telephone No. / Fax No. / Email <b>(803) 234 8728</b>		Waybill No.		Page <b>1</b> of <b>1</b>	
City <b>Greenville</b>	State <b>SC</b>	Zip Code <b>29615</b>	Preservative	1. Unpres.	4. HNO <sub>3</sub>	7. NaOH	Number of Containers
Project Name <b>IndigoVant Project</b>				2. NaOHznA	5. HCl	6. Na Thio.	Bottle (See Instructions on back)
Project Number <b>Pinewood</b>	P.O. Number	Matrix	Analysis	Preservative			
Sample ID / Description (Containers for each sample may be combined on one line)		Date	Time	G-Grab	C-Composite	GW	DW
MW - 1025		9/10/12	1545	G X		S	W
MW - 1267		9/10/12	1620	G X		S	W
UBC - 031		9/10/12	1540	G X		S	W
MW - 1017		9/11/12	1445	G X		S	W
MW - 1037		9/11/12	1430	G X		S	W
MW - 094PR		9/11/12	1600	G X		S	W
MW - 1395		9/13/12	1455	G X		S	W
MW - 1417		9/13/12	1540	G X		S	W
UBC - 026		9/13/12	1525	G X		S	W
UBC - 055		9/13/12	1400	G X		S	W
Turn Around Time Required (Prior lab approval required for expedited TAT)		Sample Disposal		QC Requirements (Specify)		Possible Hazard Identification	
<input checked="" type="checkbox"/> Standard <input type="checkbox"/> Rush (Please Specify)		<input type="checkbox"/> Return to Client <input type="checkbox"/> Disposal by Lab		<input type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant		<input type="checkbox"/> Poison <input type="checkbox"/> Unknown	
1. Relinquished by / Sampler <b>J. Langford</b>		Date <b>9/13/12</b> Time <b>1130</b>		1. Received by		Date <b>9/13/12</b> Time <b>1130</b>	
2. Relinquished by		Date		2. Received by		Date	
3. Relinquished by		Date		3. Received by		Date	
4. Relinquished by		Date		4. Laboratory Received by <b>J. Langford</b>		Date <b>9/13/12</b> Time <b>1130</b>	
Note: All samples are retained for six weeks from receipt unless other arrangements are made.				LAB USE ONLY			
				Received on Ice (Check) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Ice Pack		Receipt Temp. _____ °C	



**Chain of Custody Record**

Shealy Environmental Services, Inc.

106 Vantage Point Drive

West Columbia, South Carolina 29117

Telephone No. (803) 791-9700 Fax No. (803) 791-9111

[www.shealylab.com](http://www.shealylab.com)

Number 15225

Client AECON	Report to Contact David Cullinan	Sampler (Printed Name) Brett Dawson, James Leaphart	Quote No.			Page 1 of 1	
				Telephone No. / Fax No. / Email BC 42348928 DBCA, Cullinan	Waybill No. ABSON, CAR		Number of Containers
Address 10 Parkwood Dr Bluff Stc 500 City Greenville SC Zip Code 29615 Project Name Project Inspection Project	Preservative		Analysis C1, HClO <sub>3</sub> , Na, K, Ca, Al, Si, Li, Ba, C, O, H, Cl, S, P Other			Remarks / Cooler ID C1, 504 (10743) 310) 443-013 (5m 23200)	
	1. Unpres.	4. HNO <sub>3</sub>		7. NaOH	D		D
	2. NaOH/ZnA	5. HCl			R		I
	3. H <sub>2</sub> SO <sub>4</sub>	6. Na Thio.					
	P.O Number	P.O Number		Matrix			
	Sample ID / Description (Containers for each sample may be combined on one line)	Date		Time	C=Composite G=Grab		GW DW WW S
MU - 073 T	7/4/12	1720	G	X	1	1	
UBC - 008	7/4/12	1520	G	X	1	1	
MU - 040 P	7/4/12	1635	G	X	1	1	
UBC - 011	7/4/12	1715	G	X	1	1	
MU - 010	9/5/12	1444	G	X	1	1	
MU - 035 S	9/5/12	1530	G	X	1	1	
MU - 041 T	9/5/12	1545	G	X	1	1	
MU - 071 P	9/6/12	1500	G	X	1	1	
UBC - 019	9/7/12	1400	G	X	1	1	
Turn Around Time Required (Prior lab approval required for expedited TAT)	Sample Disposal		QC Requirements (Specify)		Possible Hazard Identification		
<input checked="" type="checkbox"/> Standard <input type="checkbox"/> Rush (Please Specify)	<input type="checkbox"/> Return to Client	<input type="checkbox"/> Disposal by Lab	<input type="checkbox"/> Non-Hazard	<input type="checkbox"/> Flammable	<input type="checkbox"/> Skin Irritant	<input type="checkbox"/> Poison	
1. Relinquished by / Sampler <i>Heidi</i>	Date 9/7/12	Time 1800	1. Received by	Date	Time	Time	
2. Relinquished by	Date	Time	2. Received by	Date	Time	Time	
3. Relinquished by	Date	Time	3. Received by	Date	Time	Time	
4. Relinquished by	Date	Time	4. Laboratory Received by <i>Lynn</i>	Date 9/7/12	Time 1800	Time	
Note: All samples are retained for six weeks from receipt unless other arrangements are made.			LAB USE ONLY Received on Ice (Check) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Ice Pack	Receipt Temp. °C	Temp. Blank	Y / <input type="checkbox"/> N	

**ATTACHMENT B**

**LABORATORY ANALYTICAL DATA**



## ANALYSIS REPORT

# Water Analysis

Lab Number: 262968

Job Number: 19172

Submitter Sample Name: MW-073T

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/04/2012 Results Reported: 10/22/2012

$\delta D$  of water ----- -21.3 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -3.93 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 262969

Job Number: 19172

Submitter Sample Name: UBC-008

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/04/2012 Results Reported: 10/22/2012

$\delta D$  of water ----- -20.2 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -3.78 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 262970

Job Number: 19172

Submitter Sample Name: MW-040P

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/04/2012 Results Reported: 10/22/2012

$\delta D$  of water ----- -18.7 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -3.53 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 262971

Job Number: 19172

Submitter Sample Name: UBC-011

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/04/2012 Results Reported: 10/22/2012

$\delta D$  of water ----- -20.7 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -3.71 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 262972

Job Number: 19172

Submitter Sample Name: MW-010

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/05/2012 Results Reported: 10/22/2012

$\delta D$  of water ----- -21.1 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -4.14 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 262973

Job Number: 19172

Submitter Sample Name: MW-035S

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/05/2012 Results Reported: 10/22/2012

$\delta D$  of water ----- -19.2 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -3.91 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 262974

Job Number: 19172

Submitter Sample Name: MW-041T

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/05/2012 Results Reported: 10/22/2012

$\delta D$  of water ----- -21.0 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -4.16 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 262975

Job Number: 19172

Submitter Sample Name: MW-072P

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/06/2012 Results Reported: 10/22/2012

$\delta D$  of water ----- -18.4 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -3.51 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 263786

Job Number: 19233

Submitter Sample Name: UBC-019

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/07/2012 Results Reported: 10/26/2012

$\delta D$  of water ----- -21.0 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -3.70 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 263787

Job Number: 19233

Submitter Sample Name: MW-102S

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/10/2012 Results Reported: 10/26/2012

$\delta D$  of water ----- -17.9 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -3.34 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 263788

Job Number: 19233

Submitter Sample Name: MW-126T

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/10/2012 Results Reported: 10/26/2012

$\delta D$  of water ----- -16.3 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -3.08 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 263789

Job Number: 19233

Submitter Sample Name: UBC-031

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/10/2012 Results Reported: 10/26/2012

$\delta D$  of water ----- -20.0 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -3.63 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 263790

Job Number: 19233

Submitter Sample Name: MW-101T

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/11/2012 Results Reported: 10/26/2012

$\delta D$  of water ----- -17.1 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -3.22 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 263791

Job Number: 19233

Submitter Sample Name: MW-103P

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/11/2012 Results Reported: 10/26/2012

$\delta D$  of water ----- -17.7 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -3.39 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 263792

Job Number: 19233

Submitter Sample Name: MW-094PR

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/11/2012 Results Reported: 10/26/2012

$\delta D$  of water ----- -17.6 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -3.43 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 263793

Job Number: 19233

Submitter Sample Name: MW-139S

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/13/2012 Results Reported: 10/26/2012

$\delta D$  of water ----- -18.7 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -3.62 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 263794

Job Number: 19233

Submitter Sample Name: MW-141T

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/13/2012 Results Reported: 10/26/2012

$\delta D$  of water ----- -14.7 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -2.79 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 263795

Job Number: 19233

Submitter Sample Name: UBC-025

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/13/2012 Results Reported: 10/26/2012

$\delta D$  of water ----- -18.4 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -3.45 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:



## ANALYSIS REPORT

# Water Analysis

Lab Number: 263796

Job Number: 19233

Submitter Sample Name: UBC-055

Submitter Sample ID:

Submitter Job #:

Company: AECOM, Inc.

Field or Site: Pinewood Improvement Project

Location: Pinewood, SC

Depth/Formation:

Container Type: 1 Liter Plastic Bottle

Sample Collected: 9/13/2012 Results Reported: 10/26/2012

$\delta D$  of water ----- -18.6 ‰ relative to VSMOW

$\delta^{18}\text{O}$  of water ----- -3.34 ‰ relative to VSMOW

Tritium content of water ----- < 1.00 TU

$\delta^{13}\text{C}$  of DIC ----- na

$\delta^{14}\text{C}$  content of DIC ----- na

$\delta^{15}\text{N}$  of nitrate ----- na

$\delta^{18}\text{O}$  of nitrate ----- na

$\delta^{34}\text{S}$  of sulfate ----- na

$\delta^{18}\text{O}$  of sulfate ----- na

Remarks:

# SHEALY ENVIRONMENTAL SERVICES, INC.

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## Report of Analysis

**Earth Tech / AECOM**

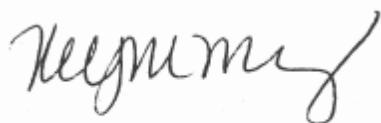
10 Patewood Drive  
Building 6, Suite 500  
Greenville, SC 29615  
Attention: Doria Cullom

Project Name: **Pinewood Improvement Project**

Project Number: **Pinewood**

Lot Number: **NI07081**

Date Completed: **09/17/2012**



**Kelly M. Maberry**  
Project Manager



This report shall not be reproduced, except in its entirety, without the written approval of Shealy Environmental Services, Inc.

The following non-paginated documents are considered part of this report: Chain of Custody Record and Sample Receipt Checklist.

\* NI 07081 \*

# SHEALY ENVIRONMENTAL SERVICES, INC.

SC DHEC No: 32010

NELAC No: E87653

NC DENR No: 329

## Case Narrative Earth Tech / AECOM Lot Number: NI07081

This Report of Analysis contains the analytical result(s) for the sample(s) listed on the Sample Summary following this Case Narrative. The sample receiving date is documented in the header information associated with each sample.

All results listed in this report relate only to the samples that are contained within this report.

Sample receipt, sample analysis, and data review have been performed in accordance with the most current approved NELAC standards, the Shealy Environmental Services, Inc. ("Shealy") Quality Assurance Management Plan (QAMP), standard operating procedures (SOPs), and Shealy policies. Any exceptions to the NELAC standards, the QAMP, SOPs or policies are qualified on the results page or discussed below.

If you have any questions regarding this report please contact the Shealy Project Manager listed on the cover page.

### Inorganic Metals

The MS/MSD associated with sample -002 had chloride recovered outside of the acceptance limits. The LCS/LCSD were recovered within the required acceptance limits; therefore, this demonstrates a matrix effect and data quality is not impacted.

# SHEALY ENVIRONMENTAL SERVICES, INC.

**Sample Summary  
Earth Tech / AECOM  
Lot Number: NI07081**

Sample Number	Sample ID	Matrix	Date Sampled	Date Received
001	MW-073T	Aqueous	09/04/2012 1720	09/07/2012
002	UBC-008	Aqueous	09/04/2012 1520	09/07/2012
003	MW-040P	Aqueous	09/04/2012 1635	09/07/2012
004	UBC-011	Aqueous	09/04/2012 1715	09/07/2012
005	MW-010	Aqueous	09/05/2012 1444	09/07/2012
006	MW-035S	Aqueous	09/05/2012 1530	09/07/2012
007	MW-041T	Aqueous	09/05/2012 1545	09/07/2012
008	MW-072P	Aqueous	09/06/2012 1500	09/07/2012
009	UBC-019	Aqueous	09/07/2012 1400	09/07/2012

(9 samples)

# SHEALY ENVIRONMENTAL SERVICES, INC.

**Executive Summary  
Earth Tech / AECOM  
Lot Number: NI07081**

Sample	Sample ID	Matrix	Parameter	Method	Result	Q	Units	Page
001	MW-073T	Aqueous	Alkalinity	SM 2320B	94		mg/L	6
001	MW-073T	Aqueous	Bicarbonate Alkalinity	SM 2320B	94		mg/L	6
001	MW-073T	Aqueous	Chloride		300.0		mg/L	6
001	MW-073T	Aqueous	Sulfate		300.0		mg/L	6
001	MW-073T	Aqueous	Calcium		6010C		mg/L	7
001	MW-073T	Aqueous	Magnesium		6010C	3.1	J mg/L	7
001	MW-073T	Aqueous	Potassium		6010C	3.5	J mg/L	7
001	MW-073T	Aqueous	Sodium		6010C	5.2	mg/L	7
002	UBC-008	Aqueous	Alkalinity	SM 2320B	62		mg/L	8
002	UBC-008	Aqueous	Bicarbonate Alkalinity	SM 2320B	62		mg/L	8
002	UBC-008	Aqueous	Chloride		300.0	0.13	JS mg/L	8
002	UBC-008	Aqueous	Sulfate		300.0	5.7	mg/L	8
002	UBC-008	Aqueous	Calcium		6010C	17	mg/L	9
002	UBC-008	Aqueous	Magnesium		6010C	2.3	J mg/L	9
002	UBC-008	Aqueous	Potassium		6010C	4.4	J mg/L	9
002	UBC-008	Aqueous	Sodium		6010C	3.9	J mg/L	9
003	MW-040P	Aqueous	Alkalinity	SM 2320B	68		mg/L	10
003	MW-040P	Aqueous	Bicarbonate Alkalinity	SM 2320B	68		mg/L	10
003	MW-040P	Aqueous	Chloride		300.0	2.3	mg/L	10
003	MW-040P	Aqueous	Sulfate		300.0	5.9	mg/L	10
003	MW-040P	Aqueous	Calcium		6010C	19	mg/L	11
003	MW-040P	Aqueous	Magnesium		6010C	2.9	J mg/L	11
003	MW-040P	Aqueous	Potassium		6010C	4.9	J mg/L	11
003	MW-040P	Aqueous	Sodium		6010C	5.8	mg/L	11
004	UBC-011	Aqueous	Alkalinity	SM 2320B	68		mg/L	12
004	UBC-011	Aqueous	Bicarbonate Alkalinity	SM 2320B	68		mg/L	12
004	UBC-011	Aqueous	Chloride		300.0	2.5	mg/L	12
004	UBC-011	Aqueous	Sulfate		300.0	5.2	mg/L	12
004	UBC-011	Aqueous	Calcium		6010C	15	mg/L	13
004	UBC-011	Aqueous	Magnesium		6010C	2.0	J mg/L	13
004	UBC-011	Aqueous	Potassium		6010C	10	mg/L	13
004	UBC-011	Aqueous	Sodium		6010C	5.7	mg/L	13
005	MW-010	Aqueous	Alkalinity	SM 2320B	68		mg/L	14
005	MW-010	Aqueous	Bicarbonate Alkalinity	SM 2320B	68		mg/L	14
005	MW-010	Aqueous	Chloride		300.0	1.4	mg/L	14
005	MW-010	Aqueous	Sulfate		300.0	22	mg/L	14
005	MW-010	Aqueous	Calcium		6010C	20	mg/L	15
005	MW-010	Aqueous	Magnesium		6010C	3.7	J mg/L	15
005	MW-010	Aqueous	Potassium		6010C	4.0	J mg/L	15
005	MW-010	Aqueous	Sodium		6010C	6.4	mg/L	15
006	MW-035S	Aqueous	Alkalinity	SM 2320B	68		mg/L	16
006	MW-035S	Aqueous	Bicarbonate Alkalinity	SM 2320B	68		mg/L	16
006	MW-035S	Aqueous	Chloride		300.0	2.4	mg/L	16
006	MW-035S	Aqueous	Sulfate		300.0	6.2	mg/L	16
006	MW-035S	Aqueous	Calcium		6010C	18	mg/L	17

## Executive Summary (Continued)

Lot Number: NI07081

Sample	Sample ID	Matrix	Parameter	Method	Result	Q	Units	Page
006	MW-035S	Aqueous	Magnesium	6010C	2.4	J	mg/L	17
006	MW-035S	Aqueous	Potassium	6010C	3.3	J	mg/L	17
006	MW-035S	Aqueous	Sodium	6010C	4.2	J	mg/L	17
007	MW-041T	Aqueous	Alkalinity	SM 2320B	68		mg/L	18
007	MW-041T	Aqueous	Bicarbonate Alkalinity	SM 2320B	68		mg/L	18
007	MW-041T	Aqueous	Chloride		300.0	1.4	mg/L	18
007	MW-041T	Aqueous	Sulfate		300.0	23	mg/L	18
007	MW-041T	Aqueous	Calcium	6010C	22		mg/L	19
007	MW-041T	Aqueous	Magnesium	6010C	3.9	J	mg/L	19
007	MW-041T	Aqueous	Potassium	6010C	3.9	J	mg/L	19
007	MW-041T	Aqueous	Sodium	6010C	6.4		mg/L	19
008	MW-072P	Aqueous	Alkalinity	SM 2320B	130		mg/L	20
008	MW-072P	Aqueous	Bicarbonate Alkalinity	SM 2320B	11		mg/L	20
008	MW-072P	Aqueous	Carbonate Alkalinity	SM 2320B	77		mg/L	20
008	MW-072P	Aqueous	Chloride		300.0	2.4	mg/L	20
008	MW-072P	Aqueous	Sulfate		300.0	7.1	mg/L	20
008	MW-072P	Aqueous	Calcium	6010C	34		mg/L	21
008	MW-072P	Aqueous	Potassium	6010C	9.4		mg/L	21
008	MW-072P	Aqueous	Sodium	6010C	8.9		mg/L	21
009	UBC-019	Aqueous	Alkalinity	SM 2320B	77		mg/L	22
009	UBC-019	Aqueous	Bicarbonate Alkalinity	SM 2320B	77		mg/L	22
009	UBC-019	Aqueous	Chloride		300.0	2.4	mg/L	22
009	UBC-019	Aqueous	Sulfate		300.0	4.8	mg/L	22
009	UBC-019	Aqueous	Calcium	6010C	21		mg/L	23
009	UBC-019	Aqueous	Magnesium	6010C	2.4	J	mg/L	23
009	UBC-019	Aqueous	Potassium	6010C	5.1		mg/L	23
009	UBC-019	Aqueous	Sodium	6010C	5.6		mg/L	23

(72 detections)

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI07081-001

Description: MW-073T

Matrix: Aqueous

Date Sampled: 09/04/2012 1720

Date Received: 09/07/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/10/2012 1030	MAC		92972
1		(Bicarbonate ) SM	1	09/10/2012 1145	MAC		
1		(Carbonate Al) SM	1	09/10/2012 1030	MAC		
1		(Chloride) 300.0	1	09/11/2012 1505	SMH		93123
1		(Sulfate) 300.0	2	09/15/2012 0012	SMH		93389

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	94		10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B	94		10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B	ND		10	3.9	mg/L	1
Chloride		300.0	2.1		1.0	0.11	mg/L	1
Sulfate		300.0	5.0		2.0	0.55	mg/L	1

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and ≥ MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI07081-001
Description: MW-073T	Matrix: Aqueous
Date Sampled: 09/04/2012 1720	
Date Received: 09/07/2012	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch			
1	3005A	6010C	1	09/10/2012 2208	BNW	09/10/2012 1414	92978			
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium		7440-70-2		6010C	29		5.0	1.0	mg/L	1
Magnesium		7439-95-4		6010C	3.1	J	5.0	1.2	mg/L	1
Potassium		7440-09-7		6010C	3.5	J	5.0	1.1	mg/L	1
Sodium		7440-23-5		6010C	5.2		5.0	1.2	mg/L	1

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and  $\geq$  MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI07081-002

Description: UBC-008

Matrix: Aqueous

Date Sampled: 09/04/2012 1520

Date Received: 09/07/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/10/2012 1030	MAC		92972
1		(Bicarbonate ) SM	1	09/10/2012 1145	MAC		
1		(Carbonate Al) SM	1	09/10/2012 1030	MAC		
1		(Chloride) 300.0	1	09/11/2012 1527	SMH		93123
1		(Sulfate) 300.0	2	09/15/2012 0035	SMH		93389

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	62		10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B	62		10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B	ND		10	3.9	mg/L	1
Chloride		300.0	0.13 JS		1.0	0.11	mg/L	1
Sulfate		300.0	5.7		2.0	0.55	mg/L	1

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and ≥ MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI07081-002
Description: UBC-008	Matrix: Aqueous
Date Sampled: 09/04/2012 1520	
Date Received: 09/07/2012	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch			
1	3005A	6010C	1	09/10/2012 2223	BNW	09/10/2012 1414	92978			
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium		7440-70-2		6010C	17		5.0	1.0	mg/L	1
Magnesium		7439-95-4		6010C	2.3	J	5.0	1.2	mg/L	1
Potassium		7440-09-7		6010C	4.4	J	5.0	1.1	mg/L	1
Sodium		7440-23-5		6010C	3.9	J	5.0	1.2	mg/L	1

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and  $\geq$  MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI07081-003

Description: MW-040P

Matrix: Aqueous

Date Sampled: 09/04/2012 1635

Date Received: 09/07/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/10/2012 1030	MAC		92972
1		(Bicarbonate ) SM	1	09/10/2012 1145	MAC		
1		(Carbonate Al) SM	1	09/10/2012 1030	MAC		
1		(Chloride) 300.0	1	09/11/2012 1634	SMH		93123
1		(Sulfate) 300.0	2	09/15/2012 0142	SMH		93389

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	68	10	3.9	mg/L	1	
Bicarbonate Alkalinity		SM 2320B	68	10	3.9	mg/L	1	
Carbonate Alkalinity		SM 2320B	ND	10	3.9	mg/L	1	
Chloride		300.0	2.3	1.0	0.11	mg/L	1	
Sulfate		300.0	5.9	2.0	0.55	mg/L	1	

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and ≥ MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI07081-003
Description: MW-040P	Matrix: Aqueous
Date Sampled: 09/04/2012 1635	
Date Received: 09/07/2012	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch			
1	3005A	6010C	1	09/10/2012 2231	BNW	09/10/2012 1414	92978			
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium		7440-70-2		6010C	19		5.0	1.0	mg/L	1
Magnesium		7439-95-4		6010C	2.9	J	5.0	1.2	mg/L	1
Potassium		7440-09-7		6010C	4.9	J	5.0	1.1	mg/L	1
Sodium		7440-23-5		6010C	5.8		5.0	1.2	mg/L	1

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and  $\geq$  MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI07081-004

Description: UBC-011

Matrix: Aqueous

Date Sampled: 09/04/2012 1715

Date Received: 09/07/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/10/2012 1030	MAC		92972
1		(Bicarbonate ) SM	1	09/10/2012 1145	MAC		
1		(Carbonate Al) SM	1	09/10/2012 1030	MAC		
1		(Chloride) 300.0	1	09/11/2012 1657	SMH		93123
1		(Sulfate) 300.0	2	09/15/2012 0204	SMH		93389

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	68	10	3.9	mg/L	1	
Bicarbonate Alkalinity		SM 2320B	68	10	3.9	mg/L	1	
Carbonate Alkalinity		SM 2320B	ND	10	3.9	mg/L	1	
Chloride		300.0	2.5	1.0	0.11	mg/L	1	
Sulfate		300.0	5.2	2.0	0.55	mg/L	1	

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and ≥ MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI07081-004
Description: UBC-011	Matrix: Aqueous
Date Sampled: 09/04/2012 1715	
Date Received: 09/07/2012	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch			
1	3005A	6010C	1	09/10/2012 2235	BNW	09/10/2012 1414	92978			
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium		7440-70-2		6010C	15		5.0	1.0	mg/L	1
Magnesium		7439-95-4		6010C	2.0	J	5.0	1.2	mg/L	1
Potassium		7440-09-7		6010C	10		5.0	1.1	mg/L	1
Sodium		7440-23-5		6010C	5.7		5.0	1.2	mg/L	1

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and  $\geq$  MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI07081-005

Description: MW-010

Matrix: Aqueous

Date Sampled: 09/05/2012 1444

Date Received: 09/07/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/10/2012 1030	MAC		92972
1		(Bicarbonate ) SM	1	09/10/2012 1145	MAC		
1		(Carbonate Al) SM	1	09/10/2012 1030	MAC		
1		(Chloride) 300.0	1	09/11/2012 1719	SMH		93123
1		(Sulfate) 300.0	5	09/15/2012 0227	SMH		93389

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	68		10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B	68		10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B	ND		10	3.9	mg/L	1
Chloride		300.0	1.4		1.0	0.11	mg/L	1
Sulfate		300.0	22		5.0	1.4	mg/L	1

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and ≥ MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI07081-005
Description: MW-010	Matrix: Aqueous
Date Sampled: 09/05/2012 1444	
Date Received: 09/07/2012	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch			
1	3005A	6010C	1	09/10/2012 2246	BNW	09/10/2012 1414	92978			
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium		7440-70-2		6010C	20		5.0	1.0	mg/L	1
Magnesium		7439-95-4		6010C	3.7	J	5.0	1.2	mg/L	1
Potassium		7440-09-7		6010C	4.0	J	5.0	1.1	mg/L	1
Sodium		7440-23-5		6010C	6.4		5.0	1.2	mg/L	1

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and ≥ MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI07081-006

Description: MW-035S

Matrix: Aqueous

Date Sampled: 09/05/2012 1530

Date Received: 09/07/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/10/2012 1030	MAC		92972
1		(Bicarbonate ) SM	1	09/10/2012 1145	MAC		
1		(Carbonate Al) SM	1	09/10/2012 1030	MAC		
1		(Chloride) 300.0	1	09/11/2012 1741	SMH		93123
1		(Sulfate) 300.0	2	09/15/2012 0249	SMH		93389

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	68		10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B	68		10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B	ND		10	3.9	mg/L	1
Chloride		300.0	2.4		1.0	0.11	mg/L	1
Sulfate		300.0	6.2		2.0	0.55	mg/L	1

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and ≥ MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI07081-006
Description: MW-035S	Matrix: Aqueous
Date Sampled: 09/05/2012 1530	
Date Received: 09/07/2012	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch			
1	3005A	6010C	1	09/10/2012 2250	BNW	09/10/2012 1414	92978			
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium		7440-70-2		6010C	18		5.0	1.0	mg/L	1
Magnesium		7439-95-4		6010C	2.4	J	5.0	1.2	mg/L	1
Potassium		7440-09-7		6010C	3.3	J	5.0	1.1	mg/L	1
Sodium		7440-23-5		6010C	4.2	J	5.0	1.2	mg/L	1

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and  $\geq$  MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI07081-007

Description: MW-041T

Matrix: Aqueous

Date Sampled: 09/05/2012 1545

Date Received: 09/07/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/10/2012 1030	MAC		92972
1		(Bicarbonate ) SM	1	09/10/2012 1145	MAC		
1		(Carbonate Al) SM	1	09/10/2012 1030	MAC		
1		(Chloride) 300.0	1	09/11/2012 1804	SMH		93123
1		(Sulfate) 300.0	5	09/15/2012 0356	SMH		93389

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	68		10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B	68		10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B	ND		10	3.9	mg/L	1
Chloride		300.0	1.4		1.0	0.11	mg/L	1
Sulfate		300.0	23		5.0	1.4	mg/L	1

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and ≥ MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI07081-007
Description: MW-041T	Matrix: Aqueous
Date Sampled: 09/05/2012 1545	
Date Received: 09/07/2012	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch			
1	3005A	6010C	1	09/10/2012 2254	BNW	09/10/2012 1414	92978			
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium		7440-70-2		6010C	22		5.0	1.0	mg/L	1
Magnesium		7439-95-4		6010C	3.9	J	5.0	1.2	mg/L	1
Potassium		7440-09-7		6010C	3.9	J	5.0	1.1	mg/L	1
Sodium		7440-23-5		6010C	6.4		5.0	1.2	mg/L	1

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and ≥ MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI07081-008

Description: MW-072P

Matrix: Aqueous

Date Sampled: 09/06/2012 1500

Date Received: 09/07/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/10/2012 1030	MAC		92972
1		(Bicarbonate ) SM	1	09/10/2012 1145	MAC		
1		(Carbonate Al) SM	1	09/10/2012 1030	MAC		
1		(Chloride) 300.0	1	09/11/2012 1826	SMH		93123
1		(Sulfate) 300.0	2	09/15/2012 0419	SMH		93389

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	130		10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B	11		10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B	77		10	3.9	mg/L	1
Chloride		300.0	2.4		1.0	0.11	mg/L	1
Sulfate		300.0	7.1		2.0	0.55	mg/L	1

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and ≥ MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI07081-008
Description: MW-072P	Matrix: Aqueous
Date Sampled: 09/06/2012 1500	
Date Received: 09/07/2012	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch			
1	3005A	6010C	1	09/10/2012 2258	BNW	09/10/2012 1414	92978			
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium		7440-70-2		6010C	34		5.0	1.0	mg/L	1
Magnesium		7439-95-4		6010C	ND		5.0	1.2	mg/L	1
Potassium		7440-09-7		6010C	9.4		5.0	1.1	mg/L	1
Sodium		7440-23-5		6010C	8.9		5.0	1.2	mg/L	1

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and ≥ MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI07081-009

Description: UBC-019

Matrix: Aqueous

Date Sampled: 09/07/2012 1400

Date Received: 09/07/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/10/2012 1030	MAC		92972
1		(Bicarbonate ) SM	1	09/10/2012 1145	MAC		
1		(Carbonate Al) SM	1	09/10/2012 1030	MAC		
1		(Chloride) 300.0	1	09/11/2012 1933	SMH		93123
1		(Sulfate) 300.0	2	09/15/2012 0441	SMH		93389

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	77	10	3.9	mg/L	1	
Bicarbonate Alkalinity		SM 2320B	77	10	3.9	mg/L	1	
Carbonate Alkalinity		SM 2320B	ND	10	3.9	mg/L	1	
Chloride		300.0	2.4	1.0	0.11	mg/L	1	
Sulfate		300.0	4.8	2.0	0.55	mg/L	1	

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and ≥ MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI07081-009
Description: UBC-019	Matrix: Aqueous
Date Sampled: 09/07/2012 1400	
Date Received: 09/07/2012	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch			
1	3005A	6010C	1	09/10/2012 2301	BNW	09/10/2012 1414	92978			
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium		7440-70-2		6010C	21		5.0	1.0	mg/L	1
Magnesium		7439-95-4		6010C	2.4	J	5.0	1.2	mg/L	1
Potassium		7440-09-7		6010C	5.1		5.0	1.1	mg/L	1
Sodium		7440-23-5		6010C	5.6		5.0	1.2	mg/L	1

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and  $\geq$  MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

## **QC Summary**

# Inorganic non-metals - MB

Sample ID: NQ92972-001

Matrix: Aqueous

Batch: 92972

Analytical Method: SM 2320B

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Alkalinity	ND		1	10	3.9	mg/L	09/10/2012 1030

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - LCS

Sample ID: NQ92972-002

Matrix: Aqueous

Batch: 92972

Analytical Method: SM 2320B

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Alkalinity	100	100		1	104	90-110	09/10/2012 1030

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - LCSD

Sample ID: NQ92972-003

Matrix: Aqueous

Batch: 92972

Analytical Method: SM 2320B

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Alkalinity	100	100		1	103	1.7	90-110	20	09/10/2012 1030

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - MS

Sample ID: NI07081-002MS

Matrix: Aqueous

Batch: 92972

Analytical Method: SM 2320B

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Alkalinity	62	100	170	1		110	70-130	09/10/2012 1030

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - MSD

Sample ID: NI07081-002MD

Matrix: Aqueous

Batch: 92972

Analytical Method: SM 2320B

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Alkalinity	62	100	170	1		110	0.00	70-130	20	09/10/2012 1030

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - MS

Sample ID: NI07081-003MS

Matrix: Aqueous

Batch: 92972

Analytical Method: SM 2320B

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Alkalinity	68	100	180	1		111	70-130	09/10/2012 1030

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - MSD

Sample ID: NI07081-003MD

Matrix: Aqueous

Batch: 92972

Analytical Method: SM 2320B

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Alkalinity	68	100	180	1		111	0.00	70-130	20	09/10/2012 1030

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - MB

Sample ID: NQ93123-001

Matrix: Aqueous

Batch: 93123

Analytical Method: 300.0

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Chloride	ND		1	1.0	0.11	mg/L	09/11/2012 1036

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - LCS

Sample ID: NQ93123-002

Matrix: Aqueous

Batch: 93123

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Chloride	20	20		1	99	90-110	09/11/2012 1058

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - LCSD

Sample ID: NQ93123-003

Matrix: Aqueous

Batch: 93123

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Chloride	20	20		1	99	0.48	90-110	20	09/11/2012 1121

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - MS

Sample ID: NI07081-002MS

Matrix: Aqueous

Batch: 93123

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Chloride	0.13	20	23	N	1	113	90-110	09/11/2012 1549

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - MSD

Sample ID: NI07081-002MD

Matrix: Aqueous

Batch: 93123

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Chloride	0.13	20	23	N	1	114	0.15	90-110	20	09/11/2012 1612

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - MS

Sample ID: NI07081-009MS

Matrix: Aqueous

Batch: 93123

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Chloride	2.4	20	22		1	98	90-110	09/11/2012 1956

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - MSD

Sample ID: NI07081-009MD

Matrix: Aqueous

Batch: 93123

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Chloride	2.4	20	22	1		98	0.025	90-110	20	09/11/2012 2018

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - MB

Sample ID: NQ93389-001

Matrix: Aqueous

Batch: 93389

Analytical Method: 300.0

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Sulfate	ND		1	1.0	0.28	mg/L	09/14/2012 2305

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - LCS

Sample ID: NQ93389-002

Matrix: Aqueous

Batch: 93389

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Sulfate	20	19		1	96	90-110	09/14/2012 2327

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - LCSD

Sample ID: NQ93389-003

Matrix: Aqueous

Batch: 93389

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Sulfate	20	19		1	97	0.46	90-110	20	09/14/2012 2350

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - MS

Sample ID: NI07081-002MS

Matrix: Aqueous

Batch: 93389

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Sulfate	5.7	20	25	2		97	90-110	09/15/2012 0057

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - MSD

Sample ID: NI07081-002MD

Matrix: Aqueous

Batch: 93389

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Sulfate	5.7	20	25		2	98	0.11	90-110	20	09/15/2012 0119

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - MS

Sample ID: NI07081-009MS

Matrix: Aqueous

Batch: 93389

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Sulfate	4.8	20	23		2	93	90-110	09/15/2012 0504

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# Inorganic non-metals - MSD

Sample ID: NI07081-009MD

Matrix: Aqueous

Batch: 93389

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Sulfate	4.8	20	24		2	94	0.66	90-110	20	09/15/2012 0526

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# ICP-AES - MB

Sample ID: NQ92978-001

Batch: 92978

Analytical Method: 6010C

Matrix: Aqueous

Prep Method: 3005A

Prep Date: 09/10/2012 1414

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Calcium	ND		1	5.0	1.0	mg/L	09/10/2012 2114
Magnesium	ND		1	5.0	1.2	mg/L	09/10/2012 2114
Potassium	ND		1	5.0	1.1	mg/L	09/10/2012 2114
Sodium	ND		1	5.0	1.2	mg/L	09/10/2012 2114

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# ICP-AES - LCS

Sample ID: NQ92978-002

Batch: 92978

Analytical Method: 6010C

Matrix: Aqueous

Prep Method: 3005A

Prep Date: 09/10/2012 1414

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Calcium	40	41		1	102	80-120	09/10/2012 2118
Magnesium	40	40		1	101	80-120	09/10/2012 2118
Potassium	40	41		1	102	80-120	09/10/2012 2118
Sodium	40	38		1	95	80-120	09/10/2012 2118

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# ICP-AES - LCSD

**Sample ID:** NQ92978-003

**Batch:** 92978

**Analytical Method:** 6010C

**Matrix:** Aqueous

**Prep Method:** 3005A

**Prep Date:** 09/10/2012 1414

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Calcium	40	40		1	101	1.2	80-120	20	09/10/2012 2122
Magnesium	40	40		1	100	0.46	80-120	20	09/10/2012 2122
Potassium	40	41		1	102	0.68	80-120	20	09/10/2012 2122
Sodium	40	38		1	96	1.4	80-120	20	09/10/2012 2122

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# ICP-AES - MS

Sample ID: NI07081-001MS

Batch: 92978

Analytical Method: 6010C

Matrix: Aqueous

Prep Method: 3005A

Prep Date: 09/10/2012 1414

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Calcium	29	40	73	1	1	110	75-125	09/10/2012 2212
Magnesium	3.1	40	45	1	1	105	75-125	09/10/2012 2212
Potassium	3.5	40	46	1	1	107	75-125	09/10/2012 2212
Sodium	5.2	40	46	1	1	102	75-125	09/10/2012 2212

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# ICP-AES - MSD

**Sample ID:** NI07081-001MD

**Matrix:** Aqueous

**Batch:** 92978

**Prep Method:** 3005A

**Analytical Method:** 6010C

**Prep Date:** 09/10/2012 1414

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Calcium	29	40	70		1	104	3.5	75-125	20	09/10/2012 2216
Magnesium	3.1	40	44		1	102	2.6	75-125	20	09/10/2012 2216
Potassium	3.5	40	45		1	104	2.5	75-125	20	09/10/2012 2216
Sodium	5.2	40	44		1	96	4.9	75-125	20	09/10/2012 2216

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

# ICP-AES - MS

Sample ID: NI07081-002MS

Matrix: Aqueous

Batch: 92978

Prep Method: 3005A

Analytical Method: 6010C

Prep Date: 09/10/2012 1414

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Calcium	17	40	55	1	1	94	75-125	09/10/2012 2227
Magnesium	2.3	40	40	1	1	93	75-125	09/10/2012 2227
Potassium	4.4	40	43	1	1	96	75-125	09/10/2012 2227
Sodium	3.9	40	39	1	1	88	75-125	09/10/2012 2227

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**



Shealy Environmental Services, Inc.

106 Vantage Point Drive

West Columbia, South Carolina 29172

Telephone No. (803) 791-9700 Fax No. (803) 791-9111

www.shealylab.com

Number 15225

# SHEALY ENVIRONMENTAL SERVICES, INC.

Client		Report to Contact		Sampler (Printed Name)		Quote No.	
AECOM		Doris Cullen		Brett Bassman		15225	
Address		Telephone No./Fax No./Email		Waybill No.		Page	
800 Parkwood Dr Bluff Stc 500		844-234-8928 Doris.Cullen@AECOM.com		49		1 of 1	
City		State		Zip Code		Number of Containers	
Greenville		SC		29615		Bottle (See Instructions on back)	
Project Name		Project Number		Preservative		Preservative	
Inq Route Project		PINEWOOD		1. Urine, 4. HNO3		7. NaOH	
				2. NaOINa		5. HCl	
				3. H2SO4		6. Na Thio.	
Project Number		P.O. Number		Matrix		Analysis	
				Date		Time	
				C-GW		D-WWW/S	
				C-Composite		S	
MLU-073T		9/4/12		1720		G X	
UBC-008		9/4/12		1520		G X	
MLU-040P		9/4/12		1435		G X	
UBC-011		9/4/12		1715		G X	
MLU-010		9/5/12		1444		G X	
MLU-035S		9/5/12		1530		G X	
MLU-041T		9/5/12		1545		G X	
MLU-072P		9/6/12		1600		G X	
UBC-019		9/7/12		1400		G X	
Turn Around Time Request (Prior lab approval required for expedited TAT)							
Standard		Rush (Please Specify)		Sample Disposal		QC Requirements (Specify)	
<input checked="" type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/> Return to Client <input type="checkbox"/> Disposal by Lab		<input type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison <input type="checkbox"/> Unknown	
1. Relinquished by Sampler		<i>Brett Bassman</i>		Date	Time	1. Received by	Date
2. Reinquished by						2. Received by	Date
3. Relinquished by						3. Received by	Date
4. Relinquished by						4. Laboratory Received by	Date
							Time
Note: All samples are retained for six weeks from receipt unless other arrangements are made.							
				LAB USE ONLY		Temp. <u>35.0</u> °C Recip. Temp. <u>35.0</u> °C	
				Received in Ice (Check) <input checked="" type="checkbox"/>		No <input type="checkbox"/> Yes <input type="checkbox"/> Ice Pack <input type="checkbox"/>	

# SHEALY ENVIRONMENTAL SERVICES, INC.

Shealy Environmental Services, Inc.  
Document Number: F-AD-016  
Revision Number: 9

Page 1 of 1  
Replaces Date: 05/06/11  
Effective Date: 10/11/11

NO7081

Client: AECOM

## Sample Receipt Checklist (SRC)

Cooler Inspected by/date: LM 19/12 Lot #: NL67079W1912

Means of receipt: <input type="checkbox"/> SESI <input checked="" type="checkbox"/> Client <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input type="checkbox"/> Airborne Exp <input type="checkbox"/> Other			
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	1. Were custody seals present on the cooler?	
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	2. If custody seals were present, were they intact and unbroken?	
Cooler ID/temperature upon receipt <u>31.6</u> °C / °C / °C / °C			
Method: <input type="checkbox"/> Temperature Blank <input checked="" type="checkbox"/> Against Bottles			
Method of coolant: <input type="checkbox"/> Wet Ice <input checked="" type="checkbox"/> Blue Ice <input type="checkbox"/> Dry Ice <input type="checkbox"/> None			
If response is No (or Yes for 14, 15, 16), an explanation/resolution must be provided.			
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>	3. If temperature of any cooler exceeded 6.0°C, was Project Manager notified? PM notified by SRC, phone, note (circle one), other: _____ . (For coolers received via commercial courier, PMs are to be notified immediately.)
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>	4. Is the commercial courier's packing slip attached to this form?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input type="checkbox"/>	5. Were proper custody procedures (relinquished/received) followed?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>	5a. Were samples relinquished by client to commercial courier?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input type="checkbox"/>	6. Were sample IDs listed?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input type="checkbox"/>	7. Was collection date & time listed?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input type="checkbox"/>	8. Were tests to be performed listed on the COC?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input type="checkbox"/>	9. Did all samples arrive in the proper containers for each test?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input type="checkbox"/>	10. Did all container label information (ID, date, time) agree with COC?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input type="checkbox"/>	11. Did all containers arrive in good condition (unbroken, lids on, etc.)?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input type="checkbox"/>	12. Was adequate sample volume available?
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	NA <input type="checkbox"/>	13. Were all samples received within ½ the holding time or 48 hours, whichever comes first?
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	NA <input type="checkbox"/>	14. Were any samples containers missing?
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	NA <input type="checkbox"/>	15. Were there any excess samples not listed on COC?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>	16. Were bubbles present >"pea-size" (¼" or 6mm in diameter) in any VOA vials?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input type="checkbox"/>	17. Were all metals/O&G/HEM/nutrient samples received at a pH of <2?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>	18. Were all cyanide and/or sulfide samples received at a pH >12?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>	19. Were all applicable NH3/TKN/cyanide/phenol/BNA/pest/PCB/herb (<0.2mg/L) samples free of residual chlorine?
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>	20. Were collection temperatures documented on the COC for NC samples?
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>	21. Were client remarks/requests (i.e. requested dilutions, MS/MSD designations, etc...) correctly transcribed from the COC into the comment section in LIMS?
<b>Sample Preservation</b> (Must be completed for any sample(s) incorrectly preserved or with headspace.)			
Sample(s) _____ were received incorrectly preserved and were adjusted accordingly in sample receiving with _____ (H <sub>2</sub> SO <sub>4</sub> , HNO <sub>3</sub> , HCl, NaOH) with the SR # (number) _____			
Sample(s) _____ were received with bubbles >6 mm in diameter.			
Sample(s) _____ were received with TRC >0.2 mg/L for NH3/TKN/cyanide/BNA/pest/PCB/herb.			

### Corrective Action taken, if necessary:

Was client notified: Yes  No

Did client respond: Yes  No

SESI employee: \_\_\_\_\_

Date of response: \_\_\_\_\_

Comments:

# SHEALY ENVIRONMENTAL SERVICES, INC.

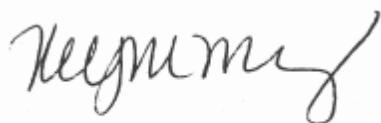
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## Report of Analysis

Earth Tech / AECOM  
10 Patewood Drive  
Building 6, Suite 500  
Greenville, SC 29615  
Attention: Doria Cullom

Project Name: Pinewood

Lot Number: NI13083  
Date Completed: 09/24/2012



Kelly M. Maberry  
Project Manager



This report shall not be reproduced, except in its entirety, without the written approval of Shealy Environmental Services, Inc.

The following non-paginated documents are considered part of this report: Chain of Custody Record and Sample Receipt Checklist.

\* NI 13083 \*

# SHEALY ENVIRONMENTAL SERVICES, INC.

SC DHEC No: 32010

NELAC No: E87653

NC DENR No: 329

## Case Narrative Earth Tech / AECOM Lot Number: NI13083

This Report of Analysis contains the analytical result(s) for the sample(s) listed on the Sample Summary following this Case Narrative. The sample receiving date is documented in the header information associated with each sample.

All results listed in this report relate only to the samples that are contained within this report.

Sample receipt, sample analysis, and data review have been performed in accordance with the most current approved NELAC standards, the Shealy Environmental Services, Inc. ("Shealy") Quality Assurance Management Plan (QAMP), standard operating procedures (SOPs), and Shealy policies. Any exceptions to the NELAC standards, the QAMP, SOPs or policies are qualified on the results page or discussed below.

If you have any questions regarding this report please contact the Shealy Project Manager listed on the cover page.

# SHEALY ENVIRONMENTAL SERVICES, INC.

---

Sample Summary  
Earth Tech / AECOM  
Lot Number: NI13083

Sample Number	Sample ID	Matrix	Date Sampled	Date Received
001	MW-102 S	Aqueous	09/10/2012 1545	09/13/2012
002	MW-126 T	Aqueous	09/10/2012 1620	09/13/2012
003	UBC-031	Aqueous	09/10/2012 1540	09/13/2012
004	MW-101 T	Aqueous	09/11/2012 1445	09/13/2012
005	MW-103 P	Aqueous	09/11/2012 1430	09/13/2012
006	MW-094 PR	Aqueous	09/11/2012 1600	09/13/2012
007	MW-139 S	Aqueous	09/13/2012 1455	09/13/2012
008	MW-141 T	Aqueous	09/13/2012 1540	09/13/2012
009	UBC-025	Aqueous	09/13/2012 1525	09/13/2012
010	UBC-055	Aqueous	09/13/2012 1400	09/13/2012

(10 samples)

# SHEALY ENVIRONMENTAL SERVICES, INC.

## Executive Summary Earth Tech / AECOM Lot Number: NI13083

Sample	Sample ID	Matrix	Parameter	Method	Result	Q	Units	Page
001	MW-102 S	Aqueous	Alkalinity	SM 2320B	83		mg/L	6
001	MW-102 S	Aqueous	Bicarbonate Alkalinity	SM 2320B	83		mg/L	6
001	MW-102 S	Aqueous	Chloride		300.0		mg/L	6
001	MW-102 S	Aqueous	Sulfate		300.0		mg/L	6
001	MW-102 S	Aqueous	Calcium		6010C		mg/L	7
001	MW-102 S	Aqueous	Magnesium		6010C	3.1	J mg/L	7
001	MW-102 S	Aqueous	Potassium		6010C	4.1	J mg/L	7
001	MW-102 S	Aqueous	Sodium		6010C	6.0	mg/L	7
002	MW-126 T	Aqueous	Alkalinity	SM 2320B	87		mg/L	8
002	MW-126 T	Aqueous	Bicarbonate Alkalinity	SM 2320B	87		mg/L	8
002	MW-126 T	Aqueous	Chloride		300.0		mg/L	8
002	MW-126 T	Aqueous	Sulfate		300.0		mg/L	8
002	MW-126 T	Aqueous	Calcium		6010C	28	mg/L	9
002	MW-126 T	Aqueous	Magnesium		6010C	4.2	J mg/L	9
002	MW-126 T	Aqueous	Potassium		6010C	4.5	J mg/L	9
002	MW-126 T	Aqueous	Sodium		6010C	4.3	J mg/L	9
003	UBC-031	Aqueous	Alkalinity	SM 2320B	52		mg/L	10
003	UBC-031	Aqueous	Bicarbonate Alkalinity	SM 2320B	52		mg/L	10
003	UBC-031	Aqueous	Chloride		300.0		mg/L	10
003	UBC-031	Aqueous	Sulfate		300.0		mg/L	10
003	UBC-031	Aqueous	Calcium		6010C	14	mg/L	11
003	UBC-031	Aqueous	Magnesium		6010C	2.0	J mg/L	11
003	UBC-031	Aqueous	Potassium		6010C	3.6	J mg/L	11
003	UBC-031	Aqueous	Sodium		6010C	1.9	J mg/L	11
004	MW-101 T	Aqueous	Alkalinity	SM 2320B	80		mg/L	12
004	MW-101 T	Aqueous	Bicarbonate Alkalinity	SM 2320B	80		mg/L	12
004	MW-101 T	Aqueous	Chloride		300.0		mg/L	12
004	MW-101 T	Aqueous	Sulfate		300.0		mg/L	12
004	MW-101 T	Aqueous	Calcium		6010C	21	mg/L	13
004	MW-101 T	Aqueous	Magnesium		6010C	3.0	J mg/L	13
004	MW-101 T	Aqueous	Potassium		6010C	4.2	J mg/L	13
004	MW-101 T	Aqueous	Sodium		6010C	13	mg/L	13
005	MW-103 P	Aqueous	Alkalinity	SM 2320B	59		mg/L	14
005	MW-103 P	Aqueous	Bicarbonate Alkalinity	SM 2320B	59		mg/L	14
005	MW-103 P	Aqueous	Chloride		300.0		mg/L	14
005	MW-103 P	Aqueous	Sulfate		300.0		mg/L	14
005	MW-103 P	Aqueous	Calcium		6010C	16	mg/L	15
005	MW-103 P	Aqueous	Magnesium		6010C	2.3	J mg/L	15
005	MW-103 P	Aqueous	Potassium		6010C	3.8	J mg/L	15
005	MW-103 P	Aqueous	Sodium		6010C	5.9	mg/L	15
006	MW-094 PR	Aqueous	Alkalinity	SM 2320B	100		mg/L	16
006	MW-094 PR	Aqueous	Bicarbonate Alkalinity	SM 2320B	100		mg/L	16
006	MW-094 PR	Aqueous	Chloride		300.0		mg/L	16
006	MW-094 PR	Aqueous	Sulfate		300.0		mg/L	16
006	MW-094 PR	Aqueous	Calcium		6010C	34	mg/L	17

# Executive Summary (Continued)

Lot Number: NI13083

Sample	Sample ID	Matrix	Parameter	Method	Result	Q	Units	Page
006	MW-094 PR	Aqueous	Magnesium	6010C	4.5	J	mg/L	17
006	MW-094 PR	Aqueous	Potassium	6010C	4.7	J	mg/L	17
006	MW-094 PR	Aqueous	Sodium	6010C	8.0		mg/L	17
007	MW-139 S	Aqueous	Alkalinity	SM 2320B	87		mg/L	18
007	MW-139 S	Aqueous	Bicarbonate Alkalinity	SM 2320B	87		mg/L	18
007	MW-139 S	Aqueous	Chloride		300.0		mg/L	18
007	MW-139 S	Aqueous	Sulfate		300.0		mg/L	18
007	MW-139 S	Aqueous	Calcium	6010C	22		mg/L	19
007	MW-139 S	Aqueous	Magnesium	6010C	3.7	J	mg/L	19
007	MW-139 S	Aqueous	Potassium	6010C	4.7	J	mg/L	19
007	MW-139 S	Aqueous	Sodium	6010C	8.2		mg/L	19
008	MW-141 T	Aqueous	Alkalinity	SM 2320B	130		mg/L	20
008	MW-141 T	Aqueous	Bicarbonate Alkalinity	SM 2320B	130		mg/L	20
008	MW-141 T	Aqueous	Chloride		300.0		mg/L	20
008	MW-141 T	Aqueous	Sulfate		300.0		mg/L	20
008	MW-141 T	Aqueous	Calcium	6010C	40		mg/L	21
008	MW-141 T	Aqueous	Magnesium	6010C	4.4	J	mg/L	21
008	MW-141 T	Aqueous	Potassium	6010C	4.3	J	mg/L	21
008	MW-141 T	Aqueous	Sodium	6010C	9.5		mg/L	21
009	UBC-025	Aqueous	Alkalinity	SM 2320B	76		mg/L	22
009	UBC-025	Aqueous	Bicarbonate Alkalinity	SM 2320B	76		mg/L	22
009	UBC-025	Aqueous	Chloride		300.0		mg/L	22
009	UBC-025	Aqueous	Sulfate		300.0		mg/L	22
009	UBC-025	Aqueous	Calcium	6010C	22		mg/L	23
009	UBC-025	Aqueous	Magnesium	6010C	2.2	J	mg/L	23
009	UBC-025	Aqueous	Potassium	6010C	3.2	J	mg/L	23
009	UBC-025	Aqueous	Sodium	6010C	2.3	J	mg/L	23
010	UBC-055	Aqueous	Alkalinity	SM 2320B	76		mg/L	24
010	UBC-055	Aqueous	Bicarbonate Alkalinity	SM 2320B	76		mg/L	24
010	UBC-055	Aqueous	Chloride		300.0		mg/L	24
010	UBC-055	Aqueous	Sulfate		300.0		mg/L	24
010	UBC-055	Aqueous	Calcium	6010C	25		mg/L	25
010	UBC-055	Aqueous	Magnesium	6010C	3.1	J	mg/L	25
010	UBC-055	Aqueous	Potassium	6010C	4.4	J	mg/L	25
010	UBC-055	Aqueous	Sodium	6010C	12		mg/L	25

(80 detections)

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI13083-001

Description: MW-102 S

Matrix: Aqueous

Date Sampled: 09/10/2012 1545

Date Received: 09/13/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/14/2012 1400	MAC		93332
1		(Bicarbonate ) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Carbonate Al) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Chloride) 300.0	1	09/14/2012 1454	SMH		93379
1		(Sulfate) 300.0	1	09/17/2012 1717	SMH		93464

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	83	10	3.9	mg/L	1	
Bicarbonate Alkalinity		SM 2320B	83	10	3.9	mg/L	1	
Carbonate Alkalinity		SM 2320B	ND	10	3.9	mg/L	1	
Chloride		300.0	2.2	1.0	0.11	mg/L	1	
Sulfate		300.0	5.4	1.0	0.28	mg/L	1	

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM

Laboratory ID: NI13083-001

Description: MW-102 S

Matrix: Aqueous

Date Sampled: 09/10/2012 1545

Date Received: 09/13/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	3005A	6010C	1	09/14/2012 2026	BNW	09/14/2012 0917	93279

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium	7440-70-2	6010C	22		5.0	1.0	mg/L	1
Magnesium	7439-95-4	6010C	3.1	J	5.0	1.2	mg/L	1
Potassium	7440-09-7	6010C	4.1	J	5.0	1.1	mg/L	1
Sodium	7440-23-5	6010C	6.0		5.0	1.2	mg/L	1

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI13083-002

Description: MW-126 T

Matrix: Aqueous

Date Sampled: 09/10/2012 1620

Date Received: 09/13/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/14/2012 1400	MAC		93332
1		(Bicarbonate ) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Carbonate Al) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Chloride) 300.0	1	09/14/2012 1602	SMH		93379
1		(Sulfate) 300.0	5	09/17/2012 1909	SMH		93464

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	87		10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B	87		10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B	ND		10	3.9	mg/L	1
Chloride		300.0	2.2		1.0	0.11	mg/L	1
Sulfate		300.0	18		5.0	1.4	mg/L	1

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI13083-002
Description: MW-126 T	Matrix: Aqueous
Date Sampled: 09/10/2012 1620	
Date Received: 09/13/2012	

Run 1	Prep Method 3005A	Analytical Method 6010C	Dilution 1	Analysis Date 09/14/2012 2030	Analyst BNW	Prep Date 09/14/2012 0917	Batch 93279				
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run	
Calcium		7440-70-2		6010C	28		5.0	1.0	mg/L	1	
Magnesium		7439-95-4		6010C	4.2	J	5.0	1.2	mg/L	1	
Potassium		7440-09-7		6010C	4.5	J	5.0	1.1	mg/L	1	
Sodium		7440-23-5		6010C	4.3	J	5.0	1.2	mg/L	1	

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and  $\geq$  MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI13083-003

Description: UBC-031

Matrix: Aqueous

Date Sampled: 09/10/2012 1540

Date Received: 09/13/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/14/2012 1400	MAC		93332
1		(Bicarbonate ) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Carbonate Al) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Chloride) 300.0	1	09/17/2012 1931	SMH		93465
1		(Sulfate) 300.0	1	09/17/2012 1931	SMH		93464

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	52		10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B	52		10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B	ND		10	3.9	mg/L	1
Chloride		300.0	2.7		1.0	0.11	mg/L	1
Sulfate		300.0	4.1		1.0	0.28	mg/L	1

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI13083-003
Description: UBC-031	Matrix: Aqueous
Date Sampled: 09/10/2012 1540	
Date Received: 09/13/2012	

Run 1	Prep Method 3005A	Analytical Method 6010C	Dilution 1	Analysis Date 09/14/2012 2034	Analyst BNW	Prep Date 09/14/2012 0917	Batch 93279				
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run	
Calcium		7440-70-2		6010C	14		5.0	1.0	mg/L	1	
Magnesium		7439-95-4		6010C	2.0	J	5.0	1.2	mg/L	1	
Potassium		7440-09-7		6010C	3.6	J	5.0	1.1	mg/L	1	
Sodium		7440-23-5		6010C	1.9	J	5.0	1.2	mg/L	1	

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and  $\geq$  MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI13083-004

Description: MW-101 T

Matrix: Aqueous

Date Sampled: 09/11/2012 1445

Date Received: 09/13/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/14/2012 1400	MAC		93332
1		(Bicarbonate ) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Carbonate Al) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Chloride) 300.0	1	09/14/2012 1624	SMH		93379
1		(Sulfate) 300.0	5	09/19/2012 1255	SMH		93736

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	80	10	3.9	mg/L	1	
Bicarbonate Alkalinity		SM 2320B	80	10	3.9	mg/L	1	
Carbonate Alkalinity		SM 2320B	ND	10	3.9	mg/L	1	
Chloride		300.0	2.1	1.0	0.11	mg/L	1	
Sulfate		300.0	25	5.0	1.4	mg/L	1	

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI13083-004
Description: MW-101 T	Matrix: Aqueous
Date Sampled: 09/11/2012 1445	
Date Received: 09/13/2012	

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch			
1	3005A	6010C	1	09/14/2012 2038	BNW	09/14/2012 0917	93279			
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run
Calcium		7440-70-2		6010C	21		5.0	1.0	mg/L	1
Magnesium		7439-95-4		6010C	3.0	J	5.0	1.2	mg/L	1
Potassium		7440-09-7		6010C	4.2	J	5.0	1.1	mg/L	1
Sodium		7440-23-5		6010C	13		5.0	1.2	mg/L	1

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and  $\geq$  MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI13083-005

Description: MW-103 P

Matrix: Aqueous

Date Sampled: 09/11/2012 1430

Date Received: 09/13/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/14/2012 1400	MAC		93332
1		(Bicarbonate ) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Carbonate Al) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Chloride) 300.0	1	09/14/2012 1646	SMH		93379
1		(Sulfate) 300.0	1	09/17/2012 2016	SMH		93464

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	59		10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B	59		10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B	ND		10	3.9	mg/L	1
Chloride		300.0	2.5		1.0	0.11	mg/L	1
Sulfate		300.0	4.6		1.0	0.28	mg/L	1

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI13083-005
Description: MW-103 P	Matrix: Aqueous
Date Sampled: 09/11/2012 1430	
Date Received: 09/13/2012	

Run 1	Prep Method 3005A	Analytical Method 6010C	Dilution 1	Analysis Date 09/14/2012 2042	Analyst BNW	Prep Date 09/14/2012 0917	Batch 93279				
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run	
Calcium		7440-70-2		6010C	16		5.0	1.0	mg/L	1	
Magnesium		7439-95-4		6010C	2.3	J	5.0	1.2	mg/L	1	
Potassium		7440-09-7		6010C	3.8	J	5.0	1.1	mg/L	1	
Sodium		7440-23-5		6010C	5.9		5.0	1.2	mg/L	1	

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and  $\geq$  MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI13083-006

Description: MW-094 PR

Matrix: Aqueous

Date Sampled: 09/11/2012 1600

Date Received: 09/13/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/14/2012 1400	MAC		93332
1		(Bicarbonate ) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Carbonate Al) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Chloride) 300.0	1	09/14/2012 1709	SMH		93379
1		(Sulfate) 300.0	2	09/17/2012 2038	SMH		93464

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	100	10	3.9	mg/L	1	
Bicarbonate Alkalinity		SM 2320B	100	10	3.9	mg/L	1	
Carbonate Alkalinity		SM 2320B	ND	10	3.9	mg/L	1	
Chloride		300.0	2.6	1.0	0.11	mg/L	1	
Sulfate		300.0	9.8	2.0	0.55	mg/L	1	

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI13083-006
Description: MW-094 PR	Matrix: Aqueous
Date Sampled: 09/11/2012 1600	
Date Received: 09/13/2012	

Run 1	Prep Method 3005A	Analytical Method 6010C	Dilution 1	Analysis Date 09/14/2012 2046	Analyst BNW	Prep Date 09/14/2012 0917	Batch 93279				
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run	
Calcium		7440-70-2		6010C	34		5.0	1.0	mg/L	1	
Magnesium		7439-95-4		6010C	4.5	J	5.0	1.2	mg/L	1	
Potassium		7440-09-7		6010C	4.7	J	5.0	1.1	mg/L	1	
Sodium		7440-23-5		6010C	8.0		5.0	1.2	mg/L	1	

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and  $\geq$  MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI13083-007

Description: MW-139 S

Matrix: Aqueous

Date Sampled: 09/13/2012 1455

Date Received: 09/13/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/14/2012 1400	MAC		93332
1		(Bicarbonate ) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Carbonate Al) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Chloride) 300.0	1	09/17/2012 2101	SMH		93465
1		(Sulfate) 300.0	1	09/17/2012 2101	SMH		93464

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	87		10	3.9	mg/L	1
Bicarbonate Alkalinity		SM 2320B	87		10	3.9	mg/L	1
Carbonate Alkalinity		SM 2320B	ND		10	3.9	mg/L	1
Chloride		300.0	2.4		1.0	0.11	mg/L	1
Sulfate		300.0	6.4		1.0	0.28	mg/L	1

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

O = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI13083-007
Description: MW-139 S	Matrix: Aqueous
Date Sampled: 09/13/2012 1455	
Date Received: 09/13/2012	

Run 1	Prep Method 3005A	Analytical Method 6010C	Dilution 1	Analysis Date 09/14/2012 2049	Analyst BNW	Prep Date 09/14/2012 0917	Batch 93279				
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run	
Calcium		7440-70-2		6010C	22		5.0	1.0	mg/L	1	
Magnesium		7439-95-4		6010C	3.7	J	5.0	1.2	mg/L	1	
Potassium		7440-09-7		6010C	4.7	J	5.0	1.1	mg/L	1	
Sodium		7440-23-5		6010C	8.2		5.0	1.2	mg/L	1	

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and  $\geq$  MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI13083-008

Description: MW-141 T

Matrix: Aqueous

Date Sampled: 09/13/2012 1540

Date Received: 09/13/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/14/2012 1400	MAC		93332
1		(Bicarbonate ) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Carbonate Al) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Chloride) 300.0	1	09/17/2012 2123	SMH		93465
1		(Sulfate) 300.0	1	09/17/2012 2123	SMH		93464

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	130	10	3.9	mg/L	1	
Bicarbonate Alkalinity		SM 2320B	130	10	3.9	mg/L	1	
Carbonate Alkalinity		SM 2320B	ND	10	3.9	mg/L	1	
Chloride		300.0	2.2	1.0	0.11	mg/L	1	
Sulfate		300.0	7.5	1.0	0.28	mg/L	1	

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI13083-008
Description: MW-141 T	Matrix: Aqueous
Date Sampled: 09/13/2012 1540	
Date Received: 09/13/2012	

Run 1	Prep Method 3005A	Analytical Method 6010C	Dilution 1	Analysis Date 09/14/2012 2053	Analyst BNW	Prep Date 09/14/2012 0917	Batch 93279				
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run	
Calcium		7440-70-2		6010C	40		5.0	1.0	mg/L	1	
Magnesium		7439-95-4		6010C	4.4	J	5.0	1.2	mg/L	1	
Potassium		7440-09-7		6010C	4.3	J	5.0	1.1	mg/L	1	
Sodium		7440-23-5		6010C	9.5		5.0	1.2	mg/L	1	

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and  $\geq$  MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI13083-009

Description: UBC-025

Matrix: Aqueous

Date Sampled: 09/13/2012 1525

Date Received: 09/13/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/14/2012 1400	MAC		93332
1		(Bicarbonate ) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Carbonate Al) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Chloride) 300.0	1	09/17/2012 2146	SMH		93465
1		(Sulfate) 300.0	1	09/17/2012 2146	SMH		93464

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	76	10	3.9	mg/L	1	
Bicarbonate Alkalinity		SM 2320B	76	10	3.9	mg/L	1	
Carbonate Alkalinity		SM 2320B	ND	10	3.9	mg/L	1	
Chloride		300.0	3.0	1.0	0.11	mg/L	1	
Sulfate		300.0	3.8	1.0	0.28	mg/L	1	

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI13083-009
Description: UBC-025	Matrix: Aqueous
Date Sampled: 09/13/2012 1525	
Date Received: 09/13/2012	

Run 1	Prep Method 3005A	Analytical Method 6010C	Dilution 1	Analysis Date 09/14/2012 2105	Analyst BNW	Prep Date 09/14/2012 0917	Batch 93279				
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run	
Calcium		7440-70-2		6010C	22		5.0	1.0	mg/L	1	
Magnesium		7439-95-4		6010C	2.2	J	5.0	1.2	mg/L	1	
Potassium		7440-09-7		6010C	3.2	J	5.0	1.1	mg/L	1	
Sodium		7440-23-5		6010C	2.3	J	5.0	1.2	mg/L	1	

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and  $\geq$  MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

# Inorganic non-metals

Client: Earth Tech / AECOM

Laboratory ID: NI13083-010

Description: UBC-055

Matrix: Aqueous

Date Sampled: 09/13/2012 1400

Date Received: 09/13/2012

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1		(Alkalinity) SM 2320B	1	09/14/2012 1400	MAC		93332
1		(Bicarbonate ) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Carbonate Al) SM	1	09/14/2012 1513	MAC	09/14/2012 1400	
1		(Chloride) 300.0	1	09/17/2012 2208	SMH		93465
1		(Sulfate) 300.0	1	09/17/2012 2208	SMH		93464

Parameter	CAS Number	Analytical Method	Result	Q	PQL	MDL	Units	Run
Alkalinity		SM 2320B	76	10	3.9	mg/L	1	
Bicarbonate Alkalinity		SM 2320B	76	10	3.9	mg/L	1	
Carbonate Alkalinity		SM 2320B	ND	10	3.9	mg/L	1	
Chloride		300.0	2.6	1.0	0.11	mg/L	1	
Sulfate		300.0	25	1.0	0.28	mg/L	1	

PQL = Practical quantitation limit

B = Detected in the method blank

E = Quantitation of compound exceeded the calibration range

H = Out of holding time

Q = Surrogate failure

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

P = The RPD between two GC columns exceeds 40%

N = Recovery is out of criteria

L = LCS/LCSD failure

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W" \* = Reportable result (only when report all runs)

S = MS/MSD failure

## ICP-AES

Client: Earth Tech / AECOM	Laboratory ID: NI13083-010
Description: UBC-055	Matrix: Aqueous
Date Sampled: 09/13/2012 1400	
Date Received: 09/13/2012	

Run 1	Prep Method 3005A	Analytical Method 6010C	Dilution 1	Analysis Date 09/14/2012 2109	Analyst BNW	Prep Date 09/14/2012 0917	Batch 93279				
Parameter		CAS Number		Analytical Method	Result	Q	PQL	MDL	Units	Run	
Calcium		7440-70-2		6010C	25		5.0	1.0	mg/L	1	
Magnesium		7439-95-4		6010C	3.1	J	5.0	1.2	mg/L	1	
Potassium		7440-09-7		6010C	4.4	J	5.0	1.1	mg/L	1	
Sodium		7440-23-5		6010C	12		5.0	1.2	mg/L	1	

PQL = Practical quantitation limit      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      H = Out of holding time      Q = Surrogate failure  
 ND = Not detected at or above the MDL      J = Estimated result < PQL and  $\geq$  MDL      P = The RPD between two GC columns exceeds 40%      N = Recovery is out of criteria      L = LCS/LCSD failure  
 Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"      \* = Reportable result (only when report all runs)      S = MS/MSD failure

## QC Summary

# Inorganic non-metals - MB

Sample ID: NQ93332-001

Matrix: Aqueous

Batch: 93332

Analytical Method: SM 2320B

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Alkalinity	ND		1	10	3.9	mg/L	09/14/2012 1400

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - LCS

Sample ID: NQ93332-002

Matrix: Aqueous

Batch: 93332

Analytical Method: SM 2320B

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Alkalinity	100	100		1	104	90-110	09/14/2012 1400

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - LCSD

Sample ID: NQ93332-003

Matrix: Aqueous

Batch: 93332

Analytical Method: SM 2320B

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Alkalinity	100	100		1	104	0.029	90-110	20	09/14/2012 1400

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - MS

Sample ID: NI13083-005MS

Matrix: Aqueous

Batch: 93332

Analytical Method: SM 2320B

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Alkalinity	59	100	170	1		115	70-130	09/14/2012 1400

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - MSD

Sample ID: NI13083-005MD

Matrix: Aqueous

Batch: 93332

Analytical Method: SM 2320B

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Alkalinity	59	100	170	1		115	0.00	70-130	20	09/14/2012 1400

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - MS

Sample ID: NI13083-009MS

Matrix: Aqueous

Batch: 93332

Analytical Method: SM 2320B

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Alkalinity	76	100	190	1		115	70-130	09/14/2012 1400

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - MSD

Sample ID: NI13083-009MD

Matrix: Aqueous

Batch: 93332

Analytical Method: SM 2320B

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Alkalinity	76	100	190	1		115	0.00	70-130	20	09/14/2012 1400

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - MB

Sample ID: NQ93379-001

Matrix: Aqueous

Batch: 93379

Analytical Method: 300.0

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Chloride	ND		1	1.0	0.11	mg/L	09/14/2012 1003

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - LCS

Sample ID: NQ93379-002

Matrix: Aqueous

Batch: 93379

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Chloride	20	20		1	98	90-110	09/14/2012 1026

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - LCSD

Sample ID: NQ93379-003

Matrix: Aqueous

Batch: 93379

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Chloride	20	20		1	98	0.40	90-110	20	09/14/2012 1048

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - MS

Sample ID: NI13083-001MS

Matrix: Aqueous

Batch: 93379

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Chloride	2.2	20	22		1	98	90-110	09/14/2012 1517

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - MSD

Sample ID: NI13083-001MD

Matrix: Aqueous

Batch: 93379

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Chloride	2.2	20	22		1	98	0.066	90-110	20	09/14/2012 1539

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - MB

Sample ID: NQ93464-001

Matrix: Aqueous

Batch: 93464

Analytical Method: 300.0

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Sulfate	ND		1	1.0	0.28	mg/L	09/17/2012 1355

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - LCS

Sample ID: NQ93464-002

Matrix: Aqueous

Batch: 93464

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Sulfate	20	19		1	97	90-110	09/17/2012 1418

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - LCSD

Sample ID: NQ93464-003

Matrix: Aqueous

Batch: 93464

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Sulfate	20	19		1	97	0.17	90-110	20	09/17/2012 1440

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - MS

Sample ID: NI13083-001MS

Matrix: Aqueous

Batch: 93464

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Sulfate	5.4	20	24		1	95	90-110	09/17/2012 1739

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - MSD

Sample ID: NI13083-001MD

Matrix: Aqueous

Batch: 93464

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Sulfate	5.4	20	24	1		95	0.29	90-110	20	09/17/2012 1846

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - MS

Sample ID: NI13083-010MS

Matrix: Aqueous

Batch: 93464

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Sulfate	25	20	44	1		93	90-110	09/17/2012 2315

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - MSD

Sample ID: NI13083-010MD

Matrix: Aqueous

Batch: 93464

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Sulfate	25	20	44	1		92	0.15	90-110	20	09/17/2012 2338

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - MB

Sample ID: NQ93465-001

Matrix: Aqueous

Batch: 93465

Analytical Method: 300.0

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Chloride	ND		1	1.0	0.11	mg/L	09/17/2012 1355

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - LCS

Sample ID: NQ93465-002

Matrix: Aqueous

Batch: 93465

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Chloride	20	20		1	99	90-110	09/17/2012 1418

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - LCSD

Sample ID: NQ93465-003

Matrix: Aqueous

Batch: 93465

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Chloride	20	20		1	99	0.25	90-110	20	09/17/2012 1440

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - MS

Sample ID: NI13083-010MS

Matrix: Aqueous

Batch: 93465

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Chloride	2.6	20	22		1	95	90-110	09/17/2012 2315

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - MSD

Sample ID: NI13083-010MD

Matrix: Aqueous

Batch: 93465

Analytical Method: 300.0

Parameter	Sample Amount (mg/L)	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Chloride	2.6	20	22		1	95	0.0097	90-110	20	09/17/2012 2338

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - MB

Sample ID: NQ93736-001

Matrix: Aqueous

Batch: 93736

Analytical Method: 300.0

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Sulfate	ND		1	1.0	0.28	mg/L	09/19/2012 0956

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - LCS

Sample ID: NQ93736-002

Matrix: Aqueous

Batch: 93736

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Sulfate	20	19		1	97	90-110	09/19/2012 1018

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# Inorganic non-metals - LCSD

Sample ID: NQ93736-003

Matrix: Aqueous

Batch: 93736

Analytical Method: 300.0

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Sulfate	20	19		1	97	0.29	90-110	20	09/19/2012 1041

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# ICP-AES - MB

Sample ID: NQ93279-001  
Batch: 93279

Analytical Method: 6010C

Matrix: Aqueous

Prep Method: 3005A

Prep Date: 09/14/2012 917

Parameter	Result	Q	Dil	PQL	MDL	Units	Analysis Date
Calcium	ND		1	5.0	1.0	mg/L	09/14/2012 1933
Magnesium	ND		1	5.0	1.2	mg/L	09/14/2012 1933
Potassium	ND		1	5.0	1.1	mg/L	09/14/2012 1933
Sodium	ND		1	5.0	1.2	mg/L	09/14/2012 1933

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# ICP-AES - LCS

Sample ID: NQ93279-002

Batch: 93279

Analytical Method: 6010C

Matrix: Aqueous

Prep Method: 3005A

Prep Date: 09/14/2012 917

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Calcium	40	41		1	102	80-120	09/14/2012 1937
Magnesium	40	42		1	105	80-120	09/14/2012 1937
Potassium	40	43		1	107	80-120	09/14/2012 1937
Sodium	40	40		1	100	80-120	09/14/2012 1937

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results

# ICP-AES - LCSD

Sample ID: NQ93279-003

Batch: 93279

Analytical Method: 6010C

Matrix: Aqueous

Prep Method: 3005A

Prep Date: 09/14/2012 917

Parameter	Spike Amount (mg/L)	Result (mg/L)	Q	Dil	% Rec	% RPD	% Rec Limit	% RPD Limit	Analysis Date
Calcium	40	40		1	99	2.8	80-120	20	09/14/2012 1941
Magnesium	40	41		1	103	2.2	80-120	20	09/14/2012 1941
Potassium	40	42		1	106	0.50	80-120	20	09/14/2012 1941
Sodium	40	40		1	100	0.34	80-120	20	09/14/2012 1941

PQL = Practical quantitation limit

P = The RPD between two GC columns exceeds 40%

N - Recovery is out of criteria

ND = Not detected at or above the MDL

J = Estimated result < PQL and  $\geq$  MDL

+ - RPD is out of criteria

Where applicable, all soil sample analysis are reported on a dry weight basis unless flagged with a "W"

Note: Calculations are performed before rounding to avoid round-off errors in calculated results



Shealy Environmental Services, Inc.

106 Vantage Point Drive

West Columbia, South Carolina 29172

Telephone No. (803) 791-9700 Fax No. (803) 791-9111

www.shealylab.com

Number 15226

## SHEALY ENVIRONMENTAL SERVICES, INC.

Client Accm	Report to Contact Dorothy Culver		Sampler (Printed Name) Brett Dawson, Doris Lepine		Quote No. 15227
Address BLDG # 10 PARKWOOD DR.	State SC	Zip Code 29615	Telephone No. / Fax No. / Email 864 234 8928	Waybill No. COLLAR, COM	Page 1 of 1
City Greenville	Preservative 1. Ultrapur. 2. NaOH 3. H2SO4	Preservative 4. HNO3 5. HCl 6. Na Thio.	Date 10/12	Time 10:10	Number of Containers Bottle (See Instructions on back)
Project Name Anellos Impacted Project					Preservative Lot No.
Project Number P-0000	P.O. Number	Matrix	Analysis	Matrix	Remarks / Cooler ID
Sample ID / Description (Containers for each sample may be contained on one line)	Date	Time	G=Gas	C=Composite	CAT# = 621 K, Ca, Mg (60103)
MU - 1023	9/10/12	1545	G	X	
MU - 1267	9/10/12	1620	G	X	
UBC - 031	9/10/12	1540	G	X	
MU - 1017	9/10/12	1445	G	X	
MU - 1037	9/10/12	1430	G	X	
MU - 094PR	9/10/12	1600	G	X	
MU - 1395	9/13/12	1455	G	X	
MU - 1417	9/13/12	1540	G	X	
UBC - 025	9/13/12	1525	G	X	
UBC - DSS	9/13/12	1400	G	X	
Turn Around Time Required (Per lab approval required for expedited AT)					
<input checked="" type="checkbox"/> Standard	<input type="checkbox"/> Fast (Please Specify)		QC Requirements (Specify)		
1. Relinquished by / Sampler <i>J. K. Johnson</i>		Return to Client	Disposal by Lab	Possible Hazard Identification	
2. Relinquished by		Date Q/13/12	Time 1730	1. Received by	<input type="checkbox"/> Non-Hazard <input type="checkbox"/> Flammable <input type="checkbox"/> Skin Irritant <input type="checkbox"/> Poison <input type="checkbox"/> Unknown
3. Relinquished by		Date	Time	2. Received by	Date
4. Relinquished by		Date	Time	3. Received by	Date
				4. Laboratory Received <i>E. L.</i>	Time
Note: All samples are retained for six weeks from receipt unless other arrangements are made.					
LAB USE ONLY Received in Ice Check <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Ice Pack Recept Temp. <i>46 °C</i> Temp. Bank <input type="checkbox"/> Y / <input type="checkbox"/> N					

# SHEALY ENVIRONMENTAL SERVICES, INC.

Shealy Environmental Services, Inc.  
Document Number: F-AD-016  
Revision Number: 9

Page 1 of 1  
Replaces Date: 05/06/11  
Effective Date: 10/11/11

## Sample Receipt Checklist (SRC)

Client: ACCOM

Cooler Inspected by/date: WR 9/13/12 Lot #: NT 15083

Means of receipt: <input checked="" type="checkbox"/> SESI <input type="checkbox"/> Client <input type="checkbox"/> UPS <input type="checkbox"/> FedEx <input type="checkbox"/> Airborne Exp <input type="checkbox"/> Other		
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	1. Were custody seals present on the cooler?
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	2. If custody seals were present, were they intact and unbroken?
Cooler ID/temperature upon receipt <u>4916</u> °C / °C / °C / °C		
Method: <input type="checkbox"/> Temperature Blank <input checked="" type="checkbox"/> Against Bottles		
Method of coolant: <input checked="" type="checkbox"/> Wet Ice <input type="checkbox"/> Blue Ice <input type="checkbox"/> Dry Ice <input type="checkbox"/> None		
If response is No (or Yes for 14, 15, 16), an explanation/resolution must be provided.		
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
3. If temperature of any cooler exceeded 6.0°C, was Project Manager notified? PM notified by SRC, phone, note (circle one), other: _____ (For coolers received via commercial courier, PMs are to be notified immediately.)		
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
4. Is the commercial courier's packing slip attached to this form?		
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
5. Were proper custody procedures (relinquished/received) followed?		
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
5a Were samples relinquished by client to commercial courier?		
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
6. Were sample IDs listed?		
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
7. Was collection date & time listed?		
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
8. Were tests to be performed listed on the COC?		
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
9. Did all samples arrive in the proper containers for each test?		
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
10. Did all container label information (ID, date, time) agree with COC?		
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
11. Did all containers arrive in good condition (unbroken, lids on, etc.)?		
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
12. Was adequate sample volume available?		
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	NA <input checked="" type="checkbox"/>
13. Were all samples received within ½ the holding time or 48 hours, whichever comes first?		
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	NA <input checked="" type="checkbox"/>
14. Were any samples containers missing?		
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	NA <input checked="" type="checkbox"/>
15. Were there any excess samples not listed on COC?		
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
16. Were bubbles present >"pea-size" (¼" or 6mm in diameter) in any VOA vials?		
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
17. Were all metals/O&G/HEM/nutrient samples received at a pH of <2?		
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
18. Were all cyanide and/or sulfide samples received at a pH >12?		
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
19. Were all applicable NH3/TKN/cyanide/phenol/BNA/pest/PCB/herb (<0.2mg/L) samples free of residual chlorine?		
Yes <input type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
20. Were collection temperatures documented on the COC for NC samples?		
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	NA <input checked="" type="checkbox"/>
21. Were client remarks/requests (i.e. requested dilutions, MS/MSD designations, etc...) correctly transcribed from the COC into the comment section in LIMS?		

### Sample Preservation (Must be completed for any sample(s) incorrectly preserved or with headspace.)

Sample(s) \_\_\_\_\_ were received incorrectly preserved and were adjusted accordingly in sample receiving with \_\_\_\_\_ (H<sub>2</sub>SO<sub>4</sub>, HNO<sub>3</sub>, HCl, NaOH) with the SR # (number) \_\_\_\_\_

Sample(s) \_\_\_\_\_ were received with bubbles >6 mm in diameter.

Sample(s) \_\_\_\_\_ were received with TRC >0.2 mg/L for NH3/TKN/cyanide/BNA/pest/PCB/herb.

### Corrective Action taken, if necessary:

Was client notified: Yes  No

Did client respond: Yes  No

SESI employee: \_\_\_\_\_

Date of response: \_\_\_\_\_

Comments:



1020 Cordova St. East Vancouver BC V6A 4A3 Canada

Acme Analytical Laboratories (Vancouver) Ltd.

[www.acmelab.com](http://www.acmelab.com)

**Client:** **AECOM**

10 Patewood Dr. Bldg #6 Ste. 500  
Greenville SC USA

Submitted By: Doria Cullom  
Receiving Lab: Canada-Vancouver  
Received: September 19, 2012  
Report Date: October 23, 2012  
Page: 1 of 3

## CERTIFICATE OF ANALYSIS

VAN12004563.1

### CLIENT JOB INFORMATION

Project: Pinewood Improvement  
Shipment ID:  
P.O. Number  
Number of Samples: 58

### SAMPLE PREPARATION AND ANALYTICAL PROCEDURES

Method Code	Number of Samples	Code Description	Test Wgt (g)	Report Status	Lab
No Prep	57	Sorting of samples on arrival and labeling			VAN
Split Solution	57	Analysis sample split/packet			VAN
2C	57	Water analysis by ICP-MS. Solutions >0.1% TDS run by IC	1	Completed	VAN

### SAMPLE DISPOSAL

DISP-PLP Dispose of Pulp After 90 days

### ADDITIONAL COMMENTS

Acme does not accept responsibility for samples left at the laboratory after 90 days without prior written instructions for sample storage or return.

Invoice To: AECOM  
10 Patewood Dr. Bldg #6 Ste. 500  
Greenville SC  
USA

CC:



This report supersedes all previous preliminary and final reports with this file number dated prior to the date on this certificate. Signature indicates final approval; preliminary reports are unsigned and should be used for reference only.  
All results are considered the confidential property of the client. Acme assumes the liabilities for actual cost of analysis only. Results apply to samples as submitted.  
\*\* asterisk indicates that an analytical result could not be provided due to unusually high levels of interference from other elements.



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Phone (604) 253-3158 Fax (604) 253-1716

Acme Analytical Laboratories (Vancouver) Ltd.

**Client:** AECOM

10 Patewood Dr. Bldg #6 Ste. 500  
Greenville SC USA

Project: Pinewood Improvement  
Report Date: October 23, 2012

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Part: 1 of 1

## CERTIFICATE OF ANALYSIS

VAN12004563.1

Analyte	Method	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	
		Dilution	Ag	Al	As	Au	B	Ba	Be	Bi	Br	Ca	Cd	Ce	Cl	Co	Cr	Cs	Dy	Er
		Unit	ppb	ppm	ppb	ppb														
		MDL	1	0.05	1	0.5	0.05	5	0.05	0.05	5	0.05	0.05	0.01	1	0.02	0.5	0.01	0.1	0.01
MW-040P 9-4-12 1635	Water	1	<0.05	10	<0.5	<0.05	19	67.94	<0.05	<0.05	12	18.01	<0.05	<0.01	3	<0.02	<0.5	0.10	<0.1	<0.01
UBC-011 9-4-12 1715	Water	1	<0.05	13	<0.5	<0.05	18	72.56	<0.05	<0.05	12	15.39	<0.05	0.05	3	0.06	<0.5	2.48	0.1	<0.01
MW-010 9-5-12 1444	Water	1	<0.05	1	<0.5	<0.05	19	66.06	0.06	<0.05	8	19.52	<0.05	<0.01	2	<0.02	<0.5	0.07	0.2	<0.01
MW-038SR 9-5-12 1715	Water	1	<0.05	1	<0.5	<0.05	15	115.5	<0.05	<0.05	14	25.45	<0.05	0.09	3	<0.02	<0.5	0.05	0.2	<0.01
MW-041T 9-5-12 1545	Water	1	<0.05	2	<0.5	<0.05	31	68.56	<0.05	<0.05	11	27.61	<0.05	<0.01	2	<0.02	<0.5	0.04	0.6	<0.01
MW-125P 9-5-12 1613	Water	1	<0.05	4	<0.5	<0.05	16	93.59	<0.05	<0.05	14	22.81	<0.05	<0.01	3	<0.02	<0.5	0.10	0.2	<0.01
MW-134T 9-5-12 1725	Water	1	<0.05	6	<0.5	<0.05	20	60.20	<0.05	<0.05	18	52.46	<0.05	0.05	3	<0.02	<0.5	0.06	0.3	<0.01
MW-135S 9-5-12 1510	Water	1	<0.05	2	<0.5	<0.05	14	104.8	<0.05	<0.05	12	17.54	<0.05	<0.01	3	<0.02	<0.5	0.02	<0.1	<0.01
UBC-034 9-5-12 1700	Water	1	<0.05	3	0.8	<0.05	15	15.96	0.06	<0.05	11	17.69	<0.05	<0.01	2	0.34	<0.5	0.07	<0.1	<0.01
MW-061T 9-6-12 1240	Water	1	<0.05	28	<0.5	<0.05	52	20.76	0.06	<0.05	85	56.90	<0.05	0.11	15	0.38	0.7	0.39	1.1	<0.01
MW-048TR 9-6-12 1440	Water	1	<0.05	3	<0.5	<0.05	27	122.3	0.07	<0.05	9	26.58	<0.05	<0.01	2	0.09	2.0	0.10	0.3	<0.01
UBC-052 9-6-12 1420	Water	1	<0.05	11	<0.5	<0.05	20	65.97	<0.05	<0.05	15	20.13	<0.05	0.23	3	0.04	<0.5	0.08	0.2	<0.01
MW-059S 9-6-12 1412	Water	1	<0.05	22	0.6	<0.05	28	38.51	<0.05	<0.05	26	24.89	<0.05	<0.01	7	<0.02	<0.5	0.07	0.4	<0.01
MW-090SR 9-6-12 1555	Water	1	<0.05	1	0.5	<0.05	14	108.8	0.06	<0.05	12	20.03	<0.05	<0.01	2	0.03	<0.5	0.03	0.2	<0.01
MW-089T 9-6-12 1605	Water	1	<0.05	13	<0.5	<0.05	18	163.1	<0.05	<0.05	17	26.29	<0.05	0.05	3	<0.02	<0.5	0.04	0.4	<0.01
MW-021 9-7-12 1520	Water	1	<0.05	8	<0.5	<0.05	31	52.84	<0.05	<0.05	18	41.08	<0.05	0.16	3	0.10	1.4	0.09	0.7	<0.01
MW-052T 9-7-12 1535	Water	1	<0.05	3	<0.5	<0.05	30	34.50	<0.05	<0.05	22	41.33	<0.05	<0.01	4	<0.02	<0.5	0.09	0.5	<0.01
MW-058P 9-7-12 1515	Water	1	<0.05	1	<0.5	<0.05	16	64.40	0.06	<0.05	12	21.13	<0.05	<0.01	2	<0.02	<0.5	0.04	<0.1	<0.01
MW-063SR 9-7-12 1333	Water	1	<0.05	2	<0.5	<0.05	13	81.52	0.06	<0.05	13	20.02	<0.05	0.01	2	0.05	<0.5	0.02	0.1	<0.01
MW-091PR 9-7-12 1630	Water	1	<0.05	2	<0.5	<0.05	15	90.94	0.13	<0.05	11	16.03	<0.05	<0.01	2	<0.02	<0.5	0.05	<0.1	<0.01
SL-023 9-7-12 1540	Water	1	<0.05	27	<0.5	<0.05	14	64.31	0.06	<0.05	12	16.11	<0.05	0.43	3	0.18	<0.5	0.20	1.2	0.02
PBC-004 9-10-12 1129	Water	1	<0.05	1	<0.5	<0.05	12	56.85	0.06	<0.05	13	16.87	<0.05	0.02	3	0.28	<0.5	0.04	<0.1	<0.01
UBC-026 9-10-12 1315	Water	1	<0.05	83	<0.5	<0.05	13	74.46	<0.05	<0.05	12	26.75	<0.05	<0.01	3	<0.02	<0.5	0.05	<0.1	<0.01
MW-102S 9-10-12 1545	Water	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.	L.N.R.		
MW-102S 9-10-12 1546	Water	1	<0.05	<1	<0.5	<0.05	15	132.5	<0.05	<0.05	11	21.90	<0.05	<0.01	2	<0.02	<0.5	0.06	<0.1	<0.01
MW-126T 9-10-12 1620	Water	1	<0.05	2	<0.5	<0.05	16	216.7	0.06	<0.05	11	29.05	<0.05	<0.01	2	0.02	<0.5	0.05	<0.1	<0.01
UBC-021 9-10-12 1440	Water	1	<0.05	393	<0.5	<0.05	15	83.54	0.25	<0.05	12	16.65	<0.05	19.87	3	1.37	8.3	0.30	2.8	0.94
UBC-031 9-10-12 1540	Water	1	<0.05	1	<0.5	<0.05	13	60.30	0.19	<0.05	12	15.10	<0.05	0.03	3	<0.02	<0.5	0.06	<0.1	<0.01
MW-101T 9-11-12 1445	Water	1	<0.05	<1	<0.5	<0.05	22	41.22	<0.05	<0.05	11	21.49	<0.05	<0.01	2	<0.02	<0.5	0.04	<0.1	<0.01
MW-103P 9-11-12 1430	Water	1	<0.05	2	<0.5	<0.05	16	87.63	<0.05	<0.05	12	15.98	<0.05	0.02	3	0.14	<0.5	0.06	<0.1	<0.01

This report supersedes all previous preliminary and final reports with this file number dated prior to the date on this certificate. Signature indicates final approval; preliminary reports are unsigned and should be used for reference only.



# AcmeLabs

1020 Cordova St. East Vancouver BC V6A 4A3 Canada  
Phone (604) 253-3158 Fax (604) 253-1716

## Acme Analytical Laboratories (Vancouver) Ltd.

## **Client:**

AECOM

10 Patewood Dr. Bldg #6 Ste. 500  
Greenville SC USA

Project: Pinewood Improvement  
Report Date: October 23, 2012

[www.acmelab.com](http://www.acmelab.com)

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Part: 2 of 1

## CERTIFICATE OF ANALYSIS

VAN12004563.1

Method	Analyte	2C	2C																		
		Eu	Fe	Ga	Gd	Ge	Hf	Hg	Ho	In	K	La	Li	Lu	Mg	Mn	Mo	Na	Nb	Nd	Ni
		Unit	ppb	ppm	ppb	ppm	ppb	ppb	ppb	ppm	ppb	ppb	ppb								
	MDL	0.01	10	0.05	0.01	0.05	0.02	0.1	0.01	0.01	0.05	0.01	0.1	0.01	0.05	0.05	0.1	0.05	0.01	0.01	0.2
MW-040P 9-4-12 1635	Water	<0.01	2648	0.06	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	4.57	<0.01	2.9	<0.01	2.78	118.9	0.1	4.83	<0.01	<0.01	
UBC-011 9-4-12 1715	Water	<0.01	1647	0.08	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	9.07	0.03	13.2	<0.01	1.97	64.76	0.4	5.68	<0.01	0.02	
MW-010 9-5-12 1444	Water	<0.01	3340	<0.05	<0.01	0.05	<0.02	<0.1	<0.01	<0.01	3.60	<0.01	3.7	<0.01	3.50	167.4	<0.1	5.98	<0.01	<0.01	
MW-038SR 9-5-12 1715	Water	<0.01	909	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.46	0.04	2.1	<0.01	2.55	92.61	<0.1	4.06	<0.01	0.04	
MW-041T 9-5-12 1545	Water	<0.01	198	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	4.43	<0.01	5.0	<0.01	4.52	85.14	2.3	8.30	<0.01	<0.01	
MW-125P 9-5-12 1613	Water	<0.01	2865	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	4.54	<0.01	6.3	<0.01	2.91	97.57	0.2	7.13	<0.01	<0.01	
MW-134T 9-5-12 1725	Water	<0.01	170	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.38	0.03	4.3	<0.01	2.94	29.85	0.6	9.65	<0.01	0.04	
MW-135S 9-5-12 1510	Water	<0.01	4464	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.40	<0.01	2.5	<0.01	2.24	144.6	0.2	5.40	<0.01	<0.01	
UBC-034 9-5-12 1700	Water	<0.01	2118	0.06	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.57	<0.01	6.9	<0.01	2.50	156.9	0.8	18.99	<0.01	<0.01	
MW-061T 9-6-12 1240	Water	<0.01	3389	<0.05	<0.01	0.18	<0.02	<0.1	<0.01	<0.01	7.32	0.08	13.8	<0.01	14.05	683.0	0.5	20.62	<0.01	0.03	
MW-048TR 9-6-12 1440	Water	<0.01	2334	0.07	<0.01	0.06	<0.02	<0.1	<0.01	<0.01	4.94	<0.01	8.3	<0.01	4.63	244.1	0.2	10.07	<0.01	1.6	
UBC-052 9-6-12 1420	Water	<0.01	1522	<0.05	0.02	<0.05	<0.02	<0.1	<0.01	<0.01	4.90	0.09	5.1	<0.01	3.33	86.42	0.4	5.03	<0.01	0.09	
MW-059S 9-6-12 1412	Water	<0.01	475	0.18	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	4.82	<0.01	1.8	<0.01	3.74	134.1	1.9	18.75	<0.01	<0.01	
MW-090SR 9-6-12 1555	Water	<0.01	1700	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.48	<0.01	1.0	<0.01	3.22	131.1	1.1	17.21	<0.01	1.0	
MW-089T 9-6-12 1605	Water	<0.01	499	<0.05	<0.01	0.05	<0.02	<0.1	<0.01	<0.01	5.45	0.01	2.9	<0.01	4.42	56.84	0.7	6.84	<0.01	0.02	
MW-021 9-7-12 1520	Water	<0.01	1458	<0.05	<0.01	0.05	<0.02	<0.1	<0.01	<0.01	5.93	0.08	7.8	<0.01	8.33	228.8	0.6	12.35	<0.01	0.07	
MW-052T 9-7-12 1535	Water	<0.01	7835	<0.05	<0.01	0.10	<0.02	<0.1	<0.01	<0.01	5.85	<0.01	9.8	<0.01	8.92	332.8	0.2	15.11	<0.01	<0.01	
MW-058P 9-7-12 1515	Water	<0.01	3086	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	4.21	<0.01	1.1	<0.01	4.04	160.9	0.2	5.91	<0.01	<0.01	
MW-063SR 9-7-12 1333	Water	<0.01	583	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.84	<0.01	1.1	<0.01	3.23	45.16	0.6	4.65	<0.01	<0.01	
MW-091PR 9-7-12 1630	Water	<0.01	2779	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.39	<0.01	1.6	<0.01	2.45	94.89	0.1	3.88	<0.01	<0.01	
SL-023 9-7-12 1540	Water	<0.01	3891	<0.05	0.03	<0.05	<0.02	<0.1	<0.01	<0.01	4.32	0.17	3.7	<0.01	2.75	148.4	<0.1	4.55	<0.01	0.15	
PBC-004 9-10-12 1129	Water	<0.01	2384	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.84	<0.01	2.4	<0.01	2.51	112.8	<0.1	3.98	<0.01	<0.01	
UBC-026 9-10-12 1315	Water	<0.01	523	0.49	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.48	<0.01	2.6	<0.01	2.11	56.98	0.4	3.56	<0.01	<0.01	
MW-102S 9-10-12 1545	Water	L.N.R.																			
MW-102S 9-10-12 1546	Water	<0.01	2756	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.98	<0.01	2.5	<0.01	2.85	97.01	0.4	6.78	<0.01	<0.01	
MW-126T 9-10-12 1620	Water	<0.01	17	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	4.44	<0.01	1.5	<0.01	4.05	11.51	1.1	5.34	<0.01	<0.01	
UBC-021 9-10-12 1440	Water	0.39	2321	0.26	1.49	<0.05	<0.02	<0.1	0.16	<0.01	3.79	6.90	7.2	0.03	2.16	47.08	0.5	3.72	<0.01	9.90	
UBC-031 9-10-12 1540	Water	<0.01	1520	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.62	0.02	4.1	<0.01	2.01	47.17	<0.1	3.59	<0.01	<0.01	
MW-101T 9-11-12 1445	Water	<0.01	245	<0.05	<0.01	0.05	<0.02	<0.1	<0.01	<0.01	4.02	<0.01	5.0	<0.01	2.84	46.34	1.0	13.80	<0.01	<0.01	
MW-103P 9-11-12 1430	Water	<0.01	1780	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.81	0.01	3.7	<0.01	2.25	79.24	0.4	6.59	<0.01	<0.01	

This report supersedes all previous preliminary and final reports with this file number dated prior to the date on this certificate. Signature indicates final approval; preliminary reports are unsigned and should be used for reference only.



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Client:

**AECOM**

10 Patewood Dr. Bldg #6 Ste. 500  
Greenville SC USA

Project:

Pinewood Improvement  
Report Date: October 23, 2012

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## CERTIFICATE OF ANALYSIS

VAN12004563.1

	Method	2C	2C																		
Analyte	P	Pb	Pd	Pr	Pt	Rb	Re	Rh	Ru	S	Sb	Sc	Se	Si	Sm	Sn	Sr	Ta	Tb	Te	
Unit	ppb	ppm	ppb	ppb																	
MDL	10	0.1	0.2	0.01	0.01	0.01	0.01	0.01	0.01	0.05	1	0.05	1	0.5	40	0.02	0.05	0.01	0.02	0.05	
MW-040P 9-4-12 1635	Water	283	<0.1	<0.2	<0.01	<0.01	11.30	<0.01	<0.01	<0.05	2	0.10	2	<0.5	6566	<0.02	<0.05	127.5	<0.02	<0.01	<0.05
UBC-011 9-4-12 1715	Water	254	0.1	<0.2	<0.01	<0.01	43.01	<0.01	<0.01	<0.05	2	0.28	2	<0.5	7167	<0.02	<0.05	222.9	<0.02	<0.01	<0.05
MW-010 9-5-12 1444	Water	194	<0.1	<0.2	<0.01	<0.01	9.20	<0.01	<0.01	<0.05	8	<0.05	3	<0.5	13327	<0.02	<0.05	92.44	<0.02	<0.01	<0.05
MW-038SR 9-5-12 1715	Water	113	0.1	<0.2	<0.01	<0.01	8.84	<0.01	<0.01	<0.05	2	0.40	3	<0.5	12562	<0.02	<0.05	158.1	<0.02	<0.01	<0.05
MW-041T 9-5-12 1545	Water	56	0.2	<0.2	<0.01	<0.01	10.85	<0.01	<0.01	<0.05	9	0.56	4	<0.5	18514	<0.02	<0.05	115.4	<0.02	<0.01	<0.05
MW-125P 9-5-12 1613	Water	5287	0.1	<0.2	<0.01	<0.01	9.55	<0.01	<0.01	<0.05	2	<0.05	2	<0.5	9664	<0.02	<0.05	177.8	<0.02	<0.01	<0.05
MW-134T 9-5-12 1725	Water	2688	0.7	<0.2	<0.01	<0.01	8.95	<0.01	<0.01	<0.05	7	0.13	3	<0.5	14793	<0.02	<0.05	196.1	<0.02	<0.01	<0.05
MW-135S 9-5-12 1510	Water	263	0.1	<0.2	<0.01	<0.01	7.02	<0.01	<0.01	<0.05	3	<0.05	2	<0.5	8294	<0.02	<0.05	123.2	<0.02	<0.01	<0.05
UBC-034 9-5-12 1700	Water	15351	<0.1	<0.2	<0.01	<0.01	7.42	<0.01	<0.01	<0.05	4	<0.05	3	<0.5	13517	<0.02	<0.05	144.6	<0.02	<0.01	<0.05
MW-061T 9-6-12 1240	Water	116	0.4	<0.2	<0.01	<0.01	23.61	<0.01	<0.01	<0.05	61	0.11	3	<0.5	15540	<0.02	<0.05	135.4	<0.02	<0.01	<0.05
MW-048TR 9-6-12 1440	Water	357	<0.1	<0.2	<0.01	<0.01	11.76	<0.01	<0.01	<0.05	9	0.26	3	<0.5	17180	<0.02	<0.05	222.8	<0.02	<0.01	<0.05
UBC-052 9-6-12 1420	Water	231	<0.1	<0.2	0.02	<0.01	10.48	<0.01	<0.01	<0.05	3	1.50	2	<0.5	8923	<0.02	<0.05	163.1	<0.02	<0.01	<0.05
MW-059S 9-6-12 1412	Water	130	<0.1	<0.2	<0.01	<0.01	11.33	<0.01	<0.01	<0.05	12	<0.05	2	<0.5	8323	<0.02	<0.05	122.2	<0.02	<0.01	<0.05
MW-090SR 9-6-12 1555	Water	99	<0.1	<0.2	<0.01	<0.01	6.85	<0.01	<0.01	<0.05	9	0.78	2	<0.5	12207	<0.02	<0.05	140.1	<0.02	<0.01	<0.05
MW-089T 9-6-12 1605	Water	67	<0.1	<0.2	<0.01	<0.01	9.44	<0.01	<0.01	<0.05	4	0.96	3	<0.5	17453	<0.02	<0.05	186.6	<0.02	<0.01	<0.05
MW-021 9-7-12 1520	Water	89	0.2	<0.2	0.02	<0.01	15.71	<0.01	<0.01	<0.05	26	0.05	3	<0.5	17628	<0.02	<0.05	141.2	<0.02	<0.01	<0.05
MW-052T 9-7-12 1535	Water	369	0.6	<0.2	<0.01	<0.01	16.17	<0.01	<0.01	<0.05	25	<0.05	3	<0.5	18472	<0.02	<0.05	140.5	<0.02	<0.01	<0.05
MW-058P 9-7-12 1515	Water	500	<0.1	<0.2	<0.01	<0.01	10.58	<0.01	<0.01	<0.05	1	<0.05	1	<0.5	7084	<0.02	<0.05	118.0	<0.02	<0.01	<0.05
MW-063SR 9-7-12 1333	Water	106	<0.1	<0.2	<0.01	<0.01	6.56	<0.01	<0.01	<0.05	6	0.09	2	<0.5	11078	<0.02	<0.05	126.5	<0.02	<0.01	<0.05
MW-091PR 9-7-12 1630	Water	180	<0.1	<0.2	<0.01	<0.01	7.19	<0.01	<0.01	<0.05	2	<0.05	2	<0.5	10274	<0.02	<0.05	129.0	<0.02	<0.01	<0.05
SL-023 9-7-12 1540	Water	456	0.4	<0.2	0.05	<0.01	11.92	<0.01	<0.01	<0.05	3	0.09	2	<0.5	7230	0.03	<0.05	104.0	<0.02	<0.01	<0.05
PBC-004 9-10-12 1129	Water	277	0.3	<0.2	<0.01	<0.01	9.38	<0.01	<0.01	<0.05	2	<0.05	2	<0.5	7734	<0.02	<0.05	120.9	<0.02	<0.01	<0.05
UBC-026 9-10-12 1315	Water	261	<0.1	<0.2	<0.01	<0.01	7.18	<0.01	<0.01	<0.05	2	0.08	2	<0.5	7162	<0.02	<0.05	193.1	<0.02	<0.01	<0.05
MW-102S 9-10-12 1545	Water	L.N.R.																			
MW-102S 9-10-12 1546	Water	143	<0.1	<0.2	<0.01	<0.01	8.72	<0.01	<0.01	<0.05	3	<0.05	2	<0.5	11529	<0.02	<0.05	164.9	<0.02	<0.01	<0.05
MW-126T 9-10-12 1620	Water	51	0.2	<0.2	<0.01	<0.01	9.06	<0.01	<0.01	<0.05	7	0.97	2	<0.5	12308	<0.02	<0.05	222.5	<0.02	<0.01	<0.05
UBC-021 9-10-12 1440	Water	591	0.9	<0.2	2.34	<0.01	10.09	<0.01	<0.01	<0.05	2	<0.05	3	<0.5	7933	1.83	<0.05	141.5	<0.02	0.19	<0.05
UBC-031 9-10-12 1540	Water	550	<0.1	<0.2	<0.01	<0.01	7.75	<0.01	<0.01	<0.05	2	<0.05	2	<0.5	7671	<0.02	<0.05	131.0	<0.02	<0.01	<0.05
MW-101T 9-11-12 1445	Water	1890	<0.1	<0.2	<0.01	<0.01	8.17	<0.01	<0.01	<0.05	6	0.24	3	<0.5	14272	<0.02	<0.05	148.1	<0.02	<0.01	<0.05
MW-103P 9-11-12 1430	Water	639	0.5	<0.2	<0.01	<0.01	8.19	<0.01	<0.01	<0.05	2	0.35	2	<0.5	8434	<0.02	<0.05	132.8	<0.02	<0.01	<0.05

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Greenville SC USA

Project:

Pinewood Improvement  
Report Date: October 23, 2012

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Part: 4 of 1

## CERTIFICATE OF ANALYSIS

VAN12004563.1

Method	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C
Analyte	Th	Ti	Tl	Tm	U	V	W	Y	Yb	Zn	Zr
Unit	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb
MDL	0.05	10	0.01	0.01	0.02	0.2	0.02	0.01	0.01	0.5	0.02
MW-040P 9-4-12 1635	Water	0.08	<10	<0.01	<0.01	<0.02	<0.2	0.05	<0.01	<0.01	<0.5 <0.02
UBC-011 9-4-12 1715	Water	<0.05	<10	<0.01	<0.01	0.05	0.4	0.08	0.01	<0.01	0.5 <0.02
MW-010 9-5-12 1444	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	<0.02	<0.01	<0.01	0.8 <0.02
MW-038SR 9-5-12 1715	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	<0.02	<0.01	<0.01	1.0 <0.02
MW-041T 9-5-12 1545	Water	<0.05	<10	0.01	<0.01	<0.02	<0.2	<0.02	<0.01	<0.01	4.3 <0.02
MW-125P 9-5-12 1613	Water	<0.05	15	<0.01	<0.01	<0.02	<0.2	0.08	<0.01	<0.01	0.7 <0.02
MW-134T 9-5-12 1725	Water	<0.05	10	<0.01	<0.01	<0.02	<0.2	0.06	0.03	<0.01	3.1 <0.02
MW-135S 9-5-12 1510	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.15	<0.01	<0.01	1.0 <0.02
UBC-034 9-5-12 1700	Water	<0.05	42	<0.01	<0.01	<0.02	<0.2	0.11	<0.01	<0.01	0.7 <0.02
MW-061T 9-6-12 1240	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	<0.02	<0.01	<0.01	3.3 <0.02
MW-048TR 9-6-12 1440	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	<0.02	<0.01	<0.01	3.6 <0.02
UBC-052 9-6-12 1420	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	<0.02	0.02	<0.01	0.9 <0.02
MW-059S 9-6-12 1412	Water	<0.05	<10	<0.01	<0.01	0.06	<0.2	0.34	<0.01	<0.01	0.7 <0.02
MW-090SR 9-6-12 1555	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.04	<0.01	<0.01	14.7 <0.02
MW-089T 9-6-12 1605	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	<0.02	<0.01	<0.01	27.8 <0.02
MW-021 9-7-12 1520	Water	<0.05	<10	<0.01	<0.01	0.02	<0.2	<0.02	0.05	<0.01	4.7 0.07
MW-052T 9-7-12 1535	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	<0.02	<0.01	<0.01	2.8 0.02
MW-058P 9-7-12 1515	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.03	<0.01	<0.01	<0.5 <0.02
MW-063SR 9-7-12 1333	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.24	<0.01	<0.01	1.2 <0.02
MW-091PR 9-7-12 1630	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.02	<0.01	<0.01	3.5 <0.02
SL-023 9-7-12 1540	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	<0.02	0.08	<0.01	4.2 <0.02
PBC-004 9-10-12 1129	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	<0.02	<0.01	<0.01	1.3 <0.02
UBC-026 9-10-12 1315	Water	<0.05	<10	<0.01	<0.01	<0.02	0.9	0.06	<0.01	<0.01	<0.5 <0.02
MW-102S 9-10-12 1545	Water	L.N.R.									
MW-102S 9-10-12 1546	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	1.01	<0.01	<0.01	<0.5 <0.02
MW-126T 9-10-12 1620	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.05	<0.01	<0.01	2.1 <0.02
UBC-021 9-10-12 1440	Water	0.91	17	0.01	0.05	0.31	2.5	<0.02	3.69	0.28	8.1 <0.02
UBC-031 9-10-12 1540	Water	0.05	<10	<0.01	<0.01	<0.02	<0.2	0.63	<0.01	<0.01	1.3 <0.02
MW-101T 9-11-12 1445	Water	<0.05	<10	<0.01	<0.01	<0.02	0.3	0.75	<0.01	<0.01	<0.5 <0.02
MW-103P 9-11-12 1430	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.10	<0.01	<0.01	1.0 <0.02



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Project: Pinewood Improvement  
Report Date: October 23, 2012

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Part: 1 of 1

## CERTIFICATE OF ANALYSIS

VAN12004563.1

Method	Analyte	Dilution	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	
			Ag	Al	As	Au	B	Ba	Be	Bi	Br	Ca	Cd	Ce	Cl	Co	Cr	Cs	Dy	Er
			ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppm	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	
		MDL	1	0.05	1	0.5	0.05	5	0.05	0.05	5	0.05	0.05	0.01	1	0.02	0.5	0.01	0.1	0.01
MW-094PR 9-11-12 1600	Water		1	<0.05	9	0.6	<0.05	14	111.5	<0.05	<0.05	12	36.46	<0.05	0.12	3	0.09	4.5	0.11	1.0 <0.01 <0.01
MW-096T 9-11-12 1615	Water		1	<0.05	1	0.6	<0.05	18	195.1	<0.05	<0.05	14	38.96	<0.05	<0.01	3	<0.02	1.5	0.04	<0.1 <0.01 <0.01
P-112A 9-11-12 1635	Water		1	<0.05	103	0.9	<0.05	21	115.9	0.07	<0.05	15	20.74	54.33	1.20	3	233.2	10.6	0.09	2.9 0.13 0.07
P-112B 9-11-12 1645	Water		1	0.25	208	1.3	<0.05	21	110.6	0.07	<0.05	18	19.30	19.57	2.25	3	155.6	9.8	0.14	4.9 0.22 0.12
UBC-028AR 9-11-12 1455	Water		1	<0.05	1	0.6	<0.05	17	35.28	<0.05	<0.05	11	19.33	<0.05	0.02	3	0.04	<0.5	0.12	<0.1 <0.01 <0.01
MW-092SR 9-12-12 1450	Water		1	<0.05	6	<0.5	<0.05	16	143.9	0.07	<0.05	12	31.81	<0.05	0.39	2	0.19	<0.5	0.05	<0.1 0.02 <0.01
MW-093PR 9-12-12 1456	Water		1	<0.05	3	<0.5	<0.05	16	128.1	<0.05	<0.05	12	30.92	<0.05	0.03	2	0.09	<0.5	0.06	<0.1 <0.01 <0.01
MW-095P 9-12-12 1645	Water		1	<0.05	1	<0.5	<0.05	15	158.5	0.05	<0.05	12	27.01	<0.05	<0.01	<1	<0.02	<0.5	0.07	0.2 <0.01 <0.01
MW-098TR 9-12-12 1635	Water		1	<0.05	2	0.8	<0.05	12	307.9	0.05	<0.05	19	57.85	<0.05	<0.01	<1	0.04	4.3	0.06	1.1 <0.01 <0.01
P-112C 9-12-12 1120	Water		1	<0.05	47	<0.5	<0.05	14	89.31	<0.05	<0.05	15	18.27	<0.05	1.11	<1	0.12	0.9	0.09	0.4 0.08 0.04
P-112D 9-12-12 1700	Water		1	<0.05	35	<0.5	<0.05	14	84.39	<0.05	<0.05	14	17.17	<0.05	1.05	<1	0.32	0.6	0.08	0.6 0.05 0.03
P-114A 9-12-12 1500	Water		1	0.68	207	0.8	<0.05	15	210.8	0.10	<0.05	14	26.47	5.38	2.37	<1	24.69	9.8	0.14	4.2 0.26 0.17
P-114B 9-12-12 1520	Water		1	0.05	5	<0.5	<0.05	16	146.1	<0.05	<0.05	13	23.34	<0.05	0.09	<1	0.19	<0.5	0.07	0.2 <0.01 <0.01
P-114C 9-12-12 1605	Water		1	<0.05	6	<0.5	<0.05	12	70.99	<0.05	<0.05	12	14.93	<0.05	0.15	<1	0.02	<0.5	0.08	0.1 <0.01 <0.01
P-114D 9-12-12 1750	Water		1	<0.05	8	<0.5	<0.05	16	70.41	<0.05	<0.05	13	15.16	<0.05	0.11	<1	<0.02	<0.5	0.08	0.1 <0.01 <0.01
UBC-027 9-12-12 1625	Water		1	<0.05	5	<0.5	<0.05	12	79.11	<0.05	<0.05	12	20.08	<0.05	0.01	<1	<0.02	<0.5	0.07	0.2 <0.01 <0.01
MW-077P 9-12-12 1800	Water		1	0.11	3234	3.4	<0.05	17	222.0	2.70	<0.05	12	82.82	0.15	88.42	<1	6.28	34.2	0.97	21.2 4.20 1.76
MW-078T 9-14-12 1035	Water		1	<0.05	24	0.5	<0.05	16	74.77	<0.05	<0.05	13	38.22	1.23	0.05	<1	2.29	1.0	0.02	1.2 <0.01 <0.01
MW-097T 9-14-12 1130	Water		1	<0.05	4	<0.5	<0.05	15	202.8	<0.05	<0.05	11	26.65	<0.05	0.07	<1	0.02	0.9	0.05	0.4 <0.01 <0.01
MW-1405 9-14-12 1055	Water		1	<0.05	832	2.6	<0.05	24	102.1	0.19	<0.05	18	26.40	0.07	42.34	1	1.64	12.1	0.40	4.3 2.51 1.08
UBC-056 9-14-12 1110	Water		1	<0.05	956	4.5	<0.05	23	120.8	0.96	<0.05	17	20.52	0.42	14.54	<1	2.85	18.3	0.40	3.0 0.99 0.51
MW-137T 9-13-12 1510	Water		1	<0.05	76	0.9	<0.05	13	131.2	<0.05	<0.05	20	15.75	0.16	1.05	1	0.23	1.7	0.07	0.7 0.11 0.06
MW-138P 9-13-12 1110	Water		1	<0.05	341	<0.5	<0.05	13	105.9	0.23	<0.05	13	17.48	<0.05	2.35	<1	0.18	1.0	0.12	0.2 0.09 0.06
MW-139S 9-13-12 1455	Water		1	<0.05	66	<0.5	<0.05	18	177.5	<0.05	<0.05	15	22.92	0.11	1.29	<1	0.48	1.6	0.10	0.9 0.13 0.08
MW-141T 9-13-12 1540	Water		1	<0.05	131	0.8	<0.05	13	187.3	0.09	<0.05	13	38.85	<0.05	7.23	<1	0.72	2.1	0.12	1.0 0.40 0.19
UBC-025 9-13-1525	Water		1	<0.05	2	<0.5	<0.05	13	83.02	<0.05	<0.05	15	22.40	<0.05	0.02	<1	<0.02	<0.5	0.06	0.2 <0.01 <0.01
UBC-054 9-13-1202	Water		1	<0.05	615	0.7	<0.05	14	98.43	0.72	<0.05	13	18.45	<0.05	36.75	<1	0.60	4.0	0.34	1.5 2.16 0.95
UBC-055 9-13-1400	Water		1	0.08	379	<0.5	<0.05	15	102.3	0.27	0.40	24	23.17	<0.05	6.21	<1	0.32	1.8	0.18	1.3 0.29 0.13



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Report Date: October 23, 2012

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## CERTIFICATE OF ANALYSIS

VAN12004563.1

Method	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C
Analyte	Eu	Fe	Ga	Gd	Ge	Hf	Hg	Ho	In	K	La	Li	Lu	Mg	Mn	Mo	Na	Nb	Nd	Ni	
Unit	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppm	ppb	ppb	ppb	ppm	ppb	ppm	ppb	ppb	ppb	ppb	ppb
MDL	0.01	10	0.05	0.01	0.05	0.02	0.1	0.01	0.01	0.05	0.01	0.1	0.01	0.05	0.05	0.05	0.1	0.05	0.01	0.01	0.2
MW-094PR 9-11-12 1600	Water	<0.01	104	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	4.68	0.06	5.4	<0.01	4.38	23.73	1.6	8.00	<0.01	0.05	2.2
MW-096T 9-11-12 1615	Water	<0.01	26	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	4.15	<0.01	8.2	<0.01	3.58	3.76	3.0	5.55	<0.01	<0.01	<0.2
P-112A 9-11-12 1635	Water	0.02	6384	<0.05	0.13	<0.05	<0.02	<0.1	0.02	<0.01	4.27	0.68	5.5	<0.01	3.41	263.8	4.5	7.05	0.03	0.71	15.2
P-112B 9-11-12 1645	Water	0.04	4401	0.08	0.24	0.05	<0.02	<0.1	0.04	<0.01	3.87	1.21	6.1	0.01	2.79	433.2	4.3	15.18	0.01	1.30	17.2
UBC-028AR 9-11-12 1455	Water	<0.01	65	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	4.13	<0.01	5.7	<0.01	2.47	18.94	1.7	22.40	<0.01	<0.01	0.5
MW-092SR 9-12-12 1450	Water	<0.01	646	<0.05	0.02	<0.05	<0.02	<0.1	<0.01	<0.01	3.70	0.17	0.7	<0.01	3.24	34.02	1.2	5.85	<0.01	0.19	<0.2
MW-093PR 9-12-12 1456	Water	<0.01	419	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	4.11	0.01	2.4	<0.01	3.11	31.08	0.6	6.13	<0.01	0.01	<0.2
MW-095P 9-12-12 1645	Water	<0.01	665	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.88	<0.01	1.3	<0.01	2.92	34.46	0.2	5.06	<0.01	<0.01	<0.2
MW-098TR 9-12-12 1635	Water	<0.01	10	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	4.73	<0.01	0.8	<0.01	5.56	10.16	9.4	10.26	<0.01	<0.01	1.2
P-112C 9-12-12 1120	Water	0.03	1346	<0.05	0.13	<0.05	<0.02	<0.1	0.01	<0.01	3.19	0.58	3.2	<0.01	2.15	41.17	0.2	3.29	<0.01	0.64	0.6
P-112D 9-12-12 1700	Water	0.02	1014	<0.05	0.11	<0.05	<0.02	<0.1	0.01	<0.01	3.11	0.56	3.3	<0.01	2.10	75.03	0.2	3.25	<0.01	0.49	1.1
P-114A 9-12-12 1500	Water	0.07	9243	0.08	0.37	<0.05	<0.02	<0.1	0.05	<0.01	3.78	1.42	3.8	0.01	3.08	215.2	3.1	5.34	<0.01	1.55	17.3
P-114B 9-12-12 1520	Water	<0.01	3132	<0.05	0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.82	0.05	3.2	<0.01	2.89	92.07	0.5	7.50	<0.01	0.04	0.4
P-114C 9-12-12 1605	Water	<0.01	1653	<0.05	0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.65	0.07	4.6	<0.01	1.96	42.27	<0.1	3.17	<0.01	0.10	<0.2
P-114D 9-12-12 1750	Water	<0.01	1401	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.76	0.04	3.6	<0.01	1.90	39.51	<0.1	3.42	<0.01	0.04	<0.2
UBC-027 9-12-12 1625	Water	<0.01	860	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.17	<0.01	3.7	<0.01	2.07	33.29	<0.1	3.34	<0.01	0.01	<0.2
MW-077P 9-12-12 1800	Water	1.93	5936	2.38	6.83	0.06	<0.02	<0.1	0.70	0.01	34.74	39.94	426.7	0.17	1.54	60.82	4.1	40.39	0.03	44.50	24.8
MW-078T 9-14-12 1035	Water	<0.01	14	0.32	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	2.56	0.02	12.7	<0.01	0.27	1.32	1.7	5.84	<0.01	0.04	1.7
MW-097T 9-14-12 1130	Water	<0.01	1942	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.96	0.03	2.9	<0.01	3.21	80.52	0.8	4.70	<0.01	0.03	0.5
MW-1405 9-14-12 1055	Water	0.96	3637	0.36	4.09	0.10	0.03	<0.1	0.43	<0.01	6.29	21.03	1.9	0.08	2.73	132.8	29.7	21.95	0.12	21.01	20.1
UBC-056 9-14-12 1110	Water	0.30	3344	0.34	1.35	0.06	0.02	<0.1	0.18	<0.01	3.35	7.49	4.3	0.05	2.12	94.71	19.3	30.41	0.06	7.92	14.7
MW-137T 9-13-12 1510	Water	0.03	2105	<0.05	0.13	<0.05	<0.02	<0.1	0.02	<0.01	3.58	0.69	2.6	<0.01	2.63	128.1	6.2	6.12	0.01	0.65	3.2
MW-138P 9-13-12 1110	Water	0.05	2321	0.12	0.18	<0.05	<0.02	<0.1	0.01	<0.01	3.30	0.94	3.4	<0.01	2.32	102.0	1.6	5.79	0.03	1.13	0.3
MW-139S 9-13-12 1455	Water	0.03	2899	<0.05	0.16	0.07	<0.02	<0.1	0.03	<0.01	4.52	0.83	1.0	<0.01	3.46	98.51	6.0	9.15	<0.01	0.83	5.4
MW-141T 9-13-12 1540	Water	0.15	1737	<0.05	0.57	<0.05	<0.02	<0.1	0.07	<0.01	3.95	3.58	2.8	0.01	3.99	73.75	1.7	9.96	<0.01	3.91	2.5
UBC-025 9-13-1525	Water	<0.01	680	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.11	<0.01	3.2	<0.01	2.03	55.43	<0.1	3.19	<0.01	<0.01	<0.2
UBC-054 9-13-1202	Water	0.79	2915	0.29	3.37	<0.05	<0.02	<0.1	0.39	<0.01	3.22	15.82	4.2	0.10	2.30	55.05	0.9	4.86	0.04	18.04	2.6
UBC-055 9-13-1400	Water	0.16	2470	0.21	0.52	<0.05	<0.02	<0.1	0.06	<0.01	3.79	2.73	2.6	<0.01	2.62	78.97	2.4	11.52	0.03	3.13	0.8



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Report Date: October 23, 2012

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## CERTIFICATE OF ANALYSIS

VAN12004563.1

		Method	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	
		Analyte	P	Pb	Pd	Pr	Pt	Rb	Re	Rh	Ru	S	Sb	Sc	Se	Si	Sm	Sn	Sr	Ta	Tb	Te
		Unit	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppm	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb
		MDL	10	0.1	0.2	0.01	0.01	0.01	0.01	0.01	0.01	0.05	1	0.05	1	0.5	40	0.02	0.05	0.01	0.02	0.05
MW-094PR	9-11-12 1600	Water	2439	0.2	<0.2	0.01	<0.01	10.34	<0.01	<0.01	<0.05	4	0.78	2	<0.5	11218	<0.02	<0.05	258.9	<0.02	<0.01	<0.05
MW-096T	9-11-12 1615	Water	19	<0.1	<0.2	<0.01	<0.01	7.81	<0.01	<0.01	<0.05	3	1.00	3	<0.5	16961	<0.02	<0.05	256.6	<0.02	<0.01	<0.05
P-112A	9-11-12 1635	Water	409	0.8	<0.2	0.16	<0.01	8.86	<0.01	<0.01	<0.05	4	3.78	3	<0.5	13556	0.14	0.12	163.4	<0.02	0.02	<0.05
P-112B	9-11-12 1645	Water	529	7.8	<0.2	0.30	<0.01	8.73	<0.01	<0.01	<0.05	4	16.25	2	<0.5	10167	0.27	0.76	145.1	<0.02	0.04	<0.05
UBC-028AR	9-11-12 1455	Water	3572	<0.1	<0.2	<0.01	<0.01	9.12	<0.01	<0.01	<0.05	6	0.34	2	<0.5	9469	<0.02	<0.05	143.6	<0.02	<0.01	<0.05
MW-092SR	9-12-12 1450	Water	117	0.2	<0.2	0.04	<0.01	7.45	<0.01	<0.01	<0.05	3	0.09	2	<0.5	9624	0.04	<0.05	216.5	<0.02	<0.01	<0.05
MW-093PR	9-12-12 1456	Water	92	0.2	<0.2	<0.01	<0.01	8.38	<0.01	<0.01	<0.05	3	<0.05	2	<0.5	8752	<0.02	<0.05	225.2	<0.02	<0.01	<0.05
MW-095P	9-12-12 1645	Water	83	0.1	<0.2	<0.01	<0.01	9.03	<0.01	<0.01	<0.05	2	0.11	4	<0.5	8273	<0.02	<0.05	221.4	<0.02	<0.01	<0.05
MW-098TR	9-12-12 1635	Water	358	<0.1	<0.2	<0.01	<0.01	9.86	<0.01	0.02	0.11	8	2.24	6	<0.5	13562	<0.02	<0.05	443.8	<0.02	<0.01	<0.05
P-112C	9-12-12 1120	Water	448	0.9	<0.2	0.13	<0.01	7.68	<0.01	0.01	<0.05	2	0.08	4	<0.5	8222	0.11	<0.05	169.8	<0.02	0.02	<0.05
P-112D	9-12-12 1700	Water	421	1.1	<0.2	0.13	<0.01	7.50	<0.01	<0.01	<0.05	1	0.68	4	<0.5	8200	0.09	0.15	160.9	<0.02	<0.01	<0.05
P-114A	9-12-12 1500	Water	1231	1.8	<0.2	0.36	<0.01	9.53	<0.01	0.01	<0.05	3	1.82	6	<0.5	12139	0.31	0.72	205.5	<0.02	0.05	<0.05
P-114B	9-12-12 1520	Water	143	<0.1	<0.2	<0.01	<0.01	9.03	<0.01	<0.01	<0.05	2	0.29	5	<0.5	10784	<0.02	<0.05	193.6	<0.02	<0.01	<0.05
P-114C	9-12-12 1605	Water	610	<0.1	<0.2	0.01	<0.01	8.24	<0.01	<0.01	<0.05	2	<0.05	4	<0.5	7733	<0.02	<0.05	143.0	<0.02	<0.01	<0.05
P-114D	9-12-12 1750	Water	602	0.2	<0.2	<0.01	<0.01	8.65	<0.01	<0.01	<0.05	2	<0.05	4	<0.5	7698	<0.02	<0.05	158.7	<0.02	<0.01	<0.05
UBC-027	9-12-12 1625	Water	414	0.9	<0.2	<0.01	<0.01	7.12	<0.01	<0.01	<0.05	2	<0.05	4	<0.5	8111	<0.02	<0.05	161.2	<0.02	<0.01	<0.05
MW-077P	9-12-12 1800	Water	626	10.5	<0.2	10.94	<0.01	64.80	<0.01	0.07	0.09	18	0.30	11	<0.5	15432	8.27	<0.05	1699	<0.02	0.88	<0.05
MW-078T	9-14-12 1035	Water	17	0.3	<0.2	<0.01	<0.01	5.52	<0.01	0.02	<0.05	5	0.99	6	<0.5	14020	<0.02	<0.05	444.0	<0.02	<0.01	<0.05
MW-097T	9-14-12 1130	Water	78	<0.1	<0.2	<0.01	<0.01	9.63	<0.01	0.01	<0.05	2	0.27	5	<0.5	11237	<0.02	<0.05	209.6	<0.02	<0.01	<0.05
MW-1405	9-14-12 1055	Water	1297	2.2	<0.2	5.12	<0.01	14.31	<0.01	<0.01	<0.05	8	6.88	4	<0.5	8892	3.97	0.47	168.8	<0.02	0.53	<0.05
UBC-056	9-14-12 1110	Water	1972	3.0	<0.2	1.95	<0.01	9.15	0.01	<0.01	<0.05	2	5.84	6	1.0	11454	1.52	0.11	145.2	<0.02	0.18	<0.05
MW-137T	9-13-12 1510	Water	358	3.7	<0.2	0.16	<0.01	7.39	<0.01	<0.01	<0.05	5	3.13	5	<0.5	10543	0.14	0.08	124.9	<0.02	0.02	<0.05
MW-138P	9-13-12 1110	Water	341	0.2	<0.2	0.27	<0.01	8.01	<0.01	<0.01	<0.05	2	0.07	4	<0.5	8470	0.20	<0.05	163.8	<0.02	0.02	<0.05
MW-139S	9-13-12 1455	Water	466	0.4	<0.2	0.19	<0.01	9.19	<0.01	<0.01	<0.05	3	1.81	5	<0.5	10378	0.17	0.19	184.4	<0.02	0.02	<0.05
MW-141T	9-13-12 1540	Water	605	0.5	<0.2	0.89	<0.01	8.50	<0.01	0.01	0.06	3	2.31	7	<0.5	14934	0.65	0.16	253.6	<0.02	0.08	<0.05
UBC-025	9-13-1525	Water	339	0.1	<0.2	<0.01	<0.01	6.63	<0.01	<0.01	<0.05	2	<0.05	4	<0.5	8844	<0.02	<0.05	186.2	<0.02	<0.01	<0.05
UBC-054	9-13-1202	Water	527	2.1	<0.2	4.24	<0.01	9.78	<0.01	<0.01	<0.05	3	0.14	5	<0.5	8701	3.39	<0.05	165.2	<0.02	0.42	<0.05
UBC-055	9-13-1400	Water	179	1.2	<0.2	0.78	<0.01	9.49	<0.01	0.01	<0.05	8	0.18	4	<0.5	7838	0.58	0.15	188.2	<0.02	0.06	<0.05



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## CERTIFICATE OF ANALYSIS

VAN12004563.1

Method	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C
Analyte	Th	Ti	Tl	Tm	U	V	W	Y	Yb	Zn	Zr
Unit	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb
MDL	0.05	10	0.01	0.01	0.02	0.2	0.02	0.01	0.01	0.5	0.02
MW-094PR 9-11-12 1600 Water	<0.05	<10	<0.01	<0.01	0.02	0.3	0.10	0.04	<0.01	3.2	<0.02
MW-096T 9-11-12 1615 Water	<0.05	<10	<0.01	<0.01	0.03	2.7	0.13	<0.01	<0.01	1.4	<0.02
P-112A 9-11-12 1635 Water	0.10	<10	<0.01	<0.01	0.18	0.4	17.56	0.83	0.06	24.2	0.08
P-112B 9-11-12 1645 Water	0.09	<10	0.04	0.01	0.51	1.3	16.57	1.44	0.10	29.9	0.12
UBC-028AR 9-11-12 1455 Water	<0.05	11	<0.01	<0.01	<0.02	0.3	0.35	<0.01	<0.01	1.2	<0.02
MW-092SR 9-12-12 1450 Water	<0.05	<10	<0.01	<0.01	0.02	<0.2	0.18	0.07	<0.01	1.1	<0.02
MW-093PR 9-12-12 1456 Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.09	<0.01	<0.01	0.6	<0.02
MW-095P 9-12-12 1645 Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.09	<0.01	<0.01	0.8	<0.02
MW-098TR 9-12-12 1635 Water	<0.05	<10	<0.01	<0.01	0.05	<0.2	1.19	<0.01	<0.01	0.9	<0.02
P-112C 9-12-12 1120 Water	0.08	<10	<0.01	<0.01	0.08	0.2	0.22	0.50	0.02	3.2	0.02
P-112D 9-12-12 1700 Water	0.06	<10	<0.01	<0.01	0.06	<0.2	0.48	0.36	0.02	5.8	0.03
P-114A 9-12-12 1500 Water	0.29	13	0.02	0.02	0.36	0.8	3.35	1.87	0.14	28.6	<0.02
P-114B 9-12-12 1520 Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.44	0.05	<0.01	1.3	<0.02
P-114C 9-12-12 1605 Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.03	0.06	<0.01	0.6	<0.02
P-114D 9-12-12 1750 Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.06	0.03	<0.01	1.5	0.02
UBC-027 9-12-12 1625 Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.08	<0.01	<0.01	2.7	<0.02
MW-077P 9-12-12 1800 Water	4.92	53	0.03	0.20	2.57	13.1	0.09	14.48	1.31	102.0	0.66
MW-078T 9-14-12 1035 Water	<0.05	<10	<0.01	<0.01	<0.02	2.9	5.33	0.02	<0.01	4.6	<0.02
MW-097T 9-14-12 1130 Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.08	0.02	<0.01	1.6	<0.02
MW-1405 9-14-12 1055 Water	0.68	26	0.03	0.11	1.14	3.7	3.67	10.39	0.78	15.9	0.71
UBC-056 9-14-12 1110 Water	2.12	23	0.06	0.06	3.24	8.1	1.09	5.79	0.39	24.5	0.80
MW-137T 9-13-12 1510 Water	0.19	<10	0.01	<0.01	0.59	0.7	0.34	0.81	0.05	13.3	0.12
MW-138P 9-13-12 1110 Water	0.39	14	<0.01	<0.01	0.07	1.1	0.09	0.44	0.03	0.6	0.14
MW-139S 9-13-12 1455 Water	0.17	<10	0.02	<0.01	0.52	0.7	0.67	1.04	0.06	4.8	0.03
MW-141T 9-13-12 1540 Water	0.09	12	0.02	0.02	0.67	1.1	0.54	1.97	0.13	3.5	0.11
UBC-025 9-13-1525 Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.15	<0.01	<0.01	1.9	<0.02
UBC-054 9-13-1202 Water	1.82	22	0.02	0.13	0.87	4.6	0.07	9.38	0.86	5.6	0.09
UBC-055 9-13-1400 Water	1.11	19	0.03	0.01	0.24	2.1	0.05	1.35	0.07	2.5	0.08



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## QUALITY CONTROL REPORT

VAN12004563.1

Method	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C		
Analyte	Dilution	Ag	Al	As	Au	B	Ba	Be	Bi	Br	Ca	Cd	Ce	Cl	Co	Cr	Cs	Cu	Dy	Er	
Unit	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppm	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb		
MDL	1	0.05	1	0.5	0.05	5	0.05	0.05	0.05	5	0.05	0.05	0.01	1	0.02	0.5	0.01	0.1	0.01	0.01	
Pulp Duplicates																					
UBC-021 9-10-12 1440	Water	1	<0.05	393	<0.5	<0.05	15	83.54	0.25	<0.05	12	16.65	<0.05	19.87	3	1.37	8.3	0.30	2.8	0.94	0.40
REP UBC-021 9-10-12 1440	QC	1	<0.05	416	<0.5	<0.05	15	85.33	0.16	<0.05	12	16.69	<0.05	19.92	3	1.43	8.7	0.32	2.9	1.05	0.39
MW-095P 9-12-12 1645	Water	1	<0.05	1	<0.5	<0.05	15	158.5	0.05	<0.05	12	27.01	<0.05	<0.01	<1	<0.02	<0.5	0.07	0.2	<0.01	<0.01
REP MW-095P 9-12-12 1645	QC	1	<0.05	<1	<0.5	<0.05	16	156.7	0.05	<0.05	12	26.74	<0.05	<0.01	<1	<0.02	<0.5	0.07	0.1	<0.01	<0.01
Reference Materials																					
STD TMDA-70	Standard	1	11.98	461	46.5	<0.05	16	340.1	13.59	18.00	33	24.39	160.3	0.02	13	311.6	425.3	<0.01	434.0	<0.01	<0.01
STD TMDA-70	Standard	1	11.80	513	47.1	<0.05	16	334.0	15.64	11.89	36	25.23	161.5	0.02	15	314.4	426.8	<0.01	438.3	<0.01	<0.01
STD TMDA-70 Expected																					
BLK	Blank	1	<0.05	<1	<0.5	<0.05	<5	<0.05	<0.05	<0.05	<5	<0.05	<0.05	<0.01	<1	<0.02	<0.5	<0.01	<0.1	<0.01	<0.01
BLK	Blank	1	<0.05	<1	<0.5	<0.05	<5	<0.05	<0.05	<0.05	<5	<0.05	<0.05	<0.01	<1	<0.02	<0.5	<0.01	<0.1	<0.01	<0.01
BLK	Blank	1	<0.05	<1	<0.5	<0.05	<5	<0.05	<0.05	<0.05	<5	<0.05	<0.05	<0.01	<1	<0.02	<0.5	<0.01	<0.1	<0.01	<0.01
BLK	Blank	1	<0.05	<1	<0.5	<0.05	<5	<0.05	<0.05	<0.05	<5	<0.05	<0.05	<0.01	<1	0.04	<0.5	<0.01	<0.1	<0.01	<0.01



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## QUALITY CONTROL REPORT

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Method	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	
Analyte	Eu	Fe	Ga	Gd	Ge	Hf	Hg	Ho	In	K	La	Li	Lu	Mg	Mn	Mo	Na	Nb	Nd	Ni	
Unit	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppm	ppm	ppb	ppb	ppm	ppb	ppm	ppb	ppm	ppb	ppb	ppb	
MDL	0.01	10	0.05	0.01	0.05	0.02	0.1	0.01	0.01	0.05	0.01	0.1	0.01	0.05	0.05	0.1	0.05	0.01	0.01	0.2	
Pulp Duplicates																					
UBC-021 9-10-12 1440	Water	0.39	2321	0.26	1.49	<0.05	<0.02	<0.1	0.16	<0.01	3.79	6.90	7.2	0.03	2.16	47.08	0.5	3.72	<0.01	9.90	9.7
REP UBC-021 9-10-12 1440	QC	0.37	2368	0.26	1.52	<0.05	<0.02	<0.1	0.16	<0.01	3.82	7.05	6.8	0.04	2.22	48.01	0.5	3.77	<0.01	10.04	9.5
MW-095P 9-12-12 1645	Water	<0.01	665	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.88	<0.01	1.3	<0.01	2.92	34.46	0.2	5.06	<0.01	<0.01	<0.2
REP MW-095P 9-12-12 1645	QC	<0.01	652	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	3.87	<0.01	0.9	<0.01	2.95	34.25	0.2	5.12	<0.01	<0.01	<0.2
Reference Materials																					
STD TMDA-70	Standard	<0.01	429	0.10	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	1.09	0.01	21.9	<0.01	5.48	336.5	300.6	8.64	<0.01	<0.01	356.9
STD TMDA-70	Standard	<0.01	413	0.10	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	1.15	<0.01	24.3	<0.01	5.91	348.8	295.5	9.84	<0.01	<0.01	372.1
STD TMDA-70 Expected																					
BLK	Blank	<0.01	<10	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	<0.05	<0.01	<0.1	<0.01	<0.05	<0.05	<0.1	<0.05	<0.01	<0.01	<0.2
BLK	Blank	<0.01	<10	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	<0.05	<0.01	<0.1	<0.01	<0.05	<0.05	<0.1	<0.05	<0.01	<0.01	<0.2
BLK	Blank	<0.01	<10	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	<0.05	<0.01	<0.1	<0.01	<0.05	<0.05	<0.1	<0.05	<0.01	<0.01	<0.2
BLK	Blank	<0.01	<10	<0.05	<0.01	<0.05	<0.02	<0.1	<0.01	<0.01	<0.05	<0.01	<0.1	<0.01	<0.05	<0.05	<0.1	<0.05	<0.01	<0.01	<0.2



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## QUALITY CONTROL REPORT

VAN12004563.1

Method	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	
Analyte	P	Pb	Pd	Pr	Pt	Rb	Re	Rh	Ru	S	Sb	Sc	Se	Si	Sm	Sn	Sr	Ta	Tb	Te	
Unit	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppm	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	
MDL	10	0.1	0.2	0.01	0.01	0.01	0.01	0.01	0.05	1	0.05	1	0.5	40	0.02	0.05	0.01	0.02	0.01	0.05	
Pulp Duplicates																					
UBC-021 9-10-12 1440	Water	591	0.9	<0.2	2.34	<0.01	10.09	<0.01	<0.01	<0.05	2	<0.05	3	<0.5	7933	1.83	<0.05	141.5	<0.02	0.19	<0.05
REP UBC-021 9-10-12 1440	QC	600	1.0	<0.2	2.35	<0.01	10.18	<0.01	<0.01	<0.05	2	<0.05	3	<0.5	8143	1.90	<0.05	141.9	<0.02	0.21	<0.05
MW-095P 9-12-12 1645	Water	83	0.1	<0.2	<0.01	<0.01	9.03	<0.01	<0.01	<0.05	2	0.11	4	<0.5	8273	<0.02	<0.05	221.4	<0.02	<0.01	<0.05
REP MW-095P 9-12-12 1645	QC	97	<0.1	<0.2	<0.01	<0.01	8.76	<0.01	0.01	<0.05	2	0.11	4	<0.5	8153	<0.02	<0.05	219.2	<0.02	<0.01	<0.05
Reference Materials																					
STD TMDA-70	Standard	14	489.3	<0.2	<0.01	<0.01	0.69	0.01	0.02	<0.05	7	23.94	<1	23.5	394	<0.02	23.67	471.2	<0.02	<0.01	<0.05
STD TMDA-70	Standard	<10	446.2	<0.2	<0.01	<0.01	0.71	0.01	0.02	<0.05	8	23.72	<1	24.5	417	<0.02	23.56	468.1	<0.02	<0.01	<0.05
STD TMDA-70 Expected			444									21.7		25.9			19.6	442			
BLK	Blank	<10	<0.1	<0.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<1	<0.05	<1	<0.5	<40	<0.02	<0.05	<0.01	<0.02	<0.01	<0.05
BLK	Blank	<10	<0.1	<0.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<1	<0.05	<1	<0.5	<40	<0.02	<0.05	0.04	<0.02	<0.01	<0.05
BLK	Blank	<10	<0.1	<0.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<1	<0.05	<1	<0.5	<40	<0.02	<0.05	<0.01	<0.02	<0.01	<0.05
BLK	Blank	<10	<0.1	<0.2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<1	<0.05	<1	<0.5	<40	<0.02	<0.05	0.04	<0.02	<0.01	<0.05



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## QUALITY CONTROL REPORT

VAN12004563.1

Method	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C
Analyte	Th	Ti	Tl	Tm	U	V	W	Y	Yb	Zn
Unit	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb	ppb
MDL	0.05	10	0.01	0.01	0.02	0.2	0.02	0.01	0.01	0.5
Pulp Duplicates										
UBC-021 9-10-12 1440	Water	0.91	17	0.01	0.05	0.31	2.5	<0.02	3.69	0.28
REP UBC-021 9-10-12 1440	QC	1.02	18	0.01	0.05	0.32	2.7	<0.02	3.70	0.30
MW-095P 9-12-12 1645	Water	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.09	<0.01	<0.01
REP MW-095P 9-12-12 1645	QC	<0.05	<10	<0.01	<0.01	<0.02	<0.2	0.08	<0.01	<0.01
Reference Materials										
STD TMDA-70	Standard	<0.05	<10	22.42	<0.01	61.21	340.4	0.10	0.01	<0.01
STD TMDA-70	Standard	<0.05	<10	21.31	<0.01	57.19	346.3	0.10	0.02	<0.01
STD TMDA-70 Expected										
				20.1		55.9	312			480
BLK	Blank	<0.05	<10	<0.01	<0.01	<0.02	<0.2	<0.02	<0.01	<0.01
BLK	Blank	<0.05	<10	<0.01	<0.01	<0.02	<0.2	<0.02	<0.01	<0.01
BLK	Blank	<0.05	<10	<0.01	<0.01	<0.02	<0.2	<0.02	<0.01	<0.01
BLK	Blank	<0.05	<10	<0.01	<0.01	<0.02	<0.2	<0.02	<0.01	<0.01

**ATTACHMENT C**

**QUALITY ASSURANCE/QUALITY CONTROL**

**ATTACHMENT C**  
**QUALITY ASSURANCE/QUALITY CONTROL**

**Elemental analyses** were performed by Acme Analytical Laboratories, Ltd., Vancouver, Canada, by inductively coupled plasma - mass spectrometry. Laboratory quality assurance/quality control consisted of analyses of laboratory splits of two samples, analysis of a reference standard (two analyses), and blank analyses (four analyses). Table C-1 lists relative percent differences (RPDs) for the splits of two samples. RPDs greater than 30 percent occurred for four metals: beryllium, copper, lithium, and zinc. RPDs for agreement of analyses of reference standards are listed in Table C-2. No RPDs exceeded 30 percent; however, the RPD for bismuth in the two analyses of the reference standard was greater than 30 percent. With the following exceptions, elements were not detected in blank samples:

- Cobalt: 0.04 parts per billion (ppb) in one of four blank samples (method detection limit: 0.04 ppb)
- Strontium: 0.04 ppb in two of four blank samples (method detection limit: 0.01 ppb)

**Major ion analysis** was performed by Shealy Environmental Services, Inc., West Columbia, South Carolina. Sample receipt, sample analysis, and data review were performed by the laboratory "in accordance with the most current approved NELAC standards, the Shealy Environmental Services, Inc. ("Shealy") Quality Assurance Management Plan (QAMP), standard operating procedures (SOPs), and Shealy policies" (Shealy 2013; see Attachment B to the Technical Memorandum).

Data Assessment Reports (DARs) were prepared by AECOM and are included with this attachment. The DARs concluded that no QC excursions were encountered during the validation of this data set. Therefore, the analytical data provided by Shealy Environmental Services, Inc. for this project should be considered compliant and adequate for its intended use.

As another check on analytical results, charge balance was calculated using major ion analysis. Concentrations were converted to milliequivalents by dividing by the molecular weight and multiplying by the electron charge. Charge balance is calculated as the sum of cation milliequivalents minus the sum of anion milliequivalents, divided by the sum of major ion milliequivalents, and converted to relative percent difference (RPD). The calculated RPDs were 7 percent or less, which is considered to be acceptable, with one exception. The sample from well MW072P had a RPD of 11 percent, indicating a deficit of anions compared to cations for this groundwater sample.

**Isotope analysis** was performed by Isotech Laboratories, Inc., Champaign, Illinois. Cavity ring-down spectroscopy was used for analysis of  $\delta^{18}\text{O}/^{16}\text{O}$  and  $\delta\text{D/H}$ , and tritium was analyzed by radiometric measurement. For  $\delta\text{D/H}$  and  $\delta^{18}\text{O}/^{16}\text{O}$  isotope analyses, the one standard deviation general analytical measurement uncertainty was reported by the laboratory based on their experience because duplicate analyses were not conducted. The laboratory assigned  $\delta\text{D/H}$  an uncertainty of +/- 2 and  $\delta^{18}\text{O}/^{16}\text{O}$  an uncertainty of +/- 0.2. Since all tritium measurements were less than 1.00 tritium units, no uncertainty was assigned.

**DATA ASSESSMENT REPORT**  
**FOR LABORATORY SAMPLE DELIVERY GROUP NI13083**

Data assessment is a systematic process for reviewing a body of data against a predefined set of criteria to provide assurance that the data meets project Data Quality Objective (DQO) requirements. The purpose of the data assessment process is to determine if and how the overall analytical processes and sample collection and handling procedures affect the usability of the analytical data. If specific DQOs are not met, the data are qualified (i.e., data flags are assigned to sample results) in accordance with guidelines established by the U.S. Environmental Protection Agency (EPA). Data assessment allows the data user to adequately determine if the data can be used for its intended purpose. The assessment of data quality and usability involves five components, as described below.

- 1) **Field Sampling Check** - is a process to ensure that all samples were collected, handled, and submitted for laboratory analyses in accordance with project work plans. Inspection of sample preservation procedures, sample handling, analysis requested, sample description and ID, cooler receipt forms, holding time evaluation, and Chain of Custody procedures are all evaluated to insure that the evidentiary nature of the samples and the resulting analytical data have not been compromised.
- 2) **Data Verification** - is a process for determining completeness, correctness, consistency, and compliance of a data package in accordance with requirements contained in the SOW and/or contract-specific requirements. This is a review of the data package, electronic data deliverable (EDD), and invoice received from the contract laboratory to insure that the contract required information is present and complete prior to data validation.
- 3) **Data Review** - is a process of reviewing the primary quality control (QC) data provided by the laboratory and the results of any internal quality assurance/quality control (QA/QC) samples, such as field, trip, equipment or ambient blanks and/or field split samples and duplicate samples, to ascertain any effect on the analytical data based on laboratory procedures or sample collection activities.
- 4) **Data Evaluation** - is a process to determine if the data meets project-specific DQOs and contract requirements. This evaluation may involve a review of field sampling and sample management procedures, laboratory audits, Performance Evaluation (PE) sample results, and any other data quality indicators that are available.
- 5) **Data Validation** - is a process to determine the accuracy and precision of the analytical data generated and to identify any anomalies encountered. The validation process is performed in accordance with EPA regional or national functional guidelines, project-specific guidelines, and compliance with the requirements of each analytical method.

Two major components of data validation are laboratory performance and matrix interferences. Evaluation of laboratory performance is a check for compliance for each analytical method to determine if the samples were analyzed within the prescribed acceptance criteria of the method. Evaluation of matrix interferences involves the analysis of surrogate spike recoveries, matrix spike recoveries, and duplicate sample results. Data not meeting project-specific DQOs or the requirements of the analytical method are qualified with data flags according to referenced guidelines.

### **Data Validation Procedures**

AECOM performed independent QC review and assessment of field and laboratory procedures that were used in collecting and analyzing the data. The QC review and assessment is conducted to verify the data collected are of appropriate quality for the intended use and meets site-specific DQOs. The steps and guidelines followed during the data validation process were modeled on the EPA's *Contract Laboratory Program National Functional Guidelines for Organic Data Review* and *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*. In addition, method-specific criteria set forth in the compendium of analytical methods found in the *Test Methods for Evaluation Solid Waste, Third Edition, Update III* are also evaluated during the validation process. This validation process has been adapted to meet the DQO requirements for generation of definitive critical data.

### **Data Validation Results**

The analytical data consist of groundwater samples analyzed by Shealy Environmental Services, Inc. (Shealy) located in West Columbia, South Carolina. Sample Delivery Group (SDG) NI13083 was validated according to the procedures outlined above.

Where data flags have been applied to this data set, they are separated by a slash "/" and presented in the following format:

#### **Laboratory Flag / AECOM Result Flags / AECOM Analysis Flags**

- Laboratory Flag: Is the flag preceding the first slash and is added by the laboratory as a result of QC excursions from the analytical method. These flags are laboratory-specific and are described in the associated laboratory report.
- AECOM Result Flags: These are presented after the first slash and are added based on data validation procedures and guidelines. They tell how the data should be used.
- AECOM Analysis Flags: These flags are presented after the second slash and inform the data user of the specific QA/QC problem that was encountered.

Data flags for each of the three categories described above are listed and defined in Data Flags List. The following describes analytical QA/QC excursions where appropriate by analytical fraction.

**Site Name: Pinewood**  
**Laboratory Sample Delivery Group No: NI13083**  
**Sampling Date: September 10-13, 2012**  
**Chain of Custody No: NA**

***Alkalinity by Method SM2320B***

The assessment of data quality and usability as defined indicate the sample results for this analytical method are acceptable and compliant. Accordingly, no data qualifiers were applied to this analytical fraction.

***Anions by Method E300.0***

The assessment of data quality and usability as defined indicate the sample results for this analytical method are acceptable and compliant. Accordingly, no data qualifiers were applied to this analytical fraction.

***Cations by Method 6010C***

The assessment of data quality and usability as defined indicate the sample results for this analytical method are acceptable and compliant. Accordingly, no data qualifiers were applied to this analytical fraction.

**Data Summary and Usability**

No QC excursions were encountered during the validation of this data set. Therefore, the analytical data associated with Shealy SDG NI13083 should be considered compliant and adequate for its intended use.

**References**

Environmental Protection Agency, June 1997. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Third Edition, Update III.

Environmental Protection Agency, October 1999. *Contract Laboratory Program National Functional Guidelines for Organic Data Review* EPA-540/R-99-008, (PB99-963506).

Environmental Protection Agency, October 2004. *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA 540-R-04-004, (OSWER 9240.1-45).

**DATA ASSESSMENT REPORT**  
**FOR LABORATORY SAMPLE DELIVERY GROUP NI07081**

Data assessment is a systematic process for reviewing a body of data against a predefined set of criteria to provide assurance that the data meets project Data Quality Objective (DQO) requirements. The purpose of the data assessment process is to determine if and how the overall analytical processes and sample collection and handling procedures affect the usability of the analytical data. If specific DQOs are not met, the data are qualified (i.e., data flags are assigned to sample results) in accordance with guidelines established by the U.S. Environmental Protection Agency (EPA). Data assessment allows the data user to adequately determine if the data can be used for its intended purpose. The assessment of data quality and usability involves five components, as described below.

- 1) **Field Sampling Check** - is a process to ensure that all samples were collected, handled, and submitted for laboratory analyses in accordance with project work plans. Inspection of sample preservation procedures, sample handling, analysis requested, sample description and ID, cooler receipt forms, holding time evaluation, and Chain of Custody procedures are all evaluated to insure that the evidentiary nature of the samples and the resulting analytical data have not been compromised.
- 2) **Data Verification** - is a process for determining completeness, correctness, consistency, and compliance of a data package in accordance with requirements contained in the SOW and/or contract-specific requirements. This is a review of the data package, electronic data deliverable (EDD), and invoice received from the contract laboratory to insure that the contract required information is present and complete prior to data validation.
- 3) **Data Review** - is a process of reviewing the primary quality control (QC) data provided by the laboratory and the results of any internal quality assurance/quality control (QA/QC) samples, such as field, trip, equipment or ambient blanks and/or field split samples and duplicate samples, to ascertain any effect on the analytical data based on laboratory procedures or sample collection activities.
- 4) **Data Evaluation** - is a process to determine if the data meets project-specific DQOs and contract requirements. This evaluation may involve a review of field sampling and sample management procedures, laboratory audits, Performance Evaluation (PE) sample results, and any other data quality indicators that are available.
- 5) **Data Validation** - is a process to determine the accuracy and precision of the analytical data generated and to identify any anomalies encountered. The validation process is performed in accordance with EPA regional or national functional guidelines, project-specific guidelines, and compliance with the requirements of each analytical method.

Two major components of data validation are laboratory performance and matrix interferences. Evaluation of laboratory performance is a check for compliance for each analytical method to determine if the samples were analyzed within the prescribed acceptance criteria of the method. Evaluation of matrix interferences involves the analysis of surrogate spike recoveries, matrix spike recoveries, and duplicate sample results. Data not meeting project-specific DQOs or the requirements of the analytical method are qualified with data flags according to referenced guidelines.

### **Data Validation Procedures**

AECOM performed independent QC review and assessment of field and laboratory procedures that were used in collecting and analyzing the data. The QC review and assessment is conducted to verify the data collected are of appropriate quality for the intended use and meets site-specific DQOs. The steps and guidelines followed during the data validation process were modeled on the EPA's *Contract Laboratory Program National Functional Guidelines for Organic Data Review* and *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*. In addition, method-specific criteria set forth in the compendium of analytical methods found in the *Test Methods for Evaluation Solid Waste, Third Edition, Update III* are also evaluated during the validation process. This validation process has been adapted to meet the DQO requirements for generation of definitive critical data.

### **Data Validation Results**

The analytical data consist of groundwater samples analyzed by Shealy Environmental Services, Inc. (Shealy) located in West Columbia, South Carolina. Sample Delivery Group (SDG) NI07081 was validated according to the procedures outlined above.

Where data flags have been applied to this data set, they are separated by a slash "/" and presented in the following format:

#### **Laboratory Flag / AECOM Result Flags / AECOM Analysis Flags**

- Laboratory Flag: Is the flag preceding the first slash and is added by the laboratory as a result of QC excursions from the analytical method. These flags are laboratory-specific and are described in the associated laboratory report.
- AECOM Result Flags: These are presented after the first slash and are added based on data validation procedures and guidelines. They tell how the data should be used.
- AECOM Analysis Flags: These flags are presented after the second slash and inform the data user of the specific QA/QC problem that was encountered.

Data flags for each of the three categories described above are listed and defined in Data Flags List. The following describes analytical QA/QC excursions where appropriate by analytical fraction.

**Site Name: Pinewood**  
**Laboratory Sample Delivery Group No: NI07081**  
**Sampling Date: September 4-7, 2012**  
**Chain of Custody No: NA**

***Alkalinity by Method SM2320B***

The assessment of data quality and usability as defined indicate the sample results for this analytical method are acceptable and compliant. Accordingly, no data qualifiers were applied to this analytical fraction.

***Anions by Method E300.0***

The assessment of data quality and usability as defined indicate the sample results for this analytical method are acceptable and compliant. Accordingly, no data qualifiers were applied to this analytical fraction.

***Cations by Method 6010C***

The assessment of data quality and usability as defined indicate the sample results for this analytical method are acceptable and compliant. Accordingly, no data qualifiers were applied to this analytical fraction.

**Data Summary and Usability**

No QC excursions were encountered during the validation of this data set. Therefore, the analytical data associated with Shealy SDG NI07081 should be considered compliant and adequate for its intended use.

**References**

Environmental Protection Agency, June 1997. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Third Edition, Update III.

Environmental Protection Agency, October 1999. *Contract Laboratory Program National Functional Guidelines for Organic Data Review* EPA-540/R-99-008, (PB99-963506).

Environmental Protection Agency, October 2004. *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA 540-R-04-004, (OSWER 9240.1-45).

**Table C-1**  
**Relative Percent Differences for Primary and Replicate Samples**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

	Units	MW095P	MW095P Rep	RPD	UBC021	UBC021 Rep	RPD
Aluminum	ppb	1	<1	0.0%	393	416	-5.7%
Antimony	ppb	0.11	0.11	0.0%	<0.05	<0.05	na
Barium	ppb	158.47	156.73	1.1%	83.54	85.33	-2.1%
Beryllium	ppb	0.05	0.05	0.0%	0.25	0.16	43.9%
Boron	ppb	15	16	-6.5%	15	15	0.0%
Bromine	ppb	12	12	0.0%	12	12	0.0%
Cerium	ppb	<0.01	<0.01	na	19.87	19.92	-0.3%
Cesium	ppb	0.07	0.07	0.0%	0.3	0.32	-6.5%
Chromium	ppb	<0.5	<0.5	na	8.3	8.7	-4.7%
Cobalt	ppb	<0.02	<0.02	na	1.37	1.43	-4.3%
Copper	ppb	0.2	0.1	66.7%	2.8	2.9	-3.5%
Dysprosium	ppb	<0.01	<0.01	na	0.94	1.05	-11.1%
Erbium	ppb	<0.01	<0.01	na	0.4	0.39	2.5%
Europium	ppb	<0.01	<0.01	na	0.39	0.37	5.3%
Gadolinium	ppb	<0.01	<0.01	na	1.49	1.52	-2.0%
Gallium	ppb	<0.05	<0.05	na	0.26	0.26	0.0%
Holmium	ppb	<0.01	<0.01	na	0.16	0.16	0.0%
Iron	ppb	665	652	2.0%	2321	2368	-2.0%
Lanthanum	ppb	<0.01	<0.01	na	6.9	7.05	-2.2%
Lead	ppb	0.1	<0.1	0.0%	0.9	1	-10.5%
Lithium	ppb	1.3	0.9	36.4%	7.2	6.8	5.7%
Lutetium	ppb	<0.01	<0.01	na	0.03	0.04	-28.6%
Manganese	ppb	34.46	34.25	0.6%	47.08	48.01	-2.0%
Molybdenum	ppb	0.2	0.2	0.0%	0.5	0.5	0.0%
Neodymium	ppb	<0.01	<0.01	na	9.9	10.04	-1.4%
Nickel	ppb	<0.2	<0.2	na	9.7	9.5	2.1%
Phosphorus	ppb	83	97	-15.6%	591	600	-1.5%
Praseodymium	ppb	<0.01	<0.01	na	2.34	2.35	-0.4%
Rhodium	ppb	<0.01	0.01	0.0%	<0.01	<0.01	na
Rubidium	ppb	9.03	8.76	3.0%	10.09	10.18	-0.9%
Samarium	ppb	<0.02	<0.02	na	1.83	1.9	-3.8%
Scandium	ppb	4	4	0.0%	3	3	0.0%
Silicon	ppb	8273	8153	1.5%	7933	8143	-2.6%
Strontium	ppb	221.38	219.16	1.0%	141.46	141.92	-0.3%
Terbium	ppb	<0.01	<0.01	na	0.19	0.21	-10.0%
Thallium	ppb	<0.01	<0.01	na	0.01	0.01	0.0%
Thorium	ppb	<0.05	<0.05	na	0.91	1.02	-11.4%
Thulium	ppb	<0.01	<0.01	na	0.05	0.05	0.0%
Titanium	ppb	<10	<10	na	17	18	-5.7%
Tungsten	ppb	0.09	0.08	11.8%	<0.02	<0.02	na
Uranium	ppb	<0.02	<0.02	na	0.31	0.32	-3.2%
Vanadium	ppb	<0.2	<0.2	na	2.5	2.7	-7.7%
Ytterbium	ppb	<0.01	<0.01	na	0.28	0.3	-6.9%
Yttrium	ppb	<0.01	<0.01	na	3.69	3.7	-0.3%
Zinc	ppb	0.8	<0.5	46.2%	8.1	8.2	-1.2%
Calcium	ppm	27.01	26.74	1.0%	16.65	16.69	-0.2%
Chlorine	ppm	<1	<1	na	3	3	0.0%

**Table C-1**  
**Relative Percent Differences for Primary and Replicate Samples**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

	Units	MW095P	MW095P Rep	RPD	UBC021	UBC021 Rep	RPD
Magnesium	ppm	<b>2.92</b>	<b>2.95</b>	-1.0%	<b>2.16</b>	<b>2.22</b>	-2.7%
Potassium	ppm	<b>3.88</b>	<b>3.87</b>	0.3%	<b>3.79</b>	<b>3.82</b>	-0.8%
Sodium	ppm	<b>5.06</b>	<b>5.12</b>	-1.2%	<b>3.72</b>	<b>3.77</b>	-1.3%
Sulfur	ppm	<b>2</b>	<b>2</b>	0.0%	<b>2</b>	<b>2</b>	0.0%

**Notes:**

ppm = parts per million

ppb = parts per billion

RPD = relative percent difference:  $[(a-b)/((a+b)/2)]*100$

< = less than the method detection limit

**Bold** indicates detected values; elements with no detections for the samples and replicates are not listed.

na = neither detected so RPD not calculated

When one value is detected and one is not, the RPD is calculated using the method detection limit.

Shaded RPDs greater than 30%.

**Table C-2**  
**Relative Percent Differences for Standards and Expected Values**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

	Standard			Comparison with Expected Value		Run 1 & 2
	Run 1	Run 2	Expected Value	Run 1 RPD	Run 2 RPD	RPD
Aluminum	461	513	415	11%	21%	-11%
Antimony	23.94	23.72	21.7	10%	9%	1%
Arsenic	46.5	47.1	40.7	13%	15%	-1%
Barium	340.1	334.0	309	10%	8%	2%
Beryllium	13.59	15.64	15.2	-11%	3%	-14%
Bismuth	18.00	11.89	13.5	29%	-13%	41%
Cadmium	160.3	161.5	145	10%	11%	-1%
Chromium	425.3	426.8	389	9%	9%	0%
Cobalt	311.6	314.4	285	9%	10%	-1%
Copper	434.0	426.8	389	11%	9%	2%
Iron	429	413	369	15%	11%	4%
Lead	489.3	446.2	444	10%	0%	9%
Lithium	21.9	24.3	21.8	0%	11%	-10%
Manganese	336.5	348.8	302	11%	14%	-4%
Molybdenum	300.6	295.5	258	15%	14%	2%
Nickel	356.9	372.1	328	8%	13%	-4%
Selenium	23.5	24.5	25.9	-10%	-6%	-4%
Silver	11.98	11.80	10.9	9%	8%	2%
Strontium	471.2	468.1	442	6%	6%	1%
Thallium	22.42	21.31	20.1	11%	6%	5%
Tin	23.67	23.56	19.6	19%	18%	0%
Uranium	61.21	57.19	55.9	9%	2%	7%
Vanadium	340.4	346.3	312	9%	10%	-2%
Zinc	494.4	516.0	480	3%	7%	-4%

**Notes:**

Concentrations in parts per billion

RPD (%) = relative percent difference:  $[(a-b)/((a+b)/2)]*100$

Shaded RPDs greater than 30%.

**ATTACHMENT D**

**STATISTICAL ANALYSES OF ELEMENTAL DATA**

## **ATTACHMENT D**

### **STATISTICAL ANALYSES OF ELEMENTAL DATA**

Statistical analyses were performed to evaluate the chemical profiles of elements and field parameters in groundwater at Pinewood Landfill. Groundwater was sampled at the site from four different hydrogeological units: Transitional Lang Syne (TLS) including the TLS paleo-channel, Secondary Sawdust Landing (SSDL), Primary Sawdust Landing (PSDL), and Upper Black Creek-A (UBC-A). A total of 57 samples were collected during the sampling event. The groundwater samples were segregated into the corresponding hydrogeological units for statistical analyses: 11 from PSDL, 11 from SSDL, 14 from TLS, 17 from UBC-A, and 4 from TLS-Channel (Table D-1).

The main objective of the analysis was to determine if the hydrogeological units had distinct profiles. A common multivariate technique, principal component analysis (PCA), was used to reduce the dimensionality of the data sets. The PCA highlighted the parameters causing the most variance in the data. The analysis then focused on these select parameters to determine if differences in their concentrations or ratios were caused by differences in the units. Ratios are particularly helpful to highlight differences in chemistry profiles due to varying sources. The reason for this is that even if the source signal is diluted, the ratios of chemicals to each other will remain the same.

An initial review of the data was performed using descriptive statistics (e.g. ranges, medians, means, standard deviations, covariance analysis, correlation analysis, histograms, and tests for normality) and through plotting the profiles of each sample using the full suite of 67 parameters available. The initial review did not exhibit readily discernible distinctions among the units. As the data and parameters were narrowed down during the successive steps of the analysis, these techniques were revisited to ascertain any differences in the profiles. The final PCA was performed using only those samples that had no detectable levels of turbidity, had detections of the 18 parameters with the highest detection frequencies, and were not flagged as outliers (Table D-1).

#### **Principal Component Analysis**

PCA is a standard statistical approach used to examine patterns in data. The PCA reduces the set of potentially co-varying parameters to a minimum of independent variables known as principal components. These components represent eigenvectors derived from the data such that the vectors (or principal components) are uncorrelated and perpendicular. Each principal component is derived so as to contain (or "explain") the maximum amount of variance in the data. Thus, the direction representing the strongest correlation within the data becomes the first principal component (PC). The vectors or PCs are derived sequentially with each successive component explaining subsequently smaller portions of the variance. The eigenvectors all have associated eigenvalues, representative of the variance that can be attributed to each. A Scree plot is a simple way to show the fraction of the total variance in the data as explained or represented by each PC. The PC with the largest fraction contribution is labeled as the first principal component (PC1), subsequent PCs are named accordingly. Figure D-1 shows the Scree plot for the final PCA performed in this analysis. PC1 accounts for 26 percent of the variance in the data. The first two PCs (PC1 and PC2) account for 46 percent of the data. After PC3 is added a total of 62 percent of the variance is taken into account.

Once constructed these components may then be plotted against each other on component axes. The principal components are expressed by simple linear combinations of the data such that:

$$PC1 = \alpha_1x_1 + \alpha_2x_2 + \alpha_3x_3 + \alpha_4x_4 + \alpha_5x_5 + \dots + \alpha_nx_n$$

$$PC2 = \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta_4x_4 + \beta_5x_5 + \dots + \beta_nx_n$$

$$PCn = \eta_1x_1 + \eta_2x_2 + \eta_3x_3 + \eta_4x_4 + \eta_5x_5 + \dots + \eta_nx_n$$

where:

$PC_i$	=	the principal component i
$n$	=	the number of parameters in the data set
$x_n$	=	the scaled value of the parameters in the data set (in this case the concentrations of the analytes were scaled by subtracting the mean and dividing by the standard deviation)
$\alpha_n$	=	the coefficient (or loading) applied to $x_n$ to calculate PC1
$\beta_n$	=	the coefficient (or loading) applied to $x_n$ to calculate PC2
$\eta_n$	=	the coefficient (or loading) applied to $x_n$ to calculate PCn

Figure D-2 shows the loadings for the first three principal components in the final principal component analysis. The loadings were multiplied by the scaled concentrations of associated parameter. The products of each loading and concentration in a given sample were then summed to calculate a PC value for that sample. Note that the magnitude of the coefficients (or loadings) reflects the importance of a given parameter to the principal component. These coefficients can be negative or positive, depending on whether the principal component is negatively or positively correlated with the parameter. For instance, in Figure D-2 for PC1, the loading (or coefficient) for iron (Fe) has a magnitude of approximately -0.3 whereas potassium has a magnitude closer to zero. This indicates that the iron concentrations are more influential in calculating PC1 than potassium concentrations.

Alternatively, the loadings may be plotted against each other for comparison. The PCA loadings are plotted against each other in Figure D-3. The first plot (Figure D-3a) shows the PC1 loadings plotted against the PC2 labels. The plot shows that iron (Fe) has a negative correlation with both PC1 and PC2. The magnitude of the loading for iron is greater for PC1 than PC2. Therefore, the value for PC1 will depend more on iron than will the value for PC2. In Figure D-3a, in comparison, potassium (K), cesium (Cs), rubidium (Rb), and lithium (Li) are all positively correlated with PC2 and have much greater loadings for PC2 than for PC1. Therefore, they have more weight in the value for PC2 than PC1.

The loadings were used to calculate PC values for each sample. These values are plotted against each other in Figure D-4. In the first plot of PC1 plotted against PC2 (Figure D-4a), TLS is distinguished from the other areas. In the second plot (Figure D-4b), showing PC1 plotted against PC3, there is a cluster of samples from UBC-A in the lower left quadrant. In Figure D-4c depicting PC2 plotted against PC3, the areas are mostly clustered but have significant areas of overlap.

The results of the PCA indicate that distinctions may exist and further review of the data is warranted. Therefore, focused analysis on the parameters with the greatest influence in the cluster areas was performed to determine if it may yield distinctions in the profiles of the hydrogeological units.

### **Comparison of Parameter Concentrations and Ratios for Hydrogeological Units**

The hydrogeological units were compared using box plots. Box plots enclose 50% of the data for each unit by showing the 25<sup>th</sup> and 75<sup>th</sup> percentiles (also known as the lower and upper quartiles). The median is shown as a straight line through the box plot. The lines extending from the top and bottom of the boxes mark the “acceptable” range of data for the dataset. Points outside these lines are outliers and deviate markedly from other data points in the set. The lines are calculated by multiplying the interquartile distance (the difference between the upper and lower quartiles) by 1.5 and adding it to the upper quartile or subtracting it from the lower quartile. The outliers are shown on the plots as separate points beyond the lines. For the box plots non-detect parameters were shown with half the detection limits. The parameters were expanded from the 18 parameters with the highest detection frequencies used in the PCA to the 35 parameters with detection frequencies of 33 percent or greater and only those samples with detectable turbidity levels were excluded.

An initial review was performed using concentrations (not ratios). The parameters that exhibited any significant or substantial differences between the units are plotted in Figure D-5. Several parameters showed substantial differences in concentrations. In the box plots for silicon in Figure D-5, the TLS box does not overlap with the other units and can be considered significant. In addition, as shown in Figure D-5, if the one sample from TLS-Channel is not used in the comparison, then TLS also has significantly higher concentrations of antimony. Antimony has low detection frequencies (30-50%) in PSDL, SSDL, and UBC-A, but was detected in all the samples from TLS. Higher calcium and lower iron concentrations were detected in TLS but these are not considered significant since the TLS boxes in Figure D-5 overlap with other units. UBC-A has significantly lower concentrations of magnesium with no overlap with other units and substantially lower concentrations of calcium with some overlap with PSDL. If TLS is not considered, when only comparing PSDL, SSDL, and UBC-A and TLS-Channel then UBC-A has substantially higher concentrations of lithium, PSDL has higher concentrations of potassium, and SSDL has higher concentrations of sulfur. These differences are not considered significant since the boxes overlap slightly in Figure D-5.

The ratios of the parameters were calculated for each sample and analyzed for each hydrogeological unit. Ratios are particularly helpful since ratios will remain constant even if a source signal is diluted. The ratio analysis focused on parameters with high detection frequencies since assumptions for the non-detects (i.e., using half the detection limit) have considerable effects on the ratios. Some of the plots with the most significant ratios are shown in Figure D-6. The ratios of iron to several parameters shown in Figure D-6 were significantly different for TLS. These parameters include: bromine, lithium, magnesium, manganese, potassium, silicon and sulfur. In addition, TLS has significantly different ratios of manganese to silicon. The ratios of magnesium to several parameters shown in Figure D-6 were significantly different for UBC-A. These parameters include: cesium, potassium and rubidium. As shown in Figure D-6, UBC-A also had significantly different ratios of sodium to potassium and sodium to rubidium.

### **Secondary Comparisons**

In addition, several other ratios become significant for the hydrogeological units if TLS or TLS-Channel is removed from the comparison. If TLS is not used in the comparison, potassium to sodium (shown on Figure D-6), magnesium to silicon, and manganese to phosphorus become significantly different for PSDL. When TLS is not used in the comparison several ratios involving boron, calcium, cesium, potassium, rubidium, silicon, sodium, strontium and sulfur are significant for SSDL. For UBC-A several more ratios using lithium and phosphorus are significant when TLS is not included in the comparison. If

further data become available or further knowledge of the units and the sources influencing them indicate a basis for these distinctions, they should be revisited.

Different programs calculate percentiles differently and therefore the upper and lower quartiles are calculated differently. Excel interpolates between values in the dataset while KaleidaGraph (used to generate the box plots) rounds up and returns a value from the dataset. Both these methods are acceptable but they can yield different results. The results above use the box plots. If the percentiles were calculated with Excel, some ratios become significantly different. Most importantly, for SSDL manganese to cesium is designated as significantly different and for PSDL sodium to rubidium, sulfur to lithium, and sulfur to magnesium are designated as significantly different. Using the interpolated method, several more ratios with iron and manganese are designated as significant for TLS and several more ratios with magnesium and sodium are designated as significant for UBC-A. It may be worthwhile to review these ratios if further data become available or information on the sources influencing the units indicates a basis for these distinctions.

### **Conclusions**

1. The analyses performed indicate that turbidity has a substantial effect on the concentrations of the metals. Filtration should be considered if future samples are collected for metals analysis.
2. The most useful parameters in the profile analyses are those with high detection frequencies. Many parameters have low detection frequencies and are not useful in the profile analyses.
3. The principal component analysis indicates that TLS may be distinguished from the other units by its higher groundwater concentrations of silicon and antimony and distinct ratios of iron to other parameters and manganese to silicon.
4. UBC-A groundwater has lower concentrations of magnesium and calcium and significantly different ratios of magnesium and sodium to other parameters, compared to other units.
5. Less obvious distinctions may exist to distinguish PSDL and SSDL groundwater, but none were found that were significant.
6. There were not enough samples from TLS-Channel to determine if it has a distinct profile.

These conclusions should be used cautiously as there were a small number of usable data points available for each unit. Additionally, some of the data were excluded from the final analyses due to effects of turbidity on the metals concentrations in the unfiltered samples. Also, the data were only collected during a single sampling event and there is no information regarding the concentration over time or during the different seasons. These limitations make it difficult to ascertain if the distinctions found actually represent consistent differences in the units or are just found in these select samples. Further sampling and analysis can be performed to determine if there is a basis for these distinctions and thereby add some validity to the differences.

**Table D-1**  
**Number of Samples Included in the Statistical Evaluation**  
**Pinewood Landfill**  
**Pinewood, South Carolina**

Aquifer Designation	Total Samples	Samples with Turbidiities > 0	Number of Samples in Box Plots <sup>a</sup>	Number of Samples with Non-Detects for 18 Parameters	Outliers	Number of Samples in Final PCA <sup>b</sup>
PSDL	11	5	6	--	--	6
SSDL	11	4	7	1	--	6
TLS	14	7	7	1	1	5
TLS-Channel	4	3	1	--	--	1
UBC-A	17	7	10	--	--	10

**Notes:**

<sup>a</sup> Equivalent to total samples minus samples with turbidity > 0.

<sup>b</sup> Samples in box plots minus samples with nondetects for the 18 key parameters or outliers.

PCA - Principal Component Analysis

TLS - Transitional Lang Syne

TLS Channel - Paleo-Channel

PSDL - Primary Sawdust Landing

SSDL - Secondary Sawdust Landing

UBC-A - Upper Black Creek-A

**Figure D-1 –PCA Scree Plot**

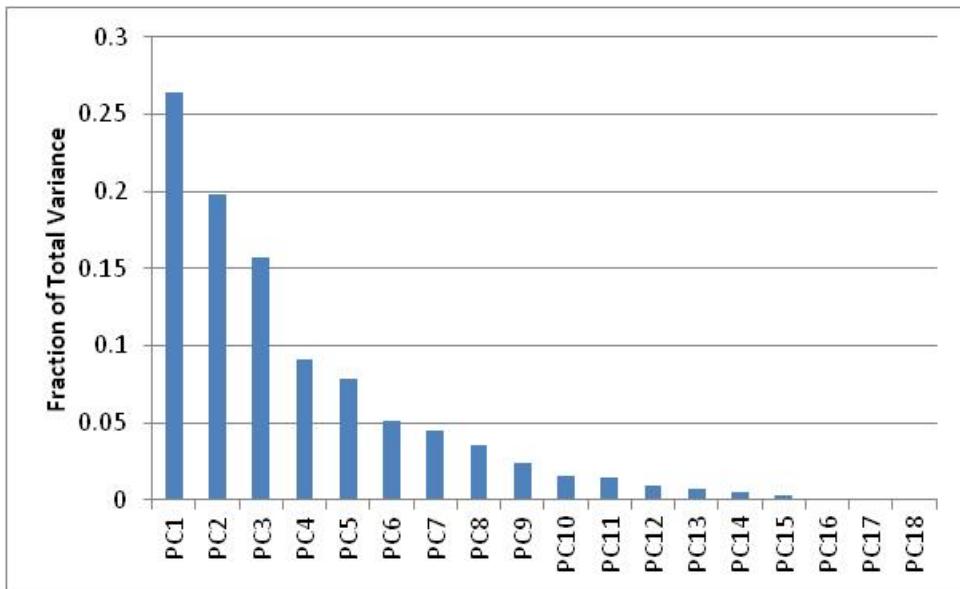
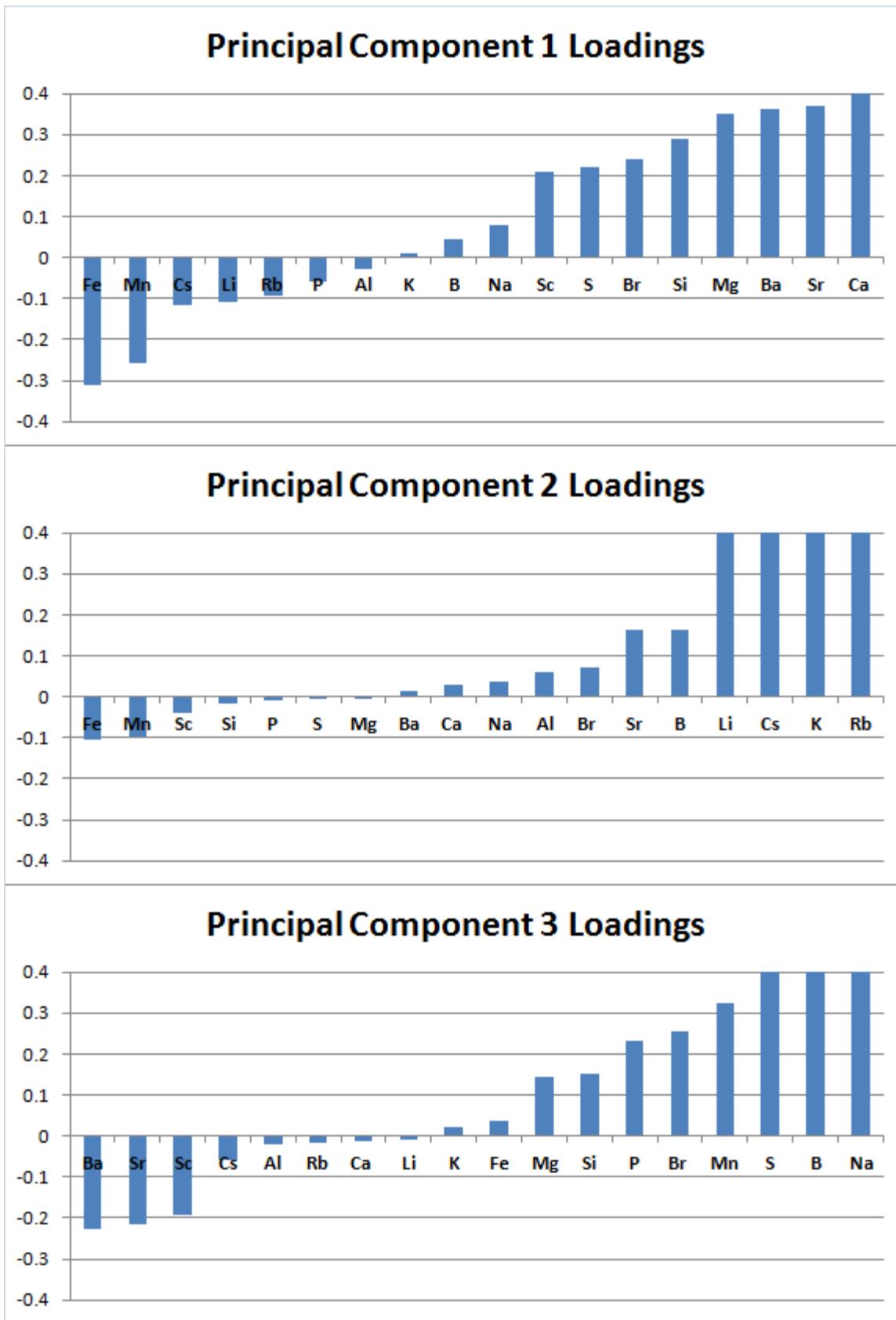
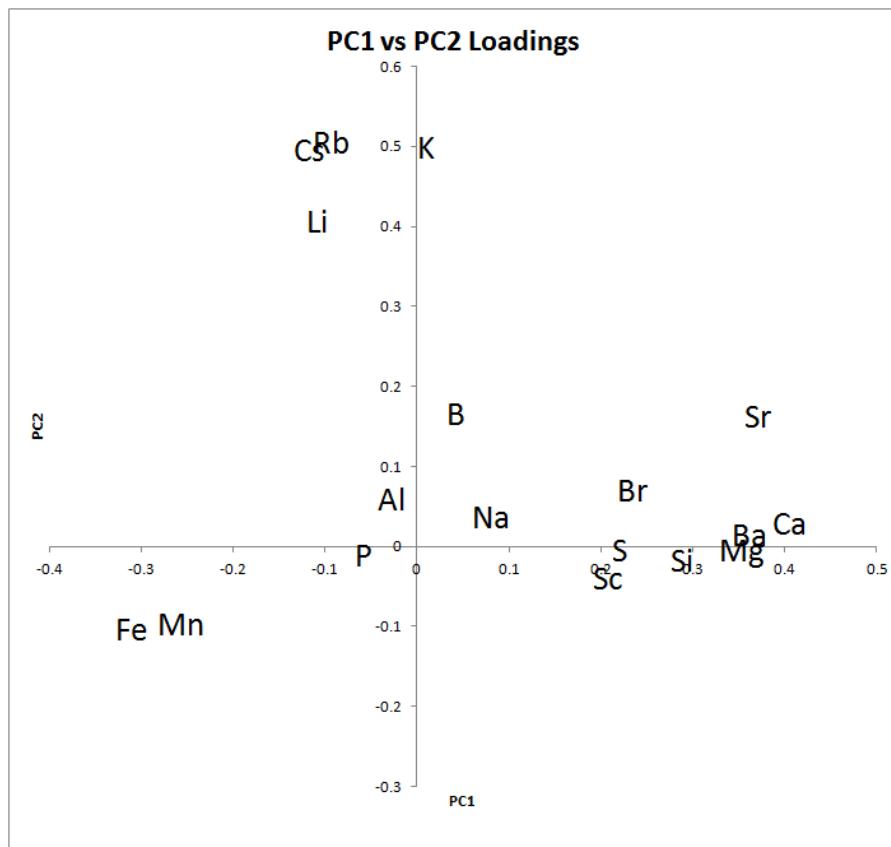


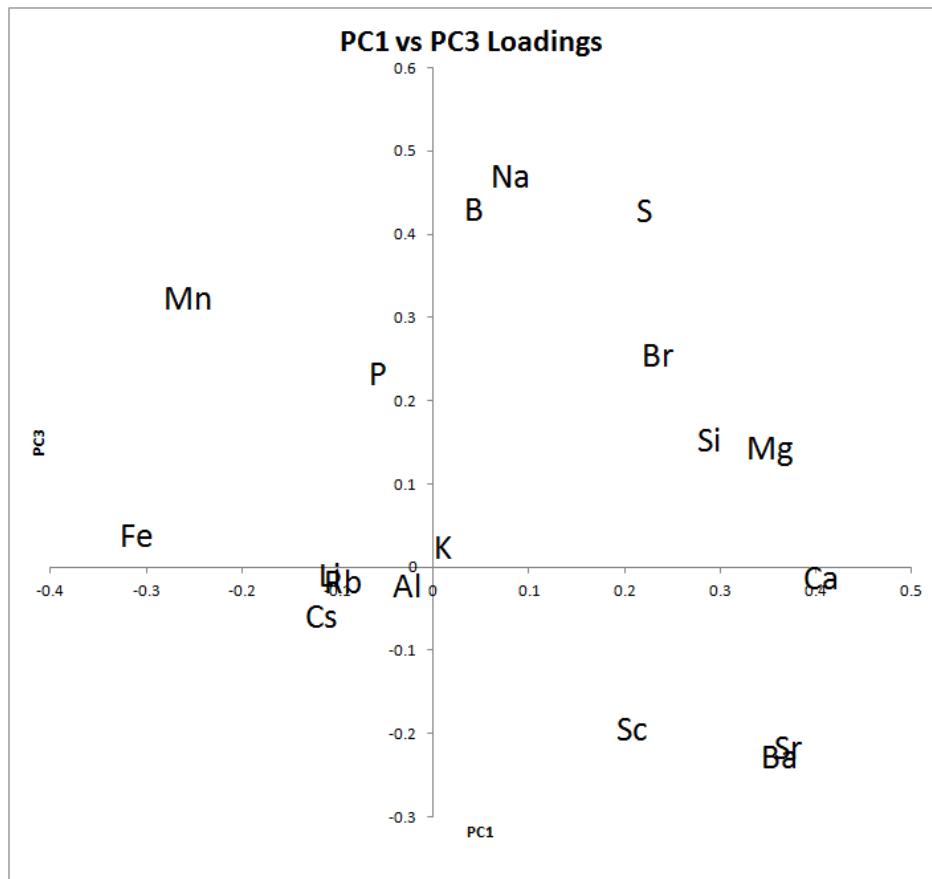
Figure D2 –PCA Loadings



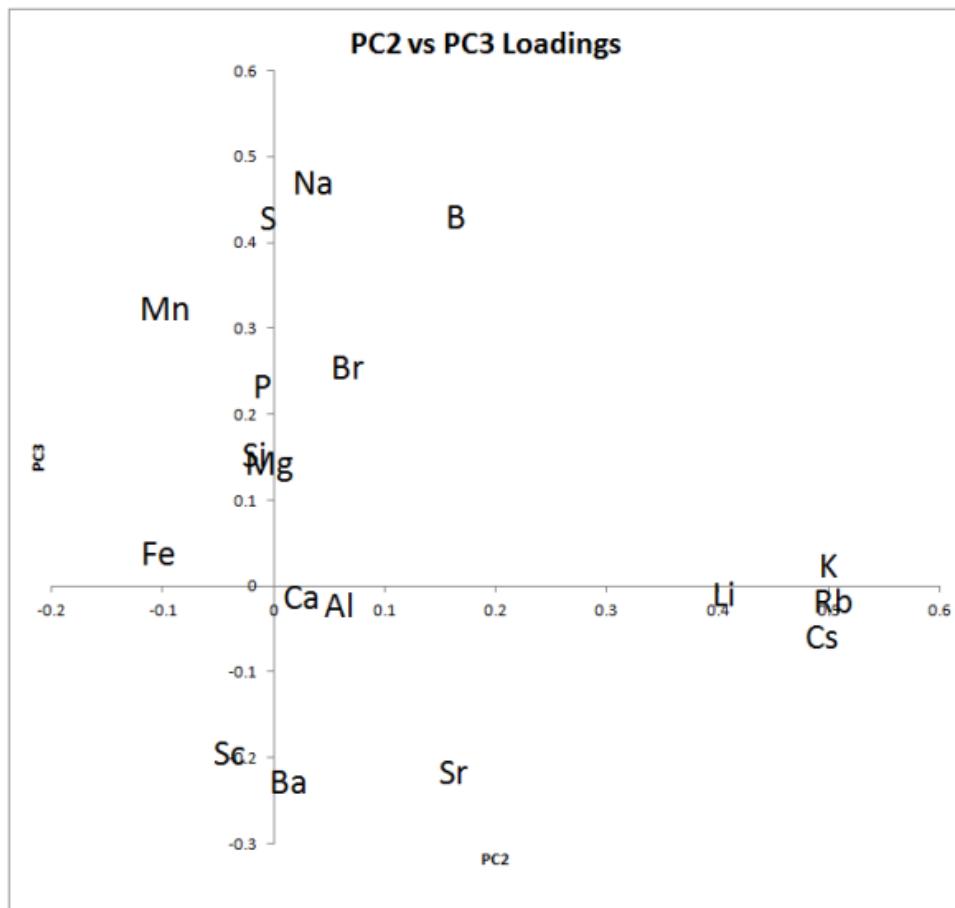
**Figure D-3a –PCA Loadings Comparisons, PC1 versus PC2**  
(X-axis is PC1; Y-axis is PC2)



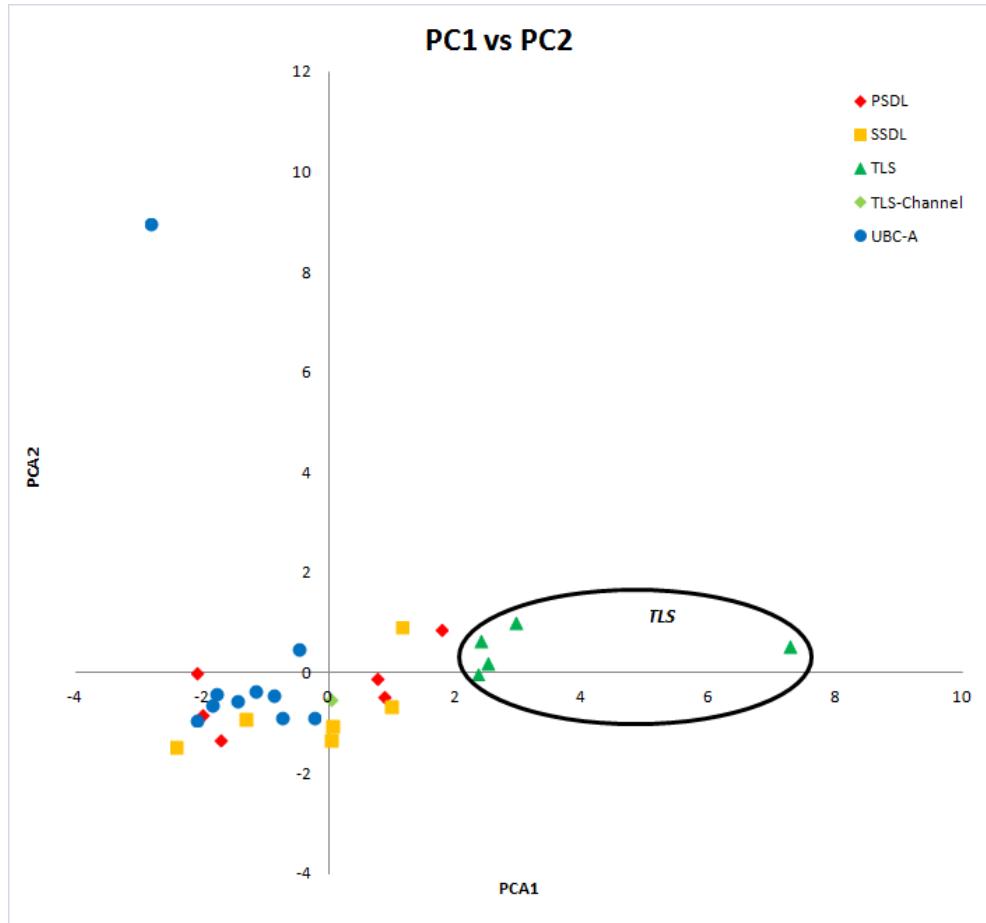
**Figure D-3b –PCA Loadings Comparisons, PC1 versus PC3**  
(X-axis is PC1; Y-axis is PC3)



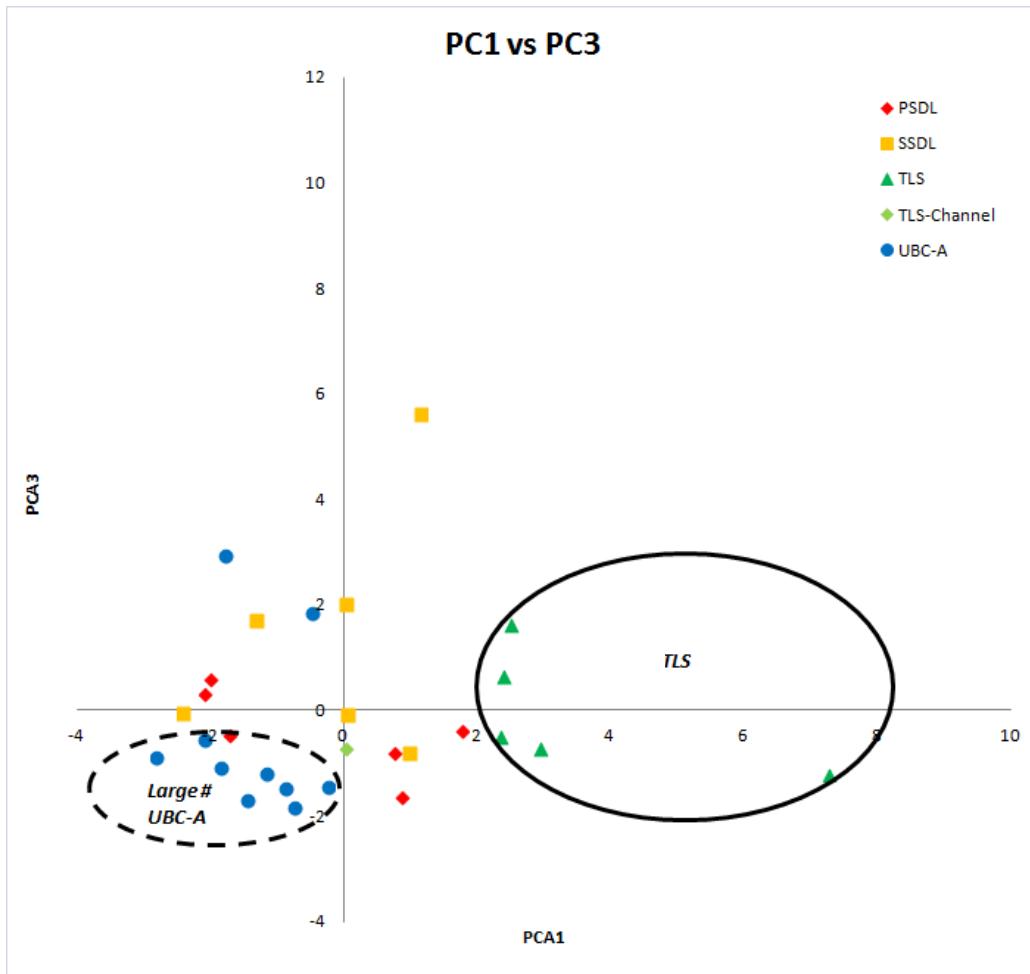
**Figure D-3c –PCA Loadings Comparisons, PC2 versus PC3**  
(X-axis is PC2; Y-axis is PC3)



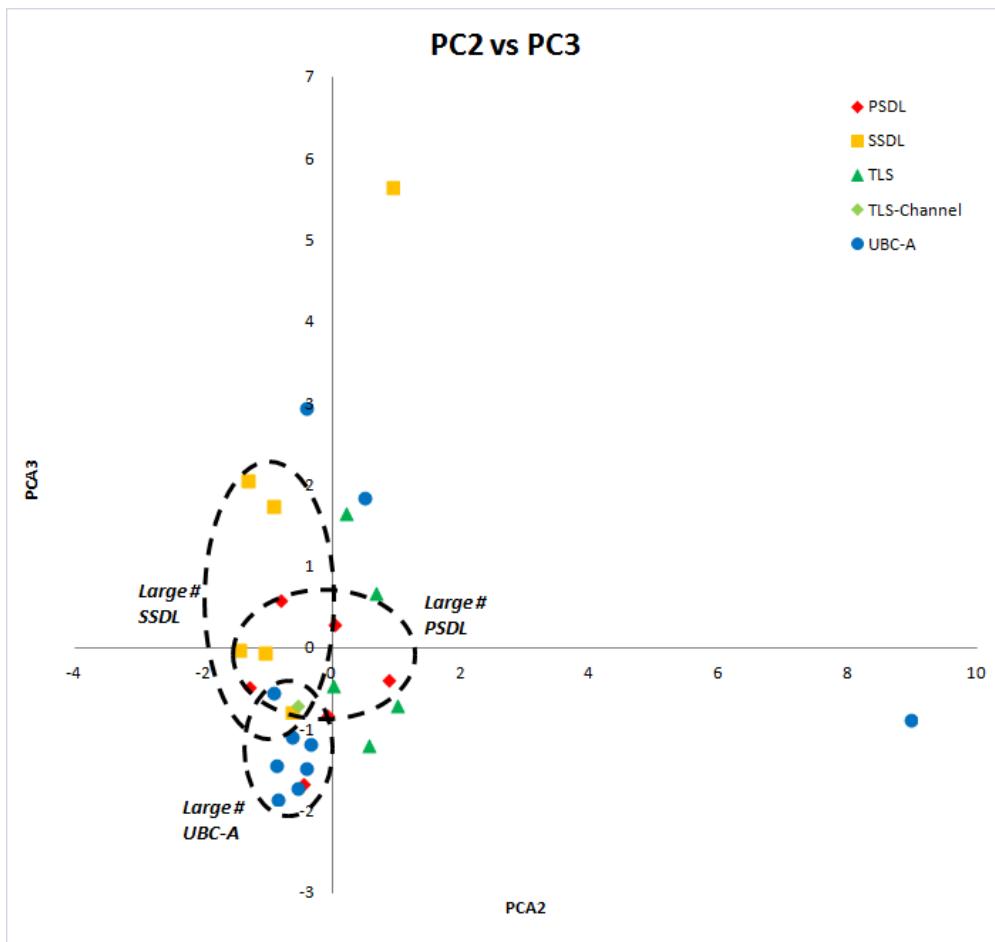
**Figure D-4a – PCA Results, PC1 versus PC2**  
(X-axis is PC1; Y-axis is PC2)

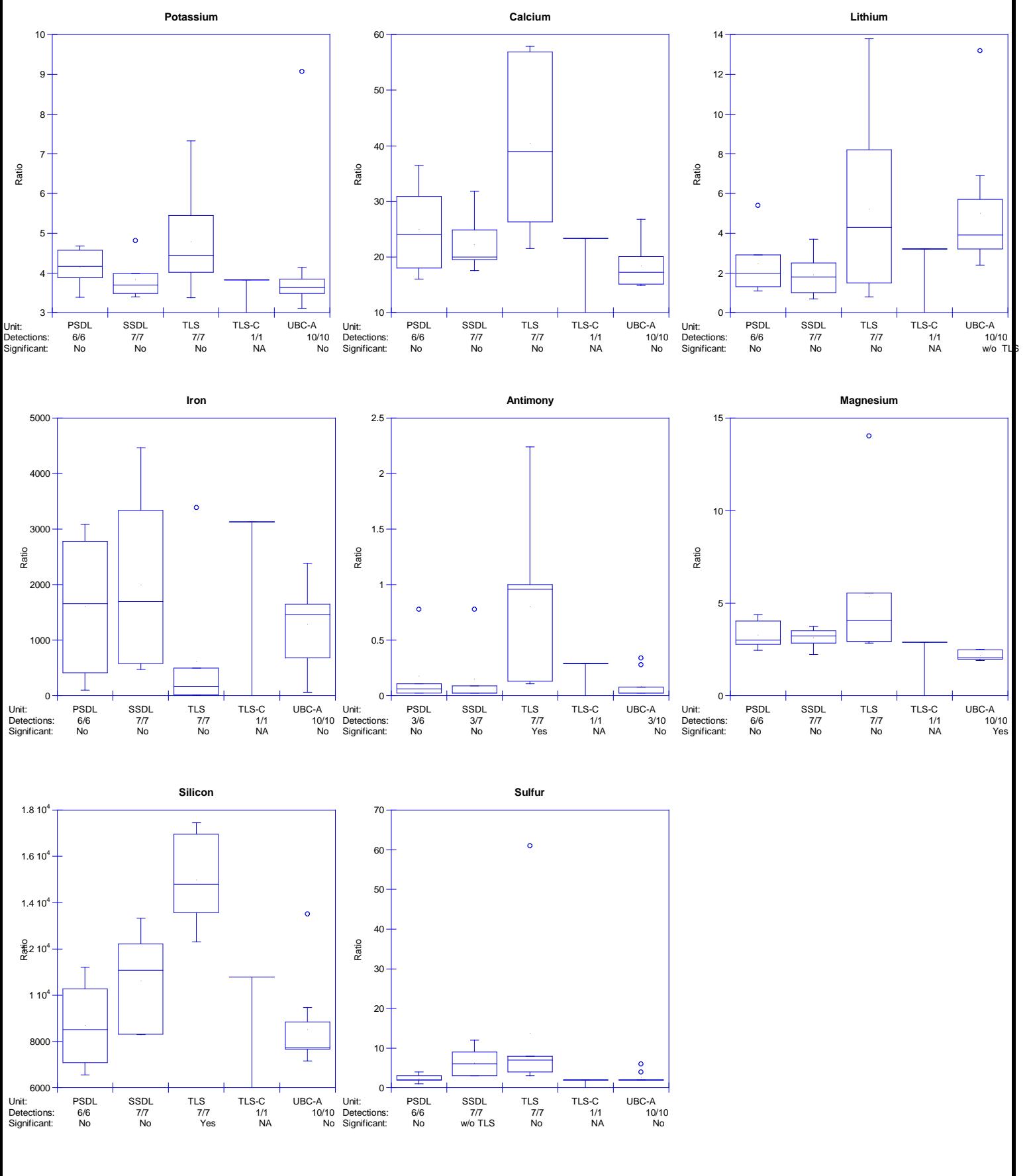


**Figure D-4b – PCA Results, PC1 versus PC3**  
(X-axis is PC1; Y-axis is PC3)

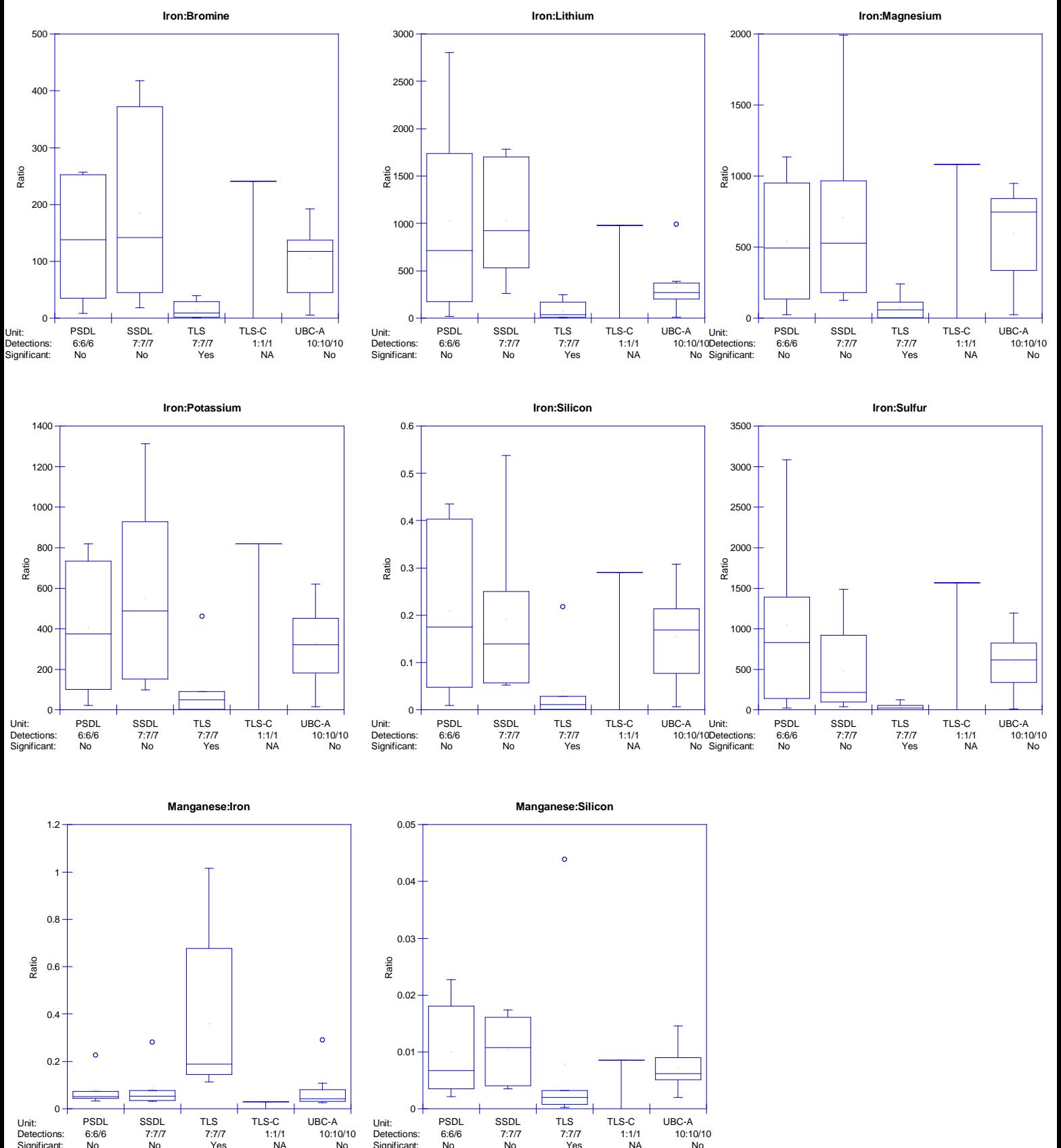


**Figure D-4c – PCA Results, PC2 versus PC3**  
(X-axis is PC2; Y-axis is PC3)

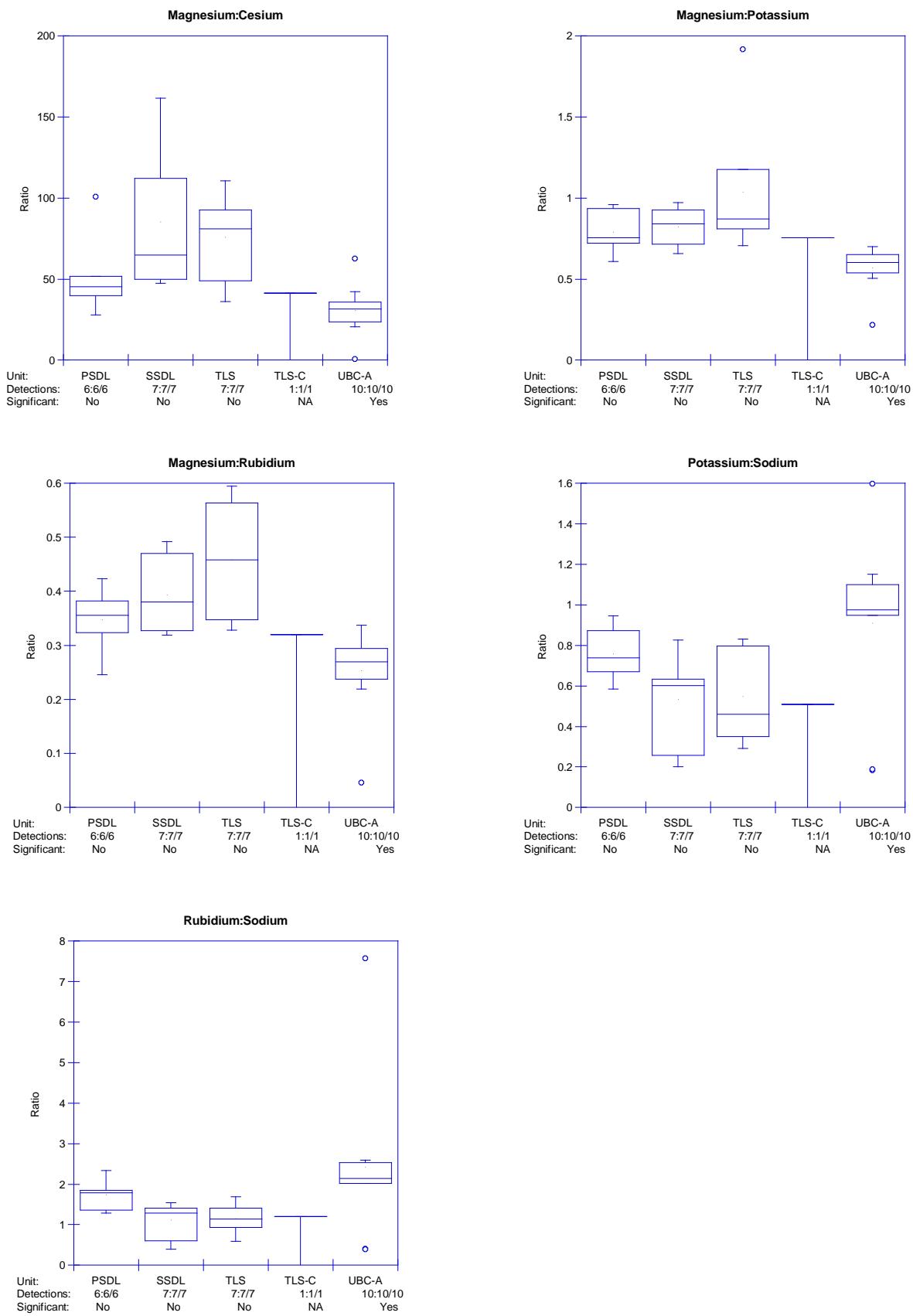




**Figure D-5 - Box Plots of Parameter Concentrations**



**Figure D-6a - Box Plots of Ratios Significant to TLS**



**Figure D-6b - Box Plots of Ratios Significant to UBC-A**