**Biogeochemical Characterization of a Wetland
Impacted by Alkaline Mine Tailings Located in
North Cobalt, Ontario**

Submitted by

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A thesis submitted to the Faculty of Graduate
Studies and Research in partial fulfillment of the
requirements for the degree of Master of Science

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ABSTRACT

The wetland area studied in the Farr Creek drainage basin in North Cobalt is entirely floored with alkaline mine tailings containing elevated concentration levels of metals including As, Co, Cu, Zn, Pb, and Sb. The results from this study clearly indicate that this wetland is a net sink for metals, with over 75% (by mass) of the metals being retained in the sediments. Also, up to 25 % (by mass) of the metals were retained in the leaves of *Typha latifolia*. Both oxidizing and reducing bacteria were quantified throughout the wetland and it was found that both types of bacteria were prevalent throughout the wetland at similar population levels. This would suggest that both oxic and anoxic geochemical processes are prevalent throughout this system. It is likely that the presence of localized oxic zones in the vicinity of root zones of *Typha latifolia*, supported the APB populations observed. The sequentially extracted metals (SEM) results indicated that much of the metals retained in the sediments are associated with the residual and organic matter (OM) fractions. These results have highlighted the geochemical processes prevalent in Alkaline drainage systems which are quite different from those observed in acid drainage systems. These results indicate the importance in considering both the geochemical conditions of the wetland or system being used to treat the mine drainage, as well as to have a detailed understanding of the metals of concern within the mining waste because different metals will have different geochemical interactions based on redox conditions, presence of sulfides, Fe and Mn oxides, and organic matter.

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1.0 INTRODUCTION

All sediments contain natural background concentrations of trace metals from the surrounding bedrock material (Gambrell, 1991). Anthropogenic sources of metals, including mining wastes, runoff waste streams, and air fall deposition from industrial operations, are becoming increasingly an issue for contamination of downstream environments and health impacts to aquatic species and humans. As a result, it is important to characterize metal distributions and transformations in aquatic environments to better understand the geochemical and biological processes regulating these transformations.

This section gives a brief introduction to the study area (Section 1.1) and provides the study objectives (Section 1.2).

1.1 Study Area

The study area is located in the Farr Creek drainage area, in Cobalt, ON. Cobalt is located on Highway 11B, approximately 130 km north of North Bay, ON (Figure 1-1). The wetland area investigated in this study is confined to a relatively narrow northeast oriented valley that is bounded to the south by Crosswise Lake and the remnants of a gravel dam, and bounded to the north by a water level control dam. Tailings underlie the entire study area as well as both upgradient and downgradient of the study area. Farr Creek flows northeast through the study area (Figure 1-2). Mill Creek, which transports

Figure 1-1: Location of Cobalt, Ontario (Taken from Dumaresq, 1993)

Figure 1-2: Study Area

metal loadings from several upstream tailings deposits and organic loadings from the municipal wastewater lagoon flows into Farr Creek as shown on Figure 1-2. The northern portion of the area is maintained under a water cover for much of the open water season, whereas the southern portion of the area is relatively dry throughout the summer and fall. This is further evidenced by the establishment of grasses and sedges in the drier areas, while waterlogged areas are primarily populated with cattails.

1.2 Study Objectives

The main objectives of this research were to characterize the biogeochemical interactions occurring throughout the wetland and to evaluate the wetland's ability to effectively attenuate heavy metals. This was accomplished by:

- Determining the magnitude and distribution of acid producing bacteria (APB), iron reducing bacteria (IRB), and sulfate reducing bacteria (SRB) populations throughout the wetland;
- Characterizing the abundance and distribution of geochemical species in the sediment, porewater, and surface water;
- Correlating microbial population results with porewater chemistry and sediment metals concentrations; and
- Conducting geochemical speciation modeling and adsorption modeling to determine the role precipitation and adsorption reactions have on metal immobilization throughout the wetland.

2.0 BACKGROUND

The environmental disturbance resulting from mining wastes has become a well documented problem. Drainages and/or seepages from mine adits, waste rock piles, and tailings impoundments containing elevated, and in many cases toxic concentrations of heavy metals, can have deleterious effects on the receiving environments. The following section will provide a literature review of the problems associated with mine drainage, the geochemical processes that are occurring in aquatic environments, the applicability of wetlands as passive treatment options for mining wastes (Section 2.1), and a summary of background geology and tailings geochemistry from the study area (Section 2.2).

2.1 Literature Review

2.1.1 Mine drainage

The most studied mine waste problem is acid mine drainage (AMD). This occurs when sulfide bearing material is exposed to the atmosphere and undergoes oxidation. The oxidation of sulfides, which may be catalyzed by microbial populations, produces sulfuric acid. This can result in extremely low pH waters, depending on the amount of sulfides in the waste rock or tailings. The highly acidic conditions produced enhance heavy metal dissolution. Metals are typically more soluble under low pH conditions due to the increased competition between protons and metal cations for organic ligands

(Schnoor, 1996). The dissolved metals have the potential to migrate offsite resulting in potential negative impacts to both humans and aquatic organisms.

The acidity produced from the oxidation reactions can potentially become neutralized if there is adequate carbonate minerals present in the tailings and mixing waters. This can result in net neutral or alkaline mine drainage (NAMD). NAMD can also be produced from mining wastes containing little to no sulfides. Such drainage, although non-acidic, can also contain elevated dissolved metal concentrations, which can potentially impact receiving environments.

2.1.2 Treatment Options

Historically several mining companies have used active treatment options for mitigating impacts to the environment as a result of acid mine drainage. These options typically involved chemical additions of neutralizing agents such as lime, which was quite expensive. This sparked the movement towards passive treatment options, one of which is the use of constructed or natural wetlands to attenuate the metals. Currently, two types of treatment wetlands are used: aerobic wetlands and anaerobic wetlands.

Aerobic wetlands typically have a large surface area pond with horizontal surface flow and aquatic vegetation such as cattails (*Typha latifolia*). The typical water cover should be maintained between 15 to 45 cm in depth (Berghorn and Hunzeker, 2001). Shallower areas may enhance the oxygenation of surficial sediments and oxidizing reactions.

Deeper areas generally decrease the vegetative diversity in the wetland (Berghorn and Hunzeker, 2001). These wetlands are only effective for NAMD because the predominant metal removal/immobilization pathway is via oxidation reactions. As such, the operational pH should be maintained above 5.5. Under oxic conditions Fe and Mn form amorphous Fe and Mn oxides, hydroxides and oxyhydroxides, which contain prime adsorption sites where metals can be bound. It has also been shown that selected metals, such as As, can coprecipitate with Fe oxides and/or hydroxides (Gambrell et al., 1994).

Anaerobic wetlands typically consist of a large pond with an organic substrate layer which is typically 30 to 60 cm thick (Berghorn and Hunzeker, 2001). Vegetation may help stabilize the organic layer and provide additional substrate to perpetuate sulfate reduction. The organic substrate stimulates chemical and microbial reduction reactions which generate alkalinity and increase solution pH. The organic matter removes any oxygen which allows for iron and sulfate reduction. Anaerobic wetlands are better suited for AMD waste streams because the prime method of metal removal is through iron and sulfate reduction. This results in the precipitation of metal sulfides. Sulfate reducing bacteria typically thrive in relatively neutral environments, however, Fortin et al. (1996) have reported active SRB populations in waters with pH values of less than 4.

2.1.3 Geochemical Processes in Freshwater Aquatic Environments

Redox condition and pH are the two most important parameters used to characterize geochemical interactions. Microbial populations play a vital role in the cycling of

geochemical species. Organic substrates, nutrients and terminal electron acceptors are required by microbial populations to survive. Variations in these geochemical species will dictate the dominance of certain microbial populations. Microorganisms will derive their energy from the breakdown of organic substrates by sequentially using electron acceptors in the most energetically favourable order (Hunter, et al., 1998). Table 2-1 lists the chemical equations for the sequential oxidation of organic compounds by microorganisms.

Table 2-1: Oxidation of Organic Compounds (Chemoorganotrophs, All Heterotrophs) (Morel and Hering, 1993)

Aerobic Respiration:		
$\text{CH}_2\text{O} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$		$\Delta G^\circ = -119 \text{ KJ/mol}$
Denitrification		
$1/4\text{CH}_2\text{O} + 1/5\text{NO}_3 + 1/5\text{H}^+ \rightarrow 1/4\text{CO}_2 + 1/10\text{N}_2 + 7/20\text{H}_2\text{O}$		$\Delta G^\circ = -113 \text{ KJ/mol}$
Manganese Reduction		
$1/4\text{CH}_2\text{O} + 1/2\text{MnO}_2 + \text{H}^+ \rightarrow 1/4\text{CO}_2 + 1/2\text{Mn}^{2+} + 3/4\text{H}_2\text{O}$		$\Delta G^\circ = -96.9 \text{ KJ/mol}$
Iron Reduction		
$1/4\text{CH}_2\text{O} + \text{Fe}(\text{OH})_3 + 2\text{H}^+ \rightarrow 1/4\text{CO}_2 + \text{Fe}^{2+} + 11/4\text{H}_2\text{O}$		$\Delta G^\circ = -46.7 \text{ KJ/mol}$
Sulfate Reduction		
$1/4\text{CH}_2\text{O} + 1/8\text{SO}_4^{2-} + 1/8\text{H}^+ \rightarrow 1/4\text{CO}_2 + 1/8\text{HS}^- + 1/4\text{H}_2\text{O}$		$\Delta G^\circ = -20.5 \text{ KJ/mol}$
Methanogenesis		
$1/4\text{CH}_2\text{O} \rightarrow 1/8\text{CO}_2 + 1/8\text{CH}_4$		$\Delta G^\circ = -17.7 \text{ KJ/mol}$
Hydrogen Fermentation:		
$1/4\text{CH}_2\text{O} + 1/4\text{H}_2\text{O} \rightarrow 1/4\text{CO}_2 + 1/2\text{H}_2$		$\Delta G^\circ = -1.1 \text{ KJ/mol}$

The Gibbs free energy of formation values for each reaction is included in Table 2-1. Microorganisms will typically favour the reactions with the highest Gibbs free energy value (aerobic respiration) and sequentially move down the chain once electron acceptors become consumed. It is important to note that these reactions are competitive between different microbial populations (Hunter et al., 1998).

In the oxic zone of the sediments, aerobic respiration is prevalent. Arsenopyrite (FeAsS), which is a relatively common sulfide mineral found in mine tailings, would undergo oxidation as shown by the reaction shown in equation 2-1, when present in the oxic zone of the tailings(Boyle and Dass, 1971):

The sulfuric acid produced from this reaction immediately reacts with carbonates present in the tailings to produce soluble sulfates. The reaction of FeCO₃ with sulfuric acid is presented in equation 2-2 (Boyle and Dass, 1971):

Fe is further oxidized to Fe(III) as ferric sulfates and hydrous ferric oxides and/or oxyhydroxides as shown in equation 2-3 (Boyle and Dass, 1971):

These oxidation reactions may be catalyzed by a wide range of acidophilic and neutrophilic microorganisms. Figure 2-1 presents a typical pore water redox zonation profile for submerged sediments.

Figure 2-1: Typical pore water profile (Fortin, 2003)

Immediately below the sediment-water interface there is a rapid reduction in the dissolved oxygen concentration, indicating the development of anoxia, followed by the reduction of nitrate concentration. The end product of nitrate reduction is nitrogen gas, which may either be converted to organic nitrogen by nitrogen fixing bacteria or released to the atmosphere. This process generates permanent alkalinity by removing one equivalent H^+ ion per ion of nitrate reduced (Rudd et al., 1986). As such, if acidic conditions persist in the oxic zone of sediments or the water column, there will be a shift towards increasing pH with depth. Deeper into the sediments there is a measurable increase in reduced manganese, followed by an increase in reduced iron. Both Mn and Fe reduction may generate alkalinity. For each equivalent H^+ ion two Fe or Mn ions are reduced. Further in depth within the pore water profile there will be a reduction in sulfate concentrations. Sulfate reduction converts sulfate to sulfides. If there is a significant concentration of dissolved metals, such as reduced Mn, iron and other metal sulfide precipitates may form. Sulfate reduction also generates alkalinity. For each equivalent H^+ ion two sulfate ions are reduced. The alkalinity produced from Mn, Fe and sulfate reduction is not permanent. Should the sediments become reoxidized, the reduced Mn, Fe and sulfide are converted back to their oxidized forms of manganese oxides, iron oxides and sulfate respectively, thereby consuming the alkalinity produced by the reduction processes (Rudd et al., 1986). This is typical in hypolimnetic lakes during fall overturn where the lake completely mixes resulting in oxic conditions throughout the entire depth of the lake. In the absence of adequate nitrate, Mn or Fe oxides, and sulfate, methanogenesis and hydrogen fermentation will proceed where an external organic substrate is converted directly to carbon dioxide and methane during methanogenesis and

to carbon dioxide and hydrogen gas during hydrogen fermentation. These processes do not add to the alkalinity budget.

The most common chemical species contributing to alkalinity in fresh waters are shown in equation 2-4 (Cook et al., 1986):

$$\text{Alk} = 2\text{CO}_3^{2-} + \text{HCO}_3^- - \text{H}^+ + 2\text{S}^{2-} + \text{HS}^- + \text{NH}_3 \quad (\text{Equation 2-4})$$

At neutral to slightly acidic pH values, the contribution of CO_3^{2-} , 2S^{2-} and NH_3 to the overall alkalinity are negligible and the dissolution of carbonates in water adds equal amounts of H^+ and HCO_3^- (Cook et al., 1986). Therefore the overall reaction can be re-written in terms of the redox species produced, as shown in equation 2-5 (Cook et al., 1986):

$$\Delta\text{Alk} = \Delta\text{Fe(II)} + \Delta\text{Mn(II)} - \Delta\text{NO}_3^- - 2\Delta\text{SO}_4^{2-} \quad (\text{Equation 2-5})$$

This production of alkalinity during nitrate, Mn and Fe reduction may help insure adequate pH values for sulfate reduction. Microorganisms involved in sulfate reduction cannot survive in pH less than 5 (Fortin et al., 1996).

It is important to note, that all of the above redox reactions are catalyzed by microorganisms. Only oxidation and reduction of Fe and Mn can occur abiotically as well as mediated by microorganisms (Fortin, 2003). Several studies have been conducted

to determine under what circumstances iron and manganese oxidation occur abiotically versus biotically. The results of these studies have indicated that iron oxidation is catalyzed more strongly by bacteria under lower pH conditions where abiotic controls may take over at circumneutral pH's (Kirby et al., 1999). It is also speculated that because both iron and manganese oxides tend to remain as amorphous solids, bacteria growth onto these surfaces may stimulate further growth, indicating an autocatalytic process (Tessier et al., 1996; Tipping et al., 1984).

2.1.4 Previous Studies on the Use of Wetlands for Treating NAMD

Metal Immobilization in Soils

Metal contamination in soils is a cumulative process. Retention of metals within substrates results from Van der Waals interactions between particulate matter and metal cations, adsorption to organic matter via lewis acid base reactions and precipitation reactions due to oxidation, hydrolysis, and bacteria catalyzed reactions (Gamrell et al., 1991). These reactions are influenced by sediment pH, redox condition, and chelating agents released during decomposition of organic matter (Gambrell et al., 1991).

Microbial biomass and pH are the dominant parameters which control metal adsorption in sediments. Metal adsorption increases with pH and is quite active under circumneutral to alkaline conditions and becomes reduced under acidic conditions. Organic matter is typically negatively charged under the pH conditions of most aquatic environments.

Bacterial surfaces become neutral at pH values approaching 2 (Yee et al, 2001). As the pH increases, the bacterial cell walls become increasingly negatively charged due to deprotonation reactions of surface functional groups such as carboxyl, hydroxyl and phosphate functional groups (Yee et al., 2000). The negative charge on the bacteria surface and the positively charged dissolved metal ions generates an electric field where positively charged ions diffuse towards the negatively charged organic matter surfaces.

Sequential extractions have been used to quantify the forms in which metals are bound in the sediment substrate. This can give an indication of the metal's availability for uptake by organisms. There are five major fractions of sediments: residual fraction, exchangeable fraction, carbonate fraction, Fe and Mn oxides fraction, and organic matter fraction. Metals retained in the residual fraction of the soil are usually in the form of metal sulfides or adsorbed to clay minerals and are considered relatively unavailable for uptake by organisms (Grambrell et al., 1991). Exchangeable metal fractions adsorb onto substrate surfaces but these forms are easily exchangeable with other cations depending on adsorption kinetics and equilibria (Miller et al., 1983). In high alkalinity waters, carbonates could bind metals as well (Miller et al., 1983). Metals adsorbed and/or coprecipitated with the Fe and Mn oxides fraction of the sediments are relatively immobile assuming that redox conditions do not change to reducing conditions. This would result in the dissolution of Fe and Mn oxides, thereby releasing the metals back into the porewater.

In a complex aquatic system, there are numerous different types of microorganisms which may be associated with specific chemical species such as iron oxides. It has also been suggested that adsorption of metal species to microorganism surfaces may promote further metal precipitations or enhance the formation of metal complexes, resulting in the generation of large molecular weight organic complexes. A classic example of this is the adsorption of metals to Fe-humic substance complexes, which form under predominantly acidic conditions. This results in enhanced metal adsorption to these reactive surfaces under reduced pH conditions. As a metal-organic matter complex grows, the molecule may become folded resulting in the permanent adsorption of metals to the structure.

Fitch and Buken (2003) reported that the main removal mechanism regulating metal immobilization at a constructed wetland in Trail BC were:

- 1) adsorption, predominantly to organic matter;
- 2) coprecipitation with iron oxyhydroxides; and
- 3) precipitation as metal sulfides.

They also noted that the bulk of the removal was due to coprecipitative adsorption onto growing Fe oxide particles. There were concerns, however, that metals adsorbed onto dissolved organic matter molecules could potentially migrate outside of the wetland.

It has been suggested that adsorbed metals can remobilize easier than metals associated with sulfide precipitate lattices. A number of studies have shown that longer residence

times in constructed wetlands can enhance the probability of forming metal sulfides (Machemer and Wildeman, 1992; Sobolewski, 1996; Chague-Goff and Rosen, 2001).

Role of Wetland Plants on Metal Immobilizations

Wetland plants play an important role in metal removal. Metals may be absorbed directly into the plant tissue via the shoot system and they enhance filtration and cation exchange reactions (Deng et al., 2004). The degree to which plant species can retain metals, either through their root system or through absorption and translocation, is dependent not only on the specific plant species, but also on its growth stage, and the specific metal characteristics (Deng et al., 2004). A study was conducted by Deng et al. (2004) where metal accumulations were tested in both the root zones and the shoots of 12 different wetland plant species, one of which was cattails (*Typha latifolia*). The results indicated that much higher metal concentrations were retained in the root zone of the plants as compared to the amount of metals in the plant shoots and leaves. The metals investigated were Pb, Cu, Cd, Zn. Jackson et al. (1993) demonstrated that under mildly oxidizing conditions in the root zone, lower concentrations of metals were reported in the shoot as opposed to the root zone. This was attributed to the formation of amorphous Fe and Al oxide precipitates to which metals would be adsorbed. It was suggested that the formation of Fe and Al oxides in the root zones prevented high concentrations of metals from being taken up into the plants, thereby helping to regulate the internal metal transport under contaminated conditions.

Wetland plants transport oxygen to the root system, also known as the rhizosphere, generating a zone of radial oxygen loss (ROL) in an otherwise predominantly anoxic environment. The total volume of ROL is dependent on several factors including the root biomass, location along the root, root age, time of day, season, and soil oxygen demand (Jacob and Otte, 2003). Thus, even though roots diffuse oxygen into the sediment, whole root systems may consume this oxygen immediately due to soil and or respiratory demands. Engler and Patrick (1979) and Trolldenier (1988) showed that in the root zone there was an increase in sulfide oxidation leading to increased concentrations of soluble ferric iron, and a reduction in the pH. Fe may also become oxidized, forming Fe oxide and oxyhydroxide precipitates, as evidenced by iron plaques observed in the rhizosphere of some wetland plants (Jacob and Otte, 2003). These plaques can act as adsorption sites for selected metals, including As, Co, Ni. This oxygen-rich rhizosphere may cycle to anoxic conditions during the winter months when plants die. Weise et al. (2001) found that both iron oxidizing bacteria and iron reducing bacteria were present in the rhizosphere. Sulfides are generally oxidized before Fe. Therefore, it would be expected that some distance away from the root surface sulfides would be abundant while near the roots ferric oxide precipitates would be plentiful. Between these zones would be an area where sulfides have oxidized to sulfates but where iron still exists in its reduced form. This is the zone where metals which were in the form of metal sulfides such as ZnS would have optimal mobility, provided no organic matter is present to facilitate adsorption (Jacob and Otte, 2003).

Vegetation also contributes to the organic matter content of the sediment through senescence, root tissue sloughing and the release of organic acids (Jacob and Otte, 2003). Through the process of senescence, metals can be immobilized temporarily, however, they may become redistributed into the water column or surficial sediments (Jacob and Otte, 2003). The presence of dissolved organic acids in the rhizosphere can enhance the formation of soluble metal –organic complexes under oxidizing conditions, thereby further increasing metal mobility.

Seasonal Influences

Seasonal influences on metal attenuation in natural and constructed wetlands appear to be site specific. Faulkner and Skousen (1994) found that climate, season, and nutrient availability in the winter months dramatically reduced sulfate reduction and thus metal retention. Ye et al. (2001) noted that in the presence of live vegetation there appeared to be no effect of season on metal retention. They attributed this to the fact that sulfate reduction was not the main removal mechanism for this treatment wetland. Adsorption onto iron hydroxides and plant uptake were noted as the main removal pathways. August et al. (2002) studied an older treatment wetland that has been receiving mining wastewater since the early 1900's. They found that the wetland shifted from a net sink for metals in the summer to a net source for metals in the winter months. During the winter months, the plants would die, fall into the water column and release metals, particularly Mn, back into the water column. Other factors that contributed to the release of metals back to the water column include the change in redox condition, flow paths,

and decreases in microbial activity. This was one of the few studies on an aged wetland. It was speculated that perhaps this wetland was initially a sink for metals throughout all seasons and at some point there was a shift due to metal accumulations over several years.

2.2 Site Background Information

The following sections summarize the local geology, provide a summary of the ore deposits geochemistry, a brief history of mining and milling activities, a brief description of the tailings deposits in the area and at the study site, and give a brief description of geochemical properties and interactions of metals of interest. The objective of these discussions is to provide the reader with an idea as to the complexity of the tailings at the study site.

2.2.1 General Geology

The geology of the Cobalt Mining Camp has been investigated by numerous government, corporate and independent academic geologists since the discovery of silver in 1903. The following section gives a brief summary of the findings of Jambor (1971).

The basic geology of the area consists of Archean volcanic basement rocks and interflow sediments overlain by Proterozoic rocks. The oldest Proterozoic rocks deposited in the area are the Coleman member of the Gowganda Formation. These rocks consist

predominantly of conglomerates with variable amounts of argillite, quartzite, and arkose. Overlying the Coleman member is the Firstbrook member of the Gowganda Formation. Typically well bedded, fine grained greywacke and argillite rock units are associated with the Firstbrook member. The Lorraine Formation overlies the Gowganda Formation. The rock units in this formation consist of pink arkose and white quartzite.

Both the Archean and Proterozoic rocks were intruded by a sill-like sheet of the Nipissing diabase and later dikes of olivine and quartz diabase. Paleozoic shales, sandstones and limestones of Silurian and Ordovician age unconformably overlie the Proterozoic formations in the northeastern portion of the region. Pleistocene sand, gravel and clay deposits unconformably overlie much of the lowlying area. These sediment deposits can vary in thickness from a few millimeters to over 90 m.

2.2.2 Silver Vein Occurrence and Geochemistry

Silver deposits in the Cobalt area occur as veins in the fractures, joints, and faults within the Archean and Proterozoic rocks and the Nipissing diabase. These veins vary in width from a few millimeters to over 30 cm (Dumaresq, 1993).

The vein mineralogy is quite complex. The gangue minerals include calcite, dolomite, quartz, and chlorite (Dumaresq, 1993). Other minerals associated with the silver deposits include arsenides, sulfarsenides, antimonides, arsenates, sulfates, carbonates, silicates,

oxides, and sulfides. A complete list of ore minerals with their chemical formulae are presented in Table 2-2.

Petruk (1971b) analyzed four rock samples from the silver veins and also presented ore geochemical data collected from other sources. These data are presented in Table 2-3.

As can be seen from these tables, the major components of the ore materials include carbonate minerals plus Ni, As, Ag, Co, and S.

Boyle et al. (1967) analyzed samples collected from local rock units located away from areas of mineralization to determine background trace metal concentrations. Table 2-4 summarizes his results. The data indicate that significantly elevated concentrations of As, Sb, Ni, Co, Pb, Zn, Cu, and Mn occur predominantly in the Archean rock units. Interestingly, Ni, Co, Cu, and Mn were found to have elevated concentrations throughout all the rock units, with the exception of the granite and the Lorraine sandstone.

2.2.3 Tailings Deposits and Composition

Tailings consist of crushed waste rock and any residues or chemicals used in the milling and refining processes. Therefore it is important to understand the procedures and processes used in the milling and refining processes to fully characterize the geochemical reactions with the tailings and surrounding porewater.

Table 2-2: Ore-bearing Minerals in Cobalt Veins (Petruk, 1971b and Boyle and Dass, (1971)

Mineral Group	Mineral Name	Chemical Formula
Arsenides	Nickeline	NiAs
	Langisite	(Co, Ni)As
	Safflorite	(Co,Fe,Ni)As
	Loellingite	FeAs ₂
	Rammelsbergite, pararammelsbergite Skutterite	NiAs ₂ (Co,Fe,Ni)As _{3-x}
Sulfarsenides	Cobaltite	(Co,Fe,Ni)AsS
	Gerdorffite	NiAsS
	Arsenopyrite	FeAsS
	Alloclatite	(Fe,Co)AsS
Antimonides	Breithauptite	NiSb
	Ullmannite	NiSbS
	Allargentum	Ag _{1-x} Sb _x
Arsenates	Erythrite	Co ₃ (AsO ₄) ₂ ·8H ₂ O
	Annabergite	Ni ₃ (AsO ₄) ₂ ·8H ₂ O
	Scordite	(Fe,Al)AsO ₄ ·2H ₂ O
Sulfides	Pyrargyrite	Ag ₃ SbS ₃
	Tetrahedrite	(Cu,Fe) ₁₂ Sb ₄ S ₁₃
	Chalcopyrite	CuFeS ₂
	Bornite	Cu ₅ FeS ₄
	Galena	PbS
	Marcasite, pyrite	FeS ₂
	Sphalerite	(Zn,Fe,Mn)S
	Pyrrhotite	Fe _{1-x} S
	Molybdenite	MoS ₂
Oxides	Rutile	TiO ₂
	Hematite	Fe ₂ O ₃
	Magnetite	Fe ₃ O ₄
	Anatase	TiO ₂
	Illmenite	FeTiO ₃
Sulfates	Melanterite	FeSO ₄ ·7H ₂ O
	Gypsum	CaSO ₄ ·2H ₂ O
Silicates	Quartz	SiO ₂
	Chlorite	(Mg,Fe) ₁₀ Al ₂ (SiAl) ₈ O ₂₀ (OH,F) ₁₆
	Albite	(Na,Ca)(Al,Si) ₄ O ₈
Carbonates	Calcite	CaCO ₃
	Dolomite	CaMg(CO ₃) ₂
	Malachite	Cu ₂ (CO ₃)(OH) ₂
Hydroxides	Limonite	FeO(OH)·nH ₂ O
	Wad	hydrated MnO ₂ mixtures

Table 2-3: Vein Composition from Cobalt area (Petruk, 1971b)

Component Units	CaO %	MgO %	MnO %	Fe %	Co %	Ni %	Cu %	Zn %	Pb %	As %	Sb %	Ag %	Hg %	SiO ₂ %	S %
	5.82	4.41	0.25	1.61	10.56	12.19	tr	0.04	0.04	44.53	2	7.85	0.37	na	na
	11.2	3.5	0.36	4.04	10	4.41	0.07	0.13	0.05	41.11	0.82	10.78	0.87	na	na
	7.98	0.36	0.05	8.55	14.35	1.82	0.1	0.01	0.03	57	0.09	0.01	0.01	na	na
	21.06	2.02	0.06	11.6	9.18	0.54	0.01	0.01	nd	35.57	0.1	0.04	0.03	na	na
	27.48	tr	na	7.19	5.04	0.74	nd	na	na	31.86	na	2.68	na	1.5	0.66
	na	na	na	4.28	21.1	tr	0.19	na	na	64.45	tr	na	na	na	4.77
	na	na	na	6.69	13.97	0.53	0.4	na	na	50.7	1.05	0.17	na	na	1.71
	na	na	na	7.43	12.1	2.24	tr	na	na	62.56	tr	0.12	na	na	0.67
	na	na	na	12.42	9.27	tr	nd	na	na	52.93	na	0.03	na	na	1.32
	18.3	tr	na	10.4	6.25	0.47	nd	na	na	47.65	na	2.81	na	0.13	tr
	na	na	na	4.81	16.02	1.1	tr	na	na	64.79	tr	9.48	na	na	1.26
	na	na	na	6.05	9.56	0.78	0.26	na	na	38.9	0.27	0.39	na	na	0.72
Average:	15.31	2.57	0.18	7.09	11.45	2.48	0.17	0.05	0.04	49.34	0.72	3.12	0.32	0.82	1.59

Notes:
na Not analyzed
nd Not detected

Table 2-4: Average metal concentrations in native bedrock units from the cobalt area (Boyle et al, 1967)

Element Units	Pb ppm	Zn ppm	Cu ppm	As ppm	Sb ppm	Mo ppm	Ag ppm	Ni ppm	Co ppm	Bi ppm	Mn ppm	Hg ppm
Archean Volcanics	5	135	100	10	<2	1	0.25	122	56	<0.05	2500	0.03
Archean Interflow Sediments	500	500	400	80	5	3	3	130	80	0.83	500	0.05
Granite	15	25	6	<1	<2	1	<0.5	2	<10	<0.05	70	0.03
Coleman Conglomerate	12	105	57	4	<2	<1	<0.5	150	30	<0.05	1500	0.02
Coleman Conglomerate	5	25	22	<5	<2	<1	<0.1	60	25	<0.05	500	0.1
Coleman Greywacke	12	75	45	5	<2	<1	<0.5	125	25	<0.05	1000	0.02
Coleman Greywacke	<5	20	20	<5	<2	<1	<0.1	60	25	<0.05	500	0.1
Lorraine Sandstone	<2.5	5	2	<1	<2	<1	<0.5	20	<10	<0.05	20	0.03
Nipissing Diabase	<2.5	65	90	<2	<2	1	0.11	128	40	<0.05	2000	0.03

Milling and Refining Processes

Milling and refining processes that were employed throughout the entire Cobalt Camp have been summarized in great detail by Dumaresq (1993). The following section gives a brief description of the milling and refining processes.

The first mining operations began in 1904 using hand sorting or gravity separation of the ore. The first cyanide mill began operation in 1909. This process involved mixing the crushed ore with KCN to dissolve the Ag. Powdered Al was then added to the mixture to form Ag precipitates. The precipitate was melted down in a furnace to produce a final bullion of approximately 960 fine. One negative aspect of using cyanide was the formation of cyanide complexes (cyanicides) with base metals such as Ni and Co present in the ore.

In 1911, the Nipissing high grade mill began adding Hg to its cyanide milling process. The revised protocol involved mixing the crushed ore with Hg and KCN. Chert pebbles were also added as grinding agents. After approximately 10 hours of milling the Ag became amalgamated with Hg. The amalgam was later refined in furnaces for an end product of 999 fine. This process was discontinued in 1918 due to the increased cost of Hg. In 1918, all the high grade ores were pretreated with calcium hypochlorite prior to cyanicidation. This process oxidized the ores thereby preventing the cyanide from forming complexes with the base metals in the ore such as Ni and Co present in the ore. This reduced the actual amount of cyanide required in the milling process. In 1921,

sulfuric acid replaced the calcium hypochlorite because it proved to be more efficient in oxidizing the base metals.

In 1912, the Nipissing low grade cyanide mill began operation using NaCN instead of KCN. During World War I, the price of Al rose significantly and as such, many of the cyanide mills switched to floatation processing. This process involved coating the finely crushed ore with a mixture of creosote, pine oil, and coal tar. The emulsified ore was then agitated in floatation cells where the Ag emulsion would float to the top of the cells and the waste material would sink to the bottom. The concentrates produced from this process were shipped elsewhere to smelters for refining.

Tailings Deposits

There were several milling operations throughout the Cobalt area. Figure 2-2 presents the locations of the major tailings deposits in the Cobalt area. The Crosswise Lake tailings deposits represent the primary source of contamination in the study area and these tailings underlie the entire study area. Small amounts of contaminants have been deposited into Farr Creek as a result of downstream transport from Mill Creek.

Figure 2-2: Locations of tailings deposits in the Cobalt area (Dumaresq, 1993)

Crosswise Lake Tailings Deposits

Crosswise Lake is home to the largest tailings deposits in the area. Tailings were deposited from at least five different mills in operation from 1908 to the early 1930's and intermittently until the 1970's (Dumaresq, 1993). A dam was built at the northern limit of Crosswise Lake in order to minimize the continued migration of tailings into Farr Creek. The dam was reportedly constructed in the 1970's and failed shortly thereafter. North of this failed dam is a marshy area followed by a road with a small water level control dam and overflow weir maintained by the province of Ontario. The purpose of the water level control dam was to minimize further migration of the tailings by maintaining water cover over the tailings and enhance the wetland vegetation in the area.

Tailings Composition

Table 2-5 presents geochemical data collected from several different tailings deposits in the Cobalt area. As can be seen from the table, there is considerable geochemical variability among the different tailings deposits. The tailings samples collected from Crosswise Lake show that the tailing are elevated with respect to carbonate and sulfate minerals, as well as As, Al, Fe, Ni, Sb, Co, Cu, Hg, Pb, Zn, and V.

The Geological Survey of Canada (GSC) Open File Report 1680 (Percival et al., 2004) summarized the results of several environmental investigations undertaken to characterize the environmental conditions of the Cobalt area. Four sediment cores were

Table 2-5: Trace element concentrations in tailings samples collected from the Cobalt area (Taken from Dumaresq, 1993)

Element (ppm)	Buffalo	Coniagas	Thretheway	Hudson Bay	NLGM	Cobalt Lake Mine*	Cobalt Lake Baseball**	Right of Way Mine***	LaRose	Sasaginaga Creek****	Nova Scotia	Crosswise Lake, SW	Crosswise Lake, SE
As	6800	594	652	952	11700	11700	41	4700	1040	718	8330	5120	7110
Al	60400	47200	50000	46000	40400	39300	47400	36200	50400	53800	46000	42700	30900
Sb	468	99	93	148	445	531	229	234	19	143	1590	10	176
Fe	56700	43500	40900	41100	51200	60400	47700	46900	49100	41900	46400	42700	56500
Mn	680	400	360	401	624	516	455	566	450	369	509	490	592
Cl	<10	<10	<10	<10	<10	10	10	10	<10	<10	<10	17	17
Mg	13200	8670	14400	15000	7730	6350	6240	6740	106000	5720	9700	7680	7370
Ca	9900	4970	4190	3310	4260	2880	5940	2832	3260	2420	10400	4030	3200
Hg	3.31	0.72	0.29	0.34	16.6	2.54	0.58	8.36	0.61	0.42	0.77	2.54	2.37
Na	23600	38900	31200	33100	25400	17500	63600	23900	23700	68900	2500	24400	21000
CO ₃	9000	<1000	<1000	<1000	7200	5400	2000	2000	3600	2500	9150	9000	9000
SO ₄	11100	40300	6010	11500	9700	6170	7790	15700	13600	10000	2980	12600	20100
Cu	699	419	175	650	813	1390	40	693	159	262	210	192	281
Pb	961	19	33	107	91	75	11	66	1130	370	267	69	314
Zn	913	107	282	361	545	347	99	342	801	194	200	346	233
Mo	<0.6	<0.6	<0.6	<0.6	<0.6	2.2	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Co	490	95	142	265	2100	4060	80	1490	173	84	8	286	566
Ni	278	76	63	52	10000	2070	64	862	103	88	182	100	88
Cd	2.9	1.1	1.9	1.9	2.4	0.9	0.6	1.2	3.2	1.4	1.6	1.2	1.2
Cr	155	263	360	110	89	119	119	107	99	116	130	106	38
Bi	<10	12	15	20	90	<10	<10	<10	<10	<10	<10	<10	53
Ba	42	27	42	50	14	30	35	25	63	20	57	38	29
Sr	82	77	93	36	67	27	61	57	46	61	58	49	55
V	971	195	156	160	159	142	142	167	198	116	120	192	222

Notes:

* it is not clear the specific location of this sample since there was no on land tailings in this area

** sample was likely collected from the playing surface of the baseball diamond at the Cobalt Lion's Club Park

*** the Right of Way Mine did not produce any tailings

**** sampling location is not known. Possibly collected within the tailings on the Chamber-Ferland Property, or unstream of these tailings

collected within 150m of the confluence of Mill Creek with Farr Creek. The report did not specify the date when these cores were collected. The specific core locations are presented on Figure 2-3. The most abundant minerals in these core samples were quartz, chlorite, and plagioclase. Table 2-6 summarizes the major constituents of these core samples and Table 2-7 presents the trace metal concentrations of the core samples. The major components of the tailings samples include approximately 60% SiO₂, 15% Al₂O₃, 8%Fe₂O₃, 5% MgO, and 4% CaO. The trace metal analytical results indicated that most of the metals were present in stable and relatively low concentrations as a function of depth. Between core samples, As, Co, Cu, and Pb displayed elevated concentrations that increased with depth. Elevated concentrations of Ni were reported but did not exhibit any observable trend with depth.

Pore water was also extracted from these cores and analyzed for dissolved metals. Table 2-8 summarizes the dissolved metal concentrations in the pore water samples. In Farr Creek, upstream of the confluence with Mill Creek (Core C14) elevated concentrations of heavy metals were reported at shallow depths followed by decreases in concentrations with depth. In Core C13, located in Farr Creek, just downstream of the confluence with Mill Creek, higher concentrations were reported with depth. Similar ranges in the concentrations of heavy metals, such as As, Ni, Co, Pb, Sb, were reported from the pore water collected from the cores in Mill Creek. However, there were not enough data available to provide a depth profile.

Figure 2-3: Location of Core Samples collected from Farr Creek and Mill Creek by Percival et al., 2004

Table Z-6: Major Components from core samples collected from Farr Creek and Mill Creek (Percival et al., 2004)

Location	Core ID	Variable Units Detection Limits Depth (cm)	SiO2	Al2O3	Fe2O3(T	Fe2O3	FeO	MnO	MgO	CaO	H2O(T	CO2(T)	CO2	C	P2O5	S(T)	LOI	
			wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %	wt %
			0.5	0.2	0.06		0.2	0.01	0.04	0.01	0.1	0.1	0.1	0.1	0.2	0.01	0.02	0.1
			(Fe2O3=Fe2O3T-1.113xFeO)															
			C=(CO2T-CO2)/3.66															
Farr Creek, 5m u/s of confluence with Mill Creek	C14	2.00	62.6	15.1	6.65	2.00	4.2	0.08	3.66	2.05	2.8	0.2	0.9	nd	0.10	0.04	3.6	
		12.00	60.3	15.0	7.63	1.90	5.2	0.11	4.70	3.37	3.1	0.5	1.2	nd	0.12	0.11	3.6	
		31.00	53.5	15.0	8.99	1.70	6.6	0.14	4.65	4.66	4.5	5.7	3.5	0.6	0.14	0.14	7.9	
Farr Creek, 50m d/s of confluence with Mill Creek	C13	31.00	53.8	15.3	8.79	1.20	6.8	0.13	4.64	3.69	5.3	8.1	2.2	1.6	0.15	0.18	8.6	
		5.00	56.7	14.4	8.02	1.50	5.9	0.12	4.37	2.74	4.8	6.4	1.3	1.4	0.26	0.24	7.4	
		14.50	61.8	15.3	7.30	0.70	5.9	0.09	3.97	2.38	2.8	0.5	1.2	nd	0.11	0.17	2.9	
		22.75	53.1	15.3	9.36	1.60	7.0	0.14	5.07	nd	4.4	4.2	2.7	0.4	0.14	0.17	6.6	
		33.00	54.3	14.7	8.96	0.60	7.5	0.15	5.45	5.28	3.4	1.9	2.6	nd	0.13	0.19	5.0	
Mill Creek, 150m u/s from confluence with Farr Creek	C12	3.00	54.0	14.3	8.59	1.60	6.3	0.12	4.79	3.48	4.9	6.4	1.6	1.3	0.15	0.13	7.2	
		26.50	54.2	14.6	9.24	1.50	7.0	0.13	5.24	4.18	3.2	1.3	2.0	nd	0.12	0.13	4.3	
Mill Creek, 10m u/s from confluence with Farr Creek	C15	26.50	55.7	15.3	9.60	1.60	7.2	0.14	5.52	4.57	3.2	1.4	2.1	nd	0.12	0.11	4.1	
		9.00	59.5	14.7	6.75	0.30	5.8	0.10	4.01	2.29	2.8	0.6	1.3	nd	0.13	0.09	3.4	
		26.00	59.9	15.2	7.33	1.10	5.6	0.09	4.08	2.41	2.8	0.6	1.3	nd	0.12	0.10	3.4	
		26.00	57.9	14.3	7.38	0.80	5.9	0.11	4.18	2.90	3.5	4.4	1.8	0.7	0.19	0.14	5.4	
		39.75	52.8	15.5	9.25	0.70	7.7	0.12	4.84	3.39	4.1	3.8	2.3	0.4	0.15	0.20	6.1	

Notes:

nd

Not detected

Table 2-7: Trace metal concentrations from core samples collected from Farr Creek and Mill Creek (Percival et al., 2004)

Location	Core ID	Variable Units Detection Limits Depth (cm)	Ag ppm 0.1	As ppm 10	Ba ppm 10	Be ppm 0.5	Bi ppm 0.5	Cd ppm 0.2	Ce ppm 0.1	Co ppm 5	Cr ppm 10	Cs ppm 0.02	Cu ppm 10	Mo ppm 0.2	Ni ppm 10	Pb ppm 10	Rb ppm 0.05
Farr Creek, 5m u/s of confluence with Mill Creek	C14	2.00	32	343	160	1.5	7.2	<0.2	31	130	87	0.86	150	3.2	96	110	23
		12.00	30	1300	180	1.5	18	0.5	38	440	100	0.93	160	6.5	170	140	26
		31.00	210	1400	190	2.1	21	0.7	62	390	120	1.50	470	7.2	300	350	34
Farr Creek, 50m d/s of confluence with Mill Creek	C13	31.00	200	1650	190	2.0	23	0.6	54	400	160	1.20	470	7.8	320	240	31
		5.00	95	1580	170	1.7	28	0.9	41	590	130	1.20	380	5.0	290	230	27
		14.50	140	878	170	1.7	15	0.5	33	260	93	1.10	320	4.4	140	180	25
		22.75	220	1980	210	2.0	36	0.7	55	480	160	1.50	460	6.5	290	340	36
		33.00	170	2610	200	1.7	38	1.0	46	600	210	0.98	540	6.3	310	310	30
Mill Creek, 150m u/s from confluence with Farr Creek	C12	3.00	54	1200	120	1.5	25	1.0	39	560	120	1.20	440	3.4	360	300	23
		26.50	17	817	110	1.5	23	1.6	34	250	120	1.30	700	8.7	130	510	22
Mill Creek, 10m u/s from confluence with Farr Creek	C15	26.50	17	876	110	1.5	22	1.6	34	270	140	1.30	640	6.1	130	460	23
		9.00	48	451	160	1.7	8.2	0.5	29	210	140	1.10	290	4.7	130	210	24
		26.00	58	456	150	1.7	11	0.6	32	210	90	1.20	330	4.6	120	210	25
		26.00	96	913	160	1.6	21	0.6	35	460	120	1.00	340	4.1	250	200	24
		39.75	230	1720	140	2.2	26	0.7	54	420	130	0.90	660	14	310	350	23

Location	Core ID	Variable Units Detection Limits Depth (cm)	Sc ppm 0.5	Sm ppm 0.02	Sn ppm 0.5	Sr ppm 5	Ta ppm 0.2	Tb ppm 0.02	Th ppm 0.02	Tl ppm 0.02	Tm ppm 0.02	U ppm 0.02	V ppm 5	Y ppm 0.02	Zn ppm 5	Zr ppm 10
Farr Creek, 5m u/s of confluence with Mill Creek	C14	2.00	16	3.2	1.5	83	0.4	0.51	4.2	0.13	0.25	1.6	130	17	110	110
		12.00	21	3.9	1.7	82	0.4	0.61	3.4	0.13	0.29	1.7	150	20	180	130
		31.00	18	5.6	3.8	94	0.6	0.75	6.7	0.31	0.31	2.5	130	26	400	100
Farr Creek, 50m d/s of confluence with Mill Creek	C13	31.00	20	5.2	3.8	89	0.5	0.68	6.3	0.27	0.30	2.5	140	24	420	100
		5.00	20	4.2	4.0	78	0.4	0.64	4.4	0.17	0.29	2.0	140	21	320	130
		14.50	18	3.4	5.2	85	0.4	0.56	4.5	0.15	0.27	1.8	130	19	200	120
		22.75	21	5.0	3.6	87	0.5	0.72	6.0	0.32	0.30	2.3	150	25	470	110
		33.00	23	4.7	3.7	79	0.4	0.66	4.4	0.27	0.29	2.0	160	23	420	100
Mill Creek, 150m u/s from confluence with Farr Creek	C12	3.00	25	4.1	1.9	75	0.3	0.68	3.2	0.17	0.33	1.9	180	23	380	110
		26.50	29	4.3	1.5	70	0.3	0.78	2.4	0.18	0.36	2.0	200	26	350	100
Mill Creek, 10m u/s from confluence with Farr Creek	C15	26.50	29	4.4	1.0	69	0.3	0.81	2.4	0.18	0.38	1.8	200	27	370	100
		9.00	18	3.3	3.1	79	0.4	0.56	4.5	0.15	0.28	1.6	140	19	190	110
		26.00	18	3.5	2.0	79	0.4	0.57	4.6	0.17	0.27	1.7	140	19	200	110
		26.00	18	3.6	2.7	82	0.5	0.58	4.5	0.21	0.27	1.7	130	20	270	110
		39.75	20	5.3	3.4	69	0.5	0.70	6.4	0.26	0.30	2.5	150	24	390	100

Table 2-8: Trace metal concentrations from core porewater samples collected from Farr Creek and Mill Creek (Percival et al., 2004)

Location	Core ID	Variable Units Detection Limits Depth (cm)	Si ppb 10	Ti ppb 1	Al ppb 100	Fe ppb 3	Mn ppb 100	Mg ppb 2	Ca ppb 5	Na ppb 20	K ppb 20	Ag ppb 1	As ppb 500	B ppb 16	Ba ppb 2	Be ppb 5	Bi ppb 1	Cd ppb 2	Co ppb 100
Farr Creek, 5m u/s of confluence with Mill Creek	C14	2.00	20000	57	4800	11000	340	18000	130000	6500	4300	9	1100	29	91	<5	11	<2	610
		12.00	15000	39	3400	6100	480	38000	230000	18000	1600	15	1500	24	110	<5	8	<2	870
		31.00	8400	8	610	1200	720	24000	130000	18000	950	3	670	27	45	<5	1	<2	85
Farr Creek, 50m d/s of confluence with Mill Creek	C13	5.00	14000	19	2300	5600	2500	21000	200000	18000	11000	6	1800	43	170	<5	3	<2	930
		14.50	9900	31	2100	4000	400	12000	98000	22000	8400	4	1600	17	100	<5	3	<2	120
		22.75	16000	53	5000	9000	640	17000	97000	17000	8600	32	1300	20	77	<5	10	<2	180
		33.00	26000	80	11000	19000	1200	32000	160000	19000	20000	87	2500	<16	160	<5	25	<2	350
Mill Creek, 150m u/s from confluence with Farr Creek	C12	3.00	6700	7	960	2000	200	16000	90000	16000	2900	6	1900	73	54	<5	2	<2	390
Mill Creek, 10m u/s from confluence with Farr Creek	C15	26.00	14000	24	2200	4600	620	31000	360000	29000	4800	8	900	200	220	<5	3	<2	2700
		39.75	17000	70	6400	12000	520	35000	190000	24000	2600	78	1100	160	100	<5	14	<2	430

Location	Core ID	Variable Units Detection Limits Depth (cm)	Cr ppb 1	Cs ppb 1	Cu ppb 2	Hg ppb 1	Mo ppb 2	Ni ppb 100	Pb ppb 1	Rb ppb 1	Sb ppb 1	Sc ppb 1	Se ppb 10	Sr ppb 1	Tl ppb 1	U ppb 1	V ppb 1	Zn ppb 10
Farr Creek, 5m u/s of confluence with Mill Creek	C14	2.00	67	1	130	<1	22	270	192	21	220	1.3	10	180	<1	1	45	120
		12.00	53	<1	54	<1	42	540	108	10	1000	1.3	12	310	<1	4	27	83
		31.00	27	<1	18	<1	24	230	25	4	720	<1	13	200	<1	9	10	20
Farr Creek, 50m d/s of confluence with Mill Creek	C13	5.00	42	<1	25	<1	32	300	66	20	110	1.1	15	190	<1	1	23	60
		14.50	38	<1	22	<1	51	130	72	13	310	2.8	10	110	<1	3	17	40
		22.75	62	<1	31	<1	11	220	158	32	380	1.2	<10	130	<1	8	41	70
		33.00	120	1	150	<1	12	460	396	67	560	1.2	<10	210	<1	15	93	130
Mill Creek, 150m u/s from confluence with Farr Creek	C12	3.00	47	<1	53	<1	33	280	56	9	750	1.0	11	140	<1	2	14	54
Mill Creek, 10m u/s from confluence with Farr Creek	C15	26.00	36	<1	65	<1	15	980	69	9	490	<1	15	390	<1	<1	15	190
		39.75	79	<1	190	<1	28	290	158	8	890	1.4	18	260	<1	2	47	180

Also summarized by Percival et al. (2004) were trace metal concentrations from several surface water samples collected at various locations within the study area from 1994 to 1997. These results are presented in Table 2-9 and the sample locations are presented in Figure 2-4. Elevated concentrations were noted for the alkali earth metals as well as As, Co, Ni, Sb, where more elevated concentrations were generally noted in Mill Creek. This could be attributed to two factors:

- 1) Mill Creek transports tailings loadings from several upstream tailings deposits and from the municipal wastewater lagoon discharge; and
- 2) Dilution effects from Mill Creek draining into Farr Creek resulting in lower observed concentrations in Farr Creek downstream of the confluence.

The remaining metals analyzed appeared to have relatively low and stable concentrations throughout the drainage path with only minor fluctuations. Table 2-10 presents the results from the anion surface water chemistry summarized by Percival et al. (2004). As can be seen from the table, there are elevated nitrates and phosphates in Mill Creek, with significantly lower concentrations, in most cases below the method detection limits, in Farr Creek. Municipal wastewater was released directly to Mill Creek without treatment prior to approximately 2000, when a wastewater treatment lagoon was installed in the

Table 2-9: Trace metal concentrations from surface water samples collected from Farr Creek and Mill Creek (Percival et al., 2004)

Location Description	Variable Units Detection Limits Sample ID	Si ppb 3.3	Ti ppb 1	Al ppb 0.5	Fe ppb 3	Mn ppb 0.5	Mg ppb 2	Ca ppb 5	Na ppb 20	K ppb 20	Ag ppb 0.5	As ppb 2	B ppb 16	Ba ppb 5	Be ppb 5	Bi ppb 0.5	Cd ppb 1	Co ppb 0.2	Cr ppb 0.2
Mill Creek, u/s from HWY 11B	PNA94-W16	3100	<1	12	38	140	10000	51000	25000	3100	<0.5	1200	18	11	<5	<0.5	<1	140	2.5
Mill Creek, u/s from HWY 11B	PNA97-W10	2000	<1	6.3	30	85	8200	43000	19000	1300	<0.2	910	20	12	<1	<0.2	<0.5	<0.2	0.2
Mill Creek, HWY 11B	PNA95-W113	860	<1	9.6	88	20	7600	37000	13000	980	<0.2	570	<16	5.4	<1	<0.2	<0.5	90	17
Mill Creek, u/s from beaver pond	PNA95-W111	820	<1	15	52	23	7500	36000	12000	920	<0.2	570	<16	5.7	<1	<0.2	<0.5	88	4.6
Mill Creek, beaver dam	PNA95-W105	830	<1	13	57	31	7700	37000	12000	940	<0.2	560	<16	6.0	<1	<0.2	<0.5	88	12
Mill Creek, below dam	PNA94-W32	2600	<1	7.3	51	160	11000	54000	36000	2700	<0.5	1400	23	13	<1	<0.2	<0.5	220*	<0.2
Mill Creek, below dam	PNA95-W110	820	<1	16	62	24	7500	36000	12000	930	<0.2	560	<16	5.9	<1	<0.2	<0.5	84	7.8
Mill Creek, below dam	PNA97-W11	2000	<1	6.9	39	75	8300	43000	20000	1300	<0.2	910	23	12	<1	<0.2	<0.5	<0.2	0.6
Mill Creek, 10m u/s of confluence with Farr Creek	PNA95-W108	830	<1	13	49	28	7700	37000	12000	930	<0.2	570	<16	5.8	<1	<0.2	<0.5	90	6.2
Mill Creek, 10m u/s of confluence with Farr Creek	PNA97-W12	1800	<1	17	37	61	8100	42000	19000	1300	<0.2	930	<16	8.8	<1	<0.2	<0.5	88	0.2
Mill Creek, 5m u/s of confluence with Farr Creek	PNA94-W7	3300	<1	9.3	56	140	10000	53000	25000	2000	<0.5	1700	19	11	<5	<0.5	<1	110	1.6
Farr Creek, 150m from culvert	PNA94-W4	1600	<1	6.6	23	13	7100	29000	1400	570	<0.5	510	<16	6.3	<5	<0.5	<1	5.9	1.0
Farr Creek, d/s from culvert	PNA94-W5	1400	<1	6.6	26	8.6	6100	25000	980	450	<0.5	340	<16	<5	<5	<0.5	<1	3.4	0.8
Farr Creek, d/s from culvert	PNA95-W109	1300	<1	12	29	5.9	6300	25000	1200	560	<0.2	240	<16	4.9	<1	<0.2	<0.5	6.4	6.6
Farr Creek, d/s from culvert	PNA97-W13	2000	2	86	210	31	6000	25000	1100	470	<0.2	420	<16	5.0	<1	0.2	<0.5	7.3	<0.2
Farr Creek, 5m u/s of confluence with Mill Creek	PNA95-W107	1100	<1	11	31	11	6400	27000	3800	650	<0.2	300	<16	4.8	<1	<0.2	<0.5	25	6.3
Farr Creek, 3m u/s of confluence with Mill Creek	PNA94-W6	1400	<1	12	58	14	6100	26000	990	450	<0.5	360	<16	5.0	<5	<0.5	<1	4.0	1.8
Farr Creek, 25m d/s of confluence with Mill Creek	PNA97-W15	1900	1	6.0	25	39	6800	32000	8500	810	<0.2	640	<16	6.5	<1	<0.2	<0.5	37	<0.2
Farr Creek, 50m d/s of confluence with Mill Creek	PNA94-W8	2000	<1	17	79	52	7400	33000	8000	880	<0.5	750	<16	7.9	<5	<0.5	<1	35	1.3
	PNA95-W106	1100	<1	10	41	16	6600	29000	5600	660	<0.2	310	<16	5.2	<1	<0.2	<0.5	40	6.0
Farr Creek, ~1.5km from Road	PNA94-W9	1800	<1	6.7	36	10	7400	34000	7800	920	<0.5	730	<16	5.8	<5	<0.5	<1	17	1.2
Farr Creek, control Weir	PNA94-W17	4800	<1	5.4	45	150	8300	37000	7200	180	<0.5	260	<16	8.6	<5	<0.5	<1	14	1.0

Location Description	Variable Units Detection Limits Sample ID	Cs ppb 0.2	Cu ppb 0.5	Ga ppb 0.2	Hg ppb 0.2	In ppb 0.2	Li ppb 1	Mo ppb 2	Ni ppb 1	Pb ppb 1	Rb ppb 0.5	Sb ppb 0.5	Sc ppb 1	Se ppb 2	Sr ppb 1	Ti ppb 0.5	U ppb 0.5	V ppb 0.5	Zn ppb 5
Mill Creek, u/s from HWY 11B	PNA94-W16	<0.2	8.4	<0.2	nd	<0.2	3	5.4	73	<1	5.9	27	<1	nd	81	<0.5	<0.5	<0.5	<5
Mill Creek, u/s from HWY 11B	PNA97-W10	<0.2	4.1	<0.2	<0.2	1	4.1	61	0.4	1.6	27	<1	<2	59	<0.2	0.4	0.4	14	8.0
Mill Creek, HWY 11B	PNA95-W113	<0.2	7.5	<0.2	<0.2	<0.2	1	6.1	76	2.0	0.9	25	0.4	<2	50	<0.2	0.4	0.4	8.0
Mill Creek, u/s from beaver pond	PNA95-W111	<0.2	7.8	<0.2	<0.2	<0.2	1	3.8	57	1.3	0.9	24	0.5	<2	49	<0.2	0.4	0.4	8.3
Mill Creek, beaver dam	PNA95-W105	<0.2	7.0	<0.2	<0.2	<0.2	<1	4.9	83	1.2	0.9	23	0.5	<2	51	<0.2	0.3	0.4	13
Mill Creek, below dam	PNA94-W32	<0.2	27	<0.2	<0.2	<0.2	2	4.8	110	0.5	2.7	26	<1	<2	81	<0.2	0.5	0.6	8.0
Mill Creek, below dam	PNA95-W110	<0.2	7.5	<0.2	<0.2	<0.2	1	4.2	63	1.4	0.9	24	0.4	<2	49	<0.2	0.4	0.4	7.9
Mill Creek, below dam	PNA97-W11	<0.2	8.9	<0.2	<0.2	<1	4.2	58	2.9	1.6	28	<1	<2	60	<0.2	0.4	0.4	13	9.6
Mill Creek, 10m u/s of confluence with Farr Creek	PNA95-W108	<0.2	7.2	<0.2	<0.2	<0.2	1	3.9	64	1.0	0.9	23	<0.4	<2	50	<0.2	0.3	0.4	9.6
Mill Creek, 10m u/s of confluence with Farr Creek	PNA97-W12	<0.2	7.2	<0.2	<0.2	<1	3.9	53	1.4	1.7	29	<1	<2	59	<0.2	0.3	0.4	11	<5
Mill Creek, 5m u/s of confluence with Farr Creek	PNA94-W7	<0.2	6.0	<0.2	nd	<0.2	3	6.4	68	<1	3.1	51	<1	nd	82	<0.5	<0.5	0.5	<5
Farr Creek, 150m from culvert	PNA94-W4	<0.2	3.3	<0.2	nd	<0.2	2	<2	5.4	<1	1.5	1.8	<1	nd	41	<0.5	<0.5	<0.5	<5
Farr Creek, d/s from culvert	PNA94-W5	<0.2	2.8	<0.2	nd	<0.2	1	<2	3.8	<1	1.4	1.6	<1	nd	35	<0.5	<0.5	<0.5	<5
Farr Creek, d/s from culvert	PNA95-W109	<0.2	3.5	<0.2	<0.2	<0.2	1	1.8	27	0.3	1.3	3.5	0.4	<2	33	<0.2	<0.2	0.3	3.9
Farr Creek, d/s from culvert	PNA97-W13	<0.2	3.7	<0.2	<0.2	<1	0.8	5.9	2.0	1.4	2.9	<1	<2	34	<0.2	0.2	0.7	<2	4.7
Farr Creek, 5m u/s of confluence with Mill Creek	PNA95-W107	<0.2	4.5	<0.2	<0.2	<0.2	1	2.3	36	0.4	1.1	8.4	0.4	<2	37	<0.2	0.2	0.3	4.7
Farr Creek, 3m u/s of confluence with Mill Creek	PNA94-W6	<0.2	3.3	<0.2	nd	<0.2	1	<2	5.2	<1	1.5	1.9	<1	nd	36	<0.5	<0.5	<0.5	<5
Farr Creek, 25m d/s of confluence with Mill Creek	PNA97-W15	<0.2	4.4	<0.2	<0.2	<1	2.1	25	0.3	1.5	13	<1	<2	44	<0.2	0.2	0.2	3	<5
Farr Creek, 50m d/s of confluence with Mill Creek	PNA94-W8	<0.2	4.5	<0.2	nd	<0.2	2	2.1	23	<1	1.9	17	<1	nd	49	<0.5	<0.5	<0.5	<5
	PNA95-W106	<0.2	4.9	<0.2	<0.2	<0.2	1	2.5	41	0.6	0.9	11	0.4	<2	42	<0.2	0.2	0.3	7.0
Farr Creek, ~1.5km from Road	PNA94-W9	<0.2	3.7	<0.2	nd	<0.2	2	2.8	21	<1	1.8	15	<1	nd	49	<0.5	<0.5	<0.5	<5
Farr Creek, control Weir	PNA94-W17	<0.2	20	<0.2	nd	<0.2	2	<2	9.2	<1	0.6	1.1	<1	nd	55	<0.5	<0.5	<0.5	<5

Figure 2-4: Location of Surface Water Samples Collected from Farr Creek and Mill Creek by Percival et al., 2004

area. The lack of nutrients detected in Farr Creek is attributable to consumption of nutrients along the flow path and to dilution effects.

2.2.4 Farr Creek Tailings Deposit Geochemistry

The mobility of elements in subsurface systems is generally regulated by the solubility of their salts (in this case mainly their sulfates, arsenates, antimonates, or carbonate salts), and the pH and Eh conditions (Boyle and Dass, 1971). Near surface oxidation reactions will mobilize soluble components whereas in deeper anoxic sediments, dissolved components tend to form precipitates as a result of the strong reducing conditions.

Geochemical interactions in tailings deposits are quite complex. As a result, this discussion will be limited to elements that are components of major mineral groups within the tailings such as Fe, Mn, Ca, Mg, Al, silicates and alkali earth metals, and to metals of significant environmental concern, which include As, Sb, Co, Ni, Pb, and Zn.

Iron, Manganese, Calcium and Magnesium

Primary carbonate minerals such as calcite and dolomite will react with the dissolved CO₂ in the mixing water, thereby forming soluble secondary bicarbonate and carbonate minerals (Boyle and Dass, 1971). Should there be any sulfide minerals in the surficial tailings, they will become oxidized producing sulfuric acid. Considering the amount of

Table 2-10: Anion concentrations from surface water samples collected from Farr Creek and Mill Creek (Percival et al., 2004)

Location Description	Variable Units Detection Limits Sample ID	NO2 ppb 50	NO3 ppb 50	F ppb 50	PO4 ppb 50	Br ppb 50	SO4 ppm 0.05	Cl ppm 0.05
Mill Creek, u/s from HWY 11B	PNA94-W16	180	4880	110	650	<50	31.6	33.3
Mill Creek, u/s from HWY 11B	PNA97-W10	<50	3460	54	<50	<50	16.9	25.7
Mill Creek, HWY 11B	PNA95-W113	<50	<50	<50	<50	<50	17.3	17.5
Mill Creek, u/s from beaver pond	PNA95-W111	<50	<50	<50	<50	<50	16.7	17.4
Mill Creek, beaver dam	PNA95-W105	<50	<50	<50	<50	<50	16.0	17.5
Mill Creek, below dam	PNA94-W32	<50	13800	160	600	<50	25.6	42.9
Mill Creek, below dam	PNA95-W110	<50	<50	210	<50	<50	16.2	17.1
Mill Creek, below dam	PNA97-W11	<50	3300	62	<50	<50	16.8	27.0
Mill Creek, 10m u/s of confluence with Farr Creek	PNA95-W108	<50	<50	<50	<50	<50	16.5	17.3
Mill Creek, 10m u/s of confluence with Farr Creek	PNA97-W12	<50	2070	61	<50	<50	15.8	25.9
Mill Creek, 5m u/s of confluence with Farr Creek	PNA94-W7	380	3760	86	450	<50	21.4	35.5
Farr Creek, 150m from culvert	PNA94-W4	<50	<50	<50	<50	<50	9.08	0.89
Farr Creek, d/s from culvert	PNA94-W5	<50	<50	<50	<50	<50	8.43	0.61
Farr Creek, d/s from culvert	PNA95-W109	<50	<50	<50	<50	<50	9.93	0.83
Farr Creek, d/s from culvert	PNA97-W13	<50	<50	<50	<50	<50	7.23	0.72
Farr Creek, 5m u/s of confluence with Mill Creek	PNA95-W107	<50	<50	<50	<50	<50	10.9	5.03
Farr Creek, 3m u/s of confluence with Mill Creek	PNA94-W6	<50	<50	<50	<50	<50	8.45	0.65
Farr Creek, 25m d/s of confluence with Mill Creek	PNA97-W15	<50	750	<50	<50	<50	10.7	10.6
Farr Creek, 50m d/s of confluence with Mill Creek	PNA94-W8	140	830	92	<50	<50	12.6	10.2
Farr Creek, 50m d/s of confluence with Mill Creek	PNA95-W106	<50	<50	<50	<50	<50	11.8	7.50
Farr Creek, ~1.5km from Road	PNA94-W9	69	747	<50	<50	<50	12.0	9.76
Farr Creek, control Weir	PNA94-W17	<50	<50	100	<50	<50	2.06	8.54

carbonate present in the tailings, the acid would be immediately neutralized and produce soluble Fe, Mn, Mg, and Ca sulfates (Boyle and Dass, 1971).

Under oxidizing conditions, Fe is found predominantly in the form of limonite and Mn as wad (Dumaresq, 1993). Wad may also coprecipitate with limonite. If arsenides are present the Fe may be bound in scordite. Under reducing conditions $\text{Fe}^{2+}(\text{aq})$ is the dominant Fe species, in the absence of reduced sulfur, at pH values below 6.8 (Brookins, 1988). If reduced sulfur is present, iron sulfide precipitates can form regardless of the pH. Between pH values of 6.8-9.4, FeCO_3 precipitates form and at pH values above 9.4 reduced iron oxides are dominant (Brookins, 1988). Similar species are formed for manganese with one exception. The formation of MnS is dependent on pH and will only occur between pH levels of 8-10 (Brookins, 1988).

Alkalies, Silica, and Alumina

The oxidation of alkalies typically results in the formation of soluble carbonates, sulfates, and arsenates (Boyle and Dass, 1971). Silica is released as alkali silicates or monosilic acid (Boyle and Dass, 1971). Much of the dissolved alkalies, silica and alumina are bound up in clay minerals, limonite, and wad. It should be noted, however, that the mobilities and Eh-pH relationships of these elements are quite different. Na and K are quite mobile for a wide range of pH values. Silica only becomes pH dependent above pH 12, after which its solubility increases significantly (Brookins, 1988). The mobility of Al is very pH dependent. Below pH 4, Al is in the form of $\text{Al}^{3+}_{(\text{aq})}$. Between pH 4-10,

Al_2O_3 and $\text{Al}(\text{OH})_3$ precipitates are abundant, and above pH 10, soluble AlO_2^- is predominant (Brookins, 1988).

Arsenic

Most of the arsenic in the tailings originates from arsenides and sulfarsenides (Boyle and Dass, 1971). The most common oxidation states in natural waters are As(III) and As(V). The oxidation of arsenides and sulfarsenides releases arsenious oxide and arsenic acid and its ionization products (Boyle and Dass, 1971). Dissolved Fe may react with the arsenic forming scorodite or it may precipitate as limonite. Similarly, Co and Ni can react with arsenic acid forming erythrite and annabergite respectively. These three minerals are the most common secondary minerals in the tailings in general and may also adsorb to or coprecipitate with limonite and wad (Dumaresq, 1993). In the presence of reduced sulfur AsS can precipitate. Under reducing conditions, bacteria can methylate arsenic producing methylarsenic acid $[(\text{CH}_3)\text{H}_2\text{AsO}_3]$, dimethylarsenic acid $[(\text{CH}_3)_2\text{HAsO}_2]$, and trimethylarsine oxide $[(\text{CH}_3)_3\text{AsO}]$ (Percival et al., 2004).

As(III) species are more toxic than As(V) species, and in general inorganic As species are more toxic than the organic forms (Percival et al., 2004). Arsenic tends to adsorb onto Fe and Al oxides, clay minerals and organic matter. The freshwater aquatic life discharge guideline for As is 5ppb (CCME, 2003). Chronic exposures to As may affect the central nervous system and form skin lesions which could become cancerous (Percival et al., 2004).

Antimony

Antimony present in the tailings is associated with antimonides and arsenides. It is considered relatively mobile under oxic conditions. Similar to As, its primary oxidation states in natural waters are Sb(III) and Sb(V). Under oxic conditions, various antimony oxides are abundant such as Sb(OH)_6^- , Sb_2O_4 , Sb_2O_5 , and Sb(OH)_3 (Krupka and Serne, 2002). Under reducing conditions and in the presence of reduced sulfur, antimony sulfides are generated at pH values below 6. Above pH 6 antimony sulfide soluble complexes such as $\text{Sb}_2\text{S}_4^{2-}$ form (Brookins, 1988). Also, under mildly reducing conditions at very low pH aqueous SbO^+ forms, while at very high pH values (above 12) SbO_2^- is formed (Krupka and Serne, 2002).

Methylated antimony species have been detected in some marine and fresh waters, comprising less than 10% of the total dissolved antimony in these waters (Krupka and Serne, 2002). Antimony is adsorbed significantly under acidic pH levels due to its negatively charged species surface for much of the pH range. It is known to adsorb and/or coprecipitate with Fe and Al oxides (Krupka and Serne, 2002). The Canadian Council of Ministers of the Environment (CCME) list the maximum allowable Sb concentration (MAC) for drinking water as 6 ppb. There is no reported guideline for freshwater aquatic life. Long term exposures to elevated concentrations of Sb may lead to irritation of the eyes, irritation of the respiratory system, and the development of skin

lesions called antimony spots. Chronic exposure may lead to damage to the heart, lungs and liver (ASTDR, 1992).

Cobalt

The cobalt present in the tailings originate from arsenides, sulfarsenides and sulfides. Cobalt has two oxidation states, Co(II) and Co(III). Co(III) is a strong oxidizing agent and chemical species containing Co(III) tend to decompose under the Eh-pH conditions of most natural waters (Krupka and Serne, 2002). However, the presence of certain complexing ligands, such as EDTA and NH_3 , can stabilize Co(III) and allow it to persist in aqueous solutions (Krupka and Serne, 2002).

Under oxidizing to slightly reducing conditions, $\text{Co}^{2+}_{(\text{aq})}$ is the dominant species for pH values less than 9. From pH 9-13.5, $\text{Co}(\text{OH})_2$ is formed and above pH 13.5, soluble $\text{Co}(\text{OH})_4^{2-}$ becomes abundant (Brookings, 1988). Under strongly oxidizing and circumneutral to alkaline conditions Co_3O_4 becomes the dominant precipitate (Brookings, 1988). In the presence of carbonates, CoCO_3 may form between pH 7-10 under slightly oxidizing conditions (Brookings, 1988). Under reducing conditions, CoS precipitates form relatively independent of pH.

Several adsorption studies have indicated that Co is strongly adsorbed and/or coprecipitated onto Mn and Fe oxide surfaces in the absence of organic ligands, with the adsorption being more strongly favoured with Mn oxides (Percival et al., 2004). Under

neutral to basic conditions, the presence of organic ligands can significantly reduce adsorption by forming soluble complexes with Co (Krupka and Serne, 2002).

Co is considered an essential element for humans, however, it becomes toxic at doses greater than 25mg/day (Reinman and de Caritat, 1998). It causes deficiencies in Fe and Cu (Percival et al., 2004).

Nickel

Nickel containing compounds present in the tailings are associated with sulfides, sulfarsenides, arsenides, and a number of silicates. The most common oxidation states for Ni in natural systems are Ni(0) and Ni(II). Chemically, Ni is very similar to Fe and Co, and as such can replace Fe and Co in primary mineral phases such as FeS₂ and CoAsS (Brookings, 1988). Under oxidizing conditions, Ni is in the form of Ni²⁺_(aq) at pH values less than 8. Ni(OH)₂ becomes the dominant species at pH values between 8.5-11, and HNiO₂⁻ predominates at pH values above 11 (Brookings, 1988). Under reducing conditions and in the presence of sulfides, NiS will form under a wide range of pH values. NiOH⁺ and NiCO₃ are metastable with respect to Ni²⁺ and Ni(OH)₂, respectively (Brookings, 1988). Nickel does not form any stable carbonate species.

In aquatic systems, Ni can become adsorbed or coprecipitated with iron and manganese oxides, clay minerals and organic matter (Dumaresq, 1993). The MAC for nickel, as reported by the CCME, is related to water hardness (Table 2-11). As shown, the toxicity

of Ni increases with decreasing hardness. It is suggested by the USEPA that short term exposure is not likely to cause negative health effects, however, prolonged or chronic exposure to elevated nickel concentrations may lead to reduced body weight, heart damage, liver damage, and skin irritation (Reimann and de Caritat, 1998).

Table 2-11: Maximum Allowable Concentrations (MAC) for Ni based on water hardness (taken from Dumaresq, 1993)

Hardness (mg CaCO ₃ /l)	Ni (ppm)
0-60	0.025
60-120	0.065
120-180	0.11
>180	0.15

Zinc

Zinc is present in the tailings in trace quantities and is most likely associated with sulfide deposits. The most common oxidation state for Zn is Zn(II) (Reimann and de Caritat, 1998). Under oxidizing conditions and pH values less than 7.5, Zn is predominantly in the form $\text{Zn}^{2+}_{(\text{aq})}$ (Brookings, 1988). At pH values between 7.5 and 8 and under oxidizing conditions, ZnCO_3 may form (Brookings, 1988). At higher pH values, Zn oxides are dominant. Under reducing conditions the only species that is formed is ZnS. This precipitate may form between pH values of 2 to 14 (Brookings, 1988).

In aquatic systems, Zn can become adsorbed or coprecipitated with iron and manganese oxides, clay minerals and organic matter. Under reducing conditions and in the presence of reduced sulfur, Zn competitively forms ZnS precipitates (Brookings, 1988). The MAC for Zn, as reported by the CCME drinking water guideline is 5 mg/l. Zinc toxicity in plants results in depressed growth. This typically occurs at soil zinc concentrations in excess of 300 mg/kg (Reimann and de Caritat, 1998). Concentrations of Zn in drinking water in excess of 3 mg/l causes aesthetic complaints (Reimann and de Caritat, 1998).

Lead

Lead is present in the tailings in trace quantities and is most likely associated with sulfide deposits. The most common oxidation states for Pb are Pb(II) and Pb(IV) (Reimann and de Caritat, 1998). Under oxidizing conditions and strongly acidic conditions with pH values less than 0.5, Pb is predominantly in the form was $Pb^{2+}_{(aq)}$ (Brookings, 1988). At pH values between 0.5 and 4.5 and under oxidizing conditions, $PbSO_4$ may form (Brookings, 1988). At pH values between 4.5 and 11 $PbCO_3$ is the dominant lead species. At higher pH values and strong oxidizing conditions, various lead oxides may form, including PbO , Pb_3O_4 , and PbO_2 . Under reducing conditions, PbS is the only species that forms. This precipitate may form between pH values of 0.4 to 14 (Brookings, 1988).

In aquatic systems, Pb is generally strongly adsorbed or coprecipitated with iron and manganese oxides, clay minerals and organic matter. Under reducing conditions and in the presence of reduced sulfur, Pb competitively forms PbS precipitates (Brookings, 1988). The MAC for Pb, as reported by the CCME drinking water guideline, is 0.05 mg/l. Concentrations of Pb above the MAC in drinking water can result in delays of normal physical and mental development in babies and young children, increases in blood pressure to adults in the short term and can cause stroke, kidney disease, and various cancers with long term exposure (Reimann and de Caritat, 1998).

3.0 METHODOLOGY

3.1 Field Methods

The following sections summarize the methodologies followed for the collection of sediment, surface and groundwater, and vegetation samples at the study site.

3.1.1 Coring Procedures

In June 2004, nine cores were collected from the Farr Creek drainage area between the south dam near Crosswise Lake and the north control dam located at 4th Avenue. These cores were collected using a Russian Auger, which consists of a 50 cm half barrel capable of holding 1/2 of a 5 cm core diameter volume. Each barrel was opened in the field and the sediment core sample was quickly transferred onto saran wrap and sealed and wrapped again with tin foil to seal the core from the atmosphere. The core samples were placed in a cooler to ensure conditions at the time of sampling were maintained through to the time of analysis. Stratigraphic borehole logs were completed for each core and are presented in Appendix A. The locations of the core samples collected in June 2004 are presented on Figure 3-1.

Individual soil samples were also collected upstream of the study area in Crosswise Lake. Both a submerged and an exposed sediment sample were collected in 125ml plastic jars.

All the cores were stored in a refrigerator (kept below 4°C) during the field trip and transported in metal coolers insulated with Styrofoam and ice packs to the Earth Sciences Laboratory at Carleton University, Ottawa, ON until they were prepared for analysis. These cores were sectioned in approximately 15 cm intervals and analyzed for total metals, water content and organic matter content.

Five additional sediment cores were collected from the study area in September 2004. The coring was completed by pushing a 5 cm diameter ABS pipe, 1.8 m in length into the sediment. The locations of the cores are presented in Figure 3-1. Four of the five cores were completed in standing water and as such the pipes were pushed down below the water level. Due to the coring methodology chosen, some compression was inevitable. It is difficult to determine the exact level of compression in each core due to losses of sediment from the base of the pipe, while extracting the pipe.

Prior to pulling the core back up to the surface, a plastic cap was pushed into the end of the pipe and then covered by several pieces of duct tape to maintain adequate suction and ensure the pipe was sealed to the atmosphere. As soon as the pipe was lifted above the sediment-water interface, the lower end of the pipe was sealed with a plastic cap and duct tape to ensure only minimal sediment was lost during the extraction. Sediment samples were collected from these cores at approximately 25 cm intervals and analyzed for acid producing bacteria (APB), iron reducing bacteria (IRB) and sulfate reducing bacteria (SRB) sequentially extracted metals (SEM), acid volatile sulfides (AVS) and chromium

Figure 3-1: Location of June and September Core Samples

reducible sulfides (CRS), water content (WC), and organic matter content (OM). Pore water was extracted from the remaining sediment samples by ultracentrifugation and analyzed for alkalinity, pH, dissolved oxygen, Fe(II), sulfate, sulfide, and dissolved metals.

3.1.2 Monitoring Well Installation and Sampling

Seven monitoring wells were installed at the site in June 2004. The locations of the monitoring wells are presented in Figure 3-2. Borehole logs detailing the well installation specifications are provided in Appendix A.

All monitoring wells installed in June 2004 were monitored and sampled in September 2004. All wells were established using HDPE 1.6 cm ID tubing with a waterra foot valve attached to the end. Monitoring wells MW1, MW2, MW3, MW4 were purged 3 well volumes, whereas MW5, MW6, and MW7 were purged dry. These monitoring wells were located outside of standing water and as such, had slower recovery times. Two 250ml HDPE plastic bottles were filled at each well, one of which was filtered with a 0.45um Gelman glass microfibre filter. In situ measurements for pH, DO, conductivity, temperature, and salinity were conducted using YSI Model 85 multiprobe and an Oakton Instruments portable pH meter. Samples were brought back to camp, where alkalinity, Fe(II), sulfate, sulfide, ammonia, nitrate, and chloride were immediately measured using Hach field test kits. All field measurements were completed within 2 hours of arriving

Figure 3-2: Location of Groundwater Monitoring Wells Installed in June 2004

back at camp. One 125 ml plastic bottle was filled for each monitoring well with filtered sample water and preserved with 1 ml concentrated nitric acid for dissolved metal analysis. The water samples were kept in the fridge and transported in coolers with icepacks to ensure the samples remained below 4°C to the Earth Sciences Laboratory at Carleton University, Ottawa, ON until they were prepared for analysis.

3.1.3 Surface Water Sampling and Flow Measurement

Surface water samples were collected throughout the length of Farr Creek and Mill Creek, from approximately 1 km upstream of the confluence with Farr Creek to the control dam. The location for each of the surface water samples collected is presented in Figure 3-3. Prior to collecting the sample, each sample bottle was rinsed 3 times with stream water. Samples were collected in two 250 ml HDPE plastic bottles. One of the bottles was later filtered using a 0.45µm Gelman glass microfibre filter into 125ml plastic bottle and preserved with 1 ml of concentrated nitric acid for dissolved metal analysis. The water samples were kept in the refrigerator and transported in coolers with icepacks to ensure the samples remained below 4°C to the Earth Sciences Laboratory at Carleton University, Ottawa, ON until they were prepared for analysis.

Estimates of surface water velocity were made at various locations throughout the study area by throwing twigs or leaves into the middle of the stream and timing their movement downstream. Measurements of stream width and depth were also made to determine an approximate streamflow volume.

Figure 3-3: Location of Surface Water Samples Collected in June 2004

3.1.4 Vegetation Sampling

Cattail shoot samples were collected near each of the monitoring well locations and analyzed for total metals. Several shoot samples were cut and placed in labeled Ziplock plastic bags. They were kept in the refrigerator and transported in coolers with icepacks to ensure the samples remained below 4°C to the Earth Sciences Laboratory at Carleton University, Ottawa, ON until they were prepared for analysis.

3.2 Laboratory Methods

The following sections summarize the methodologies followed for the chemical analysis conducted on all of the samples collected in the field.

3.2.1 Water Contents and Organic Matter Determinations

All core samples were sectioned in 15 or 25 cm intervals. A composite 1 g sample was used for determining the water and loss on ignition (LOI) contents of the sample.

Approximately 5g of sediment was oven dried at 105-115°C overnight to determine the sediment water content. The dried sample was then ashed in a furnace at 550°C for 2 hours to determine the amount of organic matter as loss on ignition. The following equation was used to determine the water content of the sample:

$$M_w = M_i - M_d$$

$$WC = M_w/M_d$$

Where:

M_w = mass of water (g)

M_i = initial mass of wet sample (g)

M_d = mass of dried sample (g)

WC = water content (%)

The organic matter (as LOI) content of the sample was calculated using the equations presented below:

$$M_{om} = M_d - M_f$$

$$OM = M_{om}/M_d$$

Where:

M_{om} = mass of organic matter lost (g)

M_f = mass of sample after furnace (g)

OM = organic matter content (%)

3.2.2 Microbiology

Sixteen sediment samples were analyzed for acid producing bacteria (APB), iron reducing bacteria (IRB) and sulfate reducing bacteria (SRB). The most probable number (MPN) technique was used to estimate the number of APB's, IRB, and SRB in each sample.

The growth medium used for the APB consisted of 10g dextrose, 2g beef extract, 20g protease peptone, 20g NaCl, and 0.2g bromothymol blue. The above ingredients and 2L of deionized water were measured and added to a 2L Erlenmeyer flask. The pH of the solution was buffered to pH 7.2 using concentrated HCl and/or NaOH. The broths were then heated to approximately 100°C and aerated for approximately 1 hour.

The APB growth medium was transferred to test tubes, whereas culture jars were used for the IRB and SRB enumerations. 10 different dilutions, at 1 ml in 10 mls were completed with 5 replicates of each dilution.

Nine ml of the APB growth medium was added to the test tubes using a 9 ml pipette. Approximately 1g of wet sediment was added to the five tubes containing the first dilution series. The remaining tubes were then inoculated with 1ml from the previous dilution set. The APB samples were incubated for 96 hours at room temperature. A blue colour indicated a positive reading.

The growth medium containing the reducing agent, used for the IRB consisted of 5g NaHCO_3 , 3g NH_4Cl , 1.2g NaH_2PO_4 , 0.2g $\text{CaCl}_2 \cdot 4\text{H}_2\text{O}$, 0.2g KCl , 0.2g $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$, 0.01g $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$, 0.002g Na_2MoO_4 , 3.68g ferric EDTA, and 3g peptone. All the above ingredients were mixed with 2L of deionized water in a 2L Erlenmeyer flask. All solutions were adjusted to pH 7 with concentrated HCl and/or NaOH . The broths were then heated to approximately 100°C and aerated for approximately 1 hour.

The Postgate growth medium was used for the SRB samples. This medium and reducing reagents consisted of 1g KH_2PO_4 , 2g NH_4Cl , 9g Na_2SO_4 , 0.08g $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$, 0.12g $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, 5.87g Na lactate, 2.56 g Na acetate, 2g yeast extract, 0.008g $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, 0.6g Na citrate dihydrate, and 0.4% resazurin. All the above ingredients were mixed with 2L of deionized water in a 2L Erlenmeyer flask. The pH of the solution was buffered to pH 7.5 with concentrated H_2SO_4 and/or NaOH . The broths were then heated to approximately 100°C and aerated for approximately 1 hour.

Nine ml of the IRB and SRB growth mediums were each transferred to their individual culture jars via a 9 ml pipette in an anaerobic chamber to maintain reducing conditions. Prior to inoculating the samples, the jars were sealed inside the anaerobic chamber and then autoclaved to ensure there was no oxygen in the media. Approximately 1g of wet sediment was added to the five jars containing the first dilution series in the anaerobic chamber. The remaining sealed jars were then inoculated with 1ml from the previous dilution set. The samples were then left in the anaerobic chamber at room temperature for the four-week incubation period.

Positive SRB counts were indicated by the formation of black FeS precipitates. For the IRB samples, 0.2 ml of ferrazine was added to each jar after the incubation period. A positive reading was indicated by the solution colour change to pink.

MPN values were calculated for each set of samples from statistical tables (Cochran, 1950) and the results were expressed as colony forming units per gram of sediment dry weight (CFU/gdw). This method gives a rough estimate of the order of magnitude of bacterial populations and therefore the results are not indicative of absolute population numbers.

3.2.3 Acid Volatile Sulfides (AVS) and Chromium Reducible Sulfides (CRS) Sequential Extraction Procedure

Sixteen sediment samples were analyzed for AVS and CRS corresponding to the same depths as the microbiology samples.

The extraction apparatus consisted of six 250 ml distillation flasks, 30 cm long condensers with water flowing through them, and six traps. This allowed for the analysis of 5 samples at a time and one blank sample for each set of five samples.

Approximately 2g of dried sediment was added to the distillation flask. 10ml of 50% ethanol was added to the flask to remove elemental sulfur from the sediment. This was

done for 15 minutes at room temperature under a continuous flow of N_2 gas to maintain reducing conditions throughout the system. Ten ml of 12M HCl was added to each flask and the AVS was extracted at room temperature for 1 hour under continuous flow of N_2 carrier gas. The evolving H_2S was trapped in 10 ml 20% Zn acetate solution. The CRS fraction was extracted from the sediment by adding 16 ml of 1M $CrCl_2$ to each flask. The solution was then boiled at 150-175 °C for 1 hour. The H_2S was trapped in the same manner as the AVS. The ZnS precipitates were collected, diluted, and run in a Spectrophotometer at 670nm wavelength under visible light. Dilutions were prepared in 50 ml volumetric flasks. Four ml of Cline's solution was added to each dilution to allow for the colourimetric determinations. Cline's solution consists of diamine, ferric chloride and 50 M HCl. Specific amounts of diamine and ferric chloride are dependent on expected sulfide range.

Prior to running the sample dilutions through the spectrophotometer, standard calibrations were made using $Na_2S \cdot 9H_2O$. 1.44 g of $Na_2S \cdot 9H_2O$ was added to a 40 ml glass vial. Then, 3.2 ml of Cline's Solution was added to each vial. The vials were then filled completely with deionized water to ensure there was no headspace. Finally, the vials were capped with a septum and plastic screw cap. Six different dilutions were made using mechanical pipettes to produce a range of sulfide concentrations from 5 to 150 μM . The samples were run in a Spectrophotometer at 670 nm wavelength under visible light. A calibration curve was generated with >99% correlation.

3.2.4 Metals Sequential Extractions Procedure

Sixteen sediment samples were analyzed in duplicate for metals using a sequential extraction procedure corresponding to the same depths as the microbiology samples.

The sequential extraction procedure followed was a modification of the methodology developed by Tessier et al. (1979). The procedure separates the extracted metals into five fractions: exchangeable, metals bound to carbonates, metals bound to iron and manganese oxides, metals bound to organic matter, and residual fraction. Blank samples were run for 10% of the samples.

a) Exchangeable Fraction

Approximately 1g of dried sediment was mixed with 10 ml of 1M MgCl_2 , buffered to pH 7 with sodium acetate. The sample was mechanically shaken for 16 hours. The samples were then centrifuged at 3000 rpm for 20 minutes and the supernatant was decanted into a sample bottle, preserved with HNO_3 to maintain a sample pH of 2. The samples were stored below 4°C until analysis. The residue was washed with 20 ml of distilled water and mechanically shaken for 15 minutes, and centrifuged at 3000 rpm for 20 minutes. The supernatant was decanted slowly to ensure that no sediment was lost and discarded.

b) Fraction Bound to Carbonates

Twenty ml of sodium acetate buffered to pH 5 with 1M acetic acid was added to the residue from the previous step. The mixture was mechanically shaken for 16 hours. The samples were then centrifuged at 3000 rpm for 20 minutes and the supernatant was decanted into a sample bottle, preserved with HNO_3 to maintain a sample pH of 2. The samples were stored below 4°C until analysis. The residue was washed with 20 ml of distilled water and mechanically shaken for 15 minutes, and centrifuged at 3000 rpm for 20 minutes. The supernatant was decanted slowly to ensure that no sediment was lost and discarded.

c) Fraction Bound to Iron and Manganese Oxides

Twenty ml of 0.05 M hydroxylamine hydrochloride buffered to pH 5 with sodium citrate was added to the residue from the previous step. The mixture was mechanically shaken for 16 hours. The samples were then centrifuged at 3000 rpm for 20 minutes and the supernatant was decanted into a sample bottle, preserved with HNO_3 to maintain a sample pH of 2. The samples were stored below 4°C until analysis. The residue was washed with 20 ml of distilled water and mechanically shaken for 15 minutes, and centrifuged at 3000 rpm for 20 minutes. The supernatant was decanted slowly to ensure that no sediment was lost and discarded.

d) Fraction Bound to Organic Matter

Ten ml of 30% H_2O_2 buffered to pH 2 with 0.02M HNO_3 was slowly added to the residue from the previous step. The solution was loosely covered and digested at room temperature for 1 hour with occasional manual agitation. The solution was digested for another hour at a temperature of approximately 85°C . The solution was then uncovered and the solution volume was reduced to approximately 3 ml by evaporation. Another 10 ml of 30% H_2O_2 buffered to pH 2 with 0.02 M HNO_3 was slowly added to the mixture and digested for 1 hour at 85°C while loosely capped. After an hour, the cap was removed and the solution was concentrated down to approximately 1 ml. The solution was allowed to cool and 50 ml of 1 M ammonium acetate was added to the mixture and the mixture was mechanically shaken for 16 hours. The samples were then centrifuged at 3000 rpm for 20 minutes and the supernatant was decanted into a sample bottle. The samples were stored below 4°C until analysis. The residue was washed with 20 ml of distilled water and mechanically shaken for 15 minutes, and centrifuged at 3000 rpm for 20 minutes. The supernatant was decanted slowly to ensure that no sediment was lost and discarded.

e) Residual Fraction

Thirty ml of aqua regia solution (3:1 $\text{HCl}:\text{HNO}_3$ mixture) was added to the residue from the previous step and the mixture was digested at $100\text{-}130^\circ\text{C}$ until the solution became clear. This varied from 2 days to 3 weeks, depending on the sample composition.

HF or HClO₄ was not used in the analysis for 2 reasons:

- 1) the ICP apparatus used to determine the metal concentrations was not equipped with the proper materials to handle HF; and
- 2) the complete dissolution of silicates and or clay minerals was not of the utmost importance because the metals associated with these mineral phases are considered relatively immobile compared to the metals associated with the other fractions.

Once the solution became clear the supernatant was decanted into a sample bottle. The samples were stored below 4°C until further analysis.

3.2.5 Total Sediment Digestions for Metals

Total sediment digestions were conducted on all of the sectioned core samples collected from the June and September sampling. This procedure is the same as the Residual Fraction step in the Sequential Extraction Procedure. The total digestion was completed on the September cores as a check to ensure that the total metals extracted from the total digestion sample corresponded to the total metals extracted from the sum of all the sequential extraction steps on the same sample. Sequential metal extractions were not conducted for the June cores. As such, the total digestion procedure was the only analysis used to determine metal concentrations in these samples.

All of the metal samples were delivered to Dr. Nimal DeSilva and he completed the metal analysis via inductively couple plasma mass spectrometry (ICPMS) at the Laboratory at Health Canada.

3.2.6 Metal Extractions from Cattail Samples

Seven cattail (*Typha latifolia*) shoot samples were analyzed for metals. The samples were washed with deionized water, manually broken into small pieces and crushed using a mortar and pestle. Blank samples were run on 10% of the samples.

Thirty ml of 4:1 HNO₃: HCl mixture was added to 200 mg of ashed cattail shoots and the mixture was digested at 100-130°C until the solution became clear. This procedure varied from 1 to 2 hours. Once the solution became clear the supernatant was decanted into a sample bottle. The samples were stored below 4°C until further analysis.

All of the metal samples were delivered to Dr. Nimal DeSilva and he completed the metal analysis via inductively couple plasma mass spectrometry (ICPMS) at the Laboratory at Health Canada.

4.0 RESULTS AND DISCUSSION

The following section summarizes the results from the field work conducted in 2004.

Much of the discussion is focused on the five cores sampled in September 2004 because a more extensive analysis was completed on these cores.

4.1 Hydrogeology and Groundwater Flow

The locations of the 9 cores collected in June 2004 are presented in Figure 3-1. The general stratigraphy at the site, as observed from the 9 cores collected during June field sampling, is summarized below, starting at ground surface:

- Grey to brown silty tailings 60 to 100 cm thick;
- Layered clay tailings, 10 to 40 cm thick;
- An organic layer underlies the layered clay unit. The cores collected from the southern portions of the wetland (J1, J2, J5) indicated that the organic layer was 2 to 10 cm thick. A thicker organic layer was observed in the northern portion of the wetland (J9, J10) where the layer extended from 20 cm to greater than 60 cm in thickness; and
- Massive brown clay was observed to underlie the layered clay and organics.

Seven monitoring wells were installed at the site to determine the direction of groundwater flow and to assess groundwater quality throughout the site. The locations of

the groundwater monitoring wells are presented in Figure 3-2 and details of the well installations are provided in Appendix A. Figure 4-1 presents the hydraulic head measurements determined in September 2004. Six of the seven monitoring wells were installed in standing water and, therefore, vertical gradients could be calculated as shown in equation 4-1:

$$i = h_1 - h_2/dl \quad \text{[equation 4-1]}$$

Where:

h_1 = water elevation in the creek (cm above arbitrary level (aal))

h_2 = water elevation in the monitoring well (cm aal)

dl = the distance from the surface water elevation and the center of the screen in the monitoring well (cm).

i = vertical hydraulic gradient (cm/cm)

Positive vertical gradients are indicative of downward gradients, whereas negative vertical gradients are indicative of upward vertical gradients. The vertical gradients are shown on Figure 4-2 for all wells with the exception of MW5. All but two wells (MW1 and MW2) had upward gradients with groundwater discharging into Farr Creek and their gradients were quite small, ranging from 0.016 to 0.006. MW1 and MW2 had downward gradients and much steeper gradients ranging from 1.08 to 0.03. The cause of the downward gradients at these locations is most likely attributable to changes in topography, which would affect vertical groundwater movement. MW2 was located

Figure 4-1: Groundwater Elevation Measurements Collected in September 2004 for all Onsite Monitoring Wells

Figure 4-2: Vertical Gradients Calculated from September Hydraulic Head Measurements from Selected Onsite Monitoring Wells

immediately west of a beaver house, which could also affect the vertical water table fluctuations.

4.2 Sediment Metal Concentrations, Organic Matter and Water Contents

Figures 4-3a through 4-3n present the organic matter (OM) and water content profiles with depth for all 14 cores. The water contents were typically less than 35 % at low OM values (less than 5%). As the OM contents increased, the water contents increased substantially (up to 90 %). The OM profiles corresponded to the stratigraphy observed. Core J10 showed the highest OM layer at over 70%.

Table 4-1 presents selected trace metal concentrations from the nine cores collected in June 2004 and from the 5 cores collected in September 2004. The reader is referred to Appendix B for complete chemical analysis. As shown in Table 4-1, concentrations of Al, Fe, Ca, Mg, Mn, and Na were found to be relatively consistent values with depth, with the exception of core J10. Potassium demonstrated considerable variability in some cases, ranging from 2000 ppm to 20,000 ppm with depth. Also, Core J10 showed substantial decreasing concentrations with depth for Na, Mn, Mg, K, Pb, Ti, Zn, Fe, Cu, Co, As, and Al. It is possible that the enhanced organic matter content and vegetative cover of the sediments at this location act as adsorption sites for these metals, thus immobilizing them within the sediment and root zones. The results from core J10 contained elevated concentrations of several metals at 55.0 cm depth. This depth also

Figure 4-3a: Core J1 - Water and organic matter content

Figure 4-3b: Core J2 - Water and organic matter content

Figure 4-3c: Core J3 - Water and organic matter content

Figure 4-3d: Core J4 - Water and organic matter content

Figure 4-3e: Core J5 - Water and organic matter content

Figure 4-3f: Core J7 - Water and organic matter content

Table 4-1: Sediment metal concentrations for June and September 2004 Cores Using Aqua Regia Digestions and ICP MS

Core ID	Depth (cm)	Al	As	Ca	Co	Cr	Cu	Fe	K	Mg	Mn	Na	Ni	P	Pb	S	Sb	Si	Ti	U	Zn
MDL	Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
CORE J1	7.5	8.87E+04	3.44E+03	7.22E+04	1.53E+03	3.76E+02	9.67E+02	9.96E+04	7.23E+03	6.65E+04	2.58E+03	2.72E+03	8.93E+02	1.50E+03	7.09E+02	2.6E+04	1.13E+02	3.7E+01	5.07E+03	5.40E+02	9.52E+02
	15.0	1.15E+05	4.17E+03	9.81E+04	1.89E+03	4.81E+02	1.13E+03	1.28E+05	9.93E+03	7.29E+04	3.39E+03	3.66E+03	1.05E+03	1.87E+03	8.77E+02	1.58E+04	1.39E+02	2.59E+01	6.43E+03	6.77E+02	1.22E+03
	22.5	9.53E+04	6.27E+03	7.59E+04	2.03E+03	4.00E+02	1.42E+03	1.03E+05	6.47E+03	5.85E+04	2.67E+03	5.54E+03	1.51E+03	1.30E+03	9.12E+02	1.79E+04	2.0E+02	4.09E+01	4.42E+03	5.84E+02	9.64E+02
	37.5	5.89E+04	3.28E+03	5.39E+04	8.56E+02	2.55E+02	6.00E+02	6.79E+04	3.82E+03	3.82E+04	1.71E+03	1.36E+03	5.22E+02	1.16E+03	4.58E+02	8.65E+03	1.34E+02	5.70E+01	4.10E+03	3.94E+02	5.54E+02
	52.5	8.16E+04	3.78E+03	6.78E+04	1.13E+03	3.50E+02	8.31E+02	9.21E+04	6.98E+03	5.11E+04	2.41E+03	3.68E+03	7.49E+02	1.43E+03	6.22E+02	1.33E+04	1.38E+02	2.26E+01	5.81E+03	3.74E+02	7.50E+02
	67.5	6.20E+04	2.53E+03	5.01E+04	8.26E+02	2.74E+02	6.62E+02	7.26E+04	3.99E+03	3.99E+04	1.79E+03	9.89E+02	4.95E+02	1.02E+03	7.45E+02	1.03E+04	6.65E+01	4.83E+01	3.83E+03	3.80E+02	6.41E+02
	82.5	6.08E+04	3.92E+03	4.50E+04	9.08E+02	2.64E+02	1.13E+03	6.51E+04	4.66E+03	3.60E+04	1.75E+03	2.36E+03	5.49E+02	6.22E+02	7.45E+02	1.05E+04	3.13E+02	7.12E+01	3.08E+03	3.35E+02	8.07E+02
	100	5.19E+04	9.96E+02	3.31E+04	1.13E+02	1.85E+03	2.63E+02	4.43E+04	6.25E+03	1.79E+04	1.08E+03	8.40E+02	1.11E+03	1.84E+03	1.50E+02	6.80E+03	1.93E+02	4.75E+01	2.47E+03	1.83E+02	2.63E+02
	115	9.49E+04	2.63E+02	3.77E+04	1.57E+02	2.56E+02	1.79E+02	5.53E+04	1.11E+04	2.28E+04	1.09E+03	1.20E+03	1.72E+02	2.64E+03	5.74E+01	5.63E+03	7.40E+01	9.37E+01	3.72E+03	2.88E+02	2.75E+02
	125	6.34E+04	1.38E+03	3.60E+04	3.24E+02	1.82E+02	3.44E+02	4.64E+04	7.68E+03	2.12E+04	1.12E+03	1.02E+03	1.87E+02	1.91E+03	1.74E+02	9.63E+03	6.53E+01	4.74E+01	2.80E+03	2.50E+02	2.88E+02
CORE J2	7.5	5.33E+04	2.44E+03	4.07E+04	8.79E+02	2.36E+02	6.00E+02	6.42E+04	3.27E+03	3.54E+04	1.58E+03	9.62E+02	4.48E+02	1.30E+03	4.57E+02	8.25E+03	2.57E+02	3.44E+01	3.74E+03	3.49E+02	3.88E+02
	22.5	3.72E+04	1.97E+03	2.58E+04	7.49E+02	1.70E+02	5.15E+02	4.60E+04	1.59E+03	2.53E+04	1.08E+03	4.82E+02	4.33E+02	1.05E+03	3.78E+02	6.49E+03	4.65E+01	8.36E+01	1.83E+03	2.62E+02	4.52E+02
	37.5	7.42E+04	5.26E+03	7.02E+04	1.39E+03	3.14E+02	6.72E+02	8.22E+04	5.81E+03	4.55E+04	2.22E+03	2.32E+03	5.32E+02	1.20E+03	6.26E+02	1.56E+04	8.65E+01	5.26E+01	4.63E+03	4.89E+02	7.31E+02
	52.5	5.44E+04	2.73E+03	4.79E+04	6.92E+02	2.34E+02	4.11E+02	6.77E+04	3.99E+03	3.47E+04	1.56E+03	1.72E+03	3.03E+02	8.88E+02	5.27E+02	1.36E+04	6.93E+01	4.56E+01	2.98E+03	3.79E+02	6.94E+02
	67.5	6.51E+04	6.36E+03	7.32E+04	1.28E+03	2.85E+02	9.86E+02	7.14E+04	3.34E+03	4.00E+04	1.99E+03	1.52E+03	6.54E+02	6.34E+02	5.27E+02	1.42E+04	1.54E+02	5.95E+01	3.06E+03	4.18E+02	7.64E+02
	82.5	6.24E+04	5.36E+03	6.41E+04	1.15E+03	2.83E+02	8.70E+02	7.72E+04	2.07E+03	4.21E+04	1.97E+03	8.06E+02	5.97E+02	9.83E+02	5.89E+02	1.45E+04	3.41E+02	8.31E+01	3.15E+03	4.12E+02	8.00E+02
	97.5	5.08E+04	3.34E+03	6.07E+04	7.52E+02	2.32E+02	6.29E+02	6.29E+04	2.12E+03	3.44E+04	1.63E+03	7.22E+02	4.30E+02	1.21E+03	4.13E+02	9.17E+03	9.24E+01	6.07E+01	2.98E+03	3.77E+02	5.28E+02
	113	5.37E+04	4.71E+03	6.06E+04	9.65E+02	2.23E+02	8.13E+02	5.94E+04	2.99E+03	3.20E+04	1.66E+03	2.53E+03	5.72E+02	9.36E+02	4.88E+02	9.45E+03	8.49E+01	6.95E+01	2.19E+03	3.61E+02	5.69E+02
	128	6.63E+04	5.87E+03	7.15E+04	1.14E+03	2.92E+02	7.02E+02	7.38E+04	3.56E+03	3.97E+04	2.04E+03	1.45E+03	8.39E+02	1.47E+03	7.11E+02	8.57E+03	8.35E+01	1.43E+02	2.33E+03	4.22E+02	6.11E+02
	138	3.13E+04	3.74E+03	4.51E+04	7.38E+02	5.72E+02	6.18E+02	3.88E+04	1.88E+03	1.93E+04	1.06E+03	7.42E+02	8.07E+02	5.21E+02	4.54E+02	2.25E+04	4.08E+02	6.07E+01	1.51E+03	1.58E+02	6.25E+02
CORE J3	148	6.96E+04	5.32E+03	7.75E+04	1.13E+03	3.16E+02	9.64E+02	7.62E+04	5.14E+03	4.19E+04	2.20E+03	1.81E+03	6.37E+02	7.94E+02	8.59E+02	1.52E+04	1.34E+02	1.18E+02	2.76E+03	4.58E+02	9.23E+02
	163	4.38E+04	1.61E+03	3.79E+04	4.28E+02	2.11E+02	3.38E+02	4.10E+04	4.41E+03	2.12E+04	1.02E+03	8.46E+02	2.92E+02	8.32E+02	2.46E+02	8.39E+03	7.11E+01	7.13E+01	2.13E+03	3.71E+02	3.81E+02
	178	4.48E+04	1.09E+03	4.12E+04	3.22E+02	1.54E+02	2.56E+02	3.69E+04	6.30E+03	1.91E+04	9.33E+02	1.00E+03	1.93E+02	9.44E+02	2.21E+02	1.11E+04	4.67E+01	6.84E+01	2.14E+03	2.91E+02	3.05E+02
	193	3.02E+04	3.69E+02	2.95E+04	1.09E+02	1.02E+02	9.67E+01	2.29E+04	3.76E+03	1.08E+04	5.60E+02	5.84E+02	8.71E+01	8.93E+02	5.28E+01	9.51E+03	3.27E+01	5.03E+01	1.68E+03	1.44E+02	1.46E+02
	5.78E+04	2.39E+03	5.24E+04	6.07E+02	2.20E+02	4.58E+02	5.55E+04	5.55E+04	5.38E+03	2.85E+04	1.38E+03	1.60E+03	3.41E+02	1.27E+03	3.48E+02	1.17E+04	9.10E+01	1.24E+02	3.06E+03	3.14E+02	4.93E+02
	5.23E+04	1.43E+03	4.27E+04	8.68E+02	2.19E+02	4.61E+02	6.55E+04	6.55E+04	4.86E+03	3.25E+04	1.59E+03	1.04E+03	4.33E+02	7.24E+02	3.63E+02	6.77E+03	4.94E+01	4.47E+01	1.91E+03	2.65E+02	4.88E+02
	6.02E+04	1.53E+03	4.07E+04	1.17E+03	2.61E+02	6.37E+02	6.80E+04	6.80E+04	4.97E+03	3.82E+04	1.78E+03	1.03E+03	5.11E+02	6.90E+02	4.80E+02	8.95E+03	6.75E+01	4.88E+01	2.56E+03	3.44E+02	6.52E+02
	7.72E+04	2.30E+03	5.63E+04	1.32E+03	3.17E+02	7.69E+02	7.69E+02	8.46E+04	6.83E+03	4.78E+04	2.26E+03	1.14E+03	7.09E+02	6.13E+02	6.04E+02	1.04E+04	5.60E+01	3.77E+01	2.48E+03	5.09E+02	6.90E+02
	3.96E+04	1.30E+03	3.15E+04	6.31E+02	1.87E+02	3.83E+02	4.44E+04	4.44E+04	3.73E+03	2.51E+04	1.13E+03	5.26E+02	3.62E+02	5.43E+02	2.88E+02	5.79E+03	nd	3.56E+01	1.52E+03	3.57E+02	3.30E+02
	5.97E+04	1.74E+03	4.45E+04	8.95E+02	2.53E+02	5.94E+02	5.94E+02	6.70E+04	5.63E+03	3.76E+04	1.70E+03	9.47E+02	4.95E+02	6.72E+02	4.46E+02	5.79E+03	6.13E+01	4.17E+01	2.37E+03	3.90E+02	5.34E+02
CORE J4	67.5	3.78E+04	1.06E+03	3.46E+04	5.07E+02	1.60E+02	3.11E+02	4.22E+04	3.23E+03	2.42E+04	1.08E+03	6.12E+02	3.01E+02	4.13E+02	2.44E+02	8.50E+03	6.44E+01	1.42E+02	1.80E+03	4.24E+02	3.12E+02
	7.5	5.77E+04	2.44E+03	5.92E+04	8.07E+02	2.48E+02	4.93E+02	6.41E+04	5.57E+03	3.66E+04	1.75E+03	1.20E+03	4.15E+02	1.13E+03	4.32E+02	8.47E+03	7.87E+01	5.28E+01	3.43E+03	3.71E+02	5.21E+02
	22.5	5.68E+04	2.00E+03	5.84E+04	6.97E+02	2.40E+02	5.10E+02	6.30E+04	5.69E+03	3.60E+04	1.66E+03	1.27E+03	3.61E+02	1.19E+03	4.21E+02	7.97E+03	9.06E+01	9.72E+01	3.45E+03	3.40E+02	4.72E+02
	37.5	5.88E+04	1.91E+03	5.61E+04	8.59E+02	2.51E+02	5.93E+02	6.60E+04	5.86E+03	3.68E+04	1.78E+03	9.72E+02	4.30E+02	7.62E+02	4.25E+02	8.87E+03	5.91E+01	2.93E+01	2.69E+03	3.72E+02	5.28E+02
	57.5	5.63E+04	1.21E+03	5.77E+04	4.82E+02	2.29E+02	5.63E+02	6.32E+04	6.19E+03	3.59E+04	1.50E+03	1.23E+03	2.64E+02	1.46E+03	4.29E+02	7.05E+03	1.18E+02	2.24E+02	3.57E+03	3.14E+02	3.84E+02
	72.5	5.38E+04	2.65E+03	5.91E+04	6.60E+02	2.24E+02	5.22E+02	5.79E+04	5.01E+03	3.21E+04	1.66E+03	1.39E+03	3.92E+02	1.39E+03	4.42E+02	7.08E+03	8.83E+01	7.63E+01	2.96E+03	3.52E+02	5.47E+02
	77.5	5.38E+04	2.65E+03	5.91E+04	6.60E+02	2.24E+02	5.22E+02	5.79E+04	5.01E+03	3.21E+04	1.66E+03	1.39E+03	3.92E+02	1.39E+03	4.42E+02	7.08E+03	8.83E+01	7.63E+01	2.96E+03	3.52E+02	5.47E+02
	80.0	4.44E+04	1.74E+03	4.17E+04	7.04E+02	1.90E+02	4.86E+02	5.15E+04	3.41E+03	2.91E+04	1.36E+03	6.72E+02	4.14E+02	8.56E+02	3.63E+02	7.52E+03	3.66E+01	7.17E+01	1.92E+03	3.02E+02	4.39E+02
	90.0	5.36E+04	2.71E+03	4.32E+04	6.38E+02	4.15E+02	6.58E+02	5.53E+04	4.99E+03	2.88E+04	1.45E+03	2.37E+03	5.07E+02	9.19E+02	4.82E+02	8.71E+03	1.10E+02	8.18E+01	2.22E+03	3.20E+02	6.14E+02
	97.5	5.54E+04	2.13E+03	4.68E+04	5.50E+02	2.32E+02	5.95E+02	5.87E+04	5.59E+03	3.08E+04	1.53E+03	1.16E+03	3.60E+02	9.13E+02	4.03E+02	9.20E+03	5.16E+01	1.02E+02	1.96E+03	2.76E+02	6.30E+02
	106	4.54E+04	3.46E+02	3.10E+04	1.62E+02	1.33E+02	1.28E+02	2.96E+04	5.44E+03	1.25E+04	7.05E+02	6.57E+02	1.22E+02	1.79E+03	5.97E+01	6.44E+03	4.03E+01	9.13E+01	1.73E+03	1.47E+02	2.07E+02

Core ID	Depth (cm)	Al	As	Ca	Co	Cr	Cu	Fe	K	Mg	Mn	Na	Ni	P	Pb	S	Sb	Si	Ti	U	Zn
MDL		0.070	0.120	0.055	0.007	0.016	0.012	0.100	0.052	0.010	0.010	0.074	0.059	0.268	0.213	0.568	0.167	0.022	0.010	0.868	0.006
Units		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
CORE J5	7.5	4.29E+04	1.72E+03	3.40E+04	4.85E+02	1.78E+02	2.31E+02	4.34E+04	3.65E+03	2.43E+04	1.20E+03	1.24E+03	1.75E+02	6.09E+02	2.13E+02	4.83E+03	4.62E+01	3.04E+01	2.80E+03	3.16E+02	2.90E+02
	22.5	5.54E+04	2.27E+03	4.13E+04	7.12E+02	2.46E+02	2.92E+02	5.57E+04	5.36E+03	3.13E+04	1.64E+03	1.91E+03	2.42E+02	8.55E+02	3.32E+02	6.45E+03	6.05E+01	1.15E+02	3.22E+03	2.97E+02	3.94E+02
	37.5	6.64E+04	2.77E+03	6.48E+04	7.60E+02	3.00E+02	3.39E+02	7.23E+04	4.73E+03	4.01E+04	2.12E+03	1.92E+03	2.90E+02	1.27E+03	4.09E+02	7.96E+03	8.95E+01	9.82E+01	5.98E+03	3.82E+02	4.89E+02
	62.5	7.30E+04	5.19E+03	7.22E+04	9.93E+02	2.99E+02	6.75E+02	7.37E+04	5.12E+03	4.16E+04	2.20E+03	2.38E+03	5.13E+02	1.06E+03	4.93E+02	8.96E+03	9.50E+01	1.20E+02	3.37E+03	4.14E+02	6.68E+02
	77.5	4.96E+05	2.77E+04	5.27E+05	7.13E+03	2.03E+03	4.64E+03	4.79E+05	3.97E+04	2.70E+05	1.50E+04	2.23E+04	3.49E+03	3.19E+03	4.96E+02	6.82E+04	4.67E+02	4.02E+02	1.57E+04	4.23E+02	4.90E+03
	92.5	8.34E+04	4.99E+03	9.98E+04	1.27E+03	3.99E+02	6.37E+02	7.61E+04	7.55E+03	4.74E+04	2.80E+03	5.15E+03	5.12E+02	4.28E+02	5.89E+02	1.16E+04	9.07E+01	2.73E+01	2.72E+03	4.61E+02	8.77E+02
	103	6.92E+04	5.88E+03	7.16E+04	1.33E+03	3.82E+02	6.10E+02	6.80E+04	4.81E+03	4.43E+04	2.60E+03	2.54E+03	4.76E+02	5.62E+02	7.46E+02	1.04E+04	1.99E+02	7.79E+01	2.54E+03	3.81E+02	9.06E+02
	118	8.08E+04	4.41E+03	6.02E+04	8.01E+02	2.86E+02	7.21E+02	6.31E+04	1.01E+04	3.39E+04	1.88E+03	1.94E+03	3.49E+02	9.43E+02	8.41E+02	9.85E+03	5.92E+01	7.46E+01	2.66E+03	3.87E+02	1.01E+03
	133	6.66E+04	4.11E+02	2.48E+04	1.15E+02	1.95E+02	1.05E+02	4.97E+04	1.22E+04	2.23E+04	9.64E+02	1.86E+03	1.31E+02	1.01E+03	5.77E+01	1.78E+03	6.80E+01	5.81E+01	3.30E+03	2.35E+02	1.77E+02
	148	7.49E+04	6.43E+02	2.79E+04	1.48E+02	2.04E+02	1.28E+02	4.93E+04	1.46E+04	2.18E+04	1.02E+03	2.06E+03	1.37E+02	8.77E+02	1.09E+02	2.45E+03	5.68E+01	1.45E+02	2.37E+03	2.75E+02	2.32E+02
CORE J7	7.5	5.70E+04	3.09E+03	5.29E+04	7.31E+02	2.43E+02	3.21E+02	7.03E+04	2.16E+03	4.14E+04	1.55E+03	9.53E+02	2.99E+02	1.06E+03	6.08E+02	4.29E+03	7.51E+01	5.87E+01	3.75E+03	3.79E+02	6.09E+02
	22.5	6.86E+04	2.19E+03	6.34E+04	8.31E+02	3.32E+02	3.42E+02	7.77E+04	4.27E+03	4.61E+04	1.77E+03	3.53E+03	3.67E+02	6.68E+02	6.50E+02	5.05E+03	7.45E+01	2.91E+01	3.54E+03	4.35E+02	6.60E+02
	37.5	6.65E+04	2.87E+03	5.69E+04	7.53E+02	2.63E+02	3.73E+02	7.82E+04	3.80E+03	4.69E+04	1.78E+03	3.22E+03	3.13E+02	9.82E+02	6.02E+02	5.02E+03	8.41E+01	2.21E+01	4.59E+03	4.32E+02	5.59E+02
	57.5	7.47E+04	3.60E+03	6.71E+04	8.30E+02	2.91E+02	4.26E+02	8.71E+04	4.13E+03	5.10E+04	1.99E+03	1.28E+03	3.46E+02	6.29E+02	5.38E+03	8.34E+01	8.50E+01	4.85E+03	4.62E+02	6.13E+02	
	CORE J8	40.0	6.83E+04	2.43E+03	7.18E+04	7.09E+02	3.73E+02	4.09E+02	7.65E+04	4.54E+03	4.46E+04	2.01E+03	1.80E+03	4.07E+02	1.21E+03	6.42E+02	8.64E+03	1.25E+02	9.57E+01	4.70E+03	4.14E+02
57.5		5.68E+04	2.89E+03	5.96E+04	7.97E+02	2.51E+02	4.37E+02	6.39E+04	4.71E+03	3.65E+04	1.72E+03	1.10E+03	4.27E+02	1.13E+03	4.63E+02	8.24E+03	7.43E+01	3.00E+01	3.70E+03	3.74E+02	5.22E+02
72.5		5.37E+04	1.66E+03	5.16E+04	5.58E+02	2.28E+02	3.97E+02	5.81E+04	4.67E+03	3.35E+04	1.48E+03	1.13E+03	2.63E+02	9.96E+02	4.80E+02	6.63E+03	4.22E+01	5.26E+01	3.20E+03	3.50E+02	5.10E+02
87.5		5.23E+04	1.73E+03	5.28E+04	5.10E+02	2.24E+02	3.43E+02	5.83E+04	3.94E+03	3.41E+04	1.52E+03	1.59E+03	2.62E+02	1.09E+03	4.51E+02	6.57E+03	6.87E+01	7.56E+01	3.74E+03	2.90E+02	4.90E+02
103		5.38E+04	1.66E+03	5.31E+04	5.44E+02	2.46E+02	3.33E+02	6.02E+04	3.76E+03	3.51E+04	1.56E+03	1.28E+03	2.73E+02	8.90E+02	5.44E+02	6.56E+03	7.73E+01	6.55E+01	3.53E+03	3.49E+02	4.96E+02
118		3.65E+04	1.29E+03	3.74E+04	4.21E+02	5.33E+03	3.16E+02	5.56E+04	2.40E+03	2.43E+04	1.44E+03	8.22E+02	2.87E+03	8.07E+02	3.14E+02	4.42E+03	4.03E+02	1.39E+02	2.48E+03	2.81E+02	3.39E+02
CORE J9	27.5	6.77E+04	1.77E+03	2.85E+04	4.10E+02	2.85E+02	2.80E+02	5.09E+04	7.18E+03	2.29E+04	9.40E+02	9.27E+02	3.03E+02	9.10E+02	1.81E+02	7.64E+03	7.19E+01	3.59E+01	3.11E+03	2.46E+02	2.82E+02
	42.5	6.35E+04	2.48E+03	5.44E+04	9.91E+02	3.10E+02	5.06E+02	6.15E+04	5.14E+03	3.51E+04	1.57E+03	3.33E+03	4.94E+02	7.28E+02	4.94E+02	8.99E+03	7.24E+01	2.89E+01	3.24E+03	3.55E+02	5.55E+02
	57.5	7.51E+04	2.68E+03	5.29E+04	9.43E+02	6.35E+02	7.92E+02	7.18E+04	5.15E+03	3.92E+04	1.69E+03	1.73E+03	7.53E+02	1.01E+03	5.88E+02	1.18E+04	1.09E+02	1.10E+02	3.43E+03	3.90E+02	6.09E+02
	75.5	7.81E+04	2.16E+03	3.36E+04	4.27E+02	8.96E+02	3.55E+02	4.76E+04	7.92E+03	2.08E+04	8.16E+02	9.66E+02	6.80E+02	1.01E+03	1.93E+02	7.11E+03	1.02E+02	7.95E+01	2.59E+03	2.38E+02	2.54E+02
	89.0	8.56E+04	2.47E+03	3.60E+04	5.52E+02	2.66E+02	3.80E+02	6.35E+04	1.09E+04	2.92E+04	1.20E+03	1.35E+03	3.44E+02	1.15E+03	4.47E+02	1.05E+04	7.66E+01	8.81E+01	4.08E+03	3.22E+02	3.75E+02
CORE J10	36.0	5.14E+04	3.80E+02	2.52E+04	4.60E+02	2.42E+02	4.66E+02	4.86E+04	4.36E+03	2.77E+04	1.25E+03	1.54E+03	4.03E+02	7.16E+02	4.01E+02	4.39E+03	5.38E+01	5.15E+01	2.52E+03	2.74E+02	5.32E+02
	55.0	8.50E+04	4.19E+02	2.52E+04	4.90E+02	1.43E+03	1.89E+03	7.98E+04	8.14E+03	4.11E+04	1.82E+03	8.35E+03	1.45E+03	1.37E+02	5.80E+02	5.10E+03	1.56E+02	1.63E+02	1.95E+03	4.64E+02	5.74E+02
	67.5	1.21E+04	1.07E+03	2.96E+04	2.48E+02	1.09E+02	5.70E+02	1.31E+04	7.39E+02	5.85E+03	2.62E+02	3.87E+02	4.24E+02	2.29E+02	1.00E+02	1.52E+04	9.43E+01	1.56E+01	3.85E+02	7.26E+01	1.19E+02
	82.5	1.17E+04	1.05E+02	1.98E+04	3.77E+01	2.95E+01	1.17E+02	5.94E+03	7.92E+02	2.67E+03	1.04E+02	2.38E+02	6.06E+01	6.63E+02	2.20E+01	6.20E+03	nd	4.27E+01	3.42E+02	nm	3.04E+01
	97.5	1.69E+04	8.96E+01	2.77E+04	3.42E+01	1.02E+02	9.63E+01	1.05E+04	1.66E+03	5.17E+03	2.06E+02	7.12E+02	9.79E+01	5.62E+02	nd	1.44E+04	1.54E+01	8.06E+01	5.66E+02	nm	6.70E+01
	113	5.10E+03	1.58E+01	5.71E+03	9.01E+00	2.25E+02	2.06E+01	3.80E+03	6.71E+02	1.63E+03	9.15E+01	1.39E+02	1.34E+02	1.17E+02	nd	2.59E+03	1.89E+01	1.40E+01	2.09E+02	nm	1.82E+01
CORE S1	25.0	5.34E+04	3.49E+03	5.53E+04	5.74E+02	2.18E+02	3.16E+02	5.59E+04	4.25E+03	2.37E+05	1.51E+03	3.10E+04	4.28E+02	nm	5.00E+02	5.22E+03	2.03E+02	2.67E+03	2.06E+03	nm	3.60E+02
	50.0	2.77E+05	2.19E+03	4.05E+04	5.43E+02	2.01E+02	1.98E+02	5.30E+04	4.50E+03	2.72E+05	1.54E+03	3.24E+04	1.51E+02	nm	2.05E+02	8.23E+03	nd	1.98E+03	3.70E+03	nm	3.70E+02
	75.0	6.71E+04	1.56E+03	7.33E+04	5.98E+02	2.62E+02	4.01E+02	7.00E+04	8.13E+03	4.12E+05	1.99E+03	4.29E+04	2.83E+02	nm	4.98E+02	9.10E+03	nd	2.81E+03	4.58E+03	nm	6.17E+02
CORE S2	25.0	6.89E+04	6.91E+02	6.64E+04	5.71E+02	3.10E+02	2.57E+02	7.33E+04	7.03E+03	6.99E+04	2.31E+03	5.09E+03	2.81E+02	nm	4.48E+02	5.50E+03	nd	2.46E+03	5.26E+03	nm	4.46E+02
	50.0	7.02E+04	1.64E+03	8.25E+04	5.80E+02	2.92E+02	2.85E+02	7.85E+04	7.32E+03	5.12E+05	2.54E+03	4.71E+04	2.91E+02	nm	3.84E+02	7.17E+03	nd	3.71E+03	6.26E+03	nm	4.60E+02
	75.0	6.51E+04	1.85E+03	8.31E+04	5.30E+02	3.26E+02	3.11E+02	7.00E+04	8.57E+03	2.67E+05	2.27E+03	4.21E+03	3.24E+02	nm	4.21E+02	7.31E+03	nd	2.66E+03	5.17E+03	nm	4.83E+02
CORE S3	25.0	3.89E+04	1.30E+03	3.35E+04	6.31E+02	3.80E+02	3.51E+02	4.45E+04	4.18E+03	2.30E+05	1.24E+03	5.24E+04	2.91E+02	nm	3.46E+02	4.60E+03	9.02E+01	2.82E+03	2.12E+03	nm	4.36E+02
	50.0	3.96E+04	1.32E+03	4.43E+04	4.12E+02	2.60E+02	2.91E+02	4.6													

represents the top of the tailings layer at this location which is likely the result of the higher concentrations. It should also be noted that Si, Mg, and Na concentrations showed notable differences between the June cores and September cores. For Si, the concentrations reported for the September cores averaged at 2500 ppm and the highest concentration from the June cores was 402 ppm. Similarly, much higher concentrations were generally reported for Mg and Na in the September cores when compared to the reported concentrations in the June cores. The analyses for all cores were conducted at the same time and the blank samples did not indicate cross contamination (refer to Appendix B, Table B4). Thus, the reason for such large differences is not known.

Figures 4-4a through to 4-4i present sediment concentration profiles with depth for selected trace metals at each core location collected in June 2004. No observable trends were noted for any of the metal profiles from the June cores. The sediment concentration profiles for the cores collected in September 2004 (S1 to S5) are based only on three or four data points and therefore may not accurately represent any significant trends. As a result the data are not present or discussed here.

4.3 Sequential Extractions

Sequential extractions were completed for five separate fractions of the sediment: exchangeables, carbonates, Fe and Mn oxides (oxides), organic matter (OM), and residuals. Metals associated with the exchangeable fraction are highly mobile and are often correlated with the cation exchange capacity (CEC) of the sediment (Grambrell et

Figure 4-4a (i): Core J1 As, Co, Cu, Zn sediment concentrations

Figure 4-4a (ii): Core J1 - Ni, Pb, Sb sediment concentrations

al., 1991). Some metals, such as Pb and Co are known to have an affinity for carbonate surfaces and as such it was important to include the carbonate fraction in the sequential extraction analyses. The surfaces of oxides and OM are also prime adsorption sites for metals. The residual fraction accounts for silicate minerals and sulfides. This is important since one of the sinks for select metals is the formation of metal sulfide precipitates under reducing conditions, thereby immobilizing metals.

Figures 4-5a through 4-5g present the results of the sequential extractions for selected metals from the five cores collected in September 2004. The complete set of analytical results are provided in Appendix B. For several metals, at all locations, larger (greater than 50%) fractions of metals were associated with the residual fraction. Generally, for metals that exhibited associations with Fe and Mn oxides, there were larger percentages of metals associated with this fraction at shallow depths than at deeper depths. A brief discussion on specific metal trends observed at each core location is provided in the following sections.

Arsenic

Arsenic had relatively constant associations with the residual fraction ranging from 35% to 75%. The fraction of As associated with the oxides fraction ranged from 31% to less than 5% and typically the fraction of As associated with oxides decreased with greater depths. This could be attributed to reduced amounts of Fe and Mn oxides at depth due to the development of reducing conditions. Fractions associated with OM increased with

depth at Core S1. This is associated with an increase in OM content at Core S1 with depth. For the remaining cores, with the exception of S3, OM fractions seemed to be relatively constant ranging from 8% to 33%. At S3, for 50 cm depth, a large spike in fractions associated with residuals was observed. The reason for this is not known, however, the OM content of this core at 50 cm depth was 6.6 %. For all locations sampled, less than 15% of the As was associated with the exchangeable or carbonate fractions

In general, As seemed to be retained predominantly in the residual fraction of the sediment as for all locations sampled, over 25% of the As was retained in this fraction. Also, As was retained significantly by OM, even under low OM contents in the sediment. This would indicate that if the OM content of the wetland increased, potentially higher associations of As could be observed with OM. It was surprising that As was not strongly associated with the Fe and Mn oxide fraction. This could be attributed to there being small quantities of oxides present in the tailings. Alternatively there could also be competition with OM for sorption sites. (Grambrell et al., 1991).

Cobalt

Cobalt associated with the OM fraction of the sediment ranged from 22% to 80%. Cobalt associated with the OM fraction increased with depth at Cores S2 and S3. At Core S1, the fraction associated with OM decreased with depth. This resulted from increases in

Figure 4-5a: Sequential Extractions Results for Arsenic

Figure 4-5b: Sequential Extractions Results for Cobalt

Figure 4-5c: Sequential Extraction Results for Zinc

Figure 4-5d: Sequential Extractions Results - Copper

Figure 4-5e: Sequential Extractions Results for Nickel

Figure 4-5f: Sequential Extraction Results for Lead

Figure 4-5g: Sequential Extraction Results for Antimony

carbonate and residual fractions at 50 cm and 75 cm depth, respectively. At core S4, the fraction of Co associated with OM increased from 45% at 25 cm depth to 60% at 50cm depth and decreased to 38% at 75 cm depth. The decrease in Co associated with OM at 75 cm depth was attributed to an increase in Co associated with the residual fraction. Cobalt associated with the residual fraction ranged from less than 5% to 40%. The fraction of Co associated with the residual fraction generally remained constant or increased with depth. Core S3 demonstrated a decrease in Co association with the residual fraction between 50 cm and 75 cm depth, which was matched with a marked increase in OM associations. Cobalt associated with the oxide fraction ranged from less than 5% to 32%. For all core locations, the fraction of Co associated with oxides decreased with depth. Cobalt associated with the carbonate fraction of the sediment ranged from 8% to 30%. The fraction of Co associated with carbonates remained relatively constant with depth at cores S2, S4, and S5. At Core S3, the fraction of Co associated with carbonates decreased with depth. At core S1, there was a spike up to 30% of Co associated with carbonates. The Co associated with the exchangeable fraction of the sediment was always less than 10% for all core locations.

It is also known that Co has an affinity for carbonates and, thus, in the presence of carbonates, it is likely that there was considerable competition for sorption sites between carbonates and OM.

Zinc

Zinc associations with the residual fraction generally increased with depth ranging from 15% to 65%. The only exception was at core S3 at 75 cm depth where over 60 % of the Zn was associated with OM. Also, Zn associations with the organic fraction of the sediment generally increased with depth. At core S1, the fraction of Zn associated with the OM fraction decreased from 45% at 50 cm depth to approximately 35% at 75 cm depth. This was matched with almost a 20% increase in Zn associated with the residual fraction, thus there could be some competition between the formation of Zn sulfides and adsorption to OM. Zn associations with the Fe and Mn oxide fraction of the sediment varied from 25 % to less than 10%. At Cores S1, S2, and S3, Zn associations with the oxide fraction at 25 cm depth averaged at 20% with associations decreasing noticeably with depth. At Cores S4 and S5, the Zn associated with the oxides fraction were considerably less, with maximum percentage of Zn associated with the oxides fraction at approximately 10%. Zn associated with the carbonates fraction of the sediment ranged from less than 5% to 20%. With the exception of Core S1, the Zn associations with carbonate minerals generally decreased with depth. At core S1, the Zn associations with carbonates increased slightly with depth however for all depths the percentage of associations with Zn remained below 10%. Associations with the exchangeable fraction were only detected in cores S2, S3. At cores S2, approximately 8% of Zn was associated with the exchangeable fraction only at the 25 cm depth. No Zn associations were found at the two deeper depths. At Core S3, Zn associations were noted at all three depths with

Zn associations ranging from 8% at 25 cm depth, to approximately 12% at 50 cm depth, and dropping to less than 5% at 75 cm depth.

Based on the results from the sequential extractions, it appears that Zn was predominantly associated with the residual and OM fractions of the sediments and that there potentially could be competition between these two fractions, most likely under reducing conditions where Zn sulfides would be forming.

Copper

Copper associated with the residual fraction of the sediment ranged from less than 10% to 50%. Copper associated with the OM fraction of the sediment ranged from 40% to 85%. There appeared to be some competition between Cu associations with these fractions. Generally, the Cu association with OM increased or remained relatively constant with depth. This was not observed at cores S1 and S4 due to marked increases in Cu associations with the residual fraction. Copper associations with exchangeable and oxide fractions were all less than 10%. The fraction of Cu associated with the carbonate fraction ranged from 20 % to less than 5%. Generally, Cu associated with the carbonate fraction decreased with depth.

Based on the results of the sequential extractions, it appears that Cu was predominantly adsorbed to OM and associated with the residual fraction.

Nickel

Nickel associated with the residual fraction of the sediment ranged from less than 10% to 100%. Associations with the residual fraction increased with depth at most locations. At core S3, there was a sharp increase in association with OM at 75 cm depth which reduced the amount of Ni associated with the residual fraction. Nickel associated with the OM fraction of the sediment was intermittent and ranged from less than 1% to 80%. There appeared to be some competition between Ni associations with these fractions. Nickel associations with the exchangeable and oxide fractions were also intermittent and ranged from less than 1% to 20%. The fraction of Ni associated with the carbonate fraction ranged from 23 % to less than 1%. Generally, higher percentages of Ni were associated with the carbonate fraction at shallower depths.

Based on the results of the sequential extractions, it appears that Ni was predominantly associated with the residual fraction of the sediment.

Lead

Lead was strongly associated with the carbonate fraction of the sediment, with associations ranging from 35% to 65%. No consistent trends were observed for Pb associated with the carbonates fraction. Associations of Pb with the residual fractions ranged from less than 1% to approximately 50%. Associations of Pb with the OM, oxide and exchangeable fractions were sporadic and ranged from less than 1% to 40%. The

oxides were associated with cores S1, S2, and S3, however, none were found at S4 and S5.

Based on the results of the sequential extractions, it appears that Pb was predominantly associated with the carbonate and to a lesser extent, the residual fraction of the sediment.

Antimony

Antimony was predominantly associated with the residual fraction. The associations of Sb with the oxide fraction ranged from 42% to 62%, however, these were only encountered at the 25 cm depths for cores S1, S2, and S3. The associations of Sb with the exchangeable fraction ranged from 22% to 45%. These associations were only noted for cores S1, S3, and S4 intermittently. There were no associations of Sb with the carbonate or OM fractions of the sediments.

4.4 Acid Volatile Sulfides (AVS) and Chromium Reducible Sulfides (CRS)

Extractions

AVS and CRS extractions were conducted on the five cores collected in September 2004. The results for AVS and CRS for each core are provided in Figures 4-6a through 4-6e. In all cases, the concentrations for AVS remained lower than 5 ppm. The AVS fraction corresponds to reduced sulfur species (H_2S) and monosulfides in the sediment. These reduced sulfur species are both the product of dissimilatory sulfate reduction and the

decomposition of organic sulfur, amorphous iron monosulfides, and crystalline iron sulfides (Praharaj, 2004). The CRS fraction corresponds to pyrite and elemental sulfur in the sediments.

The concentration of AVS in the sediments is a function of both the rate at which it is produced and the rate at which it is lost by oxidation and diffusion (Oehm et al., 1997). The concentrations of AVS can vary therefore with the supply of organic matter, the rate of sulfate reduction, and the redox status of the sediments (Praharaj and Fortin, 2004).

The CRS concentrations from Core S1 increased to 50cm depth and then began to decrease. In core S2 the CRS concentrations showed a slight decreasing trend. CRS concentrations measured at S3 increased with depth. At Core S4, the CRS concentrations exhibited a decreasing trend to a depth of 75cm followed by increasing concentrations. At core S5, the CRS concentrations showed sharp increases below a depth of 50cm. The reported elemental sulfur concentrations with depth are presented in Table 4-1. As shown, the elemental sulfur concentrations show a similar trend to the observed CRS concentration profiles with depth. Previous work conducted by the GSC (1997) reported that there were negligible amounts of pyrite or pyrrhotite in these tailings. Therefore it is possible that the sample size used for the analysis was not large enough to accurately quantify the AVS fraction in the sediment. Based on the results, it is not possible to determine if metal sulfides are being produced at these core locations. The porewater chemistry results (presented in Sections 4.5 and 4.6) and geochemical speciation modeling results (presented in Section 5.0) may provide some additional information.

4.5 Porewater Metal Concentrations

Table 4-2 presents the dissolved metals concentrations extracted from the five cores collected in September 2004 and from the 7 groundwater monitoring wells installed at the site in June 2004, which were sampled in September 2004.

The porewater metals concentrations collected from MW5 appear slightly elevated for As, Co and Zn compared to the remaining porewater data from the other monitoring wells. MW5 was the only well installed away from the creeks or the waterlogged areas. The only vegetation near MW5 was grasses. It is possible that the lack of organic material and cattail vegetation could be influencing geochemical interactions at this location. Nickel concentrations for all locations were reported below the method detection limit of 0.06 mg/l. Also, lead was reported below the method detection limit of 0.21 mg/l for all of the monitoring wells. Lead was only detected at 45cm depth for core S1, 75 cm and 135 cm depth for core S2, 50 cm depth for core S3, 23.5 cm depth for core S4, and 50 cm depth for core S5. In all cases the reported lead concentrations were less than 0.6 mg/l. Figures 4-7a through 4-7o present the concentration profiles with depth for selected heavy metals. For all these cores, concentrations of Fe and Al were strongly correlated, with correlation coefficients ranging from 98.2% to greater than 99.99%, despite fluctuating concentrations with depth.

Zn concentrations demonstrated increasing concentrations with depth at cores S1 and S3. At core S5, Zn showed increasing concentrations to a depth of 50 cm followed by

Table 4-2: Porewater dissolved metals concentrations

Core ID	Depth (cm)	Al ppm	Ag ppm	As ppm	Au ppm	B ppm	Ba ppm	Be ppm	Bi ppm	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe ppm	Hg ppm	K ppm	Mg ppm	Mn ppm	Mo ppm
Core S1	15.0	5.53	<0.014	8.40	<0.019	0.122	0.092	<0.001	<0.422	49.2	0.375	0.020	0.151	4.83	<0.009	2.15	8.51	0.256	<0.036
	45.0	13.6	0.036	5.03	<0.019	0.156	0.185	0.001	<0.422	61.0	<0.007	0.079	0.325	17.9	<0.009	2.07	12.5	0.610	<0.036
	48.5	0.178	<0.014	0.649	<0.019	0.073	0.027	<0.001	<0.422	34.1	<0.006	0.016	<0.012	0.064	<0.009	17.1	20.1	0.004	<0.036
	71.5	0.796	<0.014	5.20	<0.019	0.056	0.027	<0.001	<0.422	45.2	0.025	0.023	0.173	0.980	<0.009	3.95	5.36	0.059	<0.036
	85.0	4.81	0.031	8.95	<0.019	0.081	2.18	<0.001	<0.422	74.0	<0.006	0.394	0.226	6.88	<0.009	2.05	11.1	0.337	<0.036
Core S2	130	21.4	0.029	2.94	<0.019	0.161	0.937	0.001	<0.422	49.9	0.313	0.089	0.226	20.9	<0.009	2.97	15.8	0.467	<0.036
	15.0	11.5	<0.014	0.560	<0.019	0.095	0.126	<0.001	<0.422	50.4	<0.006	0.049	0.072	11.0	<0.009	2.84	10.6	0.346	<0.036
	23.5	3.30	<0.014	0.295	<0.019	0.036	0.037	<0.001	<0.422	38.8	<0.006	0.117	0.074	3.08	<0.009	2.11	5.98	0.079	<0.036
	71.5	4.58	<0.014	0.986	<0.019	0.120	0.032	<0.001	<0.422	32.6	0.151	0.033	0.044	5.51	1.85	11.9	6.44	0.189	<0.036
	75.0	44.6	<0.014	2.05	<0.019	0.323	0.359	<0.001	<0.422	51.1	<0.006	0.377	0.149	43.6	<0.009	6.47	25.2	1.13	<0.036
Core S3	135	27.3	0.036	2.08	<0.019	0.200	14.3	0.001	<0.422	50.8	0.295	0.127	0.102	28.4	<0.009	3.38	18.6	0.956	<0.036
	23.5	0.455	<0.014	0.382	<0.019	0.084	0.068	<0.001	<0.422	84.2	<0.006	0.208	0.051	0.452	<0.009	3.33	57.4	0.208	0.128
	50.0	9.41	0.072	3.85	<0.019	0.121	0.204	<0.001	<0.422	75.3	<0.006	0.327	0.187	11.7	<0.009	2.32	11.5	0.379	0.463
	76.5	0.835	<0.014	2.01	<0.019	0.057	0.033	<0.001	<0.422	56.0	<0.006	0.029	0.024	8.81	<0.009	3.22	9.38	0.178	<0.036
	23.5	6.02	<0.014	1.61	<0.019	0.149	0.071	<0.001	<0.422	84.3	<0.006	0.324	0.080	8.96	<0.009	6.17	13.8	0.264	0.085
Core S4	50.0	6.29	0.027	3.31	<0.019	0.285	0.071	<0.001	<0.422	104	<0.006	0.821	0.103	8.53	1.37	7.83	15.4	0.431	0.296
	87.5	3.95	0.026	1.34	<0.019	0.345	0.060	<0.001	<0.422	40.0	<0.006	0.203	0.020	4.14	<0.009	9.18	8.89	0.102	0.124
	121	0.847	<0.014	2.20	<0.019	0.391	0.046	<0.001	<0.422	48.3	<0.006	0.081	0.017	0.91	<0.009	8.24	8.83	0.053	0.547
	23.5	1.65	<0.014	1.11	<0.019	0.053	0.135	<0.001	<0.422	119	<0.006	0.499	0.054	1.45	<0.009	4.53	10.1	0.136	<0.036
	50.0	13.4	0.040	2.70	<0.019	0.182	0.069	<0.001	<0.422	48.3	<0.006	0.431	0.077	17.8	<0.009	4.96	14.4	0.452	<0.036
Core S5	76.5	4.65	0.026	1.99	<0.019	0.180	0.097	<0.001	<0.422	33.5	<0.006	0.192	0.108	5.79	1.65	6.02	8.23	0.158	<0.036
MW-1		0.610	<0.014	0.434	<0.019	0.053	0.056	<0.001	<0.422	66.2	<0.006	0.041	<0.012	0.297	<0.009	0.89	12.5	0.282	<0.036
		0.093	<0.014	2.10	<0.019	0.091	0.087	<0.001	<0.422	150	<0.006	0.189	<0.012	8.60	<0.009	3.06	14.3	1.15	<0.036
		1.32	<0.014	0.196	<0.019	0.05	0.037	<0.001	<0.422	86.1	<0.006	0.047	<0.012	0.875	<0.009	1.12	9.13	0.190	<0.036
		0.136	<0.014	0.277	<0.019	0.071	0.024	<0.001	<0.422	88.9	<0.006	0.077	<0.012	0.923	2.05	0.387	9.27	0.219	<0.036
		0.773	<0.014	9.24	<0.019	0.091	0.019	<0.001	<0.422	103	<0.006	0.588	0.063	0.911	0.212	3.6	9.44	0.677	0.040
MW-6		0.137	<0.014	0.725	<0.019	0.083	0.044	<0.001	<0.422	108	<0.006	0.162	<0.012	0.190	<0.009	2.5	5.38	0.402	<0.036
		0.190	<0.014	1.30	<0.019	0.094	0.056	<0.001	<0.422	147	<0.006	0.130	<0.012	7.85	<0.009	2.12	14.7	1.40	<0.036

Core ID	Depth (cm)	Na ppm	Ni ppm	P ppm	Pb ppm	Rb ppm	Si ppm	Sc ppm	Se ppm	Sr ppm	S ppm	Sb ppm	Th ppm	Ti ppm	U ppm	Zr ppm	Zn ppm
Core S1	15.0	9.50	<0.059	<0.268	<0.213	<0.320	16.7	0.007	<0.213	0.091	35.1	0.494	<33.2	0.058	<0.868	0.007	0.165
	45.0	33.5	<0.059	<0.268	0.549	<0.320	28.3	0.008	<0.213	0.123	11.8	0.592	<33.2	0.176	<0.868	0.005	0.566
	48.5	11.4	<0.059	<0.268	<0.213	<0.320	9.80	<0.002	<0.213	0.384	658	0.308	<33.2	<0.002	<0.868	<0.004	<0.006
	71.5	453	<0.059	<0.268	<0.213	<0.320	8.44	<0.002	<0.213	0.103	69.4	3.52	<33.2	0.007	<0.868	<0.004	0.029
	85.0	13.0	<0.059	<0.268	<0.213	<0.320	15.4	<0.002	<0.213	0.138	12.1	0.52	<33.2	0.055	<0.868	0.007	0.142
Core S2	130	13.6	<0.059	0.414	<0.213	<0.320	44.8	0.005	<0.213	0.123	14.1	0.345	<33.2	0.411	<0.868	0.012	0.288
	15.0	3.98	<0.059	<0.268	<0.213	<0.320	21.2	0.004	<0.213	0.092	21.5	0.285	<33.2	0.452	<0.868	0.008	0.181
	23.5	1.19	<0.059	<0.268	<0.213	<0.320	9.51	<0.002	<0.213	0.060	53.1	0.535	<33.2	0.073	<0.868	<0.004	0.068
	71.5	4.89	<0.059	6.66	<0.213	0.552	11.6	0.005	<0.213	0.042	43.6	0.621	<33.2	0.087	<0.868	0.012	0.138
	75.0	5.46	<0.059	0.991	0.367	0.324	37.5	0.021	<0.213	0.121	17.6	0.167	<33.2	1.86	<0.868	0.033	0.354
Core S3	135	3.72	<0.059	0.425	0.425	<0.320	38.1	0.012	<0.213	0.067	6.89	0.359	<33.2	0.589	<0.868	0.009	0.350
	23.5	4.72	<0.059	<0.268	<0.213	0.419	5.50	<0.002	<0.213	0.088	117	1.43	<33.2	0.009	<0.868	0.006	0.051
	50.0	5.53	<0.059	<0.268	0.269	<0.320	18.4	0.004	<0.213	0.091	132	4.01	<33.2	0.087	<0.868	0.007	0.197
	76.5	4.71	<0.059	<0.268	<0.213	<0.320	5.18	<0.002	<0.213	0.171	71.5	3.16	<33.2	0.016	<0.868	<0.004	0.338
	23.5	8.59	<0.059	<0.268	0.256	0.371	16.1	0.002	<0.213	0.174	151	0.944	<33.2	0.111	<0.868	<0.004	0.170
Core S4	50.0	8.00	<0.059	<0.268	<0.213	0.362	15.6	0.007	<0.213	0.216	217	1.28	<33.2	0.091	<0.868	0.006	0.201
	87.5	8.59	<0.059	<0.268	<0.213	<0.320	11.7	<0.002	<0.213	0.075	84.9	2.51	<33.2	0.135	<0.868	0.007	0.175
	121	9.22	<0.059	<0.268	<0.213	<0.320	5.35	<0.002	<0.213	0.08	123	4.59	<33.2	0.018	<0.868	<0.004	0.099
	23.5	7.12	<0.059	<0.268	<0.213	0.325	8.80	<0.002	<0.213	0.135	202	0.999	<33.2	0.036	<0.868	<0.004	0.129
	50.0	5.98	<0.059	0.279	0.405	<0.320	23.6	0.006	<0.213	0.055	52.7	1.03	<33.2	0.293	<0.868	0.01	0.246
Core S5	76.5	7.71	<0.059	<0.268	<0.213	<0.320	11.5	0.005	<0.213	0.044	66.5	1.96	<33.2	0.093	<0.868	0.006	0.137
MW-1 MW-2 MW-3 MW-4 MW-5 MW-6 MW-7		5.96	<0.059	<0.268	<0.213	<0.320	8.47	<0.002	<0.213	0.155	7.70	<0.1666	<33.2	0.01	<0.868	<0.004	<0.006
		11.5	<0.059	<0.268	<0.213	<0.320	10.0	<0.002	<0.213	0.226	8.78	<0.1666	<33.2	<0.002	<0.868	<0.004	0.006
		6.51	<0.059	<0.268	<0.213	<0.320	9.56	<0.002	<0.213	0.127	7.41	<0.1666	<33.2	0.013	<0.868	<0.004	0.032
		4.74	<0.059	<0.268	<0.213	<0.320	10.5	0.004	<0.213	0.140	7.48	<0.1666	<33.2	0.003	<0.868	<0.004	0.006
		5.03	<0.059	<0.268	<0.213	0.398	6.96	<0.002	<0.213	0.155	26.8	<0.1666	<33.2	0.011	<0.868	<0.004	0.143
MW-6 MW-7		5.10	<0.059	<0.268	<0.213	<0.320	7.43	<0.002	<0.213	0.134	19.1	<0.1666	<33.2	0.004	<0.868	<0.004	0.011
		7.90	<0.059	<0.268	<0.213	0.486	12.3	<0.002	<0.213	0.235	9.48	<0.1666	<33.2	0.002	<0.868	<0.004	0.012

Figure 4-7m: Core S5 - Al, Fe porewater concentrations

Figure 4-7n: Core S5 - Pb, Zn porewater concentrations

Figure 4-7o: Core S5 - As, Co, Sb porewater concentrations

decreasing concentrations. At core S2, Zn showed no observable trend in the concentration profile and at core S4 Zn showed a decreasing concentration profile with depth.

At cores S1, S3, S4 and S5, there was only one data point where Pb was reported above the method detection limit and therefore no concentration profile trends were observed.

At Core S2, Pb concentrations demonstrated increasing concentrations with depth.

Antimony demonstrated relatively constant concentrations with depth at S1 and S2.

Cores S4 and S5 demonstrated increasing concentrations to a depth of 50cm followed by decreasing concentrations.

At cores S3 and S5, As and Co concentrations increased to a depth of 50cm followed by decreasing concentrations. At cores S1 and S4 no trends were observed and at core S2 both As and Co concentrations increased with depth.

4.6 Porewater Field Parameters Chemistry

Table 4-3 presents the field chemistry results collected from the groundwater samples.

Concentrations of ferric iron and HS^- were low. The maximum ferric iron (Fe(II)) concentration was reported at 2.0 mg/l for MW4 and the maximum HS^- concentration was reported at 0.4 mg/l for MW1.

Table 4-3: Monitoring wells groundwater field chemistry

Parameter	Units	MW1	MW2	MW3	MW4	MW5	MW6	MW7
HS	mg/l	0.40	nd	0.10	0.10	nm	0.15	0.1
Fe(II)	mg/l	1.0	nd	0.05	2.0	0.10	nd	0.80
SO4	mg/l	1800	100	130	50	220	150	50
DO	mg/l	2.23	0.34	0.25	3.52	3.68	2.92	4.98
cond	uS/cm	349	346	80.0	53.0	198	386	593
pH		6.93	6.59	6.66	6.48	7.60	7.55	7.40
temp	C	11.3	13.5	19.5	16.9	20.5	16.2	16.3
alk	mg/l	230	266	130	423	nm	178	nm
Cl	mg/l	nm	90	15	2.2	7.5	30	nm

Notes

nm not measured

nd not detected

Sulfate concentrations ranged from 50 to 220 ppm with the exception of MW1, which had an elevated concentration of 1800 mg/l. It is not clear as to the reason for the dramatic difference. Conductivity values ranged from 593 μ S/cm at MW7 to 53 μ S/cm at MW4. The pH remained relatively similar for all monitoring wells, ranging from 6.5-7.60.

Figures 4-8a through to 4-8o present the porewater concentration profiles for ferric iron, sulfate, sulfide, alkalinity, pH, and dissolved oxygen with depth measured from the five

cores collected in September 2004. A reduction in sulfate concentration with depth was observed in all of the cores. Only cores S3, S4, and S5 showed increased or even measurable concentrations of Fe(II) and HS⁻ with depth, a further indication of the development of reducing conditions with depth.

The alkalinity was highly variable ranging from 10 mg HCO₃/l to 415 mg HCO₃/l. Alternatively, the pH values were relatively consistent throughout the entire porewater profile with the pH averaging 7.0 (std. dev 0.87).

Based on the above results, it appears that anoxic conditions have developed in cores S1, S2, S4, and S5. At cores S1 and S2, the dissolved Fe concentrations increased with depth and the Zn and Pb concentrations decreased with depth. This may be indicative of the formation of metal sulfides. Also, there would most likely be some competition among Zn, Pb, and Fe for sulfide. This is further supported by the strong sulfate reduction observed for these cores and the lack of measurable H₂S concentrations at these core locations. Cores S4 and S5 showed decreased concentrations of Fe, Zn, and Pb with depth and measurable H₂S with depth as well. There could be more reduced sulfides at this location, which would allow all metals to form metal sulfide precipitates at this location.

At Core S3, decreased concentrations of As, Co and Fe were observed with depth and increasing concentrations of Zn were observed with increasing depth. This core is located at the confluence of Mill Creek with Farr Creek and as such, localized zones of

oxidation could be expected. This would suggest that Fe oxides exist and As and Co may adsorb to or coprecipitate with these Fe oxides. H₂S concentrations were measured at this location and sulfate reduction was clearly occurring as well. There could also be competition between As, Co, and Zn for sulfides and sorption sites onto OM.

4.7 Surface Water Chemistry

Table 4-4 presents the surface water chemistry analytical results for selected parameters. Generally the concentrations of most compounds were consistent throughout the entire wetland. The electrical conductivity measured throughout the wetland ranged from 69.4 to 308.6 $\mu\text{S}/\text{cm}$, which is typical of most freshwaters. SW9, located in the hummocky area approximately 300 m northwest of SW8 (Figure 3-3), showed elevated concentrations relative to all of the remaining surface water samples. The dissolved oxygen at this location was much lower (1.2 mg/l) than at the remaining sampling locations. The surface water at this location was only a few cm deep and was not connected to the rest of Farr Creek and Mill Creek. Therefore, the surface water concentrations are most likely more representative of local geochemical transformations between the surface water, porewater and sediments than the bulk stream flow concentrations, as is the case for the rest of the surface water samples collected.

Table 4-4: Surface water Chemistry for selected parameters

Parameter Units Detection Limit Sample ID	pH pH units 0.010	DO mg/L 0.010	Temp C 0.010	Conductivity uS/cm 0.100	Alkalinity mg/L 0.010	Hardness (as CaCO3) mg/L 1.000	Cl mg/L 0.500	SO4 mg/L 1.000	Al mg/L 0.005	Sb mg/L 0.001	As mg/L 0.001	Ba mg/L 0.001	Be mg/L 0.001	Bi mg/L 0.020	B mg/L 0.005	Cd mg/L 0.001	Ca mg/L 0.020	Cr mg/L 0.001
SW2	8.37	9.30	12.3	148	31.0	73.0	1.00	6.00	0.038	0.002	0.064	0.004	<0.001	<0.020	0.013	<0.001	21.4	0.001
SW3	8.06	11.4	11.7	103	60.5	75.0	1.00	6.00	0.044	0.002	0.074	0.005	<0.001	<0.020	0.015	<0.001	21.8	0.001
SW5	8.13	11.3	12.0	127	72.0	85.0	5.10	7.00	0.034	0.004	0.151	0.005	<0.001	<0.020	0.018	<0.001	25.1	0.001
SW6	8.13	11.5	12.2	126	62.0	83.0	4.00	7.00	0.04	0.004	0.14	0.005	<0.001	<0.020	0.021	<0.001	24.4	0.001
SW7	8.12	11.4	4.10	127	61.0	85.0	4.00	7.00	0.044	0.004	0.141	0.005	<0.001	<0.020	0.026	<0.001	25.1	0.001
SW8	8.15	11.5	12.2	128	68.0	84.0	4.00	7.00	0.036	0.004	0.142	0.005	<0.001	<0.020	0.020	<0.001	24.8	0.001
SW9	7.28	1.20	13.0	309	172	202	13.9	5.00	0.016	0.004	1.490	0.012	<0.001	<0.020	0.016	<0.001	59.8	0.001
SW12	7.68	8.20	15.8	144	72.0	89.0	4.40	6.00	0.036	0.004	0.287	0.005	<0.001	<0.020	0.022	<0.001	26.1	0.001
SW16	7.72	9.68	17.8	147	68.0	84.0	4.00	6.00	0.041	0.005	0.283	0.004	<0.001	<0.020	0.025	<0.001	25.0	0.001
SW13	7.42	6.70	16.4	172	75.0	98.0	5.90	6.00	0.034	0.003	0.347	0.006	<0.001	<0.020	0.025	<0.001	29.1	0.001
SW15	8.22	11.6	17.3	148	73.0	91.0	4.40	6.00	0.030	0.004	0.347	0.004	<0.001	<0.020	0.022	<0.001	27.0	0.001
SW14	7.47	6.76	16.7	175	83.0	99.0	6.10	6.00	0.035	0.004	0.374	0.006	<0.001	<0.020	0.026	<0.001	29.4	0.001
SW11	7.37	5.96	14.5	69.4	83.5	103	6.30	6.00	0.033	0.003	0.378	0.006	<0.001	<0.020	0.026	<0.001	30.7	0.001
SW1	7.82	10.7	19.3	247	32.0	113	11.0	7.00	0.027	0.006	0.500	0.006	<0.001	<0.020	0.021	<0.001	33.6	0.001
SW10	7.53	7.16	14.6	168	82.0	103	6.60	6.00	0.033	0.003	0.411	0.006	<0.001	<0.020	0.023	<0.001	30.5	0.001

Parameter Units Detection Limit Sample ID	Co mg/L 0.001	Cu mg/L 0.002	Fe mg/L 0.005	Pb mg/L 0.001	Mg mg/L 0.010	Mn mg/L 0.001	Mo mg/L 0.001	Ni mg/L 0.010	P mg/L 0.100	K mg/L 0.100	Si mg/L 0.010	Ag mg/L 0.001	Na mg/L 0.200	Sr mg/L 0.001	Sn mg/L 0.050	Ti mg/L 0.005	U mg/L 0.001	Zn mg/L 0.005
SW2	0.001	0.003	0.020	<0.001	4.83	<0.001	0.001	<0.010	<0.100	0.200	1.65	<0.001	1.00	0.029	<0.050	<0.005	<0.001	0.007
SW3	0.001	0.003	0.032	0.001	4.89	0.006	0.001	<0.010	<0.100	0.300	1.65	<0.001	1.00	0.029	<0.050	<0.005	<0.001	<0.005
SW5	0.006	0.003	0.041	<0.001	5.45	0.010	0.001	<0.010	<0.100	0.400	1.59	<0.001	3.80	0.033	<0.050	<0.005	<0.001	<0.005
SW6	0.005	0.003	0.037	<0.001	5.34	0.010	0.001	<0.010	<0.100	0.400	1.61	<0.001	3.30	0.033	<0.050	<0.005	<0.001	<0.005
SW7	0.005	0.003	0.038	<0.001	5.39	0.009	0.001	<0.010	<0.100	0.300	1.63	<0.001	3.40	0.035	<0.050	<0.005	<0.001	<0.005
SW8	0.005	0.003	0.037	<0.001	5.38	0.009	0.001	<0.010	<0.100	0.300	1.58	<0.001	3.40	0.033	<0.050	<0.005	<0.001	<0.005
SW9	0.073	<0.002	0.016	<0.001	12.7	0.024	0.008	0.010	<0.100	1.300	3.15	<0.001	9.50	0.106	<0.050	<0.005	<0.001	<0.005
SW12	0.006	0.003	0.067	<0.001	5.63	0.008	0.001	<0.010	<0.100	0.400	1.38	<0.001	3.90	0.035	<0.050	<0.005	<0.001	<0.005
SW16	0.006	0.004	0.068	0.001	5.32	0.013	0.001	<0.010	<0.100	0.300	1.50	<0.001	3.50	0.034	<0.050	<0.005	<0.001	<0.005
SW13	0.007	0.003	0.084	0.001	6.28	0.015	0.001	<0.010	<0.100	0.400	1.43	<0.001	5.00	0.040	<0.050	<0.005	<0.001	<0.005
SW15	0.009	0.004	0.093	0.001	5.73	0.014	0.001	<0.010	<0.100	0.400	1.09	<0.001	4.00	0.036	<0.050	<0.005	<0.001	<0.005
SW14	0.007	0.003	0.088	0.001	6.33	0.012	0.001	<0.010	<0.100	0.500	1.36	<0.001	5.10	0.040	<0.050	<0.005	<0.001	<0.005
SW11	0.015	0.003	0.213	0.001	6.32	0.031	0.001	0.010	<0.100	0.600	1.10	<0.001	5.30	0.045	<0.050	<0.005	<0.001	<0.005
SW1	0.015	0.004	0.148	0.001	7.02	0.049	0.003	<0.010	<0.100	0.600	0.84	<0.001	8.00	0.046	<0.050	<0.005	<0.001	<0.005
SW10	0.014	0.003	0.146	0.001	6.52	0.045	0.001	<0.010	<0.100	0.500	1.21	<0.001	5.50	0.042	<0.050	<0.005	<0.001	<0.005

4.8 Vegetation

Table 4-5 presents the results of selected metal extractions from the cattail (*Typha latifolia*) leaf samples collected (refer to Appendix B for the complete chemical analysis results). As can be seen from the table, significant concentrations of selected metals were taken up into the leaf samples. Much higher metal concentrations were extracted from the leaf samples collected near the wetland inlet and MW1. Higher metal concentrations are expected due to higher loadings at the wetland inlet. This observation is supported by other studies (O'Sullivan et al, 2004; Miller et al., 1983). Background conditions were not known for the *Typha latifolia* in the area, however, the vegetation was flourishing in the area and thus it was not expected that the presence of metals at these concentrations were having a negative effect on *Typha latifolia*. There was also considerable variability between sample locations. This could most likely be attributed to variations in metal loadings at each location.

4.9 Microbiology

Figures 4-9a through to 4-9e present the results from the bacterial enumerations. As can be seen from these figures, the bacterial populations were relatively constant with depth. Also, there appeared to be equally strong acid producing (oxidizing) bacteria as there were reducing bacteria.

Table 4-5: Extracted metal concentrations from cattail samples

Sample ID	Element Units	Al ppm	As ppm	Co ppm	Cr ppm	Cu ppm	Fe ppm	Hg ppm	Mn ppm	Na ppm	Si ppm	Zn ppm
INLET(1)	mg/l	4280	182	171	22.5	19.7	3020		663	1890	216	98.1
Core S1	mg/l	95.0				13.8	145	153	336	2390	217	52.2
Core S3	mg/l	201	146	9.38	11.3	11.9	335		678	1440	251	58.1
MW1	mg/l	111			13.1	10.3	180	20.0	229	2230	311	66.6
MW3	mg/l	138	184		10.0	7.50	212	8.13	375	1740	192	50.3
MW6	mg/l	872		23.1	15.0	14.4	1050	21.9	438	848	286	65.3
MW7	mg/l	302	80.0	13.4		15.6	380	8.75	218	2980	278	75.0

At core S1 all three types of bacteria were prevalent with population densities ranging from 100 MPN/(grams dry weight (gdw)) to greater than 10^7 MPN/gdw. APBs showed the highest concentrations, however, they also exhibited a decreasing population trend with depth. SRB populations decreased significantly below a depth of 50 cm, whereas the IRB population remained relatively constant throughout the depth of the core.

At core S2 all three types of microbial populations demonstrated similar populations averaging between 100 – 1000 MPN/gdw. The IRBs appeared to decrease in population with depth and the SRB populations increased to a depth of approximately 50 cm and then began to decrease. The APB populations demonstrated a reversed trend to that of the SRBs.

At core S3 all three types of microbial populations had similar population numbers, ranging from 100 to 10,000 MPN/gdw. The SRBs remained relatively constant with depth and the APB populations increased slightly with depth. The IRB populations decreased to a depth of 50 cm and then began to increase.

At core S4 all three microbial populations reported similar values ranging from 100 to 10,000 MPN/gdw. SRB populations exhibited a sharp increase below 45 cm. The IRB populations remained fairly constant throughout the entire depth of the core and the APBs showed a slight increase with depth.

As with the other cores, all three microbial populations exhibited similar population values at core S5. IRB and APB populations decreased slightly with depth. The SRB population decreased to a depth of 50 cm and then appeared to stabilize.

The presence of all three types of microorganisms throughout the entire wetland and at consistent concentrations with depth at each core location may suggest that both oxic and anoxic conditions exist throughout the wetland.

4.10 Mass distribution of metals between phases

Table 4-6 presents the mass distribution of As, Co, Cu, Sb, Pb, and Zn through the sediments, porewater, surface water, and vegetation samples at each core location. For most metals, over 80% of the total mass was tied up in the sediments, either as primary or secondary minerals, precipitated sulfides, adsorbed onto organic, or on oxide fractions in the sediments. This is consistent with a previous study conducted by O'Sullivan et al.(2004). Less than 5% of the total mass of metals was associated with the porewater, which indicates that this wetland appeared to be successful in immobilizing metals, at least in the short term. Up to 20% of the metals have been taken up by *Typha latifolia*. Studies have shown that metal uptake by plant materials can be over 90% of the total mass distribution (Mays and Edwards, 2001; Zayed et al., 1998; Jackson et al., 1991). There was a large fluctuation (non-detect to 20%) of metals being taken up by *Typha latifolia* at different core locations. This could be attributed to differential loading of

Table 4-6: Mass Distribution of Heavy metals between solid, dissolved and vegetative uptake phases

Core 1	Concentration As	Percent Distribution As	Concentration Co	Percent Distribution Co	Concentration Cu	Percent Distribution Cu	Concentration Zn	Percent Distribution Zn	Concentration Sb	Percent Distribution Sb	Concentration Pb	Percent Distribution Pb
vegetation	nd	nd	nd	nd	12.1	3.80	59.4	11.67	nd	nd	nd	nd
Sediment	2420	99.59	571	99.95	305	96.14	449	88.28	203	99.53	401	99.86
Pore Water	5.20	0.21	0.294	0.05	0.180	0.06	0.238	0.05	0.963	0.47	0.549	0.14
Surface Water	0.38	0.02	0.015	0.00	0.003	0.00	nd	nd	0.003	0.00	0.001	0.00
total	2430		572		317		509		204		401	
Core 2												
vegetation	182	11.49	171	23.39	19.7	6.48	98.1	17.48	nd	nd	nd	nd
Sediment	1400	88.43	561	76.58	284	93.49	463	82.48	nd	nd	417	99.90
Pore Water	1.20	0.08	0.224	0.03	0.088	0.03	0.218	0.04	0.393	99.49	0.425	0.10
Surface Water	0.074	0.00	0.001	0.00	0.003	0.00	nd	nd	0.002	0.51	0.001	0.00
total	1583		732		304		561		0.395		418	
Core 3												
vegetation	113	4.10	15.3	2.58	14.0	3.21	66.1	14.10	nd	nd	nd	nd
Sediment	2640	95.82	578	97.39	421	96.77	402	85.77	71.3	96.13	466	99.94
Pore Water	2.08	0.08	0.187	0.03	0.087	0.02	0.586	0.12	2.87	3.87	0.269	0.06
Surface Water	0.151	0.01	0.006	0.00	0.003	0.00	nd	nd	0.004	0.01	0.004	0.00
total	2755		594		435		469		74.2		467	
Core 4												
vegetation	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Sediment	1940	99.82	619	99.93	407	99.98	508	99.97	159	98.55	487	99.95
Pore Water	2.12	0.11	0.357	0.06	0.068	0.02	0.161	0.03	2.33	1.45	0.256	0.05
Surface Water	1.43	0.07	0.073	0.01	nd	nd	nd	nd	0.004	0.00	nd	nd
total	1944		619		407		508		161		487	
Core 5												
vegetation	184	5.82	nd	nd	10.0	2.51	50.3	9.02	nd	nd	nd	nd
Sediment	2980	94.11	727	99.95	389	97.47	507	90.94	128	98.96	432	99.91
Pore Water	1.83	0.06	0.374	0.05	0.102	0.03	0.171	0.03	1.33	1.03	0.405	0.09
Surface Water	0.29	0.01	0.006	0.00	0.003	0.00	nd	nd	0.004	0.00	nd	nd
total	3167		727		399		557		129		432	

Notes:

nd

Not detected

metals in different locations of the wetlands or it could be associated with a mechanism from the plant itself preventing metals from being taken into their leaves.

4.11 Discussion

This natural wetland appears to be an overall sink for metals, with the majority of the metals being tied up in the sediments or being taken up into the leaves of *Typha latifolia*. A detailed mass balance would confirm this; however, insufficient data were collected for such a calculation in this project, but would be worthwhile in future studies. The results from the sequentially extracted metals (SEM) indicated that much of the metals were associated with the residual and OM fractions of the sediment.

Previous studies (Fuller et al., 1993; Lagmuir et al., 1999; Soprovich, 1995) have shown that As has a high affinity for Fe oxides and oxyhydroxides. The results from the SEMs indicated that much of the Fe was associated with the residual fraction of the sediment and not the oxide fraction (refer to Appendix B). As a result, much of the As was associated with the residual and OM fractions of the sediment. These results may indicate that As can be retained significantly under both reducing and oxidizing conditions given sufficient quantities of Fe oxides and OM. Also, Doyle and Otte (1999) reported that in the presence of Fe and Mn oxides and OM, metals will tend to be associated with these fractions. Under more reducing conditions, where sulfate is not limiting, metal sulfides are the predominant removal mechanism (Machemer et al., 1993; Yu et al., 2001).

Previous studies have concluded that most of the extracted metals from treatment wetlands for mine drainage are associated with the residual fraction of the sediment (O'Sullivan et al., 2004; Sobolewski, 1996). Metals associated with the residual fraction are likely in the form of metal sulfides and are relatively unavailable for uptake by organisms (Allen et al., 1993).

Zinc and copper were predominantly associated with the OM and residual fractions of the sediments. Co and Pb were also predominantly associated with the residual fraction, however, they were also significantly associated with carbonates. Both Pb and Co have known affinities for carbonates (Brookins, 1988) and therefore competition for sorption sites between OM and carbonates are likely. Nickel and antimony were both almost solely associated with the residual fraction of the sediment indicating that they were likely still in the form of primary or secondary minerals from the tailings.

The porewater sulfate and sulfide concentrations profiles indicated that sulfate reduction was occurring throughout the wetland. The microbiology results identified the presence of APB populations in consistent numbers with the SRB and IRB populations. This may indicate that all these bacteria are active and the acid produced by these populations is immediately neutralized by the dissolution of carbonate minerals within the tailings. Above pH 6.3, which was the case throughout much of the study area, the dissolution of one mole of calcite consumes one mole of H^+ as shown in the following equation:

This would also account for the elevated dissolved concentrations of Ca^{2+} in the pore water. It is also possible that APB populations are supported at depth throughout the wetland in the vicinity of vegetation root zones. Oxygen is transported by wetland plants to the root zones generating localized zones of oxidation. This could allow for sustainable populations of APBs throughout the wetland. In regions located away from the root zones, conditions are likely anoxic which are favourable conditions for IRB and SRB populations.

It is also likely from the microbiology results that there is considerable competition between bacteria species for organic substrates. This was supported by changes in population trends at different locations within the study area where there were only small changes in sulfate and reduced Fe concentrations. Previous studies have shown the competitiveness between SRBs and IRBs, which appears to be dependent on electron donor availability and pore water chemistry (Rioux and Fortin, 2002). It should also be noted that Fe reduction can occur both biotically and abiotically, whereas sulfate reduction can only proceed with the aid of SRBs (Fortin, 2002).

The AVS and CRS data reported herein were inconclusive in determining whether biogenic metal sulfides were being produced within the wetland. Stable sulfur isotope fractionation can be used as indicators for microbial sulfate reduction because biogenic sulfides generally display a unique isotopic composition due to the fact that SRB

preferentially utilize the lighter sulfur isotope ^{32}S , leaving pore fluids enriched in ^{34}S (Praharaj and Fortin, 2004). In order to accurately quantify the amount of sulfate being reduced biogenically, stable sulfur isotope fractionation may be employed but was not attempted in this thesis. Quantification of sulfate reduction simply based on measurements of porewater sulfate and sulfide concentrations is inaccurate due to concurrent abiotic geochemical transformations such as the dissolution of gypsum (CaSO_4), or the precipitation of reduced sulfur in the form of iron sulfides (Anderson and Lovely, 2000). A wide range of factors may influence sulfur isotope fractionation. Such factors include heterogeneity, carbon source variations and limitations, microbial diversity, and geochemical reactions including changing redox conditions (Kleikemper et al., 2004). Generally, at sites where re-oxidation is not important, determining sulfate reduction rates using stable sulfur isotope fractionation may prove to be useful (Spence, 2001).

The results from the extraction of metals from *Typha latifolia* leaf samples indicated that up to 20% of the total mass of metals was taken up by the leaves. Previous studies have reported metal uptake in both the leaves and root zones of *Typha latifolia* and found much higher percentages of metals associated with the roots than the leaves (Deng et al., 2004; Jackson et al., 1993). This suggests that phytoremediation may be an even more powerful source of metal immobilization in this wetland. There has been conflicting research on the ability of wetland plants to immobilize metals in the long term. This is in part due to the fact that plants transport oxygen to their root zones generating a zone of radial oxygen loss. This can result in the generation of localized oxic conditions in the

immediate vicinity of the roots which can further cause reduced sulfur and iron species to oxidize. Under these conditions metals such as As and Co may adsorb or coprecipitate with the Fe oxides, however, metals such as Zn would likely remain mobilized in the dissolved state (Jacob and Otte, 2004).

The wetland was covered with *Typha latifolia* and there did not appear to be any limitation on the growth of this plant species. It is possible, however, that the growth of other wetland plants was inhibited due to elevated metal loading to the wetland system. In addition, background metal concentrations in *Typha latifolia* and other vegetation species in the area were not known. This would aid in determining the degree of metal uptake by *Typha latifolia* as a direct result of the mine tailings deposits.

5.0 GEOCHEMICAL SPECIATION MODELLING

The following section gives background information on MINTEQA2, a geochemical speciation modeling program developed by the USEPA (Section 5.1), summarizes the methodology employed for the modeled simulations (Section 5.2), provides the results of the modeled simulations (Section 5.3), and presents and discusses the results of the modeling and how it applies to each core location (Sections 5.4 and 5.5). Raw data produced from the modeling runs are provided in Appendix C.

5.1 Background on MINTEQA2

MINTEQA2 was developed by the USEPA to predict equilibrium behavior of various metal species in dilute solutions. Input data required for the model consist of the chemical data of the sample to be analyzed, such as dissolved concentrations of the components of interest, pH, pe, partial pressures of gases or minerals (Allison et al., 1991). Also included in the model is an extensive thermodynamic database for a wide range of components of interest to environmental systems, however, the user may add new components and their corresponding thermodynamic information to this database. The model solves equilibrium speciation problems by solving simultaneous solution of nonlinear mass action expressions and linear mass balance equations (Allison et al., 1991). The model uses initial estimates for the activity of each component to calculate the concentration of each species according to mass action expressions that are written in terms of its component activities (Allison et al., 1991). The total mass of each

component is calculated, based on mass action expressions, and is then compared with the known input total mass for each component. Once the calculated total mass for each component is within the error tolerance limit for each component the corresponding solution is accepted. After equilibrating the aqueous phase, the model then computes the saturation indexes (SI) of all the possible solids with respect to the solution. The solid with the most positive SI is allowed to precipitate and the solution is then re-equilibrated after the mass has changed in the aqueous phase. This iteration is repeated until the change in SI indices for all species does not result in a species becoming precipitated or dissolved (Allison et al., 1991).

MINTEQA2 can also incorporate an adsorption routine into the model. MINTEQA2 has seven different adsorption models to choose from: activity Kd model, activity Langmuir model, activity Freundlich model, ion exchange model, constant capacitance model, triple layer model, and diffuse layer model.

An adsorption surface is created by the user with specific adsorption site information. Reactions are then defined by the user between components and the adsorption site(s). The solution is equilibrated with the surface species treated mathematically as aqueous species with constraints specified by the adsorption model. When the equilibrium composition is determined, the equilibrated mass distribution between dissolved, sorbed, and solid phases is computed and reported (Allison et al., 1991).

5.2 Model Runs

27 model runs were performed, 9 of which included adsorption. Table 5-1 lists the locations and depths for each run.

Table 5-1: Location and depth for each modeled run

Location	Depth (cm)
MW1	49
MW2	87
MW3	81
MW4	107
MW5	34
MW6	49
MW7	105
S1*	45
S1*	75
S2	15
S2*	45
S2	130
S3*	45
S3*	75
S4*	23.5
S4*	45
S5*	23.5
S5*	75

Notes:

* Additional modeled run including adsorption (activity Kd model)

The depths that were selected from the September cores to be included in the geochemical modeling were those that had adequate cation and anion input parameters for the model. The activity Kd adsorption model was used for the adsorption runs. No specific adsorption experiments were conducted. The results from the sequential

extractions indicated significant heavy metal enrichments in the organic matter fractions of the sediment. It was also observed that significant metal adsorption occurred onto iron and manganese oxide surfaces and carbonate mineral surfaces. As such, the results from the sequential extractions were used to derive Kd sorption coefficients for use in the activity Kd adsorption model. The output files from all the modeling results are provided in Appendix C. The following assumptions were made for modeling purposes:

- 1) The pore water analytical chemistry was representative of equilibrium conditions
- 2) The Kd sorption coefficient was calculated from the sequential extraction data. It was assumed that heavy metals (specifically As, Co, Cu, Sb, and Zn) associated with the carbonate, Fe and Mn oxide, and organic matter fractions of the sediment were involved in adsorption/coprecipitation reactions and that these concentrations were in equilibrium with the dissolved phase concentrations. The Kd values were calculated for each of the above mentioned metals at each location modeled, by summing up their solid phase concentration from the carbonates, oxides, and organic matter fractions and dividing this number by the corresponding dissolved phase porewater concentration, as shown in equation 5-1 below:

$$Kd = \frac{\sum (M_{sc} + M_{so} + M_{som})}{\sum M_{aq}} \quad [\text{Equation 5-1}]$$

Where:

M_{sc} = Concentration of metals associated with carbonate fraction (mg/kg)

M_{so} = Concentration of metals associated with Fe and Mn oxides fraction (mg/kg)

M_{som} = Concentration of metals associated with organic matter fraction (mg/kg)

M_{aq} = Concentration of metals in porewater (mg/l)

- 3) MINTEQA2 requires the user to input As, Fe and Sb concentrations in either their more oxidized form or more reduced form. For As, it was assumed that As was predominantly in the form of H_3AsO_4 based on the eh-pH condition. H_3AsO_3 was also included as a component in the model in the form of a redox reaction with H_3AsO_4 . It was assumed that most of the dissolved Fe was in its reduced form of Fe^{2+} , however, Fe^{3+} was also included as a component via its redox reaction. Similarly Sb was assumed to be primarily in the form of $Sb(OH)_3$ based on the Eh-pH condition, however $Sb(OH)_6^-$ was also included as a component via its redox reaction with $Sb(OH)_3$. These species were chosen based on the Eh and pH conditions of the porewater (Brookings, 1988).
- 4) Assumed value for sediment bulk density was 2 kg/L based on literature (Brady and Weil, 1996).

5.3 Results

5.3.1 Modeled Runs without Adsorption

Generally, all 18 modeled runs without adsorption showed very little difference in all dissolved phase concentrations. The one exception with almost every run was the pH. The modeled pH differed significantly from the initial field measured pH. In

MINTEQA2, the user can fix the pH such that it will not change throughout the modeling process. This was attempted; however, the model was unable to reach equilibrium conditions when this was specified. Table 5-2 summarizes the pH differences between initial field measured pH and modeled pH results.

The differences in pH change between measured and modeled values ranged from 0.09 to 3.99. There appeared to be a slightly better convergence in the core pore water samples than those obtained from the monitoring well data. It should also be noted that the modeled pH was lower than the initial pH for all the core samples with the exception of S1 at 75 cm depth, S2 at 15 cm depth and S5 at 23.5 cm depth. Conversely, the modeled pH was higher than the initial pH for all monitoring wells.

All of the modeled runs reported the formation of iron and manganese oxides and oxyhydroxides, aluminum oxides, antimony hydroxides, and carbonate minerals. Sulfide precipitates were only reported for core S4 at a depth of 23.5cm, core S5 at a depth of 75cm, MW1, MW3, MW4, MW6, and MW7. This may indicate that at these locations, strongly reducing conditions were maintained.

Table 5-2: Percent Difference of pH values for modeled runs without adsorption

Location	Depth (cm)	Initial pH	Modeled pH	Difference
MW1	49	7.55	9.39	1.84
MW2	87	6.6	10.13	3.53
MW3	81	6.66	9.77	3.11
MW4	107	6.48	10.47	3.99
MW5	34	7.6	9.8	2.2
MW6	49	7.55	10.34	2.79
MW7	105	6.6	10.19	3.59
S1	45	7.1	5.3	-1.8
S1	75	6.8	9.48	2.68
S2	15	6.18	6.27	0.09
S2	45	7.2	5.48	-1.72
S2	130	7.48	6.91	-0.57
S3	45	7.9	6.36	-1.54
S3	75	7.97	7.05	-0.92
S4	23.5	7.6	5.51	-2.09
S4	45	7.64	5.97	-1.67
S5	23.5	5.42	8.96	3.54
S5	75	5.92	5.68	-0.24

5.3.2 Modeled runs with Adsorption

The dissolved phase concentrations for components involved in adsorption (As, Co, Cu, Zn) showed significant differences from the measured concentrations. In some instances, the dissolved phase concentrations of the modeled species were up to four orders of magnitude smaller than the actual measured concentrations. This was attributed to the very large K_d sorption coefficients calculated. The assumption that the solid phase concentrations are in equilibrium with the aqueous phase and the assumption that there are an infinite number of sorption sites was probably presumptuous. It is likely that

adsorption sites are limited and best represented by a more detailed model than a linear adsorption isotherm model.

With respect to the precipitates formed, there were only minor changes. Generally there were less precipitates formed under the adsorption conditions. Only Co, Zn, and Cu precipitates were affected.

5.4 Discussion of Modeling Results from Each Core Location

Core S1

The geochemical speciation modeling results from Core S1 did not show the production of sulfide precipitates, however, the results from MW1, also located within 30 m of core S1 indicated the formation of metal sulfide precipitates, including orpiment, CoS, and FeS at a depth of 49 cm. At this location, there was over 30 cm of standing water which would enhance the establishment of reducing conditions.

Core S2

The geochemical modeling results for core S2 showed the formation of iron oxide minerals and carbonate precipitates, an indication that oxic conditions may have been present at greater depth.

Core S3

The results from the geochemical modeling from this core location did not indicate the precipitation of metal sulfides. The detected pore water concentrations of sulfides and reduced Fe may suggest that there was insufficient concentrations of metals and sulfides to form precipitates. There may also be competition with metals adsorbing onto the organic matter as the organic matter content of the sediments at this location increased with depth. A significant number of oxide minerals were reported to be supersaturated from the modeling results. The geochemical modeling results for MW6 (49 cm depth) and MW 7 (105 cm depth), both located near core S3 did report the formation of metal sulfide precipitates.

Core S4

Geochemical speciation modeling analysis completed for this core location indicated the production of metal sulfides near the surface (23.5 cm); however, no sulfide precipitates were reported at 45 cm depth. It is suspected that sulfide precipitates were being formed at deeper depths in light of the sulfate and reduced iron pore water chemistry. Several iron oxides and carbonate minerals were also reported to be supersaturated with respect to their dissolved concentration, which could equally have provided metals with additional adsorption sites.

Core S5

The geochemical modeling completed for this core reported the formation of metal sulfide precipitates at a depth of 75 cm. The modeling results from MW3, also located near core S5, reported the formation of metal sulfide precipitates at a depth of 81 cm. The organic matter profile for the core noted over 30% organic matter content near the surface, followed by a rapid decrease with depth. The presence of such high organic matter contents near the surface most likely enhanced the formation of reducing conditions with depth.

5.5 Discussion

The modeling results from some of the cores clearly indicated the formation of metal sulfides (cores S1, S4, and S5). At all core locations Fe, Mn and Al oxides and/or oxyhydroxide precipitates were reported. This would suggest that both oxic and anoxic conditions existed throughout the wetland. This statement is further supported by the results from the microbiological analysis where both oxidizing and reducing bacteria were present at similar population levels. The porewater chemistry also noted consistent sulfate reduction throughout the wetland and the formation of H₂S.

Core S2 was collected just upstream of a make-shift washed out gravel dam. This dam separates Crosswise Lake from Farr Creek. It is possible that aerobic lake water seeps through the sediment generating intermittent oxic conditions in the vicinity of core S2. In

addition, core S3 is located at the confluence of Mill Creek with Farr Creek and it is likely that some localized oxidation arises due to the mixing of these waters. Therefore, in the vicinity of these cores there may have been limited formation of permanent sulfide precipitates due to the existence of localized zones of oxidation. Any sulfides that may have formed likely diffused to areas of low sulfide concentrations and quickly became re-oxidized to sulfate. Thus, metal movement and distribution under these conditions were likely regulated by other geochemical processes, such as adsorption to OM, carbonates, and/or oxides surfaces, and uptake by vegetation.

6.0 CONCLUSIONS

The metals of concern for this wetland system were As, Co, Cu, Zn, Pb, and Sb. This wetland is clearly a sink for these metals, with over 75% of the metals tied up in the sediments. The results of the current study also indicated that several mechanisms have been responsible for the metal attenuation within this wetland system. Phytoremediation, specifically with cattails (*Typha latifolia*), appeared to attenuate significant quantities of selected metals. The results from the microbiological analysis indicated that both oxidizing and reducing bacteria were abundant throughout the wetland system and the reported populations of APB, SRB and IRB were all within an order of magnitude of each other. This would suggest that both oxic and anoxic geochemical processes were prevalent throughout this system. It is likely that the presence of localized oxic zones in the vicinity of root zones of *Typha latifolia*, supported the APB populations observed. The modeling data further supported the occurrence of concurrent oxic and anoxic conditions throughout the study area as both Fe, Mn and Al oxides and/or oxyhydroxides and metal sulfide precipitates were reported throughout the wetland system. The porewater chemistry also reported consistent sulfate reduction profiles.

The SEM results indicated that much of the metals retained in the sediments were associated with the residual and OM fractions. Arsenic was most strongly associated with the residual and OM fractions of the sediment. However, it has been well documented in the literature that As adsorbs to or coprecipitates with Fe and Mn oxides quite readily, thus given the presence of adequate Fe and Mn oxides under oxidizing

conditions and adequate sulfides or OM under reducing conditions, As is likely to be well attenuated in this wetland. Lead and Co were mainly associated with the residual, OM, and carbonates fraction of the sediments. Both Co and Pb have known affinities for carbonates and as such there was likely competition between OM and carbonates for sorption sites.

The data collected suggests that this is a relatively stable system. Should the current state of the system change, such as the input of waste stream elevated in organic substrate, it is likely that a considerable amount of the metals retained within this system would become mobilized in the short term. Over time, the geochemical processes regulating metal mobilizations throughout the system would change resulting in different biogeochemical controls on the metals throughout this system.

Alkaline drainage systems are geochemically different than acidic drainage systems. Alkaline drainage systems can immobilize metals under both oxic conditions, such as adsorption onto OM or oxide precipitates and uptake by wetland vegetation, and under anoxic conditions via microbial transformations such as biogenic sulfate reduction generating reduced sulfides which can then form metal sulfide precipitates. Acidic drainage systems typically require the formation of strongly reducing conditions in order to immobilize metals.

These results have indicated that it is important to consider both the geochemical condition of the wetland or system being used to treat the mine drainage as well as have a

detailed understanding of the metals of concern within the mining waste, because different metals will have different geochemical interactions based on redox condition, presence of sulfides, Fe and Mn oxides, and organic matter.

7.0 RECOMMENDATIONS

The following study characterized the biogeochemistry of the wetland area in question, demonstrating that several biogeochemical processes are occurring within this system. Further research is required, however, to verify and provide more specific information on the interplay between the various attenuation pathways active at this site.

Recommendations for future work are outlined below:

1. Conduct stable isotope fractionation studies to quantify sulfate reduction rates.
2. Collect vegetation samples from both the shoots and roots to fully characterize the ability of such vegetation to both uptake metals and/or immobilize them through their root zones.
3. Characterize the difference in metal sediment concentrations within the root zones of wetland plants and in the bulk sediments away from these areas to determine the influence of adsorption onto Fe and Mn oxides and/or oxyhydroxides and organic matter in this region.
4. Conduct a detailed mass balance on the system to verify that this wetland is a net sink for metals. The mass balance should include both summer and winter sampling to assess the effect seasonality may have on the wetland system.
5. Sample several different types of wetland vegetation in the area to determine if certain species of vegetation are more tolerant of metals than others. It is known that *Typha latifolia* is quite metal tolerant.

6. Conduct more detailed adsorption studies to better quantify adsorption isotherms for metals of concern to OM, carbonate, and oxide fractions of the sediment. It would also be of interest to determine how significant competition for sorption sites among those three fractions is for metals of interest

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APPENDIX A

BOREHOLE LOGS

Borehole Logs

Core J1

Location 47.405833 N; 79.653933 W

Depth (cm)	Description
0-60	grey to brown sandy tailings
60-100	varved grey to brown silty clay
100-110	dark organic layer with woodchips
110-120	brown clay
End of hole	

Core J2

Location 47.406200 N; 79.653717 W

Depth (cm)	Description
0-137	very wet, grey to brown silty and sandy tailings
137-139	dark organic layer
139-208	Light brown clay with intermittent woodchips and roots
End of hole	

Core J3

Location 47.407617 N; 79.652717 W

Depth (cm)	Description
0-70	Grey silty, sandy tailings
70-71	coarse sand
End of hole	

Core J4

Location 47.403317 N; 79.655383 W

Depth (cm)	Description
0-70	Brown silty, sandy tailings
70-71	coarse sand
71-97	varved grey clay
97-100	dark organic layer
End of hole	

Core J5**Location** 47.402767 N; 79.656267 W

Depth (cm)	Description
0-105	grey to brown silty, sandy tailings
105-112	dark organic layer
112-142	varved grey clay
End of hole	

Core J7**Location** 47.406967 N; 79.655300 W

Depth (cm)	Description
0-65	grey to brown silty, sandy tailings
End of hole	

Core J8**Location** 47.408367 N; 79.654150 W

Depth (cm)	Description
0-100	grey to brown silty, sandy tailings, very wet
End of hole	

Core J9**Location** 47.415933 N; 79.646700 W

Depth (cm)	Description
0-20	water cover
20-67	grey to brown silty, sandy tailings, very wet
67-84	dark organic layer
84-94	grey clay
End of hole	

Core J10**Location** 47.414150 N; 79.646883 W

Depth (cm)	Description
0-22	water cover
22-42	dark organic layer
42-60	grey to brown silty, sandy tailings, very wet
60-128	dark organic layer with woodchips
End of hole	

APPENDIX B

SUMMARY OF FIELD AND LABORATORY CHEMICAL ANALYSIS RESULTS

Table B1: Sediment Water Contents and Organic Matter Contents from June and September Cores

Location	Depth (cm)	Water Content (%)	OC (%)
Core J1	15	54.7	15.0
	7.5	40.8	4.8
	22.5	32.9	2.3
	37.5	31.2	2.9
	52.5	26.4	2.1
	67.5	27.7	2.3
	82.5	24.9	2.1
	100	27.0	3.6
	115	50.8	15.5
	125	40.4	6.9
Core J2	7.5	33.1	3.4
	22.5	34.5	3.5
	37.5	26.5	1.7
	52.5	25.3	1.7
	67.5	27.0	1.8
	82.5	24.4	1.7
	97.5	25.1	1.7
	112.5	28.4	1.9
	127.5	31.7	2.3
	138	65.3	24.5
	147.5	28.3	2.3
	162.5	39.2	7.7
	177.5	42.5	13.8
	192.5	60.8	22.3
	204	47.0	11.5
Core J3	7.5	35.7	3.6
	22.5	33.6	3.0
	37.5	25.3	1.5
	52.5	22.7	1.6
	67.5	20.5	1.6
Core J4	7.5	26.7	1.9
	57.5	25.8	1.7
	22.5	25.1	1.8
	72.5	20.7	1.2
	37.5	26.6	1.8
	77.5	29.8	1.9
	57.5	26.4	1.5
	90	31.1	1.8
	97.5	71.0	31.1
	90	35.6	1.7
	106	63.6	27.4

Location	Depth (cm)	Water Content (%)	OC (%)
Core J5	7.5	22.9	1.6
	22.5	24.3	1.5
	37.5	22.0	1.5
	62.5	27.1	2.3
	77.5	23.3	1.5
	92.5	22.2	1.1
	102.5	25.7	2.2
	117.5	41.5	9.3
	132.5	35.4	3.9
	147.5	37.1	3.5
Core J7	7.5	24.2	1.0
	22.5	21.8	1.1
	37.5	20.2	1.0
	57.5	21.1	1.0
Core J8	40	22.1	1.0
	57.5	23.2	1.6
	72.5	17.9	1.0
	87.5	19.5	1.2
	102.5	18.4	1.0
	117.5	17.7	0.8
Core J9	27.5	44.5	6.7
	42.5	32.0	4.5
	57.5	41.7	12.2
	75.5	52.9	15.1
	89	31.3	3.1
Core J10	36	41.0	4.4
	55	59.7	13.2
	67.5	86.3	75.2
	82.5	82.2	66.9
	97.5	88.5	32.8
	112.5	58.3	22.8
Core S1	25	29.5	2.5
	50	39.3	2.8
	75	21.9	0.8
Core S2	25	22.1	0.8
	50	21.0	3.3
	71.5	22.8	3.2
Core S3	25	15.9	3.7
	50	24.3	6.6
	75	65.2	13.0
Core S4	25	14.6	0.8
	50	10.0	0.8
	75	11.5	0.2
	87.5	7.6	0.6
	125	17.1	0.8
Core S5	25	23.9	0.8
	50	22.5	1.0
	75	19.8	1.1

Table B2: Sediment Metal Concentrations Extracted from June and September 2004 Cores

	Wt (g)	Depth (cm)	Al	Ag	As	Au	B	Ba	Be	Bi	Ca	Cd	Co
CORE 1	0.550	15.0	7.00E+04	1.09E+03	1.82E+03	<0.019	2.93E+02	1.33E+02	3.18E+00	<0.422	5.77E+04	7.27E+00	1.20E+03
	0.248	15.0	1.60E+05	4.93E+03	6.52E+03	<0.019	6.57E+02	3.00E+02	4.55E+00	<0.422	1.38E+05	1.62E+01	2.58E+03
	0.767	7.5	5.73E+04	5.86E+03	2.66E+03	<0.019	2.31E+01	9.17E+01	4.55E+00	<0.422	4.25E+04	6.03E+00	1.07E+03
	0.559	7.5	6.80E+04	2.24E+03	2.77E+03	<0.019	2.80E+02	1.07E+02	2.24E+00	<0.422	5.01E+04	6.94E+00	1.26E+03
	0.344	22.5	1.21E+05	1.05E+04	7.35E+03	<0.019	5.09E+02	2.14E+02	4.73E+00	<0.422	9.46E+04	1.20E+01	2.54E+03
	0.573	22.5	6.98E+04	1.02E+04	5.19E+03	<0.019	2.86E+02	2.40E+02	2.40E+00	<0.422	5.72E+04	7.20E+00	1.51E+03
	0.591	37.5	6.56E+04	<0.014	3.49E+03	<0.019	2.75E+02	7.83E+01	1.90E+00	<0.422	5.99E+04	6.56E+00	9.14E+02
	0.755	37.5	5.23E+04	<0.014	3.06E+03	<0.019	2.20E+02	6.02E+01	1.49E+00	<0.422	4.78E+04	5.30E+00	7.98E+02
	1.661	52.5	1.90E+04	2.18E+03	5.92E+02	<0.019	8.28E+01	2.91E+01	7.53E+01	<0.422	1.59E+04	1.96E+00	2.85E+02
	0.190	52.5	1.44E+05	<0.014	6.97E+03	<0.019	6.07E+02	2.53E+02	3.29E+00	<0.422	1.20E+05	1.38E+01	1.97E+03
	0.560	67.5	7.01E+04	<0.014	2.09E+03	<0.019	2.75E+02	1.04E+02	2.01E+00	<0.422	5.60E+04	7.14E+00	6.45E+02
	0.516	67.5	7.22E+04	<0.014	2.04E+03	<0.019	3.01E+02	8.56E+01	2.42E+00	<0.422	5.74E+04	7.51E+00	7.39E+02
	0.690	67.5	4.42E+04	<0.014	2.28E+03	<0.019	2.17E+02	5.04E+01	1.27E+00	<0.422	3.64E+04	4.89E+00	7.92E+02
	0.593	67.5	6.16E+04	<0.014	3.71E+03	<0.019	2.64E+02	6.48E+01	2.32E+00	<0.422	5.06E+04	6.75E+00	1.13E+03
	0.733	82.5	6.91E+04	1.17E+02	4.35E+03	<0.019	2.63E+02	1.17E+02	2.56E+00	<0.422	5.13E+04	6.99E+00	1.01E+03
	0.935	82.5	5.26E+04	<0.014	3.50E+03	<0.019	2.49E+02	8.55E+01	1.37E+00	<0.422	3.88E+04	5.63E+00	8.04E+02
	0.908	100.0	4.83E+04	<0.014	9.46E+02	<0.019	1.58E+02	2.45E+02	9.16E+01	<0.422	3.06E+04	3.93E+00	2.87E+02
	0.725	115.0	5.55E+04	<0.014	1.05E+03	<0.019	1.94E+02	2.75E+02	1.10E+00	<0.422	3.55E+04	4.82E+00	3.40E+02
	0.699	115.0	9.20E+04	<0.014	2.81E+02	<0.019	2.31E+02	5.34E+02	1.72E+00	<0.422	3.69E+04	5.69E+00	1.58E+02
	0.865	125.0	9.78E+04	<0.014	2.45E+02	<0.019	2.38E+02	5.38E+02	1.79E+00	<0.422	3.85E+04	5.72E+00	1.56E+02
	0.844	125.0	6.19E+04	<0.014	1.31E+03	<0.019	1.75E+02	2.79E+02	1.30E+00	<0.422	3.51E+04	4.05E+00	3.06E+02
CORE 2	0.686	7.5	5.43E+04	<0.014	2.61E+03	<0.019	1.88E+02	2.99E+02	1.48E+00	<0.422	3.69E+04	4.59E+00	3.41E+02
	0.632	7.5	5.26E+04	<0.014	2.28E+03	<0.019	2.33E+02	7.02E+01	1.46E+00	<0.422	4.14E+04	6.01E+00	9.04E+02
	1.426	22.5	2.37E+04	6.07E+02	1.13E+03	1.14E+01	2.20E+02	7.52E+01	1.58E+00	<0.422	4.00E+04	5.54E+00	8.55E+02
	0.732	22.5	5.07E+04	<0.014	2.82E+03	<0.019	1.49E+02	2.94E+01	7.01E+01	5.65E+01	1.68E+04	1.75E+00	4.72E+02
	0.586	37.5	8.13E+04	<0.014	4.80E+03	<0.019	2.20E+02	6.06E+01	1.88E+00	<0.422	3.47E+04	5.81E+00	1.03E+03
	0.622	37.5	6.70E+04	1.91E+01	5.71E+03	2.96E+01	3.37E+02	1.03E+02	2.56E+00	<0.422	7.58E+04	8.33E+00	1.59E+03
	0.678	52.5	6.12E+04	3.10E+03	3.06E+03	<0.019	3.92E+02	9.57E+01	8.05E+01	1.18E+02	6.46E+04	3.62E+00	1.18E+03
	0.851	52.5	4.76E+04	2.22E+03	3.06E+03	<0.019	2.47E+02	7.47E+01	2.21E+00	<0.422	5.38E+04	7.01E+00	7.91E+02
	0.644	67.5	7.36E+04	6.47E+02	2.39E+03	<0.019	1.92E+02	6.45E+01	1.76E+00	<0.422	4.20E+04	5.29E+00	5.93E+02
	0.710	67.5	5.65E+04	9.12E+02	5.23E+03	<0.019	2.95E+02	7.88E+01	2.52E+00	<0.422	8.29E+04	7.77E+00	1.44E+03
	0.570	82.5	6.84E+04	<0.014	5.98E+03	<0.019	2.61E+02	5.28E+01	1.94E+00	<0.422	6.36E+04	6.16E+00	1.13E+03
	0.700	82.5	5.64E+04	<0.014	4.73E+03	<0.019	2.98E+02	4.84E+01	3.07E+00	<0.422	6.99E+04	8.11E+00	1.27E+03
	0.611	97.5	5.38E+04	8.72E+03	3.58E+03	2.41E+01	2.36E+02	4.44E+01	2.32E+00	<0.422	5.84E+04	6.43E+00	1.02E+03
	0.760	97.5	4.77E+04	1.00E+04	3.09E+03	2.17E+01	3.42E+02	4.28E+01	1.43E+00	<0.422	6.51E+04	3.27E+00	7.12E+02
	0.806	112.5	5.35E+04	3.57E+04	4.19E+03	<0.019	2.36E+02	6.27E+01	1.86E+00	<0.422	5.55E+04	5.12E+00	8.76E+02
	0.727	112.5	5.39E+04	7.81E+02	5.23E+03	2.19E+01	3.32E+02	5.23E+01	2.24E+00	8.88E+01	6.57E+04	2.92E+00	1.05E+03
	0.744	127.5	5.77E+04	3.83E+02	5.26E+03	2.29E+01	3.38E+02	6.25E+01	2.52E+00	1.25E+02	6.19E+04	2.52E+00	1.01E+03
	0.674	127.5	7.49E+04	2.02E+03	6.47E+03	3.49E+01	4.49E+02	8.66E+01	2.97E+00	1.77E+02	8.12E+04	3.52E+00	1.27E+03
	1.100	138.0	2.90E+04	<0.014	3.32E+03	<0.019	1.33E+02	5.24E+01	1.59E+00	<0.422	4.07E+04	3.98E+00	6.50E+02
	0.412	138.0	3.37E+04	<0.014	4.16E+03	<0.019	1.61E+02	5.13E+01	1.82E+00	<0.422	4.95E+04	4.55E+00	8.26E+02
	0.709	147.5	7.28E+04	3.56E+03	5.73E+03	<0.019	3.00E+02	1.02E+02	3.52E+00	<0.422	8.18E+04	7.75E+00	1.21E+03
	0.708	147.5	6.65E+04	2.29E+04	4.91E+03	<0.019	3.14E+02	1.03E+02	2.47E+00	<0.422	7.32E+04	6.88E+00	1.05E+03
	0.801	162.5	2.62E+04	1.13E+03	3.23E+02	9.84E+00	1.26E+02	1.13E+02	<0.0001	<0.422	2.08E+04	1.09E+00	1.04E+02

CORE 3													
Wt(g)	Depth (cm)	Al	Ag	As	Au	B	Ba	Be	Bi	Ca	Cd	Co	
0.800	162.5	6.14E+04	2.06E+03	2.89E+03	<0.019	2.33E+02	1.59E+02	2.03E+00	<0.422	5.50E+04	5.63E+00	7.52E+02	
0.736	177.5	5.93E+04	6.00E+02	1.85E+03	<0.019	2.16E+02	1.87E+02	2.04E+00	<0.422	5.57E+04	5.27E+00	6.19E+02	
0.762	177.5	5.51E+04	<0.014	2.12E+03	<0.019	2.08E+02	1.82E+02	1.48E+00	<0.422	5.23E+04	4.59E+00	5.56E+02	
1.105	177.5	3.15E+04	<0.014	1.84E+02	<0.019	1.10E+02	2.12E+02	1.13E+01	<0.422	2.82E+04	1.81E+00	6.16E+01	
1.054	177.5	3.30E+04	3.65E+01	2.00E+02	<0.019	1.39E+02	2.63E+02	<0.0001	<0.422	2.85E+04	1.07E+00	5.37E+01	
0.922	192.5	3.12E+04	<0.014	3.82E+02	<0.019	1.03E+02	1.55E+02	3.42E+01	<0.422	3.06E+04	2.17E+00	1.12E+02	
0.958	192.5	2.92E+04	<0.014	3.56E+02	<0.019	9.78E+01	1.46E+02	3.91E+01	<0.422	2.84E+04	2.09E+00	1.07E+02	
0.495	204.0	7.89E+04	<0.014	4.37E+03	<0.019	3.11E+02	1.93E+02	2.78E+00	<0.422	7.66E+04	7.58E+00	1.08E+03	
0.672	204.0	3.67E+04	7.89E+01	4.09E+02	<0.019	1.16E+02	1.64E+02	5.58E+01	<0.422	2.83E+04	2.23E+00	1.34E+02	
CORE 4													
Wt(g)	Depth (cm)	Al	Ag	As	Au	B	Ba	Be	Bi	Ca	Cd	Co	
0.657	7.5	5.10E+04	7.46E+03	1.71E+03	1.58E+01	2.99E+02	8.74E+01	1.14E+00	1.03E+02	4.30E+04	3.05E+00	8.64E+02	
0.640	7.5	5.33E+04	<0.014	1.16E+03	<0.019	2.36E+02	1.06E+02	2.15E+00	<0.422	4.24E+04	5.27E+00	8.73E+02	
0.693	22.5	5.00E+04	1.27E+03	1.33E+03	1.93E+01	2.83E+02	8.01E+01	1.44E+00	1.28E+02	3.43E+04	3.25E+00	9.74E+02	
0.581	22.5	7.03E+04	7.23E+03	1.73E+03	<0.019	2.80E+02	1.24E+02	3.01E+00	<0.422	4.71E+04	7.10E+00	1.36E+03	
0.492	37.5	8.16E+04	2.04E+04	2.20E+03	<0.019	3.76E+02	1.32E+02	3.56E+00	<0.422	5.87E+04	8.39E+00	1.41E+03	
0.558	37.5	7.28E+04	1.66E+04	2.40E+03	2.82E+01	4.21E+02	1.15E+02	2.46E+00	1.61E+02	5.40E+04	4.48E+00	1.23E+03	
1.139	52.5	1.92E+04	7.35E+02	6.31E+02	8.89E+00	1.14E+02	3.16E+01	7.68E+01	<0.422	1.55E+04	1.10E+00	3.15E+02	
0.589	52.5	6.01E+04	1.15E+03	1.97E+03	2.25E+01	3.50E+02	9.47E+01	2.33E+00	1.22E+02	4.75E+04	3.61E+00	9.47E+02	
0.632	67.5	6.25E+04	1.15E+04	1.55E+03	<0.019	2.47E+02	1.04E+02	2.77E+00	<0.422	4.63E+04	6.13E+00	9.39E+02	
0.590	67.5	5.70E+04	1.49E+03	1.92E+03	1.38E+01	3.39E+02	9.26E+01	1.48E+00	2.27E+02	4.26E+04	3.60E+00	8.50E+02	
1.114	7.5	1.30E+04	2.29E+03	3.48E+02	5.39E+00	7.87E+01	2.23E+01	3.37E+01	<0.422	1.22E+04	7.86E+01	1.78E+02	
CORE 5													
Wt(g)	Depth (cm)	Al	Ag	As	Au	B	Ba	Be	Bi	Ca	Cd	Co	
0.654	57.5	5.07E+04	2.29E+04	2.18E+03	<0.019	2.12E+02	8.37E+01	1.91E+00	<0.422	5.05E+04	4.97E+00	8.07E+02	
0.584	7.5	6.25E+04	3.04E+03	1.77E+03	<0.019	2.48E+02	9.24E+01	2.52E+00	<0.422	5.69E+04	5.56E+00	8.35E+02	
0.545	57.5	6.70E+04	9.61E+03	1.63E+03	<0.019	3.17E+02	1.22E+02	2.35E+00	<0.422	6.17E+04	6.42E+00	9.11E+02	
0.587	22.5	4.90E+04	1.69E+03	2.51E+03	2.09E+01	3.04E+02	7.64E+01	1.06E+00	1.20E+02	4.98E+04	2.77E+00	7.45E+02	
0.526	72.5	5.99E+04	6.27E+03	1.22E+03	2.50E+01	3.47E+02	1.22E+02	9.51E+01	<0.422	6.39E+04	3.33E+00	4.78E+02	
0.694	22.5	6.87E+04	1.51E+03	3.66E+03	<0.019	2.60E+02	1.07E+02	1.62E+00	<0.422	7.53E+04	6.67E+00	8.72E+02	
0.563	72.5	5.31E+04	1.36E+03	1.19E+03	2.20E+01	2.98E+02	1.08E+02	6.66E+01	<0.422	5.15E+04	3.11E+00	4.86E+02	
0.586	37.5	5.33E+04	3.95E+02	2.20E+03	2.26E+01	3.22E+02	1.17E+02	2.13E+01	9.77E+01	5.87E+04	2.77E+00	6.98E+02	
0.739	77.5	6.31E+04	1.07E+03	3.44E+03	2.76E+01	3.52E+02	1.58E+02	2.03E+00	1.11E+02	6.07E+04	3.22E+00	7.29E+02	
0.624	37.5	4.47E+04	<0.014	1.92E+03	<0.019	2.22E+02	7.09E+01	8.01E+01	<0.422	4.75E+04	4.41E+00	6.27E+02	
0.605	77.5	4.45E+04	2.32E+02	1.87E+03	2.09E+01	2.69E+02	7.38E+01	4.14E+01	<0.422	5.73E+04	2.48E+00	5.91E+02	
0.762	57.5	3.41E+04	<0.014	1.29E+03	1.90E+01	2.08E+02	5.00E+01	6.56E+01	<0.422	4.54E+04	1.97E+00	4.86E+02	
0.689	57.5	7.41E+04	3.16E+03	4.03E+03	<0.019	2.87E+02	1.59E+02	3.09E+00	<0.422	7.26E+04	6.90E+00	8.86E+02	
0.636	90.0	8.08E+04	1.61E+04	5.35E+03	<0.019	3.14E+02	1.13E+02	3.81E+00	<0.422	6.15E+04	8.00E+00	9.87E+02	
0.705	90.0	6.93E+04	2.93E+03	4.38E+03	<0.019	2.77E+02	1.05E+02	3.72E+00	<0.422	5.50E+04	6.91E+00	8.85E+02	
0.699	97.5	5.83E+04	3.45E+03	1.91E+03	<0.019	2.27E+02	1.30E+02	3.04E+00	<0.422	4.85E+04	5.19E+00	5.90E+02	
0.740	80.0	3.73E+04	<0.014	1.14E+03	<0.019	1.83E+02	5.80E+01	1.52E+00	<0.422	3.31E+04	3.89E+00	5.90E+02	
0.649	80.0	5.12E+04	2.77E+03	2.35E+03	2.60E+01	3.10E+02	6.88E+01	1.35E+00	1.37E+02	5.03E+04	3.47E+00	8.19E+02	
0.760	97.5	5.25E+04	5.31E+03	2.34E+03	2.40E+01	2.85E+02	1.19E+02	1.65E+00	8.03E+01	4.51E+04	2.96E+00	5.10E+02	
1.042	90.0	4.26E+04	3.59E+02	2.95E+02	1.02E+01	1.62E+02	2.71E+02	3.60E+01	<0.422	2.90E+04	1.92E+00	1.42E+02	
0.882	90.0	4.36E+03	2.35E+03	2.93E+02	<0.019	3.02E+01	7.79E+00	1.42E+01	<0.422	3.81E+03	<0.006	9.41E+01	
0.570	90.0	6.71E+04	<0.014	4.40E+03	<0.019	2.85E+02	8.74E+01	2.19E+00	<0.422	5.96E+04	7.01E+00	1.26E+03	
0.924	106.0	4.54E+04	<0.014	3.46E+02	<0.019	1.53E+02	2.42E+02	5.41E+01	<0.422	3.10E+04	3.11E+00	1.62E+02	
CORE 5													
Wt(g)	Depth (cm)	Al	Ag	As	Au	B	Ba	Be	Bi	Ca	Cd	Co	
0.644	7.5	6.83E+04	8.93E+02	2.64E+03	<0.019	2.58E+02	1.10E+02	1.16E+00	<0.422	5.40E+04	5.43E+00	7.57E+02	
1.000	7.5	1.73E+04	3.03E+02	8.04E+02	<0.019	6.88E+01	2.49E+01	2.50E+01	<0.422	1.40E+04	1.63E+00	2.14E+02	
0.769	22.5	4.36E+04	2.83E+03	1.52E+03	<0.019	1.97E+02	9.64E+01	8.13E+01	<0.422	3.28E+04	3.58E+00	5.01E+02	

0.567	22.5	6.73E+04	2.34E+03	3.02E+03	<0.019	3.02E+02	1.01E+02	2.21E-01	<0.422	4.99E+04	5.96E+00	9.24E+02
0.600	37.5	5.98E+04	<0.014	2.44E+03	<0.019	2.40E-02	8.19E-01	4.17E-01	<0.422	5.75E+04	5.21E+00	6.67E+02
0.498	37.5	7.30E+04	3.61E+03	3.11E+03	3.64E-01	4.24E-02	9.61E-01	<0.0001	<0.422	7.20E+04	3.76E+00	8.53E+02
0.739	62.5	6.43E+04	9.20E-02	4.72E+03	2.67E-01	3.35E-02	8.61E-01	1.35E+00	1.32E+02	6.38E+04	2.71E+00	8.81E+02
0.721	62.5	8.17E+04	<0.014	5.67E+03	<0.019	2.88E-02	1.06E+02	2.60E+00	<0.422	8.06E+04	6.76E+00	1.10E+03
0.706	77.5	8.18E+04	6.53E+02	4.16E+03	<0.019	2.76E-02	1.29E+02	3.01E+00	<0.422	8.68E+04	6.73E+00	1.09E+03
0.058	77.5	9.10E+05	3.42E+05	5.12E+04	<0.019	3.25E+03	1.33E+03	3.42E+01	<0.422	9.67E+05	7.92E+01	1.32E+04
0.640	92.5	8.77E+04	1.02E+04	6.56E+03	<0.019	3.01E-02	1.49E+02	2.34E+00	<0.422	1.12E+05	8.20E+00	1.59E+03
0.736	90.0	6.90E+04	1.77E+03	4.25E+03	<0.019	2.39E-02	1.18E+02	1.87E+00	<0.422	8.76E+04	6.45E+00	1.22E+03
0.834	92.5	8.71E+04	5.49E+03	4.47E+03	<0.019	3.04E+02	1.66E+02	2.55E+00	<0.422	7.79E+04	7.20E+00	1.12E+03
0.763	92.5	8.98E+04	8.01E+03	4.69E+03	<0.019	3.00E+02	1.85E+02	2.62E+00	<0.422	7.37E+04	7.21E+00	1.14E+03
0.829	102.5	5.78E+04	1.14E+03	4.90E+03	<0.019	2.38E+02	1.04E+02	1.06E+00	<0.422	7.16E+04	5.88E+00	1.08E+03
0.740	102.5	8.06E+04	<0.014	6.86E+03	<0.019	2.89E+02	1.22E+02	2.20E+00	<0.422	6.73E+04	8.45E+00	1.59E+03
0.775	117.5	8.53E+04	<0.014	4.63E+03	<0.019	2.73E+02	3.27E+02	2.58E+00	<0.422	6.32E+04	7.58E+00	8.81E+02
0.821	117.5	7.63E+04	3.31E+02	4.19E+03	2.65E-01	3.32E+02	3.23E+02	9.14E-01	<0.422	5.73E+04	4.11E+00	7.21E+02
0.745	132.5	7.25E+04	<0.014	2.28E+02	<0.019	2.28E+02	5.24E+02	1.01E+00	<0.422	2.50E+04	3.52E+00	7.60E+01
0.661	132.5	6.07E+04	<0.014	5.94E+02	<0.019	1.99E+02	4.03E+02	9.46E-01	<0.422	2.46E+04	3.41E+00	1.54E+02
0.807	147.5	7.45E+04	2.23E+03	7.09E+02	2.31E-01	2.73E+02	6.33E+02	1.55E-01	<0.422	2.62E+04	2.01E+00	1.34E+02
0.647	147.5	7.54E+04	<0.014	5.76E+02	<0.019	2.18E+02	4.68E+02	2.13E+00	<0.422	2.96E+04	3.87E+00	1.62E+02
CORE 7												
0.654	7.5	5.91E+04	<0.014	3.23E+03	<0.019	2.51E+02	3.63E+01	1.91E+00	<0.422	5.47E+04	6.69E+00	7.56E+02
0.698	7.5	5.50E+04	<0.014	2.95E+03	<0.019	2.33E+02	3.60E+01	1.61E+00	<0.422	5.10E+04	6.27E+00	7.07E+02
0.594	22.5	6.76E+04	2.53E+03	2.01E+03	<0.019	2.67E+02	6.53E+01	2.53E+00	<0.422	6.27E+04	6.95E+00	8.21E+02
0.642	22.5	6.97E+04	1.42E+02	2.38E+03	<0.019	2.84E+02	6.87E+01	2.53E+00	<0.422	6.41E+04	7.01E+00	8.41E+02
0.707	37.5	4.67E+04	4.07E+02	2.03E+03	<0.019	1.98E+02	3.43E+01	1.59E+00	<0.422	4.28E+04	5.13E+00	5.82E+02
0.246	37.5	8.62E+04	1.29E+03	3.71E+03	<0.019	3.88E+02	8.57E+01	2.54E+00	<0.422	7.10E+04	8.62E+00	9.23E+02
0.493	57.5	8.06E+04	2.79E+03	4.03E+03	<0.019	3.32E+02	7.35E+01	2.03E+00	<0.422	7.07E+04	8.11E+00	8.82E+02
0.489	57.5	6.88E+04	5.01E+02	3.17E+03	<0.019	3.53E+02	5.37E+01	1.53E+00	<0.422	6.34E+04	7.16E+00	7.78E+02
CORE 8												
0.588	40.0	7.25E+04	<0.014	2.55E+03	<0.019	2.76E+02	8.95E+01	1.91E+00	<0.422	7.57E+04	7.23E+00	7.42E+02
0.614	40.0	6.41E+04	<0.014	2.32E+03	<0.019	2.54E+02	7.35E+01	1.63E+00	<0.422	6.80E+04	6.51E+00	6.76E+02
0.676	57.5	5.16E+04	<0.014	2.65E+03	<0.019	2.42E+02	8.07E+01	7.40E-01	<0.422	5.66E+04	5.18E+00	6.59E+02
0.545	57.5	6.19E+04	<0.014	3.14E+03	<0.019	2.57E+02	9.26E+01	1.83E+00	<0.422	6.26E+04	5.96E+00	9.35E+02
0.593	72.5	6.95E+04	6.30E+03	2.26E+03	3.08E-01	3.98E+02	9.86E+01	1.05E+00	<0.422	6.74E+04	4.43E+00	7.14E+02
0.671	72.5	3.78E+04	<0.014	1.06E+03	<0.019	1.85E+02	5.22E+01	7.46E-01	<0.422	3.58E+04	3.91E+00	4.01E+02
0.647	87.5	5.08E+04	<0.014	1.80E+03	2.67E-01	2.98E+02	5.58E+01	5.80E-01	<0.422	5.28E+04	3.48E+00	5.16E+02
0.663	87.5	5.37E+04	<0.014	1.66E+03	2.41E-01	3.07E+02	7.79E+01	1.89E-01	<0.422	5.28E+04	3.39E+00	5.03E+02
0.852	102.5	4.75E+04	<0.014	1.47E+03	<0.019	1.91E+02	6.16E+01	1.32E+00	<0.422	4.66E+04	4.69E+00	4.80E+02
0.660	102.5	6.00E+04	<0.014	1.86E+03	<0.019	2.31E+02	6.86E+01	1.70E+00	<0.422	5.95E+04	5.87E+00	6.08E+02
0.615	117.5	5.22E+04	<0.014	1.89E+03	3.25E-01	4.18E+02	5.79E+01	6.09E-01	<0.422	5.38E+04	2.64E+00	6.13E+02
1.999	117.5	2.09E+04	<0.014	6.88E+02	<0.019	1.09E+02	2.81E+01	5.63E-01	<0.422	2.09E+04	2.69E+00	2.29E+02
CORE 9												
0.725	27.5	7.08E+04	<0.014	2.81E+02	<0.019	1.70E+02	4.43E+02	1.21E+00	<0.422	2.50E+04	3.10E+00	1.01E+02
0.664	27.5	6.46E+04	1.81E+03	3.26E+03	<0.019	2.09E+02	2.37E+02	1.13E+00	<0.422	3.20E+04	4.89E+00	7.19E+02
0.903	42.5	5.51E+04	<0.014	2.37E+03	<0.019	2.01E+02	1.30E+02	1.38E+00	<0.422	4.62E+04	4.85E+00	8.49E+02
0.716	42.5	7.20E+04	2.66E+03	2.59E+03	<0.019	2.53E+02	1.60E+02	2.10E+00	<0.422	6.25E+04	6.46E+00	1.13E+03
0.779	57.5	7.06E+04	2.10E+03	2.54E+03	<0.019	2.44E+02	1.65E+02	2.25E+00	<0.422	5.07E+04	6.26E+00	8.91E+02
0.794	57.5	7.96E+04	<0.014	2.82E+03	<0.019	2.90E+02	1.90E+02	2.36E+00	<0.422	5.51E+04	6.92E+00	9.96E+02
0.911	75.5	8.81E+04	1.98E+03	2.61E+03	<0.019	2.18E+02	4.87E+02	2.33E+00	<0.422	4.21E+04	4.66E+00	5.91E+02

CORE 10	Wt(g)	Depth (cm)	Al	Ag	As	Au	B	Ba	Be	Bi	Ca	Cd	Co	Cr
	1010	75.5	7.72E+04	2.80E+03	2.23E+03	1.26E+01	2.49E+02	4.63E+02	1.36E+00	<0.422	3.79E+04	2.10E+00	4.81E+02	4.81E+02
	0.927	75.5	7.27E+04	<0.014	1.89E+03	<0.019	1.71E+02	3.91E+02	1.75E+00	<0.422	2.87E+04	3.51E+00	3.22E+02	3.22E+02
	0.924	75.5	7.43E+04	7.35E+02	1.93E+03	<0.019	1.77E+02	4.29E+02	1.76E+00	<0.422	2.58E+04	3.52E+00	3.14E+02	3.14E+02
	0.540	89.0	9.10E+04	1.15E+02	4.68E+03	<0.019	2.94E+02	3.68E+02	1.62E+00	<0.422	4.35E+04	6.94E+00	1.00E+03	1.00E+03
	0.588	89.0	8.03E+04	<0.014	2.61E+02	<0.019	1.93E+02	5.59E+02	1.28E+00	<0.422	2.85E+04	3.40E+00	9.99E+01	9.99E+01
	0.601	35.0	6.26E+04	<0.014	1.25E+03	<0.019	3.01E+02	1.24E+02	2.70E+00	<0.422	4.16E+04	5.61E+00	2.68E+02	2.68E+02
	0.544	35.0	5.44E+04	6.89E+02	1.18E+03	2.62E+01	3.12E+02	9.37E+01	3.20E+00	1.20E+02	4.04E+04	3.22E+00	2.46E+02	2.46E+02
	0.541	1.0	5.71E+04	1.57E+03	1.45E+03	2.43E+01	3.28E+02	1.07E+02	3.00E+00	1.49E+02	4.30E+04	3.24E+00	3.03E+02	3.03E+02
	0.770	36.0	7.45E+04	8.10E+02	5.34E+02	<0.019	2.32E+02	1.31E+02	1.79E+00	<0.422	3.59E+04	5.68E+00	6.58E+02	6.58E+02
	0.936	36.0	2.83E+04	8.49E+02	2.26E+02	<0.019	9.81E+01	5.97E+01	5.34E+01	<0.422	1.46E+04	2.14E+00	2.62E+02	2.62E+02
	0.806	55.0	9.12E+04	<0.014	3.75E+02	<0.019	3.09E+02	1.78E+02	4.34E+00	<0.422	2.70E+04	6.36E+00	5.09E+02	5.09E+02
	0.821	55.0	7.89E+04	<0.014	4.63E+02	<0.019	2.76E+02	1.47E+02	3.35E+00	<0.422	2.35E+04	5.79E+00	4.71E+02	4.71E+02
	1.670	67.5	1.21E+04	<0.014	1.07E+03	<0.019	6.59E+01	4.95E+01	5.99E+01	<0.422	2.96E+04	1.50E+00	2.48E+02	2.48E+02
	1.767	82.5	1.16E+04	5.29E+02	1.03E+02	2.12E+00	5.18E+01	6.71E+01	2.83E+01	<0.422	1.93E+04	<0.006	3.49E+01	3.49E+01
	1.769	82.5	1.17E+04	6.23E+02	1.07E+02	2.26E+00	4.49E+01	6.54E+01	2.83E+01	<0.422	2.02E+04	<0.006	4.04E+01	4.04E+01
	1.756	97.5	1.47E+04	<0.014	5.83E+01	<0.019	5.59E+01	1.17E+02	4.27E+01	<0.422	2.33E+04	8.54E+01	2.41E+01	2.41E+01
	0.713	97.5	1.91E+04	2.12E+02	1.21E+02	<0.019	6.89E+01	1.50E+02	5.26E+01	<0.422	3.21E+04	1.40E+00	4.44E+01	4.44E+01
	1.093	112.5	2.49E+04	<0.014	2.63E+01	<0.019	8.82E+01	1.78E+02	3.43E+01	<0.422	2.54E+04	1.60E+00	3.41E+01	3.41E+01
	1.790	112.5	5.10E+03	<0.014	1.58E+01	<0.019	1.82E+01	3.54E+01	6.98E+02	<0.422	5.71E+03	<0.006	9.01E+00	9.01E+00
	0.770	36.0	7.45E+04	8.10E+02	5.34E+02	<0.019	2.32E+02	1.31E+02	1.79E+00	<0.422	3.59E+04	5.68E+00	6.58E+02	6.58E+02
	0.936	36.0	2.83E+04	8.49E+02	2.26E+02	<0.019	9.81E+01	5.97E+01	5.34E+01	<0.422	1.46E+04	2.14E+00	2.62E+02	2.62E+02
	0.806	55.0	9.12E+04	<0.014	3.75E+02	<0.019	3.09E+02	1.78E+02	4.34E+00	<0.422	2.70E+04	6.36E+00	5.09E+02	5.09E+02
	0.821	55.0	7.89E+04	<0.014	4.63E+02	<0.019	2.76E+02	1.47E+02	3.35E+00	<0.422	2.35E+04	5.79E+00	4.71E+02	4.71E+02
	1.670	67.5	1.21E+04	<0.014	1.07E+03	<0.019	6.59E+01	4.95E+01	5.99E+01	<0.422	2.96E+04	1.50E+00	2.48E+02	2.48E+02
	1.767	82.5	1.16E+04	5.29E+02	1.03E+02	2.12E+00	5.18E+01	6.71E+01	2.83E+01	<0.422	1.93E+04	<0.006	3.49E+01	3.49E+01
	1.769	82.5	1.17E+04	6.23E+02	1.07E+02	2.26E+00	4.49E+01	6.54E+01	2.83E+01	<0.422	2.02E+04	<0.006	4.04E+01	4.04E+01
	1.756	97.5	1.47E+04	<0.014	5.83E+01	<0.019	5.59E+01	1.17E+02	4.27E+01	<0.422	2.33E+04	8.54E+01	2.41E+01	2.41E+01
	0.713	97.5	1.91E+04	2.12E+02	1.21E+02	<0.019	6.89E+01	1.50E+02	5.26E+01	<0.422	3.21E+04	1.40E+00	4.44E+01	4.44E+01
	1.093	112.5	2.49E+04	<0.014	2.63E+01	<0.019	8.82E+01	1.78E+02	3.43E+01	<0.422	2.54E+04	1.60E+00	3.41E+01	3.41E+01
	1.790	112.5	5.10E+03	<0.014	1.58E+01	<0.019	1.82E+01	3.54E+01	6.98E+02	<0.422	5.71E+03	<0.006	9.01E+00	9.01E+00
	0.770	36.0	7.45E+04	8.10E+02	5.34E+02	<0.019	2.32E+02	1.31E+02	1.79E+00	<0.422	3.59E+04	5.68E+00	6.58E+02	6.58E+02
	0.936	36.0	2.83E+04	8.49E+02	2.26E+02	<0.019	9.81E+01	5.97E+01	5.34E+01	<0.422	1.46E+04	2.14E+00	2.62E+02	2.62E+02
	0.806	55.0	9.12E+04	<0.014	3.75E+02	<0.019	3.09E+02	1.78E+02	4.34E+00	<0.422	2.70E+04	6.36E+00	5.09E+02	5.09E+02
	0.821	55.0	7.89E+04	<0.014	4.63E+02	<0.019	2.76E+02	1.47E+02	3.35E+00	<0.422	2.35E+04	5.79E+00	4.71E+02	4.71E+02
	1.670	67.5	1.21E+04	<0.014	1.07E+03	<0.019	6.59E+01	4.95E+01	5.99E+01	<0.422	2.96E+04	1.50E+00	2.48E+02	2.48E+02
	1.767	82.5	1.16E+04	5.29E+02	1.03E+02	2.12E+00	5.18E+01	6.71E+01	2.83E+01	<0.422	1.93E+04	<0.006	3.49E+01	3.49E+01
	1.769	82.5	1.17E+04	6.23E+02	1.07E+02	2.26E+00	4.49E+01	6.54E+01	2.83E+01	<0.422	2.02E+04	<0.006	4.04E+01	4.04E+01
	1.756	97.5	1.47E+04	<0.014	5.83E+01	<0.019	5.59E+01	1.17E+02	4.27E+01	<0.422	2.33E+04	8.54E+01	2.41E+01	2.41E+01
	0.713	97.5	1.91E+04	2.12E+02	1.21E+02	<0.019	6.89E+01	1.50E+02	5.26E+01	<0.422	3.21E+04	1.40E+00	4.44E+01	4.44E+01
	1.093	112.5	2.49E+04	<0.014	2.63E+01	<0.019	8.82E+01	1.78E+02	3.43E+01	<0.422	2.54E+04	1.60E+00	3.41E+01	3.41E+01
	1.790	112.5	5.10E+03	<0.014	1.58E+01	<0.019	1.82E+01	3.54E+01	6.98E+02	<0.422	5.71E+03	<0.006	9.01E+00	9.01E+00
	0.770	36.0	7.45E+04	8.10E+02	5.34E+02	<0.019	2.32E+02	1.31E+02	1.79E+00	<0.422	3.59E+04	5.68E+00	6.58E+02	6.58E+02
	0.936	36.0	2.83E+04	8.49E+02	2.26E+02	<0.019	9.81E+01	5.97E+01	5.34E+01	<0.422	1.46E+04	2.14E+00	2.62E+02	2.62E+02
	0.806	55.0	9.12E+04	<0.014	3.75E+02	<0.019	3.09E+02	1.78E+02	4.34E+00	<0.422	2.70E+04	6.36E+00	5.09E+02	5.09E+02
	0.821	55.0	7.89E+04	<0.014	4.63E+02	<0.019	2.76E+02	1.47E+02	3.35E+00	<0.422	2.35E+04	5.79E+00	4.71E+02	4.71E+02
	1.670	67.5	1.21E+04	<0.014	1.07E+03	<0.019	6.59E+01	4.95E+01	5.99E+01	<0.422	2.96E+04	1.50E+00	2.48E+02	2.48E+02
	1.767	82.5	1.16E+04	5.29E+02	1.03E+02	2.12E+00	5.18E+01	6.71E+01	2.83E+01	<0.422	1.93E+04	<0.006	3.49E+01	3.49E+01
	1.769	82.5	1.17E+04	6.23E+02	1.07E+02	2.26E+00	4.49E+01	6.54E+01	2.83E+01	<0.422	2.02E+04	<0.006	4.04E+01	4.04E+01
	1.756	97.5	1.47E+04	<0.014	5.83E+01	<0.019	5.59E+01	1.17E+02	4.27E+01	<0.422	2.33E+04	8.54E+01	2.41E+01	2.41E+01
	0.713	97.5	1.91E+04	2.12E+02	1.21E+02	<0.019	6.89E+01	1.50E+02	5.26E+01	<0.422	3.21E+04	1.40E+00	4.44E+01	4.44E+01
	1.093	112.5	2.49E+04	<0.014	2.63E+01	<0.019	8.82E+01	1.78E+02	3.43E+01	<0.422	2.54E+04	1.60E+00	3.41E+01	3.41E+01
	1.790	112.5	5.10E+03	<0.014	1.58E+01	<0.019	1.82E+01	3.54E+01	6.98E+02	<0.422	5.71E+03	<0.006	9.01E+00	9.01E+00
	0.770	36.0	7.45E+04	8.10E+02	5.34E+02	<0.019	2.32E+02	1.31E+02	1.79E+00	<0.422	3.59E+04	5.68E+00	6.58E+02	6.58E+02
	0.936	36.0	2.83E+04	8.49E+02	2.26E+02	<0.019	9.81E+01	5.97E+01	5.34E+01	<0.422	1.46E+04	2.14E+00	2.62E+02	2.62E+02
	0.806	55.0	9.12E+04	<0.014	3.75E+02	<0.019	3.09E+02	1.78E+02	4.34E+00	<0.422	2.70E+04	6.36E+00	5.09E+02	5.09E+02
	0.821	55.0	7.89E+04	<0.014	4.63E+02	<0.019	2.76E+02	1.47E+02	3.35E+00	<0.422	2.35E+04	5.79E+00	4.71E+02	4.71E+02
	1.670	67.5	1.21E+04	<0.014	1.07E+03	<0.019	6.59E+01	4.95E+01	5.99E+01	<0.422	2.96E+04	1.50E+00	2.48E+02	2.48E+02
	1.767	82.5	1.16E+04	5.29E+02	1.03E+02	2.12E+00	5.18E+01	6.71E+01	2.83E+01	<0.422	1.93E+04	<0.006	3.49E+01	3.49E+01
	1.769	82.5	1.17E+04	6.23E+02	1.07E+02	2.26E+00	4.49E+01	6.54E+01	2.83E+01	<0.422	2.02E+04	<0.006	4.04E+01	4.04E+01
	1.756	97.5	1.47E+04	<0.014	5.83E+01	<0.019	5.59E+01	1.17E+02	4.27E+01	<0.422	2.33E+04	8.54E+01	2.41E+01	2.41E+01
	0.713	97.5	1.91E+04	2.12E+02	1.21E+02	<0.019	6.89E+01	1.50E+02	5.26E+01	<0.422	3.21E+04	1.40E+00	4.44E+01	4.44E+01
	1.093	112.5	2.49E+04	<0.014	2.63E+01	<0.019	8.82E+01	1.78E+02	3.43E+01	<0.422	2.54E+04	1.60E+00	3.41E+01	3.41E+01
	1.790	112.5	5.10E+03	<0.014	1.58E+01	<0.019	1.82E+01	3.54E+01	6.98E+02	<0.422	5.71E+03	<0.006	9.01E+00	9.01E+00
	0.770	36.0	7.45E+04	8.10E+02	5.34E+02	<0.019	2.32E+02	1.31E+02	1.79E+00	<0.422	3.59E+04	5.68E+00	6.58E+02	6.58E+02
	0.936	36.0	2.83E+04	8.49E+02	2.26E+02	<0.019	9.81E+01	5.97E+01	5.34E+01	<0.422	1.46E+04	2.14E+00	2.62E+02	2.62E+02
	0.806	55.0	9.12E+04	<0.014	3.75E+02	<0.019	3.09E+02	1.78E+02	4.34E+00	<0.422	2.70E+04	6.36E+00	5.09E+02	5.09E+02
	0.821	55.0	7.89E+04	<0.014	4.63E+02	<0.019	2.76E+02	1.47E+02	3.35E+00	<0.422	2.35E+04	5.79E+00	4.71E+02	4.71E+02
	1.670	67.5	1.21E+04	<0.014	1.07E+03	<0.019	6.59E+01	4.95E+01	5.99E+01	<0.422	2.96			

CORE 1	Wt (g)	Depth (cm)	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo
	5.50E-01	1.50E+01	3.00E+02	7.18E+02	7.93E+04	<0.009	6.18E+03	4.48E+04	1.98E+03	<0.036
	2.48E-01	1.50E+01	6.62E+02	1.55E+03	1.77E+05	<0.009	1.37E+04	1.01E+05	4.80E+03	2.17E+01
	7.67E-01	7.50E+00	2.51E+02	7.36E+02	6.48E+04	<0.009	4.19E+03	3.63E+04	1.63E+03	8.96E+00
	5.59E-01	7.50E+00	2.91E+02	8.61E+02	7.76E+04	<0.009	4.86E+03	4.39E+04	1.92E+03	<0.036
	3.44E-01	2.25E+01	4.98E+02	1.76E+03	1.28E+05	<0.009	8.88E+03	7.28E+04	3.35E+03	1.60E-01
	5.73E-01	2.25E+01	3.01E+02	1.08E+03	7.73E+04	<0.009	4.06E+03	4.43E+04	1.99E+03	1.00E-01
	5.91E-01	3.75E+01	2.77E+02	7.43E+02	7.43E+04	<0.009	4.36E+03	4.23E+04	1.85E+03	9.52E+00
	7.55E-01	3.75E+01	2.33E+02	5.36E+02	6.16E+04	<0.009	3.28E+03	3.41E+04	1.58E+03	8.77E+00
	1.66E+00	5.25E+01	8.51E+01	2.01E+02	2.24E+04	<0.009	1.45E+03	1.21E+04	5.57E+02	2.71E+00
	1.90E-01	5.25E+01	6.15E+02	1.46E+03	1.62E+05	<0.009	1.25E+04	9.01E+04	4.26E+03	2.37E+01
	5.60E-01	6.75E+01	2.97E+02	5.60E+02	7.93E+04	<0.009	6.41E+03	4.31E+04	1.95E+03	1.18E+01
	5.16E-01	6.75E+01	3.15E+02	6.42E+02	8.41E+04	<0.009	4.92E+03	4.56E+04	2.07E+03	9.94E+00
	6.90E-01	6.75E+01	1.97E+02	5.47E+02	5.18E+04	<0.009	2.12E+03	2.88E+04	1.31E+03	6.70E+00
	5.93E-01	6.75E+01	2.85E+02	8.96E+02	7.53E+04	<0.009	2.53E+03	4.20E+04	1.83E+03	1.10E+01
	7.33E-01	8.25E+01	2.98E+02	1.28E+03	7.35E+04	<0.009	5.37E+03	4.08E+04	2.00E+03	1.57E-01
	7.32E-01	8.25E+01	2.29E+02	9.71E+02	5.67E+04	<0.009	3.94E+03	3.12E+04	1.51E+03	1.18E-01
	9.55E-01	1.00E+02	9.41E+02	2.30E+02	3.94E+04	<0.009	5.95E+03	1.69E+04	9.55E+02	1.83E-01
	9.08E-01	1.00E+02	2.77E+03	2.96E+02	4.92E+04	<0.009	6.54E+03	1.89E+04	1.20E+03	5.55E+01
	7.25E-01	1.15E+02	2.48E+02	1.74E+02	5.43E+04	<0.009	1.16E+04	2.24E+04	1.08E+03	<0.036
	6.99E-01	1.15E+02	2.65E+02	1.84E+02	5.63E+04	<0.009	1.06E+04	2.33E+04	1.10E+03	<0.036
	8.65E-01	1.25E+02	1.72E+02	3.51E+02	4.39E+04	<0.009	7.62E+03	2.05E+04	1.06E+03	6.36E+00
	8.44E-01	1.25E+02	1.93E+02	3.36E+02	4.89E+04	<0.009	7.74E+03	2.19E+04	1.18E+03	<0.036
CORE 2	Wt (g)	Depth (cm)	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo
	6.86E-01	7.50E+00	2.42E+02	6.14E+02	6.54E+04	<0.009	3.04E+03	3.61E+04	1.60E+03	9.30E+00
	6.32E-01	7.50E+00	2.30E+02	5.86E+02	6.29E+04	<0.009	3.50E+03	3.46E+04	1.55E+03	9.69E+00
	1.43E+00	2.25E+01	1.06E+02	3.32E+02	2.87E+04	2.23E+01	1.03E+03	1.59E+04	6.80E+02	4.91E+00
	7.32E-01	2.25E+01	2.34E+02	6.99E+02	6.32E+04	<0.009	2.15E+03	3.47E+04	1.49E+03	8.88E+00
	5.86E-01	3.75E+01	3.46E+02	7.45E+02	9.07E+04	<0.009	6.02E+03	5.02E+04	2.43E+03	2.80E+01
	6.22E-01	3.75E+01	2.82E+02	5.99E+02	7.36E+04	5.37E+01	5.59E+03	4.08E+04	2.01E+03	3.00E+01
	6.78E-01	5.25E+01	2.65E+02	4.50E+02	7.10E+04	<0.009	4.28E+03	3.93E+04	1.76E+03	1.57E+01
	8.51E-01	5.25E+01	2.03E+02	3.73E+02	5.45E+04	<0.009	3.70E+03	3.01E+04	1.36E+03	1.03E+01
	6.44E-01	6.75E+01	3.24E+02	1.12E+03	8.04E+04	<0.009	4.02E+03	4.52E+04	2.23E+03	2.06E+01
	7.10E-01	6.75E+01	2.45E+02	8.52E+02	6.24E+04	<0.009	2.66E+03	3.47E+04	1.75E+03	1.57E+01
	5.70E-01	8.25E+01	3.13E+02	9.58E+02	8.53E+04	<0.009	2.09E+03	4.65E+04	2.19E+03	2.13E+01
	7.00E-01	8.25E+01	2.52E+02	7.82E+02	6.91E+04	<0.009	2.05E+03	3.77E+04	1.75E+03	1.70E+01
	6.11E-01	9.75E+01	2.50E+02	6.67E+02	6.75E+04	4.66E+01	2.17E+03	3.68E+04	1.75E+03	1.98E+01
	7.60E-01	9.75E+01	2.14E+02	5.90E+02	5.82E+04	3.70E+01	2.07E+03	3.19E+04	1.55E+03	1.69E+01
	8.06E-01	1.13E+02	2.08E+02	7.15E+02	5.46E+04	<0.009	3.43E+03	2.95E+04	1.54E+03	1.05E+01
	7.27E-01	1.13E+02	2.39E+02	9.10E+02	6.42E+04	1.15E+02	2.55E+03	3.46E+04	1.77E+03	1.70E+01
	7.44E-01	1.28E+02	2.54E+02	6.29E+02	6.52E+04	4.34E+01	2.96E+03	3.48E+04	1.77E+03	1.50E+01
	6.74E-01	1.28E+02	3.30E+02	7.75E+02	8.23E+04	6.56E+01	4.15E+03	4.47E+04	2.32E+03	1.74E+01
	1.10E+00	1.38E+02	9.90E+02	5.50E+02	3.54E+04	<0.009	1.98E+03	1.72E+04	9.84E+02	2.65E+01
	4.12E-01	1.38E+02	1.54E+02	6.86E+02	4.22E+04	<0.009	1.79E+03	2.15E+04	1.13E+03	<0.036
	7.09E-01	1.48E+02	3.38E+02	1.04E+03	8.18E+04	<0.009	5.04E+03	4.48E+04	2.33E+03	1.48E+01
	7.08E-01	1.48E+02	2.95E+02	8.84E+02	7.06E+04	<0.009	5.24E+03	4.48E+04	2.08E+03	1.31E+01
	8.01E-01	1.63E+02	1.78E+02	8.09E+01	2.09E+04	1.53E+02	3.17E+03	9.49E+03	4.81E+02	1.73E+01

CORE 3									
Wt (g)	Depth (cm)	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo
6.57E-01	7.50E+00	2.15E+02	4.76E+02	5.67E+04	4.40E+01	4.30E+03	3.27E+04	1.57E+03	8.38E+00
6.40E-01	7.50E+00	2.23E+02	4.47E+02	5.62E+04	<0.009	5.43E+03	3.22E+04	1.61E+03	<0.036
6.93E-01	2.25E+01	2.16E+02	5.68E+02	5.75E+04	4.33E+01	3.79E+03	3.21E+04	1.49E+03	8.48E+00
5.81E-01	2.25E+01	3.05E+02	7.06E+02	7.85E+04	<0.009	6.15E+03	4.43E+04	2.07E+03	9.46E+00
4.92E-01	3.75E+01	3.35E+02	7.98E+02	8.82E+04	<0.009	7.32E+03	4.98E+04	2.40E+03	<0.036
5.58E-01	3.75E+01	2.98E+02	7.39E+02	8.11E+04	5.76E+01	6.34E+03	4.57E+04	1.12E+03	1.34E+01
1.14E+00	5.25E+01	1.25E+02	1.99E+02	2.22E+04	1.20E+01	1.84E+03	1.24E+04	5.61E+02	<0.036
5.89E-01	5.25E+01	2.48E+02	5.67E+02	6.66E+04	5.37E+01	5.62E+03	3.78E+04	1.69E+03	1.29E+01
6.32E-01	6.75E+01	2.61E+02	6.19E+02	6.96E+04	<0.009	5.81E+03	3.92E+04	1.78E+03	<0.036
5.90E-01	6.75E+01	2.46E+02	5.70E+02	6.44E+04	4.72E+01	5.49E+03	3.60E+04	1.63E+03	1.21E+01
1.11E+00	7.50E+00	5.97E+01	1.12E+02	1.49E+04	8.08E+00	1.22E+03	8.43E+03	3.83E+02	<0.036
CORE 4									
Wt (g)	Depth (cm)	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo
6.54E-01	5.75E+01	2.22E+02	5.03E+02	5.93E+04	<0.009	4.47E+03	3.31E+04	1.58E+03	8.03E+00
5.84E-01	7.50E+00	2.61E+02	5.09E+02	6.96E+04	<0.009	5.24E+03	4.00E+04	1.77E+03	<0.036
5.45E-01	5.75E+01	2.80E+02	6.84E+02	7.27E+04	<0.009	7.25E+03	4.06E+04	1.97E+03	<0.036
5.87E-01	2.25E+01	2.07E+02	4.28E+02	5.66E+04	4.17E+01	3.89E+03	3.21E+04	1.49E+03	9.15E+00
5.26E-01	7.25E+01	2.42E+02	5.09E+02	6.80E+04	4.28E+02	6.18E+03	3.87E+04	1.61E+03	9.51E+00
6.94E-01	2.25E+01	3.17E+02	4.25E+02	7.43E+04	<0.009	5.93E+03	4.34E+04	2.07E+03	1.06E+01
5.63E-01	7.25E+01	2.16E+02	6.17E+02	5.84E+04	3.55E+01	6.20E+03	3.31E+04	1.40E+03	1.11E+01
5.86E-01	7.75E+01	2.13E+02	4.27E+02	5.78E+04	3.95E+01	6.29E+03	3.37E+04	1.63E+03	1.02E+01
7.39E-01	7.75E+01	2.61E+02	6.57E+02	6.43E+04	4.55E+01	6.31E+03	3.33E+04	1.88E+03	1.13E+01
6.24E-01	3.75E+01	1.93E+02	4.07E+02	5.03E+04	<0.009	3.53E+03	2.92E+04	1.39E+03	<0.036
6.05E-01	7.75E+01	1.88E+02	3.87E+02	5.15E+04	4.30E+01	3.70E+03	3.08E+04	1.44E+03	9.93E+00
7.62E-01	5.75E+01	1.44E+02	3.40E+02	4.04E+04	2.76E+01	2.43E+03	2.48E+04	1.10E+03	6.73E+00
6.89E-01	5.75E+01	3.07E+02	7.93E+02	7.82E+04	<0.009	6.12E+03	4.08E+04	2.23E+03	1.23E+01
6.56E-01	9.00E+01	4.06E+02	1.28E+03	8.14E+04	<0.009	6.44E+03	4.27E+04	2.17E+03	2.69E+01
7.05E-01	9.00E+01	2.98E+02	1.15E+03	7.25E+04	<0.009	5.83E+03	3.79E+04	1.97E+03	1.52E+01
6.99E-01	9.75E+01	2.51E+02	6.08E+02	6.16E+04	<0.009	5.96E+03	3.22E+04	1.61E+03	8.77E+00
7.40E-01	8.00E+01	1.61E+02	3.94E+02	4.23E+04	<0.009	3.23E+03	2.37E+04	1.11E+03	6.25E+00
6.49E-01	8.00E+01	2.20E+02	5.78E+02	6.07E+04	4.22E+01	3.58E+03	3.45E+04	1.60E+03	1.14E+01
7.60E-01	9.75E+01	2.14E+02	5.82E+02	5.58E+04	3.36E+01	5.22E+03	2.94E+04	1.45E+03	1.02E+01
1.04E+00	9.00E+01	1.20E+02	1.07E+02	2.78E+04	1.88E+01	6.31E+03	2.96E+03	6.66E+02	<0.036
8.82E-01	9.00E+01	1.12E+03	7.52E+02	8.62E+03	<0.009	4.76E+02	2.96E+03	2.32E+02	2.13E+01
5.70E-01	9.00E+01	4.93E+02	8.00E+02	7.98E+04	<0.009	4.67E+03	4.45E+04	2.06E+03	1.97E+01
9.24E-01	1.06E+02	1.33E+02	1.28E+02	2.96E+04	<0.009	5.44E+03	1.25E+04	7.05E+02	<0.036
CORE 5									
Wt (g)	Depth (cm)	Cr	Cu	Fe	Hg	K	Mg	Mn	Mo
6.44E-01	7.50E+00	2.76E+02	3.59E+02	6.81E+04	<0.009	6.02E+03	3.82E+04	1.89E+03	6.99E+00
1.00E+00	7.50E+00	8.05E+01	1.02E+02	1.88E+04	<0.009	1.29E+03	1.04E+04	5.21E+02	<0.036
7.69E-01	2.25E+01	2.00E+02	2.10E+02	4.26E+04	<0.009	5.54E+03	2.39E+04	1.33E+03	<0.036

5.67E-01	2.25E+01	2.91E+02	3.75E+02	6.88E+04	<0.009	5.18E+03	3.86E+04	1.95E+03	8.16E+00
6.00E-01	3.75E+01	2.60E+02	2.79E+02	6.46E+04	<0.009	4.42E+03	3.56E+04	1.90E+03	8.75E+00
4.98E-01	3.75E+01	3.39E+02	3.99E+02	8.01E+04	3.89E+02	5.04E+03	4.47E+04	2.35E+03	1.30E+01
7.39E-01	6.25E+01	2.57E+02	6.12E+02	6.51E+04	2.11E+02	4.52E+03	3.64E+04	1.95E+03	1.10E+01
7.21E-01	6.25E+01	3.42E+02	7.39E+02	8.24E+04	<0.009	5.72E+03	4.68E+04	2.46E+03	1.11E+01
7.06E-01	7.75E+01	3.35E+02	7.33E+02	7.61E+04	<0.009	6.82E+03	4.34E+04	2.46E+03	8.50E+00
5.84E-02	7.75E+01	3.72E+03	8.54E+03	8.82E+05	<0.009	7.26E+04	4.97E+05	2.76E+04	7.71E+01
6.40E-01	9.25E+01	4.34E+02	8.75E+02	7.96E+04	<0.009	8.03E+03	4.96E+04	2.97E+03	<0.036
7.36E-01	9.00E+01	3.28E+02	6.67E+02	6.27E+04	<0.009	5.72E+03	3.89E+04	2.31E+03	<0.036
8.34E-01	9.25E+01	4.20E+02	5.11E+02	7.96E+04	<0.009	7.76E+03	5.04E+04	2.97E+03	6.75E+00
7.63E-01	9.25E+01	4.13E+02	4.95E+02	8.06E+04	<0.009	8.68E+03	5.06E+04	2.98E+03	6.39E+00
8.29E-01	1.03E+02	3.06E+02	4.93E+02	5.41E+04	<0.009	4.34E+03	3.27E+04	2.08E+03	<0.036
7.40E-01	1.03E+02	4.58E+02	7.27E+02	8.18E+04	<0.009	5.27E+03	4.99E+04	3.11E+03	6.93E+00
7.75E-01	1.18E+02	3.11E+02	7.92E+02	6.72E+04	<0.009	1.04E+04	3.63E+04	2.03E+03	<0.036
8.21E-01	1.18E+02	2.60E+02	6.50E+02	5.90E+04	1.05E+02	9.76E+03	3.15E+04	1.74E+03	6.09E+00
7.45E-01	1.33E+02	2.05E+02	7.79E+01	5.22E+04	<0.009	1.38E+04	2.30E+04	1.00E+03	<0.036
6.61E-01	1.33E+02	1.83E+02	1.31E+02	4.71E+04	<0.009	1.06E+04	2.16E+04	9.27E+02	<0.036
8.07E-01	1.48E+02	1.92E+02	1.14E+02	4.62E+04	2.94E+01	1.70E+04	2.06E+04	9.71E+02	<0.036
6.47E-01	1.48E+02	2.17E+02	1.43E+02	5.24E+04	<0.009	1.23E+04	2.30E+04	1.08E+03	<0.036
CORE 7									
6.54E-01	7.50E+00	2.52E+02	3.35E+02	7.31E+04	<0.009	2.08E+03	4.32E+04	1.60E+03	1.26E+01
6.98E-01	7.50E+00	2.33E+02	3.08E+02	6.75E+04	<0.009	2.24E+03	3.96E+04	1.49E+03	1.06E+01
5.94E-01	2.25E+01	3.14E+02	3.41E+02	7.77E+04	<0.009	4.13E+03	4.57E+04	1.75E+03	1.24E+01
6.42E-01	2.25E+01	3.50E+02	3.43E+02	7.77E+04	<0.009	4.42E+03	4.65E+04	1.80E+03	1.44E+01
7.07E-01	3.75E+01	1.88E+02	2.53E+02	5.75E+04	<0.009	2.07E+03	3.40E+04	1.27E+03	1.04E+01
2.46E-01	3.75E+01	3.39E+02	4.94E+02	9.89E+04	<0.009	5.53E+03	5.99E+04	2.29E+03	2.28E+01
4.93E-01	5.75E+01	3.09E+02	4.41E+02	9.48E+04	<0.009	4.82E+03	5.53E+04	2.15E+03	1.57E+01
4.89E-01	5.75E+01	2.74E+02	4.12E+02	7.93E+04	<0.009	3.45E+03	4.68E+04	1.82E+03	1.51E+01
CORE 8									
5.88E-01	4.00E+01	3.40E+02	4.23E+02	8.03E+04	<0.009	5.04E+03	4.70E+04	2.11E+03	1.25E+01
6.14E-01	4.00E+01	4.07E+02	3.93E+02	7.26E+04	<0.009	4.05E+03	4.23E+04	1.92E+03	2.85E+01
6.76E-01	5.75E+01	2.41E+02	3.26E+02	5.53E+04	<0.009	4.72E+03	3.18E+04	1.53E+03	7.96E+00
5.45E-01	5.75E+01	2.61E+02	5.48E+02	7.24E+04	<0.009	4.70E+03	4.13E+04	1.92E+03	8.25E+00
5.93E-01	7.25E+01	2.93E+02	5.54E+02	7.48E+04	5.14E+01	6.11E+03	4.34E+04	1.89E+03	1.64E+01
6.71E-01	7.25E+01	1.63E+02	2.40E+02	4.14E+04	<0.009	3.23E+03	2.37E+04	1.06E+03	<0.036
6.47E-01	8.75E+01	2.24E+02	3.36E+02	5.85E+04	4.12E+01	3.13E+03	3.42E+04	1.48E+03	1.14E+01
6.63E-01	8.75E+01	2.24E+02	3.51E+02	5.81E+04	3.96E+02	4.75E+03	3.39E+04	1.57E+03	1.19E+01
8.52E-01	1.03E+02	2.13E+02	2.71E+02	5.25E+04	<0.009	3.64E+03	3.07E+04	1.38E+03	8.21E+00
6.60E-01	1.03E+02	2.78E+02	3.94E+02	6.78E+04	<0.009	3.88E+03	3.96E+04	1.74E+03	9.66E+00
6.15E-01	1.18E+02	7.78E+03	4.51E+02	8.08E+04	6.01E+01	3.13E+03	3.51E+04	2.07E+03	1.61E+02
2.00E+00	1.18E+02	2.89E+03	1.82E+02	3.04E+04	<0.009	1.67E+03	1.34E+04	8.06E+02	5.91E+01
CORE 9									
7.25E-01	2.75E+01	3.38E+02	9.79E+01	4.45E+04	<0.009	7.34E+03	1.86E+04	7.07E+02	<0.036
6.64E-01	2.75E+01	2.31E+02	4.63E+02	5.74E+04	<0.009	7.02E+03	2.71E+04	1.17E+03	<0.036
9.03E-01	4.25E+01	3.39E+02	4.42E+02	5.32E+04	<0.009	4.98E+03	3.05E+04	1.37E+03	1.18E+01
7.16E-01	4.25E+01	2.81E+02	5.71E+02	6.99E+04	<0.009	5.29E+03	3.97E+04	1.76E+03	1.29E+01
7.79E-01	5.75E+01	6.20E+02	7.27E+02	6.95E+04	<0.009	4.77E+03	3.76E+04	1.62E+03	1.06E+01
7.94E-01	5.75E+01	6.50E+02	8.56E+02	7.41E+04	<0.009	5.52E+03	4.08E+04	1.76E+03	1.73E+01
9.11E-01	7.55E+01	2.47E+02	5.06E+02	5.53E+04	<0.009	9.27E+03	2.68E+04	1.00E+03	8.23E+00

1.01E+00	7.55E+01	1.91E+02	4.20E+02	4.63E+04	3.39E+01	8.59E+03	2.22E+04	8.39E+02	7.67E+00
9.27E-01	7.55E+01	1.39E+03	2.48E+02	4.50E+04	<0.009	6.64E+03	1.81E+04	7.44E+02	2.71E+01
9.24E-01	7.55E+01	1.76E+03	2.48E+02	4.38E+04	<0.009	7.18E+03	1.64E+04	6.79E+02	3.40E+01
5.40E-01	8.90E+01	3.19E+02	6.62E+02	7.78E+04	<0.009	1.15E+04	3.77E+04	1.62E+03	9.26E+00
5.88E-01	8.90E+01	2.13E+02	9.86E+01	4.93E+04	<0.009	1.04E+04	2.07E+04	7.82E+02	<0.036
6.01E-01	3.50E+01	2.35E+02	3.49E+02	6.24E+04	<0.009	1.15E+04	3.68E+04	1.49E+03	<0.036
5.44E-01	3.50E+01	2.13E+02	3.15E+02	5.90E+04	4.16E+01	8.52E+03	3.51E+04	1.37E+03	<0.036
5.41E-01	1.00E+00	2.18E+02	3.40E+02	6.08E+04	3.95E+01	9.18E+03	3.65E+04	1.37E+03	<0.036
CORE 10									
7.70E-01	3.60E+01	3.47E+02	6.75E+02	6.97E+04	<0.009	6.27E+03	3.98E+04	1.80E+03	<0.036
9.36E-01	3.60E+01	1.36E+02	2.56E+02	2.76E+04	<0.009	2.46E+03	1.56E+04	7.04E+02	<0.036
8.06E-01	5.50E+01	1.58E+03	2.00E+03	8.42E+04	<0.009	8.90E+03	4.33E+04	1.92E+03	<0.036
8.21E-01	5.50E+01	1.27E+03	1.78E+03	7.54E+04	<0.009	7.39E+03	3.90E+04	1.72E+03	1.23E+01
1.67E+00	6.75E+01	1.09E+02	5.70E+02	1.31E+04	<0.009	7.39E+02	5.85E+03	2.62E+02	8.01E+00
1.77E+00	8.25E+01	2.93E+01	1.13E+02	5.89E+03	1.64E+01	8.00E+02	2.64E+03	1.00E+02	<0.036
1.77E+00	8.25E+01	2.97E+01	1.22E+02	5.99E+03	5.16E+00	7.84E+02	2.70E+03	1.07E+02	<0.036
1.76E+00	9.75E+01	4.32E+01	7.62E+01	8.54E+03	<0.009	1.58E+03	4.29E+03	1.66E+02	<0.036
7.13E-01	9.75E+01	1.60E+02	1.16E+02	1.25E+04	<0.009	1.73E+03	6.05E+03	2.45E+02	<0.036
1.09E+00	1.13E+02	6.69E+02	6.13E+01	1.92E+04	<0.009	3.20E+03	8.85E+03	4.34E+02	4.69E+00
1.79E+00	1.13E+02	2.25E+02	2.06E+01	3.80E+03	<0.009	6.71E+02	1.63E+03	9.15E+01	<0.036
Core S1									
1.41E+00	2.50E+01	1.40E+02	2.35E+02	3.62E+04	2.67E+01	2.26E+03	1.98E+04	9.82E+02	7.08E+00
8.15E-01	2.50E+01	2.96E+02	3.96E+02	7.57E+04	5.22E+01	4.30E+03	4.10E+04	1.92E+03	1.37E+01
1.23E+00	5.00E+01	1.23E+02	1.87E+02	3.35E+04	2.46E+01	2.93E+03	1.82E+04	1.01E+03	5.37E+00
1.42E+00	5.00E+01	1.02E+02	1.54E+02	2.74E+04	2.16E+01	2.75E+03	1.50E+04	8.36E+02	5.39E+00
5.44E-01	7.50E+01	2.69E+02	4.14E+02	7.22E+04	2.00E+02	8.20E+03	4.11E+04	1.95E+03	#VALUE!
5.43E-01	7.50E+01	2.53E+02	3.89E+02	6.79E+04	4.78E+02	8.05E+03	3.84E+04	1.81E+03	#VALUE!
Core S2									
5.75E-01	2.50E+01	3.05E+02	2.28E+02	6.63E+04	4.11E+01	8.35E+03	3.70E+04	1.88E+03	#VALUE!
4.79E-01	2.50E+01	3.05E+02	2.71E+02	8.04E+04	5.09E+01	8.35E+03	4.49E+04	2.36E+03	#VALUE!
4.62E-01	5.00E+01	2.76E+02	2.78E+02	7.89E+04	5.24E+01	6.79E+03	4.33E+04	2.42E+03	#VALUE!
4.93E-01	5.00E+01	2.97E+02	2.92E+02	7.82E+04	4.82E+01	6.14E+03	4.24E+04	2.34E+03	#VALUE!
5.06E-01	7.50E+01	3.41E+02	2.99E+02	7.16E+04	4.69E+02	8.89E+03	4.00E+04	2.11E+03	#VALUE!
5.19E-01	7.50E+01	3.11E+02	3.23E+02	6.81E+04	4.24E+01	8.26E+03	3.90E+04	2.06E+03	#VALUE!
Core S3									
1.39E+00	2.50E+01	9.52E+02	2.69E+01	2.32E+04	1.43E+01	2.02E+03	1.12E+04	5.40E+02	1.37E+01
1.39E+00	2.50E+01	9.43E+01	2.13E+02	2.60E+04	1.65E+01	2.54E+03	1.50E+04	6.83E+02	#VALUE!
1.44E+00	2.50E+01	9.35E+01	2.26E+02	2.51E+04	1.66E+01	2.60E+03	1.43E+04	6.56E+02	#VALUE!
1.21E+00	5.00E+01	1.15E+02	2.53E+02	3.25E+04	2.02E+01	2.15E+03	1.85E+04	8.66E+02	6.53E+00
1.39E+00	5.00E+01	9.61E+01	2.30E+02	2.75E+04	1.98E+01	1.27E+03	1.54E+04	7.25E+02	8.80E+00
9.98E-01	7.50E+01	2.04E+02	5.12E+02	3.19E+04	1.72E+01	3.70E+03	1.99E+04	1.01E+03	6.64E+00
7.50E-01	7.50E+01	2.35E+02	7.30E+02	4.61E+04	3.15E+01	5.83E+03	2.92E+04	1.50E+03	8.83E+00
Core S4									
7.25E-01	2.50E+01	2.17E+02	2.83E+02	5.95E+04	4.19E+01	3.81E+03	3.48E+04	1.47E+03	1.17E+01
7.25E-01	2.50E+01	1.74E+02	2.38E+02	5.04E+04	3.05E+01	2.35E+03	2.97E+04	1.21E+03	8.28E+00
5.63E-01	5.00E+01	2.20E+02	3.78E+02	6.42E+04	4.49E+01	2.95E+03	3.86E+04	1.39E+03	2.07E+01
4.89E-01	5.00E+01	2.71E+02	4.25E+02	7.57E+04	5.47E+01	5.19E+03	4.58E+04	1.69E+03	2.61E+01
5.63E-01	7.50E+01	2.51E+02	4.44E+02	6.47E+04	4.55E+01	7.31E+03	3.58E+04	1.55E+03	1.42E+01
5.27E-01	7.50E+01	2.70E+02	4.29E+02	6.71E+04	2.47E+02	6.43E+03	3.70E+04	1.63E+03	1.28E+01
5.45E-01	1.00E+02	2.66E+02	4.93E+02	6.76E+04	3.94E+01	6.38E+03	3.74E+04	1.63E+03	2.18E+01
5.40E-01	1.00E+02	2.78E+02	5.63E+02	7.15E+04	4.65E+01	6.39E+03	4.05E+04	1.68E+03	1.69E+01
Core S5									
6.49E-01	2.50E+01	2.20E+02	2.54E+02	5.55E+04	3.00E+01	5.95E+03	3.10E+04	1.52E+03	1.04E+01
5.99E-01	2.50E+01	2.63E+02	3.04E+02	6.44E+04	3.80E+01	6.76E+03	3.67E+04	1.77E+03	1.17E+01
6.49E-01	5.00E+01	1.91E+02	3.99E+02	5.53E+04	4.05E+01	2.29E+03	3.12E+04	1.34E+03	1.66E+01
6.73E-01	5.00E+01	2.30E+02	4.34E+02	6.29E+04	4.31E+01	5.09E+03	3.67E+04	1.67E+03	1.89E+01
6.72E-01	7.50E+01	2.12E+02	4.75E+02	5.55E+04	3.28E+01	4.36E+03	3.02E+04	1.54E+03	1.10E+01
5.65E-01	7.50E+01	2.81E+02	4.66E+02	6.15E+04	3.76E+01	5.31E+03	3.38E+04	1.73E+03	1.06E+01

CORE 3	8.00E-01	1.63E+02	1.15E+03	4.22E+02	9.68E+02	4.46E+02	<0.32	1.27E+04	7.11E+01	4.85E+01	<0.213	6.32E+01	8.71E+01
	7.36E-01	1.78E+02	1.01E+03	3.45E+02	8.14E+02	3.28E+02	1.17E+02	1.41E+04	6.30E+01	4.27E+01	<0.213	9.18E+01	1.12E+02
	7.62E-01	1.78E+02	1.21E+03	3.08E+02	1.06E+03	3.07E+02	5.33E+01	1.32E+04	7.12E+01	4.26E+01	<0.213	4.89E+01	1.06E+02
	1.10E+00	1.78E+02	9.02E+02	5.67E+01	9.40E+02	2.77E+01	9.91E+01	8.59E+03	3.17E+01	1.64E+01	<0.213	7.89E+01	1.06E+02
	1.05E+00	1.78E+02	8.89E+02	6.28E+01	9.56E+02	<0.213	<0.32	8.68E+03	2.09E+01	1.82E+01	<0.213	5.40E+01	1.12E+02
	9.22E-01	1.93E+02	5.95E+02	8.96E+01	9.08E+02	5.33E+01	<0.32	9.68E+03	3.69E+01	1.72E+01	<0.213	4.42E+01	1.09E+02
	9.58E-01	1.93E+02	5.73E+02	8.46E+01	8.78E+02	5.23E+01	4.24E+01	9.34E+03	2.86E+01	1.70E+01	<0.213	5.63E+01	1.02E+02
	4.95E-01	2.04E+02	1.45E+03	9.84E+02	1.68E+03	6.27E+02	<0.32	1.75E+04	1.40E+02	6.29E+01	<0.213	1.56E+02	1.15E+02
	6.72E-01	2.04E+02	1.76E+03	9.90E+01	8.52E+02	6.94E+01	6.72E+01	5.83E+03	4.22E+01	2.12E+01	<0.213	9.31E+01	1.25E+02
	Wt (g)	Depth (cm)	Na	Ni	P	Pb	Rb	S	Sb	Sc	Se	Si	Sr
	6.57E-01	7.50E+00	9.29E+02	4.27E+02	1.03E+03	3.58E+02	<0.32	6.65E+03	<0.167	4.70E+01	<0.213	6.23E+01	4.91E+01
	6.40E-01	7.50E+00	1.15E+03	4.39E+02	4.22E+02	3.69E+02	6.97E+01	6.89E+03	4.94E+01	4.86E+01	<0.213	2.71E+01	5.07E+01
	6.93E-01	2.25E+01	8.61E+02	4.28E+02	8.26E+02	3.95E+02	<0.32	7.52E+03	<0.167	4.62E+01	<0.213	3.39E+01	3.93E+01
	5.81E-01	2.25E+01	1.21E+03	5.94E+02	5.53E+02	5.66E+02	8.15E+01	1.04E+04	6.73E+01	6.47E+01	<0.213	6.37E+01	5.53E+01
	4.92E-01	3.75E+01	1.27E+03	7.52E+02	2.90E+02	6.30E+02	1.17E+02	1.08E+04	7.32E+01	7.62E+01	<0.213	2.87E+01	6.20E+01
	5.58E-01	3.75E+01	1.01E+03	6.65E+02	9.37E+02	5.78E+02	<0.32	9.95E+03	3.88E+01	6.81E+01	<0.213	4.66E+01	5.42E+01
	1.14E+00	5.25E+01	2.57E+02	2.01E+02	2.62E+02	1.45E+02	<0.32	3.01E+03	<0.167	1.89E+01	<0.213	2.68E+01	1.48E+01
	5.89E-01	5.25E+01	7.96E+02	5.24E+02	8.23E+02	4.31E+02	<0.32	8.57E+03	<0.167	5.62E+01	<0.213	4.44E+01	4.46E+01
	6.32E-01	6.75E+01	8.37E+02	5.14E+02	4.27E+02	4.85E+02	<0.32	8.78E+03	6.15E+01	5.95E+01	<0.213	3.66E+01	4.65E+01
	5.90E-01	6.75E+01	1.06E+03	4.77E+02	9.17E+02	4.07E+02	<0.32	8.07E+03	<0.167	5.51E+01	<0.213	4.68E+01	4.30E+01
	1.11E+00	7.50E+00	2.23E+02	1.10E+02	1.82E+02	8.31E+01	<0.32	1.61E+03	<0.167	1.20E+01	<0.213	3.57E+01	1.34E+01
	Wt (g)	Depth (cm)	Na	Ni	P	Pb	Rb	S	Sb	Sc	Se	Si	Sr
CORE 4	6.54E-01	5.75E+01	8.66E+02	3.96E+02	9.98E+02	4.00E+02	<0.32	8.30E+03	5.60E+01	4.72E+01	<0.213	4.66E+01	5.26E+01
	5.84E-01	7.50E+00	1.00E+03	4.92E+02	6.44E+02	4.04E+02	<0.32	1.54E+04	6.44E+01	5.56E+01	<0.213	2.48E+02	6.31E+01
	5.45E-01	5.75E+01	1.08E+03	4.63E+02	5.25E+02	4.50E+02	1.39E+02	9.45E+03	6.24E+01	6.24E+01	<0.213	1.19E+01	6.72E+01
	5.87E-01	2.25E+01	8.41E+02	3.94E+02	1.38E+03	3.94E+02	<0.32	7.22E+03	<0.167	4.38E+01	<0.213	7.77E+01	5.36E+01
	5.26E-01	7.25E+01	1.53E+03	2.88E+02	1.64E+03	4.54E+02	<0.32	7.11E+03	1.89E+02	5.28E+01	<0.213	4.09E+02	7.89E+01
	6.94E-01	2.25E+01	1.72E+03	4.72E+02	1.23E+03	5.95E+02	<0.32	9.93E+03	1.04E+02	6.52E+01	<0.213	3.97E+01	6.85E+01
	5.63E-01	7.25E+01	9.39E+02	2.40E+02	1.28E+03	4.04E+02	<0.32	7.00E+03	4.80E+01	4.53E+01	<0.213	4.00E+01	7.06E+01
	5.86E-01	3.75E+01	1.52E+03	3.52E+02	1.54E+03	3.24E+02	<0.32	7.45E+03	9.28E+01	4.93E+01	<0.213	8.81E+01	6.66E+01
	7.39E-01	7.75E+01	1.81E+03	4.70E+02	1.39E+03	5.80E+02	<0.32	7.70E+03	7.11E+01	4.89E+01	<0.213	5.87E+01	7.55E+01
	6.24E-01	3.75E+01	1.27E+03	3.15E+02	1.09E+03	3.23E+02	<0.32	6.53E+03	8.27E+01	4.03E+01	<0.213	4.57E+01	5.21E+01
	6.05E-01	7.75E+01	9.64E+02	3.14E+02	1.38E+03	3.04E+02	<0.32	6.45E+03	1.05E+02	4.07E+01	<0.213	9.39E+01	5.96E+01
	7.62E-01	5.75E+01	4.79E+02	2.48E+02	9.25E+02	2.58E+02	<0.32	5.20E+03	<0.167	2.95E+01	<0.213	3.84E+01	4.43E+01
	6.89E-01	5.75E+01	2.21E+03	5.61E+02	1.14E+03	7.21E+02	<0.32	9.51E+03	6.13E+02	5.59E+01	<0.213	2.14E+02	8.71E+01
	6.56E-01	9.00E+01	7.51E+03	6.69E+02	7.22E+02	9.93E+02	<0.32	1.22E+04	1.62E+02	6.27E+01	<0.213	7.51E+01	6.61E+01
	7.05E-01	9.00E+01	4.50E+03	5.67E+02	5.30E+02	9.17E+02	<0.32	1.08E+04	6.38E+01	5.50E+01	<0.213	5.21E+01	5.46E+01
	6.99E-01	9.75E+01	1.09E+03	3.72E+02	5.82E+02	4.33E+02	<0.32	9.70E+03	6.30E+01	4.87E+01	<0.213	1.42E+02	7.14E+01
	6.49E-01	8.00E+01	5.24E+02	3.38E+02	2.40E+02	2.96E+02	<0.32	8.77E+03	3.96E+01	3.48E+01	<0.213	2.40E+01	3.41E+01
	7.60E-01	9.75E+01	1.22E+03	3.49E+02	1.25E+03	3.73E+02	<0.32	8.70E+03	3.37E+01	4.82E+01	<0.213	1.19E+02	4.64E+01
	1.04E+00	9.00E+01	9.37E+02	1.15E+02	1.68E+03	4.25E+01	<0.32	6.01E+03	4.01E+01	4.20E+01	<0.213	6.25E+01	6.76E+01
	8.82E-01	9.00E+01	8.47E+01	6.21E+02	8.63E+01	4.04E+01	<0.32	8.46E+02	2.98E+01	2.32E+01	<0.213	9.81E+01	1.11E+02
	5.70E-01	9.00E+01	1.25E+03	8.55E+02	1.59E+03	5.74E+02	<0.32	8.46E+02	1.40E+02	4.25E+00	<0.213	8.89E+01	4.25E+00
	9.24E-01	1.06E+02	6.57E+02	1.22E+02	1.79E+03	5.97E+01	5.75E+01	1.27E+04	2.70E+02	6.27E+01	<0.213	5.39E+01	5.72E+01
	Wt (g)	Depth (cm)	Na	Ni	P	Pb	Rb	S	Sb	Sc	Se	Si	Sr
CORE 5	6.44E-01	7.50E+00	1.96E+03	2.72E+02	9.37E+02	3.32E+02	1.05E+02	7.32E+03	7.12E+01	5.38E+01	<0.213	4.46E+01	7.70E+01
	1.00E+00	7.50E+00	5.16E+02	7.91E+01	2.81E+02	9.39E+01	<0.32	2.34E+03	2.11E+01	1.43E+01	<0.213	1.61E+01	1.94E+01
	7.69E-01	2.25E+01	2.06E+03	1.80E+02	5.58E+02	2.34E+02	6.91E+01	4.70E+03	4.54E+01	4.00E+01	<0.213	1.28E+02	4.76E+02

CORE 7														
Wt(g)	Depth (cm)	Na	Ni	P	Pb	Rb	S	Sb	Sc	Se	Si	Sr		
5.67E-01	2.25E+01	1.76E+03	3.04E+02	1.15E+03	4.30E+02	<0.32	8.21E+03	7.57E+01	5.34E+01	<0.213	1.03E+02	6.97E+01		
6.00E-01	3.75E+01	1.79E+03	2.48E+02	1.05E+03	3.56E+02	<0.32	7.17E+03	1.21E+02	5.35E+01	<0.213	7.79E+01	6.75E+01		
4.98E-01	3.75E+01	2.04E+03	3.31E+02	1.49E+03	4.62E+02	<0.32	8.76E+03	5.82E+01	6.30E+01	<0.213	1.18E+02	7.73E+01		
7.39E-01	6.25E+01	2.00E+03	4.65E+02	1.18E+03	4.43E+02	<0.32	8.05E+03	5.13E+01	5.06E+01	<0.213	1.29E+02	6.92E+01		
7.21E-01	6.25E+01	2.76E+03	5.62E+02	9.36E+02	5.43E+02	<0.32	9.86E+03	1.39E+02	6.48E+01	<0.213	1.10E+02	8.50E+01		
7.06E-01	7.75E+01	6.34E+03	5.52E+02	4.27E+02	4.96E+02	<0.32	1.12E+04	8.91E+01	6.62E+01	<0.213	<0.022	9.46E+01		
5.84E-02	7.75E+01	3.83E+04	6.42E+03	5.95E+03	<0.213	<0.32	1.25E+05	8.45E+02	7.32E+02	<0.213	4.02E+02	1.00E+03		
6.40E-01	9.25E+01	4.22E+03	5.78E+02	4.67E+02	7.99E+02	8.99E+01	1.53E+04	8.01E+01	7.01E+01	<0.213	4.63E+01	1.06E+02		
7.36E-01	9.00E+01	3.52E+03	4.57E+02	2.51E+02	6.23E+02	5.67E+01	1.18E+04	6.83E+01	5.45E+01	<0.213	2.55E+01	8.39E+01		
8.34E-01	9.25E+01	6.15E+03	5.04E+02	5.01E+02	4.60E+02	<0.32	9.31E+03	1.09E+02	7.75E+01	<0.213	3.25E+01	1.07E+02		
7.63E-01	9.25E+01	6.70E+03	5.11E+02	4.95E+02	4.72E+02	<0.32	9.88E+03	1.05E+02	7.68E+01	<0.213	4.92E+00	1.10E+02		
8.29E-01	1.03E+02	2.05E+03	3.83E+02	3.92E+02	4.69E+02	<0.32	8.14E+03	6.41E+01	3.98E+01	<0.213	5.02E+01	6.62E+01		
7.40E-01	1.03E+02	3.02E+03	5.69E+02	7.32E+02	8.82E+02	<0.32	1.26E+04	6.18E+01	3.35E+02	<0.213	1.06E+02	9.24E+01		
7.75E-01	1.18E+02	2.08E+03	3.74E+02	6.74E+02	9.27E+02	<0.32	1.09E+04	6.89E+01	5.35E+01	<0.213	2.48E+01	1.21E+02		
8.21E-01	1.18E+02	1.80E+03	3.24E+02	1.21E+03	7.56E+02	<0.32	8.82E+03	4.95E+01	4.65E+01	<0.213	1.24E+02	1.13E+02		
7.45E-01	1.33E+02	1.81E+03	1.18E+02	1.10E+03	3.83E+01	1.48E+02	1.41E+03	6.44E+01	3.29E+01	<0.213	6.88E+01	1.29E+02		
6.61E-01	1.33E+02	1.91E+03	1.45E+02	9.27E+02	7.72E+01	1.76E+02	2.16E+03	7.15E+01	3.03E+01	<0.213	4.73E+01	1.03E+02		
8.07E-01	1.48E+02	2.94E+03	1.32E+02	8.66E+02	8.63E+01	<0.32	2.21E+03	6.15E+01	3.24E+01	<0.213	1.63E+02	1.46E+02		
6.47E-01	1.48E+02	1.17E+03	1.41E+02	8.87E+02	1.31E+02	1.03E+02	2.69E+03	5.22E+01	3.52E+01	<0.213	1.28E+02	1.23E+02		
CORE 8														
Wt(g)	Depth (cm)	Na	Ni	P	Pb	Rb	S	Sb	Sc	Se	Si	Sr		
5.88E-01	4.00E+01	1.94E+03	3.83E+02	1.27E+03	6.82E+02	<0.32	9.07E+03	1.43E+02	7.03E+01	<0.213	9.12E+01	6.84E+01		
6.14E-01	4.00E+01	1.66E+03	4.31E+02	1.15E+03	6.02E+02	<0.32	8.20E+03	1.08E+02	6.21E+01	<0.213	1.08E+02	6.02E+01		
6.76E-01	5.75E+01	1.27E+03	3.52E+02	8.70E+02	4.50E+02	<0.32	7.38E+03	6.94E+01	4.98E+01	<0.213	2.04E+01	5.16E+01		
5.45E-01	5.75E+01	9.21E+02	5.02E+02	1.38E+03	4.77E+02	<0.32	9.10E+03	7.93E+01	5.52E+01	<0.213	3.96E+01	6.74E+01		
5.93E-01	7.25E+01	1.38E+03	3.41E+02	1.52E+03	6.24E+02	<0.32	8.28E+03	4.07E+01	6.79E+01	<0.213	9.17E+01	6.34E+01		
6.71E-01	7.25E+01	8.86E+02	1.85E+02	4.75E+02	3.36E+02	9.68E+01	4.98E+03	4.36E+01	3.71E+01	<0.213	1.34E+01	3.49E+01		
6.47E-01	8.75E+01	1.17E+03	2.78E+02	1.10E+03	4.58E+02	<0.32	6.53E+03	5.60E+01	4.99E+01	<0.213	6.82E+01	4.56E+01		
6.63E-01	8.75E+01	2.02E+03	2.45E+02	1.09E+03	4.43E+02	<0.32	6.62E+03	8.13E+01	5.49E+01	<0.213	8.30E+01	4.96E+01		
8.52E-01	1.03E+02	1.16E+03	2.36E+02	8.20E+02	5.06E+02	<0.32	5.68E+03	6.48E+01	4.59E+01	<0.213	5.33E+01	4.34E+01		
6.60E-01	1.03E+02	1.40E+03	3.11E+02	9.60E+02	5.81E+02	<0.32	7.44E+03	8.98E+01	5.59E+01	<0.213	7.78E+01	5.40E+01		
6.15E-01	1.18E+02	1.11E+03	4.20E+03	1.27E+03	4.49E+02	<0.32	6.24E+03	5.77E+02	4.85E+01	<0.213	2.66E+02	4.81E+01		
2.00E+00	1.18E+02	5.34E+02	1.54E+03	3.47E+02	1.79E+02	<0.32	2.59E+03	2.28E+02	2.02E+01	<0.213	1.28E+01	1.95E+01		
CORE 9														
Wt(g)	Depth (cm)	Na	Ni	P	Pb	Rb	S	Sb	Sc	Se	Si	Sr		
7.25E-01	2.75E+01	7.20E+02	2.14E+02	9.03E+02	4.77E+01	<0.32	2.57E+03	6.70E+01	3.10E+01	<0.213	3.93E+01	1.24E+02		
6.64E-01	2.75E+01	1.13E+03	3.91E+02	9.17E+02	3.14E+02	<0.32	1.27E+04	7.68E+01	4.14E+01	<0.213	3.26E+01	1.24E+02		
9.03E-01	4.25E+01	3.75E+03	4.54E+02	7.28E+02	4.13E+02	<0.32	7.55E+03	7.06E+01	4.78E+01	<0.213	2.52E+01	5.88E+01		
7.16E-01	4.25E+01	2.92E+03	5.35E+02	7.29E+02	5.75E+02	5.92E+01	1.04E+04	7.42E+01	6.01E+01	<0.213	3.27E+01	7.69E+01		
7.79E-01	5.75E+01	1.47E+03	7.09E+02	9.57E+02	5.57E+02	5.14E+01	1.39E+04	9.28E+01	5.44E+01	<0.213	1.61E+02	7.03E+01		
7.94E-01	5.75E+01	1.98E+03	7.96E+02	1.05E+03	6.20E+02	<0.32	9.79E+03	1.26E+02	6.36E+01	<0.213	6.03E+01	7.84E+01		
9.11E-01	7.55E+01	1.34E+03	4.07E+02	1.03E+03	2.87E+02	9.41E+01	8.29E+03	7.35E+01	4.62E+01	<0.213	5.09E+01	1.10E+02		

CORE 10	1.01E+00	7.55E+01	1.24E+02	3.47E+02	1.20E+02	2.27E+02	<0.32	6.78E+03	3.45E+01	3.80E+01	<0.213	9.83E+01	1.01E+02
	9.27E-01	7.55E+01	6.66E+02	8.90E+02	9.01E+02	1.40E+02	6.69E+01	6.51E+03	1.38E+01	3.32E+01	<0.213	7.17E+01	8.78E+01
	9.24E-01	7.55E+01	6.18E+02	1.08E+03	9.01E+02	1.17E+02	7.56E+01	6.87E+03	1.64E+02	3.20E+01	<0.213	9.12E+01	9.12E+01
	5.40E-01	8.90E+01	1.76E+03	5.46E+02	1.31E+03	4.47E+02	1.09E+02	1.83E+04	9.21E+01	5.88E+01	<0.213	1.38E+02	1.38E+02
	5.88E-01	8.90E+01	9.35E+02	1.41E+02	9.99E+02	<0.213	<0.32	2.78E+03	6.10E+01	3.57E+01	<0.213	6.87E+01	1.51E+02
	6.01E-01	3.50E+01	6.49E+02	1.73E+02	1.14E+03	9.11E+02	1.45E+02	3.28E+03	1.26E+02	5.97E+01	<0.213	5.72E+01	3.08E+01
	5.44E-01	3.50E+01	5.26E+02	1.68E+02	1.29E+03	8.25E+02	<0.32	3.42E+03	4.02E+01	5.26E+01	<0.213	4.48E+01	2.88E+01
	5.41E-01	1.00E+00	2.84E+02	1.86E+02	1.41E+03	8.46E+02	<0.32	3.98E+03	<0.167	5.52E+01	<0.213	5.73E+01	3.03E+01
	7.70E-01	3.60E+01	2.26E+03	5.80E+02	1.01E+03	5.75E+02	<0.42	6.15E+03	7.52E+01	5.55E+01	<0.213	3.38E+01	7.08E+01
	9.36E-01	3.60E+01	2.22E+02	2.26E+02	4.25E+02	6.06E+02	<0.32	2.62E+03	3.24E+01	2.12E+01	<0.213	6.92E+01	2.75E+01
Core S1	8.06E-01	5.50E+01	9.80E+03	1.55E+03	1.15E+02	6.06E+02	1.09E+02	5.76E+03	1.60E+02	6.75E+01	<0.213	8.93E+01	6.73E+01
	8.21E-01	5.50E+01	6.90E+03	1.34E+03	1.58E+02	5.53E+02	<0.32	4.94E+03	1.52E+02	5.93E+01	<0.213	2.36E+02	5.62E+01
	1.67E+00	6.75E+01	3.87E+02	4.24E+02	2.29E+02	1.00E+02	<0.32	1.52E+04	9.43E+01	8.83E+00	<0.213	1.56E+01	9.73E+01
	1.77E+00	8.25E+01	2.24E+02	5.84E+01	6.41E+02	<0.213	<0.32	6.15E+03	<0.167	7.43E+00	<0.213	4.41E+01	1.01E+02
	1.77E+00	8.25E+01	2.52E+02	6.28E+01	6.84E+02	2.20E+01	<0.32	6.25E+03	<0.167	7.42E+00	<0.213	4.14E+01	1.02E+02
	1.76E+00	9.75E+01	4.09E+02	4.11E+01	4.25E+02	<0.213	<0.32	1.18E+04	1.54E+01	8.75E+00	<0.213	1.25E+02	1.46E+02
	1.73E-01	9.75E+01	1.02E+03	1.55E+02	7.00E+02	<0.213	<0.32	1.70E+04	<0.167	1.12E+01	<0.213	3.66E+01	2.09E+02
	1.09E+00	1.13E+02	6.70E+02	3.98E+02	4.86E+02	<0.213	6.61E+01	1.08E+04	6.28E+01	1.28E+01	<0.213	3.24E+01	1.64E+02
	1.79E+00	1.13E+02	1.39E+02	1.34E+02	1.17E+02	<0.213	<0.32	2.59E+03	1.89E+01	2.51E+00	<0.213	1.40E+01	3.46E+01
	1.41E+00	2.50E+01	2.59E+03	2.98E+02	6.11E+02	2.83E+02	<0.32	4.07E+03	2.68E+01	2.89E+01	<0.213	1.41E+02	2.87E+01
Core S2	8.15E-01	2.50E+01	4.71E+03	5.59E+02	1.19E+03	5.51E+02	<0.32	6.17E+03	4.54E+01	5.80E+01	<0.213	1.17E+02	5.23E+01
	1.23E+00	5.00E+01	9.65E+02	1.65E+02	5.63E+02	2.26E+02	<0.32	7.09E+03	1.73E+01	2.84E+01	<0.213	8.63E+01	2.97E+01
	1.42E+00	5.00E+01	8.39E+02	1.36E+02	2.99E+02	1.84E+02	<0.32	5.71E+03	#VALUE!	2.37E+01	<0.213	2.50E+01	2.47E+01
	5.44E-01	7.50E+01	1.81E+03	2.90E+02	1.19E+03	5.22E+02	<0.32	9.31E+03	#VALUE!	6.80E+01	<0.213	6.25E+01	6.96E+01
	5.43E-01	7.50E+01	1.71E+03	2.76E+02	1.03E+03	4.74E+02	<0.32	8.90E+03	#VALUE!	6.23E+01	<0.213	2.21E+02	6.67E+01
	5.75E-01	2.50E+01	1.74E+03	2.96E+02	1.01E+03	3.04E+02	<0.32	4.57E+03	#VALUE!	6.29E+01	<0.213	8.37E+01	5.91E+01
	4.79E-01	2.50E+01	2.32E+03	2.66E+02	1.21E+03	3.65E+02	<0.32	5.35E+03	#VALUE!	7.99E+01	<0.213	1.62E+02	7.31E+01
	4.62E-01	5.00E+01	2.05E+03	2.92E+02	6.35E+02	3.84E+02	<0.32	7.06E+03	#VALUE!	7.43E+01	<0.213	8.49E+01	7.46E+01
	4.93E-01	5.00E+01	1.89E+03	2.89E+02	9.03E+02	3.83E+02	<0.32	7.28E+03	4.29E+01	7.34E+01	<0.213	6.90E+02	7.08E+01
	5.06E-01	7.50E+01	1.56E+03	3.16E+02	5.21E+02	4.35E+02	<0.32	7.11E+03	4.30E+01	6.22E+01	<0.213	2.31E+02	7.97E+01
Core S3	5.19E-01	7.50E+01	2.04E+03	3.32E+02	6.21E+02	4.07E+02	<0.32	6.94E+03	#VALUE!	6.00E+01	<0.213	1.27E+02	7.80E+01
	1.39E+00	2.50E+01	5.32E+02	4.98E+02	2.62E+02	2.39E+01	<0.32	4.75E+02	7.36E+01	1.88E+01	<0.213	5.25E+01	1.60E+01
	1.39E+00	2.50E+01	5.84E+02	1.92E+02	2.99E+02	1.66E+02	<0.32	2.42E+03	#VALUE!	2.17E+01	<0.213	6.93E+01	2.54E+01
	1.44E+00	2.50E+01	5.66E+02	1.83E+02	2.86E+02	1.69E+02	<0.32	2.41E+03	#VALUE!	2.11E+01	<0.213	4.52E+01	2.41E+01
	1.21E+00	5.00E+01	1.36E+03	1.63E+02	5.09E+02	2.41E+02	<0.32	3.62E+03	#VALUE!	2.68E+01	<0.213	5.86E+01	2.31E+01
	1.39E+00	5.00E+01	6.13E+02	1.38E+02	4.45E+02	2.01E+02	<0.32	3.11E+03	1.87E+01	2.17E+01	<0.213	6.23E+01	1.82E+01
	9.98E-01	7.50E+01	9.38E+02	2.23E+02	5.19E+02	4.87E+02	<0.32	1.11E+04	3.11E+01	2.53E+01	<0.213	7.84E+01	5.87E+01
	7.50E-01	7.50E+01	1.48E+03	2.95E+02	7.75E+02	7.21E+02	<0.32	1.60E+04	4.48E+01	3.73E+01	<0.213	5.03E+02	8.83E+01
	7.25E-01	2.50E+01	1.43E+03	1.91E+02	1.10E+03	5.61E+02	<0.32	6.23E+03	3.36E+01	5.74E+01	<0.213	6.99E+01	4.61E+01
	7.25E-01	2.50E+01	1.02E+03	1.64E+02	9.11E+02	4.88E+02	<0.32	5.40E+03	3.29E+01	4.50E+01	<0.213	2.19E+02	3.74E+01
Core S4	5.63E-01	5.00E+01	9.73E+02	3.18E+02	1.20E+03	6.97E+02	<0.32	7.88E+03	4.24E+01	4.77E+01	<0.213	1.25E+02	4.62E+01
	4.89E-01	5.00E+01	3.66E+02	1.59E+03	1.36E+03	5.27E+02	<0.32	7.88E+03	5.01E+01	6.29E+01	<0.213	1.31E+02	6.19E+01
	5.63E-01	7.50E+01	1.15E+03	2.98E+02	1.17E+03	2.78E+02	<0.32	6.78E+03	#VALUE!	5.07E+01	<0.213	8.82E+01	4.77E+01
	5.27E-01	7.50E+01	1.14E+03	3.18E+02	1.36E+03	3.41E+02	<0.32	6.88E+03	4.29E+01	5.12E+01	<0.213	1.36E+02	4.91E+01
	5.45E-01	1.00E+02	1.21E+03	3.67E+02	1.42E+03	3.37E+02	<0.32	7.80E+03	7.04E+01	5.32E+01	<0.213	7.63E+01	4.98E+01
	5.40E-01	1.00E+02	1.28E+03	3.70E+02	1.28E+03	3.06E+02	<0.32	7.89E+03	5.90E+01	5.67E+01	<0.213	1.27E+02	5.02E+01
	6.49E-01	2.50E+01	1.46E+03	2.48E+02	9.67E+02	3.81E+02	<0.32	7.49E+03	3.54E+01	4.93E+01	<0.213	7.34E+01	5.80E+01
	5.99E-01	2.50E+01	1.78E+03	2.94E+02	1.17E+03	4.80E+02	<0.32	8.90E+03	4.44E+01	5.94E+01	<0.213	6.86E+01	6.92E+01
	6.49E-01	5.00E+01	1.53E+03	3.08E+02	1.01E+03	4.76E+02	<0.32	9.89E+03	4.01E+01	4.07E+01	<0.213	1.01E+02	4.47E+01
	6.73E-01	5.00E+01	2.02E+03	3.34E+02	1.14E+03	5.07E+02	<0.32	1.09E+04	5.79E+01	5.31E+01	<0.213	5.31E+01	6.37E+01
Core S5	6.72E-01	7.50E+01	2.81E+02	1.47E+03	1.05E+03	8.00E+03	<0.32	8.00E+03	6.33E+01	4.34E+01	<0.213	6.89E+01	5.04E+01
	5.65E-01	7.50E+01	1.72E+03	3.40E+02	1.11E+03	4.18E+02	<0.32	8.33E+03	3.87E+01	4.91E+01	<0.213	4.31E+01	5.66E+01

	Wt (g)	Depth (cm)	Th	Ti	U	Zn	Zr
CORE 1	5.50E-01	1.50E+01	<33.1	2.50E+03	4.04E+02	7.98E+02	9.45E+01
	2.48E-01	1.50E+01	<33.1	1.04E+04	9.49E+02	1.64E+03	1.21E+02
	7.67E-01	7.50E+00	<33.1	3.76E+03	3.53E+02	6.40E+02	6.99E+01
	5.59E-01	7.50E+00	<33.1	3.65E+03	4.54E+02	7.27E+02	8.35E+01
	3.44E-01	2.25E+01	<33.1	5.17E+03	7.53E+02	1.22E+03	3.78E+01
	5.73E-01	2.25E+01	<33.1	3.67E+03	4.15E+02	7.05E+02	8.47E+01
	5.91E-01	3.75E+01	<33.1	4.44E+03	4.36E+02	5.92E+02	8.27E+01
	7.55E-01	3.75E+01	<33.1	3.76E+03	3.53E+02	5.16E+02	6.12E+01
	1.66E+00	5.25E+01	<33.1	8.96E+02	1.14E+02	1.91E+02	2.27E+01
	1.90E-01	5.25E+01	<33.1	1.07E+04	6.34E+02	1.31E+03	1.77E+02
	5.60E-01	6.75E+01	<33.1	5.22E+03	4.89E+02	6.68E+02	6.39E+01
	5.16E-01	6.75E+01	<33.1	4.65E+03	4.48E+02	7.20E+02	8.12E+01
	6.90E-01	6.75E+01	<33.1	2.17E+03	2.50E+02	4.77E+02	4.93E+01
	5.93E-01	6.75E+01	<33.1	3.27E+03	3.33E+02	7.00E+02	6.18E+01
	7.33E-01	8.25E+01	<33.1	3.51E+03	3.74E+02	9.21E+02	3.65E+01
	7.32E-01	8.25E+01	<33.1	2.63E+03	2.97E+02	6.93E+02	4.98E+01
	9.55E-01	1.00E+02	<33.1	2.42E+03	1.48E+02	2.47E+02	4.14E+01
	9.08E-01	1.00E+02	2.99E+04	2.52E+03	2.18E+02	2.80E+02	2.97E+01
	7.25E-01	1.15E+02	<33.1	3.65E+03	2.74E+02	2.74E+02	9.79E+01
	6.99E-01	1.15E+02	9.52E+04	3.79E+03	3.02E+02	2.75E+02	9.96E+01
	8.65E-01	1.25E+02	<33.1	2.69E+03	2.60E+02	2.69E+02	5.87E+01
	8.44E-01	1.25E+02	1.04E+04	2.90E+03	2.40E+02	3.07E+02	5.94E+01
CORE 2	6.86E-01	7.50E+00	<33.1	3.86E+03	3.70E+02	5.92E+02	4.63E+01
	6.32E-01	7.50E+00	<33.1	3.62E+03	3.28E+02	5.84E+02	4.10E+01
	1.43E+00	2.25E+01	<33.1	1.07E+03	1.85E+02	2.83E+02	2.54E+01
	7.32E-01	2.25E+01	<33.1	2.60E+03	3.40E+02	6.20E+02	5.14E+01
	5.86E-01	3.75E+01	<33.1	4.48E+03	5.00E+02	8.33E+02	9.14E+01
	6.22E-01	3.75E+01	<33.1	4.77E+03	4.79E+02	6.30E+02	8.09E+01
	6.78E-01	5.25E+01	<33.1	3.37E+03	4.52E+02	7.80E+02	6.66E+01
	8.51E-01	5.25E+01	<33.1	2.58E+03	3.05E+02	6.08E+02	5.05E+01
	6.44E-01	6.75E+01	<33.1	3.86E+03	4.78E+02	8.66E+02	6.83E+01
	7.10E-01	6.75E+01	<33.1	2.25E+03	3.58E+02	6.62E+02	5.46E+01
	5.70E-01	8.25E+01	<33.1	3.11E+03	4.69E+02	8.79E+02	5.72E+01
	7.00E-01	8.25E+01	<33.1	3.20E+03	3.55E+02	7.21E+02	5.18E+01
	6.11E-01	9.75E+01	<33.1	3.15E+03	3.81E+02	5.67E+02	7.02E+01
	7.60E-01	9.75E+01	<33.1	2.81E+03	3.73E+02	4.88E+02	5.86E+01
	8.06E-01	1.13E+02	<33.1	2.11E+03	3.13E+02	5.10E+02	1.58E+01
	7.27E-01	1.13E+02	<33.1	2.27E+03	4.08E+02	6.28E+02	7.69E+01
	7.44E-01	1.28E+02	<33.1	2.07E+03	3.65E+02	5.46E+02	9.41E+00
	6.74E-01	1.28E+02	<33.1	2.60E+03	4.78E+02	6.75E+02	5.75E+00
	1.10E+00	1.38E+02	<33.1	1.42E+03	1.58E+02	5.42E+02	4.71E+01
	4.12E-01	1.38E+02	<33.1	1.61E+03	1.61E+02	7.07E+02	4.89E+01
	7.09E-01	1.48E+02	<33.1	2.94E+03	4.72E+02	9.99E+02	8.81E+01
	7.08E-01	1.48E+02	<33.1	2.58E+03	4.45E+02	8.47E+02	2.66E+01
	8.01E-01	1.63E+02	<33.1	1.47E+03		1.30E+02	3.31E+01

CORE 3										
Wt (g)	Depth (cm)	Th	Ti	U	Zn	Zr	Wt (g)	Depth (cm)	Th	Ti
8.00E-01	1.63E+02	<33.1	2.78E+03	3.71E+02	6.32E+02	7.75E+01	6.57E-01	7.50E+00	<33.1	2.67E+03
7.36E-01	1.78E+02	<33.1	2.35E+03	2.96E+02	5.25E+02	7.54E+01	6.40E-01	7.50E+00	<33.1	1.15E+03
7.62E-01	1.78E+02	<33.1	3.00E+03	2.85E+02	4.63E+02	7.40E+01	6.93E-01	2.25E+01	<33.1	2.16E+03
1.10E+00	1.78E+02	<33.1	1.56E+03		1.18E+02	4.05E+01	5.81E-01	2.25E+01	<33.1	2.95E+03
1.05E+00	1.78E+02	<33.1	1.64E+03		1.14E+02	4.50E+01	4.92E-01	3.75E+01	<33.1	2.36E+03
9.22E-01	1.93E+02	<33.1	1.71E+03		1.46E+02	4.09E+01	5.58E-01	3.75E+01	<33.1	2.60E+03
9.58E-01	1.93E+02	<33.1	1.66E+03	1.44E+02	1.46E+02	4.07E+01	1.14E+00	5.25E+01	<33.1	6.90E+02
4.95E-01	2.04E+02	<33.1	3.87E+03	4.52E+02	8.29E+02	9.35E+01	5.89E-01	5.25E+01	<33.1	2.36E+03
6.72E-01	2.04E+02	<33.1	2.25E+03	1.75E+02	1.57E+02	5.06E+01	6.32E-01	6.75E+01	1.53E+04	2.08E+03
							5.90E-01	6.75E+01	<33.1	2.67E+03
							1.11E+00	7.50E+01	<33.1	5.62E+02
CORE 4										
Wt (g)	Depth (cm)	Th	Ti	U	Zn	Zr	Wt (g)	Depth (cm)	Th	Ti
6.54E-01	5.75E+01	<33.1	2.77E+03	3.48E+02	4.91E+02	6.38E+01	6.54E-01	5.75E+01	<33.1	3.04E+03
5.84E-01	7.50E+00	<33.1	3.04E+03	4.24E+02	5.11E+02	7.73E+01	5.45E-01	5.75E+01	<33.1	2.62E+03
5.87E-01	2.25E+01	<33.1	3.04E+03	3.97E+02	5.64E+02	9.04E+01	5.87E-01	2.25E+01	<33.1	3.04E+03
5.26E-01	7.25E+01	<33.1	3.90E+03	3.13E+02	4.73E+02	6.00E+01	6.94E-01	2.25E+01	<33.1	4.79E+03
5.63E-01	7.25E+01	<33.1	3.24E+03	3.68E+02	6.24E+02	7.57E+01	5.63E-01	7.25E+01	<33.1	3.24E+03
5.86E-01	3.75E+01	<33.1	3.90E+03	2.60E+02	4.00E+02	6.51E+01	7.39E-01	7.75E+01	<33.1	2.74E+03
7.39E-01	7.75E+01	<33.1	2.74E+03	4.21E+02	4.52E+02	6.72E+01	6.05E-01	7.75E+01	<33.1	3.18E+03
6.24E-01	3.75E+01	<33.1	2.90E+03	2.10E+02	4.05E+02	4.49E+01	7.62E-01	5.75E+01	<33.1	1.82E+03
6.05E-01	7.75E+01	<33.1	3.18E+03	2.83E+02	3.91E+02	4.40E+01	6.89E-01	5.75E+01	<33.1	3.32E+03
7.62E-01	5.75E+01	<33.1	1.82E+03	1.92E+02	3.22E+02	3.69E+01	6.56E-01	9.00E+01	<33.1	2.76E+03
6.89E-01	5.75E+01	<33.1	3.32E+03	4.57E+02	8.80E+02	6.03E+01	7.05E-01	9.00E+01	<33.1	2.07E+03
7.40E-01	8.00E+01	<33.1	2.76E+03	4.38E+02	1.11E+03	9.56E+01	6.99E-01	9.75E+01	<33.1	1.83E+03
6.49E-01	8.00E+01	<33.1	2.07E+03	3.83E+02	1.00E+03	7.82E+01	7.40E-01	8.00E+01	<33.1	1.27E+03
7.60E-01	9.75E+01	<33.1	1.83E+03	2.88E+02	6.85E+02	8.00E+01	6.49E-01	8.00E+01	<33.1	2.58E+03
1.04E+00	9.00E+01	<33.1	1.27E+03	2.27E+02	3.58E+02	5.04E+01	7.60E-01	9.75E+01	<33.1	2.09E+03
8.82E-01	9.00E+01	<33.1	1.90E+03	3.78E+02	5.20E+02	6.07E+01	8.82E-01	9.00E+01	<33.1	1.90E+03
5.70E-01	9.00E+01	<33.1	4.15E+02	1.32E+02	1.88E+02	2.30E+01	5.70E-01	9.00E+01	<33.1	4.15E+02
9.24E-01	1.06E+02	<33.1	1.73E+03	4.12E+02	5.09E+01	7.23E+00	9.24E-01	1.06E+02	<33.1	1.73E+03
				1.47E+02	2.07E+02	4.48E+01				
CORE 5										
Wt (g)	Depth (cm)	Th	Ti	U	Zn	Zr	Wt (g)	Depth (cm)	Th	Ti
6.44E-01	7.50E+00	<33.1	4.27E+03	3.16E+02	4.48E+02	6.15E+01	6.44E-01	7.50E+00	<33.1	4.27E+03
1.00E+00	7.50E+00	<33.1	1.34E+03		1.31E+02	1.15E+01	1.00E+00	7.50E+00	<33.1	1.34E+03
7.69E-01	2.25E+01	<33.1	1.80E+03	2.15E+02	2.81E+02	3.92E+01	7.69E-01	2.25E+01	<33.1	1.80E+03

CORE 7	5.67E-01	2.25E+01	<33.1	4.63E+03	3.79E+02	5.07E+02	6.33E+01
	6.00E-01	3.75E+01	<33.1	5.69E+03	3.40E+02	4.31E+02	5.52E+01
	4.98E-01	3.75E+01	<33.1	6.27E+03	4.24E+02	5.47E+02	6.57E+01
	7.39E-01	6.25E+01	<33.1	2.94E+03	3.70E+02	5.99E+02	1.71E+01
	7.21E-01	6.25E+01	<33.1	3.80E+03	4.58E+02	7.37E+02	5.22E+01
	7.06E-01	7.75E+01	<33.1	2.57E+03	4.23E+02	7.60E+02	4.94E+01
	5.84E-02	7.75E+01	<33.1	2.89E+04		9.03E+03	4.86E+02
	6.40E-01	9.25E+01	<33.1	3.34E+03	5.00E+02	1.07E+03	5.22E+01
	7.36E-01	9.00E+01	<33.1	2.24E+03	3.41E+02	8.10E+02	1.63E+01
	8.34E-01	9.25E+01	<33.1	2.70E+03	5.14E+02	8.05E+02	3.06E+01
	7.63E-01	9.25E+01	<33.1	2.61E+03	4.87E+02	8.23E+02	2.64E+01
	8.29E-01	1.03E+02	<33.1	2.02E+03	3.03E+02	7.31E+02	3.17E+01
	7.40E-01	1.03E+02	<33.1	3.06E+03	4.58E+02	1.08E+03	3.33E+01
	7.75E-01	1.18E+02	<33.1	2.26E+03	3.66E+02	1.12E+03	7.64E+01
	8.21E-01	1.18E+02	<33.1	3.06E+03	4.08E+02	9.05E+02	6.89E+01
	7.45E-01	1.33E+02	7.97E+04	3.61E+03	2.30E+02	1.65E+02	7.17E+01
CORE 8	6.61E-01	1.33E+02	2.25E+04	2.99E+03	2.40E+02	1.89E+02	5.83E+01
	8.07E-01	1.48E+02	<33.1	3.41E+03	2.54E+02	2.04E+02	6.95E+01
	6.47E-01	1.48E+02	3.79E+04	1.34E+03	2.96E+02	2.59E+02	7.00E+01
	6.54E-01	7.50E+00	<33.1	3.86E+03	4.00E+02	6.31E+02	6.04E+01
	6.98E-01	7.50E+00	<33.1	3.63E+03	3.58E+02	5.87E+02	5.64E+01
	5.94E-01	2.25E+01	<33.1	3.28E+03	4.15E+02	6.65E+02	6.42E+01
	6.42E-01	2.25E+01	<33.1	3.80E+03	4.56E+02	6.54E+02	3.91E+01
	7.07E-01	3.75E+01	<33.1	2.85E+03	2.95E+02	4.53E+02	2.67E+01
	2.46E-01	3.75E+01	<33.1	6.34E+03	5.68E+02	6.65E+02	2.69E+01
	4.93E-01	5.75E+01	<33.1	5.48E+03	5.02E+02	6.54E+02	9.36E+01
	4.89E-01	5.75E+01	<33.1	4.22E+03	4.22E+02	5.73E+02	8.01E+01
	5.88E-01	4.00E+01	<33.1	4.99E+03	4.36E+02	6.97E+02	6.89E+01
	6.14E-01	4.00E+01	<33.1	4.42E+03	3.93E+02	6.23E+02	5.98E+01
	6.76E-01	5.75E+01	<33.1	3.35E+03	3.52E+02	4.40E+02	5.64E+01
	5.45E-01	5.75E+01	<33.1	4.06E+03	3.96E+02	6.03E+02	6.90E+01
	5.93E-01	7.25E+01	<33.1	4.24E+03	4.72E+02	6.45E+02	6.20E+01
CORE 9	6.71E-01	7.25E+01	<33.1	2.16E+03	2.27E+02	3.75E+02	3.86E+01
	6.47E-01	8.75E+01	<33.1	3.46E+03	2.80E+02	5.14E+02	4.64E+01
	6.63E-01	8.75E+01	<33.1	4.02E+03	3.00E+02	4.66E+02	5.19E+01
	8.52E-01	1.03E+02	<33.1	3.23E+03	3.10E+02	4.50E+02	4.53E+01
	6.60E-01	1.03E+02	<33.1	3.83E+03	3.88E+02	5.42E+02	5.43E+01
	6.15E-01	1.18E+02	<33.1	3.49E+03	4.06E+02	4.98E+02	4.69E+01
	2.00E+00	1.18E+02	<33.1	1.46E+03	1.56E+02	1.79E+02	2.08E+01
	7.25E-01	2.75E+01	3.10E+04	2.71E+03	2.34E+02	1.50E+02	6.75E+01
	6.64E-01	2.75E+01	<33.1	3.52E+03	2.58E+02	4.14E+02	6.12E+01
	9.03E-01	4.25E+01	<33.1	3.11E+03	3.13E+02	4.75E+02	5.73E+01
	7.16E-01	4.25E+01	<33.1	3.37E+03	3.97E+02	6.36E+02	6.53E+01
	7.79E-01	5.75E+01	<33.1	3.13E+03	3.84E+02	5.75E+02	6.87E+01
	7.94E-01	5.75E+01	<33.1	3.73E+03	3.97E+02	6.44E+02	7.41E+01
	9.11E-01	7.55E+01	<33.1	3.10E+03	2.66E+02	3.35E+02	7.81E+01

	1.01E+00	7.55E+01	<33.1	2.64E+03	2.65E+02	2.95E+02	6.42E+01
	9.27E-01	7.55E+01	<33.1	2.35E+03	2.12E+02	2.01E+02	6.28E+01
	9.24E-01	7.55E+01	<33.1	2.27E+03	2.11E+02	1.84E+02	6.39E+01
	5.40E-01	8.90E+01	<33.1	5.11E+03	4.49E+02	5.79E+02	8.82E+01
	5.88E-01	8.90E+01	1.78E+04	3.04E+03	1.96E+02	1.71E+02	7.86E+01
	6.01E-01	3.50E+01	<33.1	2.81E+03	3.51E+02	3.64E+02	2.16E+01
	5.44E-01	3.50E+01	<33.1	2.46E+03	3.49E+02	3.51E+02	1.36E+01
	5.41E-01	1.00E+00	<33.1	2.06E+03	2.94E+02	3.77E+02	7.12E+01
	Wt (g)	Depth (cm)	Th	Ti	U	Zn	Zr
CORE 10	7.70E-01	3.60E+01	<33.1	3.46E+03	3.85E+02	7.47E+02	6.93E+01
	9.36E-01	3.60E+01	<33.1	1.58E+03	1.63E+02	3.18E+02	2.75E+01
	8.06E-01	5.50E+01	<33.1	1.21E+03	4.78E+02	6.00E+02	8.45E+01
	8.21E-01	5.50E+01	<33.1	2.70E+03	4.49E+02	5.47E+02	7.52E+01
	1.67E+00	6.75E+01	<33.1	3.85E+02	7.26E+01	1.19E+02	1.31E+01
	1.77E+00	8.25E+01	<33.1	3.45E+02		2.89E+01	1.29E+01
	1.77E+00	8.25E+01	<33.1	3.39E+02		3.20E+01	1.29E+01
	1.76E+00	9.75E+01	<33.1	4.46E+02		5.49E+01	1.86E+01
	7.13E-01	9.75E+01	<33.1	6.87E+02		7.91E+01	2.37E+01
	1.09E+00	1.13E+02	<33.1	1.19E+03		7.30E+01	2.99E+01
	1.79E+00	1.13E+02	<33.1	2.09E+02		1.82E+01	6.22E+00
	Wt (g)	Depth (cm)	Th	Ti	U	Zn	Zr
Core S1	1.41E+00	2.50E+01	<33.1	1.31E+03	2.35E+02	2.82E+02	2.75E+01
	8.15E-01	2.50E+01	<33.1	2.42E+03	4.28E+02	4.37E+02	2.06E+01
	1.23E+00	5.00E+01	<33.1	1.45E+03	1.76E+02	2.80E+02	3.06E+01
	1.42E+00	5.00E+01	<33.1	9.19E+02	1.63E+02	2.43E+02	2.57E+01
	5.44E-01	7.50E+01	<33.1	1.54E+03	4.46E+02	6.53E+02	7.08E+01
	5.43E-01	7.50E+01	<33.1	1.62E+03	2.78E+02	5.82E+02	7.22E+01
	Wt (g)	Depth (cm)	Th	Ti	U	Zn	Zr
Core S2	5.75E-01	2.50E+01	<33.1	9.07E+02	3.09E+02	3.57E+02	6.28E+01
	4.79E-01	2.50E+01	<33.1	8.40E+02	4.93E+02	4.36E+02	7.78E+01
	4.62E-01	5.00E+01	<33.1	4.19E+03	3.81E+02	4.70E+02	7.24E+01
	4.93E-01	5.00E+01	<33.1	5.28E+03	4.03E+02	4.49E+02	6.62E+01
	5.06E-01	7.50E+01	<33.1	1.57E+03	3.85E+02	4.62E+02	8.47E+01
	5.19E-01	7.50E+01	<33.1	3.18E+03	3.56E+02	4.05E+02	7.78E+01
	Wt (g)	Depth (cm)	Th	Ti	U	Zn	Zr
Core S3	1.39E+00	2.50E+01	<33.1	1.37E+03	9.97E+01	4.23E+01	2.80E+01
	1.39E+00	2.50E+01	<33.1	7.91E+02	1.34E+02	2.36E+02	3.14E+01
	1.44E+00	2.50E+01	<33.1	6.46E+02	1.28E+02	2.30E+02	3.07E+01
	1.21E+00	5.00E+01	<33.1	1.39E+03	1.93E+02	2.05E+02	4.08E+01
	1.39E+00	5.00E+01	<33.1	1.25E+03	1.31E+02	1.71E+02	3.05E+01
	9.98E-01	7.50E+01	<33.1	1.23E+03	1.27E+02	3.82E+02	3.13E+01
	7.50E-01	7.50E+01	<33.1	1.59E+03	2.65E+02	5.61E+02	4.78E+01
	Wt (g)	Depth (cm)	Th	Ti	U	Zn	Zr
Core S4	7.25E-01	2.50E+01	<33.1	3.45E+03	3.92E+02	6.14E+02	5.30E+01
	7.25E-01	2.50E+01	<33.1	2.69E+03	2.60E+02	5.19E+02	4.04E+01
	5.63E-01	5.00E+01	<33.1	3.35E+03	3.75E+02	4.17E+02	5.80E+01
	4.89E-01	5.00E+01	<33.1	4.22E+03	3.91E+02	5.40E+02	8.08E+01
	5.63E-01	7.50E+01	<33.1	3.64E+03	3.31E+02	3.71E+02	6.73E+01
	5.27E-01	7.50E+01	<33.1	3.94E+03	3.56E+02	5.74E+02	7.02E+01
	5.45E-01	1.00E+02	<33.1	3.81E+03	3.14E+02	4.04E+02	7.25E+01
	5.40E-01	1.00E+02	<33.1	3.87E+03	3.63E+02	5.02E+02	7.57E+01
	Wt (g)	Depth (cm)	Th	Ti	U	Zn	Zr
Core S5	6.49E-01	2.50E+01	<33.1	4.06E+03	2.68E+02	4.02E+02	6.07E+01
	5.99E-01	2.50E+01	<33.1	4.67E+03	4.13E+02	4.78E+02	6.78E+01
	6.49E-01	5.00E+01	<33.1	3.14E+03	2.87E+02	5.42E+02	4.39E+01
	6.73E-01	5.00E+01	<33.1	4.55E+03	4.20E+02	5.92E+02	6.57E+01
	6.72E-01	7.50E+01	<33.1	3.85E+03	2.77E+02	4.73E+02	5.19E+01
	5.65E-01	7.50E+01	<33.1	3.82E+03	2.87E+02	5.55E+02	6.08E+01

Table B3: Metal Sequential Extraction Results from September 2004 Cores

Core ID	Extraction	Wt (g)	Depth (cm)	Al	Ag	As	Au	B	Ba
Core S1	Exchangeable	1.41E+00	2.50E+01	3.12E+01	2.62E+02	1.03E+02	<0.019	5.57E+00	5.04E+00
	Carbonate	1.41E+00	2.50E+01	1.23E+02	<0.014	1.93E+02	2.04E+00	2.92E+00	6.46E+00
	Fe, Mn Oxides	1.41E+00	2.50E+01	1.15E+03	6.06E+01	5.60E+02	<0.019	1.57E+01	2.04E+00
	Organic Matter	1.41E+00	2.50E+01	6.30E+02	1.42E+02	2.42E+02	<0.019	4.87E+00	1.33E+00
	Residual	1.41E+00	2.50E+01	3.56E+04	1.20E+03	1.56E+03	1.51E+01	1.87E+02	3.92E+01
	Exchangeable	8.15E-01	2.50E+01	5.17E+01	1.36E+03	1.23E+02	<0.019	3.20E+01	5.75E+00
	Carbonate	8.15E-01	2.50E+01	2.32E+02	<0.014	1.87E+02	<0.019	2.17E+01	6.28E+00
	Fe, Mn Oxides	8.15E-01	2.50E+01	1.86E+03	1.20E+02	5.07E+02	<0.019	1.52E+01	2.12E+00
	Organic Matter	8.15E-01	2.50E+01	9.71E+02	8.02E+01	2.14E+02	<0.019	<0.012	7.96E-01
	Residual	8.15E-01	2.50E+01	6.61E+04	3.00E+03	1.47E+03	1.45E+01	1.78E+02	4.71E+01
	Exchangeable	7.69E-01	5.00E+01	4.00E+01	1.27E+01	1.17E+01	<0.019	3.98E+00	5.75E+00
	Exchangeable	7.69E-01	5.00E+01	1.32E+01	4.66E+01	<0.124	<0.019	2.48E+00	2.74E+00
	Carbonate	7.69E-01	5.00E+01	1.08E+02	<0.014	3.47E+01	<0.019	6.99E+00	4.42E+00
	Carbonate	7.69E-01	5.00E+01	1.47E+02	<0.014	6.09E+01	<0.019	4.78E+00	2.21E+00
	Fe, Mn Oxides	7.69E-01	5.00E+01	4.68E+02	<0.014	2.39E+02	<0.019	1.22E+01	1.15E+00
	Fe, Mn Oxides	7.69E-01	5.00E+01	1.72E+02	<0.014	3.97E+01	<0.019	3.89E+00	7.08E-01
	Organic Matter	7.69E-01	5.00E+01	1.08E+03	1.09E+02	3.84E+02	<0.019	4.16E+00	6.19E-01
	Organic Matter	7.69E-01	5.00E+01	4.21E+02	2.16E+02	1.42E+02	<0.019	5.22E+00	3.54E-01
	Residual	8.15E-01	5.00E+01	3.70E+04	8.08E+02	4.91E+02	7.43E+00	1.21E+02	2.51E+01
	Exchangeable	5.86E-01	5.00E+01	3.52E+01	9.38E+00	1.90E+01	<0.019	9.82E+00	1.24E+00
	Carbonate	5.86E-01	5.00E+01	9.83E+01	1.11E+02	1.11E+02	<0.019	6.55E+00	7.70E+00
	Fe, Mn Oxides	5.86E-01	5.00E+01	5.63E+02	<0.014	3.34E+02	<0.019	1.03E+01	2.39E+00
	Organic Matter	5.86E-01	5.00E+01	4.92E+02	7.97E+01	2.41E+02	<0.019	3.54E+00	6.19E-01
	Residual	5.86E-01	5.00E+01	5.16E+04	9.91E+02	5.33E+02	9.64E+00	1.22E+02	3.10E+01
	Exchangeable	5.44E-01	7.50E+01	2.87E+02	1.04E+02	1.56E+01	<0.019	4.25E+00	3.63E+00
	Carbonate	5.44E-01	7.50E+01	5.01E+02	6.42E+01	2.85E+01	<0.019	6.46E+00	3.54E+00
	Fe, Mn Oxides	5.44E-01	7.50E+01	5.77E+02	7.83E+01	4.45E+01	<0.019	2.74E+00	1.06E+00
	Organic Matter	5.44E-01	7.50E+01	6.59E+02	1.93E+02	1.73E+02	<0.019	<0.012	9.73E-01
	Residual	5.44E-01	7.50E+01	6.11E+04	8.77E+02	2.65E+02	7.79E+00	1.33E+02	3.67E+01
	Exchangeable	5.43E-01	7.50E+01	3.20E+02	1.32E+02	1.24E+01	<0.019	5.31E+00	3.45E+00
	Carbonate	5.43E-01	7.50E+01	4.49E+02	5.34E+01	3.12E+01	<0.019	2.65E+00	3.45E+00
	Fe, Mn Oxides	5.43E-01	7.50E+01	5.36E+02	4.29E+01	5.60E+01	<0.019	6.72E+00	1.24E+00
	Organic Matter	5.43E-01	7.50E+01	4.44E+02	1.17E+02	1.44E+02	<0.019	2.48E+00	5.31E-01
	Residual	5.43E-01	7.50E+01	6.07E+04	2.26E+03	4.34E+02	7.34E+00	1.27E+02	4.15E+01
Core ID	Extraction	Wt (g)	Depth (cm)	Al	Ag	As	Au	B	Ba
Core S2	Exchangeable	5.75E-01	2.50E+01	2.61E+02	6.16E+01	<0.124	<0.019	1.68E+01	4.16E+00
	Carbonate	5.75E-01	2.50E+01	3.70E+02	7.28E+01	1.83E+01	<0.019	3.63E+00	1.68E+00
	Fe, Mn Oxides	5.75E-01	2.50E+01	4.26E+02	3.71E+01	4.26E+01	<0.019	4.87E+00	8.85E-01
	Organic Matter	5.75E-01	2.50E+01	5.50E+02	8.67E+01	6.90E+01	<0.019	6.28E+00	7.08E-01
	Residual	5.75E-01	2.50E+01	5.89E+04	7.49E+02	1.43E+02	1.24E+01	1.36E+02	3.93E+01
	Exchangeable	4.79E-01	2.50E+01	2.37E+02	2.92E+01	<0.124	<0.019	2.92E+00	4.34E+00
	Carbonate	4.79E-01	2.50E+01	4.20E+02	3.22E+01	1.75E+01	<0.019	2.04E+00	1.24E+00
	Fe, Mn Oxides	4.79E-01	2.50E+01	6.19E+02	7.26E+02	5.03E+01	<0.019	4.96E+00	9.73E-01
	Organic Matter	4.79E-01	2.50E+01	8.33E+02	1.48E+02	7.40E+01	<0.019	4.34E+00	1.06E+00
	Residual	4.79E-01	2.50E+01	6.86E+04	3.85E+02	9.91E+01	1.25E+01	1.40E+02	3.87E+01
	Exchangeable	4.62E-01	5.00E+01	4.87E+02	1.15E+02	3.58E+01	<0.019	3.19E+00	3.27E+00
	Carbonate	4.62E-01	5.00E+01	6.33E+02	7.11E+01	5.33E+01	<0.019	2.74E+00	3.10E+00
	Fe, Mn Oxides	4.62E-01	5.00E+01	8.27E+02	2.71E+01	6.80E+01	<0.019	7.17E+00	1.50E+00
	Organic Matter	4.62E-01	5.00E+01	7.33E+02	1.15E+02	1.49E+02	<0.019	<0.012	9.73E-01
	Residual	4.62E-01	5.00E+01	6.89E+04	<0.014	2.63E+02	1.14E+01	1.31E+02	3.09E+01
	Exchangeable	4.93E-01	5.00E+01	4.80E+02	1.21E+02	3.82E+01	<0.019	7.17E+00	2.83E+00
	Carbonate	4.93E-01	5.00E+01	5.05E+02	7.33E+01	4.80E+01	<0.019	2.83E+00	2.83E+00
	Fe, Mn Oxides	4.93E-01	5.00E+01	6.34E+02	1.10E+02	1.18E+02	<0.019	<0.012	7.08E-01
	Organic Matter	4.93E-01	5.00E+01	6.90E+02	3.46E+01	6.82E+01	<0.019	6.02E+00	1.59E+00
	Residual	4.93E-01	5.00E+01	5.91E+04	2.80E+02	2.69E+02	1.08E+01	1.23E+02	3.75E+01
	Exchangeable	5.06E-01	7.50E+01	2.33E+02	3.15E+01	2.18E+01	<0.019	2.57E+00	5.13E+00
	Carbonate	5.06E-01	7.50E+01	3.43E+02	2.52E+01	7.13E+01	<0.019	5.57E+00	1.15E+00
	Fe, Mn Oxides	5.06E-01	7.50E+01	7.63E+02	1.95E+01	7.05E+01	<0.019	7.43E+00	1.33E+00
	Organic Matter	5.06E-01	7.50E+01	6.42E+02	1.43E+02	1.88E+02	<0.019	<0.012	8.85E-01
	Residual	5.06E-01	7.50E+01	5.63E+04	8.09E+02	3.47E+02	9.82E+00	1.19E+02	3.96E+01
	Exchangeable	5.19E-01	7.50E+01	3.23E+02	3.06E+01	1.77E+01	<0.019	4.87E+00	5.22E+00
	Carbonate	5.19E-01	7.50E+01	3.23E+02	2.57E+01	4.22E+01	<0.019	2.83E+00	3.19E+00
	Fe, Mn Oxides	5.19E-01	7.50E+01	7.34E+02	1.73E+02	6.18E+01	<0.019	6.55E+00	1.24E+00
	Organic Matter	5.19E-01	7.50E+01	6.67E+02	8.45E+01	1.70E+02	<0.019	3.01E+00	7.96E-01
	Residual	5.19E-01	7.50E+01	6.53E+04	2.31E+02	3.53E+02	1.04E+01	1.32E+02	5.34E+01
Core ID	Extraction	Wt (g)	Depth (cm)	Al	Ag	As	Au	B	Ba
Core S3	Exchangeable	6.10E-01	2.50E+01	4.33E+02	7.72E+02	1.39E+01	<0.019	6.46E+00	8.94E+00
	Exchangeable	6.10E-01	2.50E+01	3.44E+02	6.21E+02	<0.124	<0.019	2.83E+00	3.89E+00
	Carbonate	6.10E-01	2.50E+01	2.21E+02	6.94E+01	2.93E+01	<0.019	4.69E+00	2.21E+00
	Carbonate	6.10E-01	2.50E+01	2.89E+02	<0.014	4.12E+01	<0.019	4.34E+00	9.73E-01
	Fe, Mn Oxides	6.10E-01	2.50E+01	7.05E+02	2.06E+01	1.54E+02	<0.019	7.70E+00	1.06E+00
	Fe, Mn Oxides	6.10E-01	2.50E+01	3.44E+02	1.65E+01	3.34E+01	<0.019	5.13E+00	8.85E-01
	Organic Matter	6.10E-01	2.50E+01	1.64E+03	1.70E+02	3.25E+02	<0.019	5.66E+00	1.24E+00
	Organic Matter	6.10E-01	2.50E+01	6.01E+02	2.79E+02	7.59E+01	<0.019	2.30E+00	7.08E-01
	Exchangeable	5.58E-01	2.50E+01	3.61E+01	<0.014	<0.124	<0.019	4.34E+00	9.03E+00
	Carbonate	5.58E-01	2.50E+01	1.37E+02	1.58E+01	5.37E+01	<0.019	2.21E+00	4.69E+00
	Fe, Mn Oxides	5.58E-01	2.50E+01	1.18E+03	5.21E+01	3.01E+02	<0.019	9.56E+00	2.65E+00
	Organic Matter	5.58E-01	2.50E+01	7.04E+02	1.32E+02	1.54E+02	<0.019	<0.012	9.73E-01
	Residual	5.58E-01	2.50E+01	4.57E+04	1.05E+03	2.26E+02	5.75E+00	1.04E+02	3.80E+01
	Exchangeable	6.55E-01	5.00E+01	1.67E+02	5.04E+01	1.37E+01	<0.019	7.34E+00	4.07E+00
	Carbonate	6.55E-01	5.00E+01	3.76E+02	<0.014	7.15E+01	<0.019	2.57E+00	1.06E+00
	Fe, Mn Oxides	6.55E-01	5.00E+01	6.94E+02	1.37E+02	9.03E+01	<0.019	5.66E+00	1.15E+00
	Organic Matter	6.55E-01	5.00E+01	6.09E+02	1.19E+02	2.04E+02	<0.019	3.36E+00	8.85E-01

	Residual	6.55E-01	5.00E+01	4.22E+04	1.83E+02	4.52E+02	5.75E+00	1.20E+02	1.50E+01
	Exchangeable	7.98E-01	5.00E+01	2.04E+02	7.62E+01	<0.124	<0.019	3.72E+00	3.54E+00
	Carbonate	7.98E-01	5.00E+01	2.38E+02	1.42E+02	1.22E+01	<0.019	3.27E+00	1.15E+00
	Fe, Mn Oxides	7.98E-01	5.00E+01	2.71E+02	2.04E+01	3.50E+01	<0.019	4.51E+00	7.08E-01
	Organic Matter	7.98E-01	5.00E+01	3.40E+02	4.73E+01	8.27E+01	<0.019	4.96E+00	5.31E-01
	Residual	7.98E-01	5.00E+01	4.32E+02	6.33E+01	4.21E+01	<0.019	5.13E+00	5.31E-01
	Exchangeable	7.98E-01	5.00E+01	3.26E+02	6.82E+01	<0.124	<0.019	5.22E+00	6.19E-01
	Carbonate	7.98E-01	5.00E+01	9.46E+02	2.25E+02	5.15E+02	<0.019	4.78E+00	5.31E-01
	Fe, Mn Oxides	7.98E-01	5.00E+01	3.45E+02	2.92E+02	4.81E+01	<0.019	2.48E+00	1.77E-01
	Organic Matter	7.98E-01	5.00E+01	2.76E+04	2.08E+02	5.06E+01	6.19E+00	1.03E+02	1.34E+01
	Residual	1.25E+00	7.50E+01	1.92E+01	<0.014	1.38E+02	<0.019	7.26E+00	2.42E+01
	Exchangeable	1.25E+00	7.50E+01	4.01E+01	<0.014	4.11E+02	<0.019	5.40E+00	1.46E+01
	Carbonate	1.25E+00	7.50E+01	2.03E+03	5.04E+00	2.70E+02	<0.019	5.75E+00	1.08E+01
	Fe, Mn Oxides	1.25E+00	7.50E+01	2.45E+03	2.77E+01	9.20E+02	<0.019	7.70E+00	5.22E+00
	Organic Matter	1.25E+00	7.50E+01	1.84E+04	2.19E+03	8.05E+02	8.23E+00	8.37E+01	4.61E+01
	Residual	1.01E+00	7.50E+01	2.14E+01	4.80E+01	2.09E+01	<0.019	3.36E+00	1.73E+01
	Exchangeable	1.01E+00	7.50E+01	1.48E+01	5.12E+01	2.79E+01	<0.019	2.83E+00	7.34E+00
	Carbonate	1.01E+00	7.50E+01	1.54E+02	<0.014	9.11E+01	<0.019	3.27E+00	6.81E+00
	Fe, Mn Oxides	1.01E+00	7.50E+01	2.77E+02	<0.014	2.76E+02	<0.019	6.72E+00	2.12E+00
	Organic Matter	1.01E+00	7.50E+01	1.59E+03	<0.014	4.74E+02	<0.019	1.17E+01	2.39E+00
	Residual	1.01E+00	7.50E+01	4.47E+02	1.07E+01	9.56E+01	<0.019	8.32E+00	9.73E-01
	Exchangeable	1.01E+00	7.50E+01	1.79E+03	1.05E+02	7.57E+02	<0.019	4.51E+00	1.68E+00
	Carbonate	1.01E+00	7.50E+01	6.35E+02	2.88E+02	2.27E+02	<0.019	5.22E+00	7.96E-01
	Fe, Mn Oxides	1.01E+00	7.50E+01	3.37E+04	3.00E+03	2.67E+03	1.06E+01	1.50E+02	4.79E+01
Core ID	Extraction	Wt (g)	Depth (cm)	Al	Ag	As	Au	B	Ba
Core S4	Exchangeable	7.25E-01	2.50E+01	1.97E+02	2.01E+02	<0.124	<0.019	8.76E+00	3.36E+00
	Carbonate	7.25E-01	2.50E+01	3.74E+02	3.73E+01	7.32E+01	<0.019	9.03E+00	2.83E+00
	Fe, Mn Oxides	7.25E-01	2.50E+01	4.14E+02	2.89E+01	4.16E+01	<0.019	6.37E+00	8.85E-01
	Organic Matter	7.25E-01	2.50E+01	2.78E+02	5.59E+01	1.23E+02	<0.019	2.83E+00	3.54E-01
	Residual	7.25E-01	2.50E+01	3.93E+04	1.85E+02	2.50E+02	7.96E+00	1.26E+02	1.31E+01
	Exchangeable	4.99E-01	2.50E+01	2.93E+02	3.22E+02	<0.124	<0.019	7.26E+00	3.36E+00
	Carbonate	4.99E-01	2.50E+01	6.01E+02	3.86E+01	8.01E+01	<0.019	6.19E+00	2.92E+00
	Fe, Mn Oxides	4.99E-01	2.50E+01	6.74E+02	3.69E+01	4.02E+01	<0.019	2.92E+00	7.96E-01
	Organic Matter	4.99E-01	2.50E+01	6.42E+02	7.81E+01	1.01E+02	<0.019	2.83E+00	3.54E-01
	Residual	4.99E-01	2.50E+01	6.64E+04	3.48E+01	3.08E+02	9.56E+00	1.39E+02	1.77E+01
	Exchangeable	5.63E-01	5.00E+01	1.81E+02	1.10E+02	1.92E+01	<0.019	1.27E+01	2.57E+00
	Carbonate	5.63E-01	5.00E+01	6.57E+02	1.50E+02	6.28E+01	<0.019	3.89E+00	2.39E+00
	Fe, Mn Oxides	5.63E-01	5.00E+01	6.17E+02	8.94E+01	3.77E+01	<0.019	2.74E+00	1.15E+00
	Organic Matter	5.63E-01	5.00E+01	6.42E+02	1.39E+02	2.04E+02	<0.019	1.86E+00	4.42E-01
	Residual	5.63E-01	5.00E+01	5.11E+04	5.24E+02	3.10E+02	1.00E+01	1.24E+02	1.58E+01
	Exchangeable	4.89E-01	5.00E+01	4.58E+02	1.89E+02	3.13E+01	<0.019	8.14E+00	2.74E+00
	Carbonate	4.89E-01	5.00E+01	5.58E+02	8.39E+01	5.94E+01	<0.019	4.07E+00	1.95E+00
	Fe, Mn Oxides	4.89E-01	5.00E+01	7.01E+02	8.30E+01	2.97E+01	<0.019	5.13E+00	9.73E-01
	Organic Matter	4.89E-01	5.00E+01	5.30E+02	9.38E+01	2.25E+02	<0.019	2.39E+00	4.42E-01
	Residual	4.89E-01	5.00E+01	5.86E+04	<0.014	5.75E+02	7.61E+00	1.18E+02	1.97E+01
	Exchangeable	5.63E-01	7.50E+01	1.96E+02	3.71E+02	1.22E+01	<0.019	4.25E+00	4.42E+00
	Carbonate	5.63E-01	7.50E+01	6.04E+02	2.23E+02	5.19E+01	<0.019	3.10E+00	1.95E+00
	Fe, Mn Oxides	5.63E-01	7.50E+01	5.84E+02	1.25E+02	2.60E+01	<0.019	9.20E+00	1.15E+00
	Organic Matter	5.63E-01	7.50E+01	5.55E+02	2.35E+02	1.35E+02	<0.019	2.57E+00	4.51E+00
	Residual	5.63E-01	7.50E+01	4.67E+04	<0.014	2.27E+02	1.04E+01	1.42E+02	2.48E+01
	Exchangeable	5.27E-01	7.50E+01	1.01E+02	3.19E+02	<0.124	<0.019	4.42E+00	4.25E+00
	Carbonate	5.27E-01	7.50E+01	4.77E+02	1.04E+02	4.73E+01	<0.019	3.10E+00	1.68E+00
	Fe, Mn Oxides	5.27E-01	7.50E+01	6.71E+02	9.82E+01	2.34E+01	<0.019	1.00E+01	1.33E+00
	Organic Matter	5.27E-01	7.50E+01	3.01E+02	2.49E+02	9.38E+01	<0.019	5.75E+00	5.31E-01
	Residual	5.27E-01	7.50E+01	5.88E+04	2.12E+03	3.80E+02	9.38E+00	1.27E+02	2.58E+01
	Exchangeable	5.45E-01	1.00E+02	2.45E+02	2.56E+02	3.72E+01	<0.019	1.36E+01	2.04E+00
	Carbonate	5.45E-01	1.00E+02	7.15E+02	1.92E+02	1.01E+02	<0.019	<0.012	2.04E+00
	Fe, Mn Oxides	5.45E-01	1.00E+02	7.08E+02	1.96E+02	4.41E+01	<0.019	6.02E+00	1.15E+00
	Organic Matter	5.45E-01	1.00E+02	1.95E+02	9.91E+02	2.12E+02	<0.019	2.48E+00	2.65E-01
	Residual	5.45E-01	1.00E+02	4.95E+04	<0.014	5.06E+02	1.07E+01	1.38E+02	3.42E+01
	Exchangeable	5.40E-01	1.00E+02	2.62E+02	2.18E+02	3.32E+01	<0.019	5.49E+00	2.04E+00
	Carbonate	5.40E-01	1.00E+02	5.14E+02	1.08E+02	7.59E+01	<0.019	4.16E+00	1.68E+00
	Fe, Mn Oxides	5.40E-01	1.00E+02	6.88E+02	5.65E+01	3.48E+01	<0.019	9.82E+00	1.15E+00
	Organic Matter	5.40E-01	1.00E+02	4.95E+02	1.02E+02	1.30E+02	<0.019	<0.012	3.54E-01
	Residual	5.40E-01	1.00E+02	5.95E+04	3.95E+01	3.46E+02	8.94E+00	1.31E+02	3.40E+01
Core ID	Extraction	Wt (g)	Depth (cm)	Al	Ag	As	Au	B	Ba
Core S5	Exchangeable	6.49E-01	2.50E+01	2.08E+02	1.73E+02	2.42E+01	<0.019	6.28E+00	4.34E+00
	Carbonate	6.49E-01	2.50E+01	2.89E+02	1.68E+00	9.03E+01	<0.019	5.84E+00	3.27E+00
	Fe, Mn Oxides	6.49E-01	2.50E+01	4.24E+02	3.32E+01	5.23E+01	<0.019	2.74E+00	1.42E+00
	Organic Matter	6.49E-01	2.50E+01	8.01E+02	1.80E+02	2.47E+02	<0.019	1.06E+00	6.19E-01
	Residual	6.49E-01	2.50E+01	4.78E+04	4.57E+02	5.99E+02	8.05E+00	1.27E+02	2.57E+01
	Exchangeable	5.99E-01	2.50E+01	1.98E+02	1.48E+02	3.50E+01	<0.019	9.56E+00	4.78E+00
	Carbonate	5.99E-01	2.50E+01	2.77E+02	3.36E+00	8.20E+01	<0.019	6.02E+00	2.83E+00
	Fe, Mn Oxides	5.99E-01	2.50E+01	4.46E+02	1.23E+01	6.08E+01	<0.019	6.19E+00	1.59E+00
	Organic Matter	5.99E-01	2.50E+01	6.19E+02	1.24E+02	2.96E+02	<0.019	<0.012	1.06E+00
	Residual	5.99E-01	2.50E+01	5.26E+04	<0.014	6.63E+02	1.02E+01	1.38E+02	2.93E+01
	Exchangeable	6.49E-01	5.00E+01	2.22E+02	1.16E+02	2.80E+01	<0.019	3.10E+00	2.74E+00
	Carbonate	6.49E-01	5.00E+01	3.78E+02	6.49E+01	9.56E+01	<0.019	3.89E+00	2.48E+00
	Fe, Mn Oxides	6.49E-01	5.00E+01	4.74E+02	6.29E+01	4.19E+01	<0.019	4.07E+00	8.85E-01
	Organic Matter	6.49E-01	5.00E+01	5.40E+02	1.37E+02	4.51E+02	<0.019	<0.012	4.42E-01
	Residual	6.73E-01	5.00E+01	1.74E+02	9.56E+01	2.61E+01	<0.019	3.80E+00	3.10E+00
	Exchangeable	6.73E-01	5.00E+01	3.25E+02	6.23E+01	1.02E+02	<0.019	2.83E+00	2.21E+00
	Carbonate	6.73E-01	5.00E+01	5.16E+02	4.95E+01	3.92E+01	<0.019	5.75E+00	8.85E-01
	Fe, Mn Oxides	6.73E-01	5.00E+01	3.77E+02	4.28E+01	3.73E+02	<0.019	5.84E+00	3.54E-01
	Organic Matter	6.73E-01	5.00E+01	4.25E+04	<0.014	1.11E+03	1.03E+01	1.48E+02	1.52E+01

	Exchangeable	6.72E-01	7.50E+01	1.63E+02	5.22E+02	<0.124	<0.019	9.03E+00	3.19E+00
	Carbonate	6.72E-01	7.50E+01	3.15E+02	5.43E+01	<0.019	<0.019	3.01E+00	2.04E+00
	Fe, Mn Oxides	6.72E-01	7.50E+01	3.76E+02	5.26E+01	<0.019	<0.019	5.57E+00	7.96E-01
	Organic Matter	6.72E-01	7.50E+01	4.36E+02	1.28E+02	<0.019	<0.019	3.89E+00	5.31E-01
	Residual	6.72E-01	7.50E+01	3.83E+04	2.96E+02	3.82E+02	6.90E+00	1.01E+02	2.24E+01
	Exchangeable	5.65E-01	7.50E+01	2.45E+02	5.34E+02	<0.124	<0.019	1.02E+01	3.01E+00
	Carbonate	5.65E-01	7.50E+01	5.35E+02	1.02E+02	5.19E+01	<0.019	3.80E+00	2.30E+00
	Fe, Mn Oxides	5.65E-01	7.50E+01	4.60E+02	4.84E+01	2.83E+01	<0.019	6.81E+00	8.85E-01
	Organic Matter	5.65E-01	7.50E+01	5.44E+02	1.36E+02	2.22E+02	<0.019	<0.012	4.42E-01
	Residual	5.65E-01	7.50E+01	5.13E+04	3.50E+01	5.76E+02	9.11E+00	1.19E+02	1.50E+01
Total Digestions									
Core ID	Extraction	Wt (g)	Depth (cm)	Al	Ag	As	Au	B	Ba
Core S1		1.41E+00	2.50E+01	3.41E+04	5.61E+02	2.11E+03	1.55E+01	1.83E+02	3.83E+01
		8.15E-01	2.50E+01	7.20E+04	6.77E+02	3.15E+03	2.92E+01	3.73E+02	7.33E+01
		1.23E+00	5.00E+01	2.99E+04	4.33E+01	1.32E+03	1.28E+01	1.69E+02	5.54E+01
		1.42E+00	5.00E+01	2.51E+04	4.74E+02	8.29E+02	1.23E+01	1.40E+02	4.96E+01
		5.44E-01	7.50E+01	6.92E+04	1.51E+03	1.56E+03	2.32E+01	3.91E+02	1.23E+02
		5.43E-01	7.50E+01	6.51E+04	2.02E+03	1.57E+03	2.37E+01	3.52E+02	1.19E+02
Core S2		5.75E-01	2.50E+01	6.11E+04	7.00E+02	5.07E+02	2.70E+01	3.33E+02	9.46E+01
		4.79E-01	2.50E+01	7.67E+04	1.71E+03	6.42E+02	3.81E+01	4.25E+02	1.31E+02
		4.62E-01	5.00E+01	7.16E+04	3.05E+03	9.00E+02	3.43E+01	3.95E+02	1.15E+02
		4.93E-01	5.00E+01	6.88E+04	1.70E+02	1.23E+03	3.10E+01	3.91E+02	1.03E+02
		5.06E-01	7.50E+01	6.67E+04	2.52E+03	6.72E+02	3.18E+01	3.83E+02	1.39E+02
		5.19E-01	7.50E+01	6.36E+04	3.54E+03	7.34E+02	2.62E+01	3.56E+02	1.37E+02
Core S3		1.39E+00	2.50E+01	1.94E+04	3.96E+02	1.97E+02	1.01E+01	1.24E+02	3.02E+01
		1.39E+00	2.50E+01	2.42E+04	2.26E+03	4.88E+02	8.62E+00	1.32E+02	5.07E+01
		1.44E+00	2.50E+01	2.32E+04	1.58E+03	3.81E+02	9.87E+00	1.32E+02	5.00E+01
		1.21E+00	5.00E+01	2.89E+04	4.22E+03	9.41E+02	1.44E+01	1.65E+02	3.38E+01
		1.39E+00	5.00E+01	2.34E+04	1.40E+03	8.00E+02	9.52E+00	1.32E+02	2.04E+01
		9.98E-01	7.50E+01	3.47E+04	2.08E+03	3.07E+03	1.30E+01	1.72E+02	9.19E+01
Core S4		7.50E-01	7.50E+01	5.15E+04	1.12E+03	3.91E+03	2.05E+01	2.53E+02	1.41E+02
		7.25E-01	2.50E+01	5.40E+04	2.69E+03	1.26E+03	2.52E+01	3.07E+02	6.45E+01
		7.25E-01	2.50E+01	4.42E+04	2.42E+03	1.07E+03	1.95E+01	2.40E+02	3.71E+01
		5.63E-01	5.00E+01	5.53E+04	3.84E+02	2.80E+03	2.84E+01	3.13E+02	4.80E+01
		4.89E-01	5.00E+01	6.75E+04	4.73E+03	3.17E+03	2.76E+01	3.84E+02	8.39E+01
		5.63E-01	7.50E+01	6.15E+04	7.35E+03	1.48E+03	2.69E+01	3.35E+02	1.06E+02
Core S5		5.27E-01	7.50E+01	6.24E+04	7.78E+03	1.47E+03	2.80E+01	3.58E+02	9.11E+01
		5.45E-01	1.00E+02	6.21E+04	7.41E+03	2.19E+03	2.61E+01	3.35E+02	8.83E+01
		5.40E-01	1.00E+02	6.50E+04	4.98E+03	1.98E+03	3.22E+01	3.52E+02	9.21E+01
		6.49E-01	2.50E+01	5.16E+04	4.68E+03	2.46E+03	2.21E+01	2.79E+02	9.59E+01
		5.99E-01	2.50E+01	6.15E+04	3.48E+03	2.88E+03	2.48E+01	3.32E+02	1.11E+02
		6.49E-01	5.00E+01	4.65E+04	<0.014	3.93E+03	1.93E+01	2.62E+02	3.99E+01
		6.73E-01	5.00E+01	5.79E+04	1.20E+03	4.21E+03	2.32E+01	3.30E+02	8.02E+01
		6.72E-01	7.50E+01	5.12E+04	3.22E+03	2.29E+03	2.21E+01	2.74E+02	7.05E+01
		5.65E-01	7.50E+01	5.81E+04	2.68E+03	2.12E+03	2.52E+01	3.16E+02	8.58E+01

Core ID	Extraction	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe
Core S1	Exchangeable	<0.0001	1.50E+02	3.00E+03	<0.006	4.69E+00	5.84E+00	3.36E+00	2.77E+01
	Carbonate	1.77E-01	8.41E+01	3.02E+04	<0.006	5.79E+01	1.42E+00	3.63E+00	2.31E+02
	Fe, Mn Oxides	1.77E-01	<0.422	7.90E+02	<0.006	8.54E+01	4.87E+00	<0.012	1.94E+03
	Organic Matter	8.85E-02	<0.422	9.11E+02	<0.006	2.42E+02	2.30E+00	1.29E+02	4.20E+02
	Residual	6.19E-01	<0.422	7.28E+03	1.33E+00	4.00E+01	1.42E+02	2.18E+01	3.65E+04
	Exchangeable	<0.0001	9.91E+01	3.36E+03	<0.006	4.42E+00	5.49E+00	1.95E+00	3.62E+01
	Carbonate	8.85E-02	6.50E+01	2.80E+04	<0.006	5.65E+01	<0.016	3.36E+00	2.37E+02
	Fe, Mn Oxides	1.77E-01	<0.422	8.49E+02	<0.006	7.75E+01	4.51E+00	1.33E+00	1.77E+03
	Organic Matter	8.85E-02	<0.422	6.17E+02	<0.006	2.34E+02	1.86E+00	1.21E+02	2.84E+02
	Residual	6.19E-01	<0.422	6.69E+03	1.24E+00	3.86E+01	1.31E+02	2.06E+01	3.34E+04
	Exchangeable	<0.0001	1.04E+02	3.88E+03	<0.006	1.97E+01	4.51E+00	<0.012	2.99E+01
	Carbonate	<0.0001	1.09E+02	1.11E+03	<0.006	1.07E+01	4.51E+00	1.15E+00	1.79E+01
	Carbonate	<0.0001	4.23E+01	5.78E+03	<0.006	9.47E+01	<0.016	4.34E+00	1.73E+02
	Carbonate	<0.0001	<0.422	2.29E+03	<0.006	4.27E+01	<0.016	3.36E+00	2.73E+02
	Fe, Mn Oxides	<0.0001	<0.422	2.72E+02	<0.006	2.73E+01	1.68E+00	<0.012	1.52E+03
	Fe, Mn Oxides	<0.0001	<0.422	1.27E+02	<0.006	7.43E+00	<0.016	<0.012	3.07E+02
	Organic Matter	8.85E-02	<0.422	5.61E+02	<0.006	1.88E+02	2.74E+00	1.44E+02	8.14E+02
	Organic Matter	<0.0001	<0.422	6.90E+02	<0.006	2.12E+01	<0.016	1.03E+01	2.34E+02
	Residual	<0.0001	<0.422	1.01E+04	8.85E-01	2.37E+01	9.82E+01	1.02E+01	2.32E+04
	Exchangeable	<0.0001	8.49E+01	1.32E+03	<0.006	9.03E+00	1.68E+00	<0.012	1.64E+01
	Carbonate	<0.0001	8.58E+01	9.38E+03	<0.006	9.91E+01	2.21E+00	4.69E+00	1.40E+02
	Fe, Mn Oxides	<0.0001	<0.422	6.61E+02	<0.006	4.88E+01	1.86E+00	1.06E+00	1.69E+03
	Organic Matter	<0.0001	<0.422	1.33E+03	<0.006	1.06E+02	<0.016	7.37E+01	2.91E+02
	Residual	<0.0001	<0.422	1.00E+04	9.73E-01	4.77E+01	8.63E+01	2.20E+01	2.32E+04
	Exchangeable	<0.0001	1.20E+02	1.69E+03	<0.006	5.75E+00	5.13E+00	<0.012	1.28E+02
	Carbonate	<0.0001	7.48E+01	1.32E+04	<0.006	3.02E+01	1.68E+00	4.07E+00	3.44E+02
	Fe, Mn Oxides	<0.0001	<0.422	5.52E+02	<0.006	2.31E+01	1.42E+00	1.50E+00	4.26E+02
	Organic Matter	8.85E-02	<0.422	1.64E+03	<0.006	8.14E+01	1.50E+00	7.95E+01	3.57E+02
	Residual	1.77E-01	<0.422	1.06E+04	1.15E+00	6.33E+01	9.29E+01	3.42E+01	2.50E+04
	Exchangeable	<0.0001	1.08E+02	1.62E+03	<0.006	5.31E+00	5.04E+00	1.06E+00	1.40E+02
	Carbonate	8.85E-02	9.20E+01	1.45E+04	<0.006	3.27E+01	1.68E+00	5.84E+00	3.38E+02
	Fe, Mn Oxides	<0.0001	<0.422	6.12E+02	<0.006	2.89E+01	1.50E+00	1.68E+00	4.66E+02
	Organic Matter	<0.0001	<0.422	1.35E+03	<0.006	7.97E+01	<0.016	7.26E+01	2.13E+02
	Residual	<0.0001	<0.422	1.06E+04	1.06E+00	6.35E+01	9.20E+01	2.86E+01	2.42E+04
Core ID	Extraction	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe
Core S2	Exchangeable	<0.0001	<0.422	6.24E+03	<0.006	1.40E+01	<0.016	1.85E+01	1.28E+02
	Carbonate	<0.0001	<0.422	4.64E+03	<0.006	4.00E+01	<0.016	2.05E+01	2.18E+02
	Fe, Mn Oxides	<0.0001	<0.422	4.11E+02	<0.006	5.95E+01	1.59E+00	3.54E+00	4.06E+02
	Organic Matter	8.85E-02	<0.422	1.41E+03	<0.006	4.12E+01	<0.016	3.60E+01	2.33E+02
	Residual	<0.0001	<0.422	1.26E+04	1.15E+00	5.35E+01	9.91E+01	1.74E+01	2.62E+04
	Exchangeable	<0.0001	<0.422	5.93E+03	<0.006	1.24E+01	<0.016	1.69E+01	1.02E+02
	Carbonate	<0.0001	<0.422	3.98E+03	<0.006	3.92E+01	<0.016	1.86E+01	2.18E+02
	Fe, Mn Oxides	<0.0001	<0.422	4.96E+02	<0.006	6.88E+01	1.77E+00	3.80E+00	4.67E+02
	Organic Matter	8.85E-02	<0.422	1.31E+03	<0.006	4.51E+01	1.42E+00	3.99E+01	2.96E+02
	Residual	<0.0001	<0.422	1.23E+04	1.15E+00	4.86E+01	9.38E+01	1.50E+01	2.54E+04
	Exchangeable	<0.0001	1.21E+02	1.79E+03	<0.006	8.23E+00	5.75E+00	<0.012	2.06E+02
	Carbonate	8.85E-02	9.38E+01	1.36E+04	<0.006	4.42E+01	2.48E+00	5.57E+00	3.44E+02
	Fe, Mn Oxides	<0.0001	<0.422	5.60E+02	<0.006	4.20E+01	2.39E+00	1.86E+00	5.02E+02
	Organic Matter	8.85E-02	<0.422	1.28E+03	<0.006	6.34E+01	<0.016	4.72E+01	2.48E+02
	Residual	<0.0001	<0.422	1.11E+04	1.06E+00	4.58E+01	9.38E+01	3.12E+01	2.51E+04
	Exchangeable	<0.0001	1.20E+02	1.78E+03	<0.006	8.58E+00	5.75E+00	1.33E+00	1.76E+02
	Carbonate	<0.0001	1.09E+02	1.32E+04	<0.006	4.09E+01	2.57E+00	5.31E+00	3.09E+02
	Fe, Mn Oxides	8.85E-02	<0.422	1.14E+03	<0.006	5.81E+01	<0.016	4.75E+01	2.44E+02
	Organic Matter	<0.0001	<0.422	6.61E+02	<0.006	4.34E+01	2.12E+00	<0.012	4.62E+02
	Residual	<0.0001	<0.422	1.06E+04	9.73E-01	3.67E+01	8.66E+01	1.82E+01	2.27E+04
	Exchangeable	<0.0001	<0.422	6.44E+03	<0.006	8.94E+00	<0.016	7.17E+00	1.04E+02
	Carbonate	<0.0001	<0.422	1.29E+04	<0.006	2.78E+01	<0.016	3.80E+00	2.25E+02
	Fe, Mn Oxides	<0.0001	<0.422	4.89E+02	<0.006	2.89E+01	2.92E+00	<0.012	5.08E+02
	Organic Matter	8.85E-02	<0.422	1.25E+03	<0.006	6.65E+01	1.59E+00	4.37E+01	2.29E+02
	Residual	<0.0001	<0.422	9.82E+03	9.73E-01	4.65E+01	1.08E+02	3.65E+01	2.28E+04
	Exchangeable	<0.0001	1.04E+02	2.04E+03	<0.006	4.96E+00	5.57E+00	<0.012	1.29E+02
	Carbonate	<0.0001	1.03E+02	1.42E+04	<0.006	2.80E+01	2.30E+00	3.72E+00	2.25E+02
	Fe, Mn Oxides	<0.0001	<0.422	4.85E+02	<0.006	3.02E+01	3.01E+00	1.86E+00	4.65E+02
	Organic Matter	<0.0001	<0.422	1.03E+03	<0.006	6.48E+01	1.42E+00	5.26E+01	2.79E+02
	Residual	<0.0001	<0.422	1.16E+04	1.15E+00	5.40E+01	1.19E+02	5.71E+01	2.58E+04
Core ID	Extraction	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe
Core S3	Exchangeable	<0.0001	1.11E+02	2.81E+03	<0.006	2.88E+01	5.04E+00	7.96E+00	2.10E+02
	Exchangeable	<0.0001	9.38E+01	1.04E+03	<0.006	1.39E+01	5.31E+00	3.63E+00	1.63E+02
	Carbonate	<0.0001	5.30E+01	4.02E+03	<0.006	5.97E+01	1.77E+00	2.00E+01	1.65E+02
	Carbonate	<0.0001	<0.422	2.66E+03	<0.006	4.51E+01	<0.016	1.13E+01	2.37E+02
	Fe, Mn Oxides	<0.0001	<0.422	3.25E+02	<0.006	5.80E+01	1.50E+00	2.48E+00	8.85E+02
	Fe, Mn Oxides	<0.0001	<0.422	1.90E+02	<0.006	1.86E+01	<0.016	1.59E+00	2.96E+02
	Organic Matter	8.85E-02	<0.422	7.20E+02	<0.006	1.23E+02	3.10E+00	1.70E+02	9.38E+02
	Organic Matter	<0.0001	<0.422	7.42E+02	<0.006	1.39E+01	<0.016	1.53E+01	2.47E+02
	Exchangeable	<0.0001	<0.422	5.31E+03	<0.006	2.40E+01	<0.016	1.14E+01	1.72E+01
	Carbonate	8.85E-02	<0.422	5.00E+03	<0.006	9.20E+01	<0.016	3.20E+01	1.25E+02
	Fe, Mn Oxides	8.85E-02	<0.422	1.04E+03	<0.006	1.38E+02	2.21E+00	8.85E+00	1.58E+03
	Organic Matter	8.85E-02	<0.422	2.03E+03	<0.006	7.74E+01	<0.016	9.56E+01	2.55E+02
	Residual	1.77E-01	<0.422	7.21E+03	7.96E-01	5.01E+01	7.21E+01	3.53E+01	1.86E+04
	Exchangeable	<0.0001	<0.422	6.16E+03	<0.006	9.64E+00	<0.016	1.17E+01	8.21E+01
	Carbonate	8.85E-02	<0.422	1.98E+04	<0.006	2.56E+01	<0.016	6.28E+00	2.44E+02
	Fe, Mn Oxides	8.85E-02	<0.422	7.06E+02	<0.006	2.03E+01	1.42E+00	<0.012	5.23E+02
	Organic Matter	8.85E-02	<0.422	1.59E+03	<0.006	1.46E+02	<0.016	1.19E+02	2.98E+02

	Residual	2.65E-01	<0.422	4.39E+03	1.06E+00	6.16E+01	9.20E+01	4.15E+01	2.40E+04
	Exchangeable	<0.0001	7.79E+01	1.64E+03	<0.006	4.25E+00	4.96E+00	<0.012	1.27E+02
	Exchangeable	<0.0001	1.03E+02	1.32E+03	<0.006	3.89E+00	5.40E+00	<0.012	1.46E+02
	Carbonate	8.85E-02	3.84E+01	1.64E+04	<0.006	1.74E+01	2.12E+00	2.74E+00	2.20E+02
	Carbonate	<0.0001	<0.422	2.88E+03	<0.006	2.08E+01	<0.016	4.51E+00	2.85E+02
	Fe, Mn Oxides	<0.0001	<0.422	1.47E+02	<0.006	7.34E+00	<0.016	1.77E+00	3.51E+02
	Fe, Mn Oxides	<0.0001	<0.422	1.00E+02	<0.006	2.39E+00	1.59E+00	<0.012	2.39E+02
	Organic Matter	8.85E-02	<0.422	3.60E+02	<0.006	2.07E+02	2.04E+00	1.65E+02	8.15E+02
	Organic Matter	<0.0001	<0.422	5.63E+02	<0.006	1.93E+01	<0.016	1.04E+01	2.04E+02
	Residual	2.65E-01	<0.422	3.80E+03	7.96E-01	1.03E+01	7.01E+01	2.65E+00	1.90E+04
	Exchangeable	<0.0001	<0.422	1.41E+04	<0.006	1.68E+00	<0.016	<0.012	1.79E+01
	Carbonate	<0.0001	<0.422	1.26E+04	<0.006	4.79E+01	<0.016	<0.012	1.09E+01
	Fe, Mn Oxides	1.77E-01	<0.422	3.79E+03	<0.006	5.57E+00	5.04E+00	1.24E+00	1.34E+03
	Organic Matter	1.77E-01	<0.422	8.84E+02	6.19E-01	3.54E+02	9.56E+00	3.36E+02	2.27E+03
	Residual	1.77E-01	5.34E+01	7.35E+03	<0.006	2.61E+01	7.54E+01	3.33E+01	1.49E+04
	Exchangeable	<0.0001	9.56E+01	4.66E+03	<0.006	2.92E+00	4.51E+00	<0.012	2.61E+01
	Exchangeable	<0.0001	9.82E+01	2.43E+03	<0.006	2.39E+00	4.78E+00	<0.012	1.05E+01
	Carbonate	8.85E-02	5.16E+01	2.72E+04	<0.006	5.34E+01	1.50E+00	2.30E+00	1.58E+02
	Carbonate	8.85E-02	<0.422	4.80E+03	<0.006	7.03E+01	<0.016	2.48E+00	3.30E+02
	Fe, Mn Oxides	1.77E-01	<0.422	5.68E+02	<0.006	2.34E+01	3.72E+00	<0.012	2.09E+03
	Fe, Mn Oxides	<0.0001	<0.422	1.94E+02	<0.006	7.96E+00	<0.016	<0.012	4.42E+02
	Organic Matter	1.77E-01	<0.422	3.27E+02	6.19E-01	7.41E+02	4.42E+00	4.36E+02	4.34E+02
	Organic Matter	8.85E-02	<0.422	3.48E+02	<0.006	7.88E+01	1.68E+00	4.05E+01	2.24E+02
	Residual	7.08E-01	<0.422	7.82E+03	5.31E-01	4.88E+01	2.02E+02	2.86E+01	2.59E+04
Core ID	Extraction	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe
Core S4	Exchangeable	<0.0001	9.91E+01	1.53E+03	<0.006	6.37E+00	5.66E+00	1.42E+00	1.49E+02
	Carbonate	8.85E-02	3.86E+01	1.33E+04	<0.006	3.39E+01	1.50E+00	8.32E+00	9.03E+02
	Fe, Mn Oxides	<0.0001	<0.422	7.57E+02	<0.006	2.11E+01	1.50E+00	1.15E+00	4.89E+02
	Organic Matter	<0.0001	<0.422	1.49E+03	<0.006	6.57E+01	<0.016	5.57E+01	1.25E+02
	Residual	1.77E-01	<0.422	6.65E+03	9.73E-01	3.21E+01	3.94E+02	2.75E+01	2.42E+04
	Exchangeable	<0.0001	1.17E+02	1.40E+03	<0.006	5.93E+00	5.84E+00	1.33E+00	1.25E+02
	Carbonate	8.85E-02	4.48E+01	1.54E+04	<0.006	3.71E+01	1.77E+00	9.56E+00	9.82E+02
	Fe, Mn Oxides	<0.0001	<0.422	7.38E+02	<0.006	1.96E+01	1.77E+00	1.59E+00	4.95E+02
	Organic Matter	8.85E-02	<0.422	1.50E+03	<0.006	6.52E+01	<0.016	6.14E+01	2.11E+02
	Residual	1.77E-01	<0.422	8.65E+03	1.33E+00	3.81E+01	1.00E+02	2.14E+01	2.69E+04
	Exchangeable	<0.0001	1.10E+02	1.28E+03	<0.006	5.13E+00	5.22E+00	<0.012	7.71E+01
	Carbonate	8.85E-02	4.68E+01	1.04E+04	<0.006	2.99E+01	1.42E+00	5.31E+00	4.34E+02
	Fe, Mn Oxides	<0.0001	<0.422	6.43E+02	<0.006	1.50E+01	<0.016	1.59E+00	3.67E+02
	Organic Matter	8.85E-02	<0.422	1.19E+03	<0.006	1.21E+02	<0.016	7.60E+01	2.27E+02
	Residual	8.85E-02	<0.422	6.41E+03	1.06E+00	5.49E+01	8.94E+01	4.51E+01	2.34E+04
	Exchangeable	<0.0001	1.06E+02	1.21E+03	<0.006	8.05E+00	5.49E+00	1.33E+00	1.73E+02
	Carbonate	8.85E-02	5.95E+01	1.00E+04	<0.006	2.67E+01	<0.016	4.51E+00	3.49E+02
	Fe, Mn Oxides	<0.0001	<0.422	6.51E+02	<0.006	1.33E+01	<0.016	<0.012	3.73E+02
	Organic Matter	8.85E-02	<0.422	1.19E+03	<0.006	1.31E+02	<0.016	6.00E+01	1.42E+02
	Residual	<0.0001	<0.422	7.22E+03	9.73E-01	4.75E+01	8.25E+01	3.54E+01	2.30E+04
	Exchangeable	<0.0001	1.15E+02	1.09E+03	<0.006	8.85E+00	5.57E+00	1.15E+00	7.66E+01
	Carbonate	8.85E-02	3.96E+01	8.85E+03	<0.006	2.80E+01	<0.016	8.85E+00	3.43E+02
	Fe, Mn Oxides	<0.0001	<0.422	5.57E+02	<0.006	1.12E+01	<0.016	<0.012	3.09E+02
	Organic Matter	8.85E-02	<0.422	1.04E+03	<0.006	7.06E+01	<0.016	8.11E+01	2.31E+02
	Residual	2.65E-01	<0.422	6.47E+03	6.19E-01	6.84E+01	2.80E+03	1.07E+02	2.75E+04
	Exchangeable	<0.0001	1.22E+02	9.38E+02	<0.006	7.52E+00	5.04E+00	<0.012	3.66E+01
	Carbonate	8.85E-02	<0.422	8.74E+03	<0.006	2.51E+01	<0.016	8.05E+00	2.67E+02
	Fe, Mn Oxides	<0.0001	<0.422	6.34E+02	<0.006	1.17E+01	<0.016	1.24E+00	3.16E+02
	Organic Matter	<0.0001	<0.422	9.11E+02	<0.006	3.91E+01	<0.016	3.74E+01	1.43E+02
	Residual	1.77E-01	<0.422	7.53E+03	9.73E-01	6.86E+01	1.12E+02	4.72E+01	2.46E+04
	Exchangeable	<0.0001	1.20E+02	1.26E+03	<0.006	8.67E+00	5.49E+00	1.42E+00	9.64E+01
	Carbonate	8.85E-02	<0.422	1.19E+04	<0.006	3.81E+01	1.50E+00	9.38E+00	3.92E+02
	Fe, Mn Oxides	<0.0001	<0.422	7.52E+02	<0.006	1.62E+01	<0.016	1.06E+00	3.63E+02
	Organic Matter	<0.0001	<0.422	1.25E+03	<0.006	6.85E+01	<0.016	6.06E+01	9.38E+01
	Residual	1.77E-01	<0.422	8.46E+03	6.19E-01	8.46E+01	1.88E+03	6.55E+01	2.52E+04
	Exchangeable	<0.0001	1.04E+02	1.34E+03	<0.006	8.23E+00	5.49E+00	1.33E+00	1.05E+02
	Carbonate	8.85E-02	<0.422	1.02E+04	<0.006	3.33E+01	<0.016	7.79E+00	3.10E+02
	Fe, Mn Oxides	<0.0001	<0.422	6.91E+02	<0.006	1.60E+01	<0.016	<0.012	3.56E+02
	Organic Matter	8.85E-02	<0.422	1.06E+03	<0.006	7.55E+01	<0.016	8.17E+01	1.42E+02
	Residual	1.77E-01	<0.422	8.66E+03	1.06E+00	5.71E+01	1.00E+02	6.68E+01	2.43E+04
Core ID	Extraction	Be	Bi	Ca	Cd	Co	Cr	Cu	Fe
Core S5	Exchangeable	<0.0001	1.43E+02	1.62E+03	<0.006	7.26E+00	6.28E+00	3.19E+00	1.05E+02
	Carbonate	8.85E-02	5.72E+01	1.30E+04	<0.006	3.67E+01	1.50E+00	5.84E+00	3.25E+02
	Fe, Mn Oxides	<0.0001	<0.422	8.41E+02	<0.006	2.22E+01	1.59E+00	1.33E+00	3.77E+02
	Organic Matter	8.85E-02	<0.422	1.62E+03	<0.006	1.19E+02	2.12E+00	6.44E+01	3.26E+02
	Residual	<0.0001	<0.422	1.01E+04	9.73E-01	3.77E+01	9.38E+01	1.50E+01	2.43E+04
	Exchangeable	<0.0001	1.09E+02	1.71E+03	<0.006	6.46E+00	5.04E+00	1.15E+00	9.11E+01
	Carbonate	8.85E-02	5.51E+01	1.21E+04	<0.006	3.45E+01	<0.016	5.84E+00	2.96E+02
	Fe, Mn Oxides	<0.0001	<0.422	1.14E+03	<0.006	2.71E+01	1.68E+00	<0.012	4.26E+02
	Organic Matter	8.85E-02	<0.422	1.87E+03	<0.006	1.30E+02	1.77E+00	6.58E+01	1.74E+02
	Residual	<0.0001	<0.422	9.91E+03	9.73E-01	4.13E+01	5.61E+02	2.36E+01	2.57E+04
	Exchangeable	<0.0001	1.49E+02	1.56E+03	<0.006	7.08E+00	6.81E+00	3.10E+00	1.19E+02
	Carbonate	8.85E-02	6.25E+01	1.46E+04	<0.006	3.34E+01	<0.016	3.72E+00	3.43E+02
	Fe, Mn Oxides	<0.0001	<0.422	1.00E+03	<0.006	1.73E+01	<0.016	<0.012	3.84E+02
	Organic Matter	8.85E-02	<0.422	1.34E+03	<0.006	2.27E+02	1.42E+00	9.64E+01	2.85E+02
	Exchangeable	<0.0001	1.49E+02	1.57E+03	<0.006	7.17E+00	6.46E+00	2.92E+00	1.03E+02
	Carbonate	8.85E-02	6.33E+01	1.48E+04	<0.006	3.44E+01	<0.016	3.36E+00	3.19E+02
	Fe, Mn Oxides	<0.0001	<0.422	6.72E+02	<0.006	1.68E+01	1.50E+00	<0.012	4.26E+02
	Organic Matter	8.85E-02	<0.422	1.25E+03	<0.006	2.28E+02	<0.016	9.64E+01	1.38E+02
	Residual	<0.0001	<0.422	8.29E+03	7.08E-01	8.66E+01	1.90E+03	5.45E+01	2.88E+04

		Exchangeable	<0.0001	1.04E+02	1.52E+03	<0.006	7.87E+00	5.84E+00	1.68E+00	9.73E+01
		Carbonate	8.85E-02	4.88E+01	1.21E+04	<0.006	3.75E+01	<0.016	7.70E+00	3.01E+02
		Fe, Mn Oxides	<0.0001	<0.422	5.80E+02	<0.006	2.00E+01	<0.016	<0.012	3.25E+02
		Organic Matter	8.85E-02	<0.422	1.19E+03	<0.006	1.04E+02	1.42E+00	9.56E+01	1.82E+02
		Residual	<0.0001	<0.422	7.97E+03	7.96E-01	4.19E+01	7.95E+01	2.42E+01	1.97E+04
		Exchangeable	<0.0001	1.22E+02	1.50E+03	<0.006	7.96E+00	5.40E+00	1.95E+00	1.13E+02
		Carbonate	<0.0001	4.67E+01	1.24E+04	<0.006	4.06E+01	<0.016	8.58E+00	3.80E+02
		Fe, Mn Oxides	<0.0001	<0.422	5.61E+02	<0.006	2.18E+01	<0.016	<0.012	3.27E+02
		Organic Matter	8.85E-02	<0.422	1.27E+03	<0.006	1.16E+02	<0.016	1.19E+02	2.00E+02
		Residual	1.77E-01	<0.422	6.98E+03	9.73E-01	5.64E+01	1.40E+02	3.33E+01	2.34E+04
Total Digestions										
		Core ID	Extraction	Be	Bi	Ca	Cd	Co	Cr	Cu
		Fe								
		Core S1								
				1.15E+00	4.80E+01	2.92E+04	1.86E+00	4.70E+02	1.40E+02	2.35E+02
				2.61E+00	8.99E+01	5.29E+04	3.68E+00	6.68E+02	2.96E+02	3.96E+02
				6.08E-01	5.45E+01	2.80E+04	1.92E+00	4.51E+02	1.23E+02	1.87E+02
				7.95E-01	<0.422	2.22E+04	1.59E+00	3.64E+02	1.02E+02	1.54E+02
				2.53E+00	<0.422	6.71E+04	4.37E+00	6.09E+02	2.69E+02	4.14E+02
				2.30E+00	<0.422	6.44E+04	4.14E+00	5.87E+02	2.53E+02	3.89E+02
		Core S2								
				2.17E+00	<0.422	4.98E+04	3.48E+00	4.76E+02	3.15E+02	2.28E+02
				3.13E+00	<0.422	6.13E+04	4.18E+00	5.72E+02	3.05E+02	2.71E+02
				1.08E+00	1.15E+02	7.22E+04	4.33E+00	5.81E+02	2.76E+02	2.78E+02
				2.54E-01	<0.422	7.13E+04	4.06E+00	5.79E+02	2.97E+02	2.92E+02
				2.22E+00	1.79E+02	7.11E+04	3.70E+00	5.36E+02	3.41E+02	2.99E+02
				9.63E-01	<0.422	6.89E+04	3.61E+00	5.25E+02	3.11E+02	3.23E+02
		Core S3								
				8.98E-02	<0.422	8.19E+03	8.08E-01	2.87E+01	9.52E+02	2.69E+01
				8.08E-01	<0.422	1.94E+04	1.53E+00	3.65E+02	9.43E+01	2.13E+02
				8.65E-01	5.77E+01	1.84E+04	1.38E+00	3.51E+02	9.35E+01	2.26E+02
				8.30E-01	5.84E+01	3.27E+04	1.66E+00	3.54E+02	1.15E+02	2.53E+02
				8.08E-01	<0.422	2.73E+04	1.35E+00	2.97E+02	9.61E+01	2.30E+02
				7.52E-01	1.55E+02	3.31E+04	1.38E+00	5.69E+02	2.04E+02	5.12E+02
				1.17E+00	2.23E+02	4.93E+04	2.33E+00	8.15E+02	2.35E+02	7.30E+02
		Core S4								
				1.04E+00	<0.422	4.92E+04	3.97E+00	4.12E+02	2.17E+02	2.83E+02
				1.04E+00	<0.422	4.14E+04	3.28E+00	3.33E+02	1.74E+02	2.38E+02
				4.66E+00	1.49E+02	4.75E+04	3.11E+00	8.68E+02	2.20E+02	3.78E+02
				1.02E+00	1.96E+02	5.94E+04	3.84E+00	9.95E+02	2.71E+02	4.25E+02
				1.33E+00	9.71E+01	4.09E+04	3.11E+00	5.00E+02	2.51E+02	4.44E+02
				1.19E+00	1.09E+02	4.51E+04	3.79E+00	5.31E+02	2.70E+02	4.29E+02
				1.15E+00	<0.422	4.93E+04	3.21E+00	6.37E+02	2.66E+02	4.93E+02
				1.16E+00	<0.422	5.00E+04	3.70E+00	6.37E+02	2.78E+02	5.63E+02
		Core S5								
				<0.0001	<0.422	5.76E+04	2.70E+00	5.82E+02	2.20E+02	2.54E+02
				2.09E-01	9.07E+01	6.78E+04	3.13E+00	6.94E+02	2.63E+02	3.04E+02
				7.71E-01	1.05E+02	4.95E+04	2.89E+00	9.23E+02	1.91E+02	3.99E+02
				<0.0001	1.22E+02	6.11E+04	3.34E+00	9.71E+02	2.30E+02	4.34E+02
				1.86E-01	<0.422	5.06E+04	2.79E+00	5.86E+02	2.12E+02	4.75E+02
				4.42E-01	<0.422	5.62E+04	3.54E+00	6.06E+02	2.81E+02	4.66E+02

Core ID	Extraction	Hg	K	Mg	Mn	Mo	Na
Core S1	Exchangeable	<0.009	1.34E+02	1.25E+05	2.15E+01	8.05E+00	1.41E+04
	Carbonate	<0.009	1.85E+02	2.34E+04	2.78E+02	<0.036	<0.1
	Fe, Mn Oxides	<0.009	4.50E+01	8.94E+02	5.13E+01	<0.036	<0.1
	Organic Matter	2.65E+00	4.18E+01	7.57E+02	2.13E+01	<0.036	1.89E+03
	Residual	2.24E+01	2.45E+03	1.91E+04	7.87E+02	5.31E+00	3.62E+03
	Exchangeable	2.79E+01	1.52E+02	1.33E+05	2.50E+01	6.99E+00	1.68E+04
	Carbonate	9.03E+00	1.70E+02	2.41E+04	2.72E+02	<0.036	<0.1
	Fe, Mn Oxides	<0.009	5.21E+01	9.38E+02	4.88E+01	<0.036	<0.1
	Organic Matter	<0.009	3.90E+01	4.03E+02	1.72E+01	<0.036	1.25E+03
	Residual	1.89E+01	2.84E+03	1.74E+04	7.10E+02	4.34E+00	6.45E+03
	Exchangeable	2.27E+01	9.20E+01	1.15E+05	1.84E+01	6.19E+00	2.04E+04
	Carbonate	2.36E+01	5.33E+01	1.18E+05	1.34E+01	6.19E+00	2.01E+04
	Carbonate	1.36E+01	8.28E+01	1.68E+04	1.81E+02	<0.036	<0.1
	Carbonate	<0.009	8.36E+01	2.96E+03	5.46E+01	<0.036	<0.1
	Fe, Mn Oxides	<0.009	2.37E+01	2.59E+02	1.11E+01	<0.036	<0.1
	Fe, Mn Oxides	<0.009	2.29E+01	8.78E+01	3.72E+00	<0.036	<0.1
	Organic Matter	<0.009	3.24E+01	5.13E+02	1.85E+01	4.25E+00	2.52E+03
	Organic Matter	7.02E+01	1.78E+01	1.68E+02	6.46E+00	<0.036	1.52E+02
	Residual	1.28E+01	1.74E+03	1.27E+04	5.25E+02	<0.036	6.20E+02
	Exchangeable	1.70E+01	2.79E+01	5.57E+04	1.14E+01	3.54E+00	4.87E+03
	Carbonate	1.75E+01	1.20E+02	5.41E+04	1.90E+02	<0.036	<0.1
	Fe, Mn Oxides	<0.009	3.62E+01	1.69E+03	2.94E+01	<0.036	<0.1
	Organic Matter	<0.009	9.11E+00	4.26E+02	1.58E+01	<0.036	8.80E+02
	Residual	1.15E+02	2.07E+03	1.26E+04	5.58E+02	3.63E+00	6.95E+02
	Exchangeable	2.11E+01	8.94E+01	1.24E+05	2.04E+01	6.64E+00	1.47E+04
	Carbonate	9.11E+00	1.61E+02	2.62E+04	1.19E+02	<0.036	<0.1
	Fe, Mn Oxides	<0.009	3.97E+01	5.91E+02	1.09E+01	<0.036	<0.1
	Organic Matter	<0.009	2.71E+01	4.88E+02	1.72E+01	<0.036	1.19E+03
	Residual	1.50E+02	2.50E+03	1.35E+04	6.11E+02	<0.036	8.08E+02
	Exchangeable	2.22E+01	7.59E+01	1.18E+05	1.96E+01	5.93E+00	1.41E+04
	Carbonate	<0.009	1.66E+02	2.12E+04	1.25E+02	<0.036	<0.1
	Fe, Mn Oxides	<0.009	3.75E+01	5.31E+02	1.22E+01	<0.036	<0.1
	Organic Matter	<0.009	1.63E+01	3.75E+02	1.36E+01	<0.036	1.12E+03
	Residual	1.22E+01	2.80E+03	1.30E+04	5.83E+02	4.78E+00	1.13E+03
Core ID	Extraction	Hg	K	Mg	Mn	Mo	Na
Core S2	Exchangeable	4.69E+00	6.95E+01	9.38E+03	4.61E+01	<0.036	<0.1
	Carbonate	<0.009	6.72E+01	2.83E+03	4.58E+01	<0.036	<0.1
	Fe, Mn Oxides	<0.009	2.12E+01	2.00E+02	9.47E+00	<0.036	<0.1
	Organic Matter	4.81E+01	2.28E+01	3.50E+02	1.37E+01	<0.036	7.03E+02
	Residual	1.65E+01	2.50E+03	1.40E+04	7.51E+02	<0.036	1.02E+03
	Exchangeable	5.31E+00	6.48E+01	8.73E+03	4.30E+01	<0.036	<0.1
	Carbonate	<0.009	5.93E+01	2.05E+03	4.18E+01	<0.036	<0.1
	Fe, Mn Oxides	<0.009	1.65E+01	2.36E+02	1.16E+01	<0.036	<0.1
	Organic Matter	<0.009	2.34E+01	3.85E+02	1.55E+01	<0.036	9.73E+02
	Residual	1.70E+01	2.34E+03	1.37E+04	7.35E+02	<0.036	1.04E+03
	Exchangeable	2.13E+01	6.95E+01	1.26E+05	2.03E+01	6.72E+00	1.50E+04
	Carbonate	<0.009	1.53E+02	3.26E+04	1.09E+02	<0.036	<0.1
	Fe, Mn Oxides	<0.009	3.08E+01	8.19E+02	1.36E+01	<0.036	<0.1
	Organic Matter	<0.009	3.18E+01	3.34E+02	1.31E+01	<0.036	9.91E+02
	Residual	1.34E+01	2.03E+03	1.31E+04	7.36E+02	<0.036	7.09E+02
	Exchangeable	2.96E+01	6.03E+01	1.25E+05	2.01E+01	6.28E+00	1.53E+04
	Carbonate	<0.009	1.47E+02	3.50E+04	1.04E+02	<0.036	<0.1
	Fe, Mn Oxides	<0.009	3.20E+01	3.13E+02	1.14E+01	<0.036	1.19E+03
	Organic Matter	<0.009	3.92E+01	1.14E+03	1.33E+01	<0.036	<0.1
	Residual	1.39E+01	2.36E+03	1.19E+04	6.71E+02	<0.036	7.53E+02
	Exchangeable	5.13E+00	8.18E+01	8.48E+03	4.12E+01	<0.036	<0.1
	Carbonate	1.57E+01	5.90E+01	1.47E+03	9.56E+01	<0.036	<0.1
	Fe, Mn Oxides	<0.009	3.45E+01	2.11E+02	1.19E+01	<0.036	<0.1
	Organic Matter	<0.009	5.07E+01	2.99E+02	1.10E+01	<0.036	7.00E+02
	Residual	1.40E+01	2.22E+03	1.21E+04	6.27E+02	<0.036	6.86E+02
	Exchangeable	2.25E+01	1.19E+02	1.23E+05	1.70E+01	6.28E+00	1.45E+04
	Carbonate	<0.009	1.55E+02	3.56E+04	1.02E+02	3.19E+00	<0.1
	Fe, Mn Oxides	1.06E+00	4.07E+01	5.70E+02	1.11E+01	<0.036	<0.1
	Organic Matter	<0.009	1.57E+01	2.78E+02	1.10E+01	<0.036	6.82E+02
	Residual	1.33E+01	3.19E+03	1.40E+04	7.19E+02	<0.036	9.91E+02
Core ID	Extraction	Hg	K	Mg	Mn	Mo	Na
Core S3	Exchangeable	4.61E+01	7.80E+01	1.14E+05	5.77E+01	5.93E+00	1.96E+04
	Exchangeable	2.19E+01	3.37E+01	1.23E+05	2.04E+01	6.64E+00	2.19E+04
	Carbonate	9.29E+00	4.03E+01	1.91E+04	6.18E+01	<0.036	<0.1
	Carbonate	<0.009	5.22E+01	2.21E+03	2.79E+01	<0.036	<0.1
	Fe, Mn Oxides	<0.009	3.03E+01	2.01E+02	1.05E+01	<0.036	<0.1
	Fe, Mn Oxides	<0.009	2.83E+01	1.02E+02	4.60E+00	<0.036	<0.1
	Organic Matter	<0.009	3.73E+01	5.94E+02	2.05E+01	3.19E+00	2.62E+03
	Organic Matter	<0.009	1.82E+01	1.65E+02	6.55E+00	<0.036	2.05E+02
	Exchangeable	6.90E+00	6.46E+01	6.52E+03	8.53E+01	<0.036	<0.1
	Carbonate	<0.009	5.92E+01	2.11E+03	8.49E+01	<0.036	<0.1
	Fe, Mn Oxides	<0.009	3.13E+01	3.91E+02	2.90E+01	<0.036	<0.1
	Organic Matter	<0.009	2.47E+01	6.48E+02	1.81E+01	<0.036	1.07E+03
	Residual	2.43E+01	2.33E+03	9.56E+03	4.35E+02	<0.036	7.96E+02
	Exchangeable	3.89E+00	6.18E+01	6.90E+03	4.57E+01	<0.036	<0.1
	Carbonate	<0.009	4.56E+01	1.70E+03	1.83E+02	<0.036	<0.1
	Fe, Mn Oxides	<0.009	1.74E+01	2.47E+02	1.59E+01	<0.036	<0.1
	Organic Matter	<0.009	9.56E+00	4.77E+02	2.23E+01	<0.036	7.32E+02

	Residual	1.42E+01	1.02E+03	1.26E+04	4.78E+02	5.84E+00	4.80E+02
	Exchangeable	2.23E+01	3.57E+01	1.17E+05	1.31E+01	6.72E+00	2.07E+04
	Exchangeable	2.14E+01	2.29E+01	1.24E+05	1.19E+01	6.37E+00	2.15E+04
	Carbonate	3.45E+00	4.42E+01	8.94E+03	1.41E+02	<0.036	<0.1
	Carbonate	<0.009	5.34E+01	1.31E+03	4.05E+01	<0.036	<0.1
	Fe, Mn Oxides	<0.009	2.65E+01	1.43E+02	5.84E+00	<0.036	<0.1
	Fe, Mn Oxides	<0.009	2.29E+01	1.19E+02	4.51E+00	<0.036	<0.1
	Organic Matter	<0.009	2.24E+01	5.59E+02	1.42E+01	6.28E+00	4.24E+03
	Organic Matter	<0.009	1.24E+01	1.43E+02	5.57E+00	<0.036	5.15E+02
	Residual	8.75E+01	9.47E+02	1.00E+04	3.85E+02	<0.036	3.19E+02
	Exchangeable	6.64E+00	1.47E+02	7.20E+03	5.22E+01	<0.036	<0.1
	Carbonate	9.73E-01	8.09E+01	2.96E+03	1.25E+02	<0.036	<0.1
	Fe, Mn Oxides	<0.009	4.82E+01	7.44E+02	5.76E+01	<0.036	<0.1
	Organic Matter	<0.009	6.10E+01	1.25E+03	5.66E+01	<0.036	2.40E+03
	Residual	9.47E+00	2.24E+03	8.76E+03	4.36E+02	<0.036	8.57E+02
	Exchangeable	2.44E+01	1.01E+02	1.16E+05	3.75E+01	6.19E+00	2.04E+04
	Exchangeable	2.37E+01	5.05E+01	1.25E+05	2.05E+01	6.55E+00	2.21E+04
	Carbonate	<0.009	1.39E+02	1.91E+04	1.89E+02	<0.036	<0.1
	Carbonate	7.70E+00	6.39E+01	2.57E+03	4.42E+01	<0.036	<0.1
	Fe, Mn Oxides	<0.009	4.69E+01	4.41E+02	3.04E+01	<0.036	<0.1
	Fe, Mn Oxides	3.36E+00	2.96E+01	1.55E+02	7.96E+00	<0.036	<0.1
	Organic Matter	1.73E+02	4.88E+01	6.58E+02	2.96E+01	4.96E+00	1.60E+03
	Organic Matter	<0.009	2.11E+01	2.66E+02	1.06E+01	<0.036	5.25E+02
	Residual	2.90E+01	2.88E+03	1.22E+04	5.33E+02	<0.036	7.80E+02
Core ID	Extraction	Hg	K	Mg	Mn	Mo	Na
Core S4	Exchangeable	2.73E+01	7.49E+01	1.30E+05	1.38E+01	6.90E+00	2.06E+04
	Carbonate	3.86E+01	1.72E+02	4.52E+03	1.34E+02	<0.036	<0.1
	Fe, Mn Oxides	<0.009	2.88E+01	3.31E+02	1.49E+01	<0.036	<0.1
	Organic Matter	<0.009	1.08E+01	4.41E+02	1.65E+01	<0.036	8.68E+02
	Residual	1.05E+02	8.94E+02	1.29E+04	4.86E+02	7.79E+00	4.98E+02
	Exchangeable	2.19E+01	7.64E+01	1.32E+05	1.24E+01	6.90E+00	2.12E+04
	Carbonate	<0.009	2.00E+02	5.70E+03	1.51E+02	<0.036	<0.1
	Fe, Mn Oxides	<0.009	4.42E+01	3.47E+02	1.36E+01	<0.036	<0.1
	Organic Matter	<0.009	1.65E+01	5.11E+02	1.84E+01	<0.036	1.48E+03
	Residual	1.81E+01	1.27E+03	1.50E+04	5.49E+02	<0.036	8.25E+02
	Exchangeable	2.68E+01	7.41E+01	1.26E+05	9.73E+00	6.81E+00	1.96E+04
	Carbonate	<0.009	1.31E+02	3.00E+03	9.38E+01	<0.036	<0.1
	Fe, Mn Oxides	<0.009	3.45E+01	2.96E+02	1.09E+01	<0.036	<0.1
	Organic Matter	<0.009	1.96E+01	4.38E+02	1.46E+01	3.89E+00	1.40E+03
	Residual	1.57E+01	1.07E+03	1.33E+04	4.39E+02	<0.036	6.55E+02
	Exchangeable	2.83E+01	7.13E+01	1.23E+05	1.06E+01	6.55E+00	1.88E+04
	Carbonate	<0.009	1.19E+02	4.32E+03	8.65E+01	<0.036	<0.1
	Fe, Mn Oxides	<0.009	3.57E+01	3.54E+02	1.16E+01	<0.036	<0.1
	Organic Matter	1.15E+00	1.67E+01	4.09E+02	1.34E+01	3.89E+00	9.91E+02
	Residual	1.42E+01	1.35E+03	1.30E+04	4.65E+02	<0.036	6.45E+02
	Exchangeable	2.38E+01	7.75E+01	1.30E+05	8.58E+00	6.99E+00	2.07E+04
	Carbonate	<0.009	1.37E+02	4.80E+03	7.67E+01	<0.036	<0.1
	Fe, Mn Oxides	3.10E+00	3.76E+01	2.57E+02	1.04E+01	<0.036	<0.1
	Organic Matter	7.96E-01	1.06E+01	3.73E+02	1.39E+01	<0.036	8.70E+02
	Residual	1.86E+01	1.82E+03	1.08E+04	6.31E+02	5.58E+01	3.62E+02
	Exchangeable	2.17E+01	6.49E+01	1.25E+05	7.17E+00	6.64E+00	1.92E+04
	Carbonate	<0.009	1.39E+02	5.52E+03	7.50E+01	<0.036	<0.1
	Fe, Mn Oxides	4.22E+01	4.55E+01	2.94E+02	1.09E+01	<0.036	<0.1
	Organic Matter	8.14E+00	4.78E+00	2.42E+02	6.81E+00	<0.036	4.92E+02
	Residual	1.57E+01	1.90E+03	1.30E+04	5.04E+02	<0.036	3.73E+02
	Exchangeable	2.27E+01	7.28E+01	1.27E+05	1.04E+01	6.72E+00	1.97E+04
	Carbonate	<0.009	1.44E+02	3.65E+03	1.04E+02	<0.036	<0.1
	Fe, Mn Oxides	<0.009	4.98E+01	3.01E+02	1.34E+01	<0.036	<0.1
	Organic Matter	9.73E-01	1.42E+01	3.22E+02	1.12E+01	<0.036	1.27E+02
	Residual	1.73E+01	2.50E+03	1.10E+04	5.85E+02	3.62E+01	5.97E+02
	Exchangeable	2.29E+01	7.84E+01	1.28E+05	1.09E+01	6.99E+00	2.06E+04
	Carbonate	<0.009	1.32E+02	3.92E+03	9.11E+01	<0.036	<0.1
	Fe, Mn Oxides	1.27E+01	4.32E+01	3.00E+02	1.24E+01	<0.036	<0.1
	Organic Matter	<0.009	2.22E+01	3.24E+02	1.20E+01	<0.036	1.17E+03
	Residual	1.73E+01	2.48E+03	1.28E+04	5.44E+02	<0.036	6.34E+02
Core ID	Extraction	Hg	K	Mg	Mn	Mo	Na
Core S5	Exchangeable	4.88E+01	8.03E+01	1.24E+05	1.13E+01	7.52E+00	1.88E+04
	Carbonate	1.18E+02	1.42E+02	1.03E+04	1.14E+02	<0.036	<0.1
	Fe, Mn Oxides	<0.009	2.81E+01	5.34E+02	1.19E+01	<0.036	<0.1
	Organic Matter	<0.009	3.21E+01	6.05E+02	1.81E+01	<0.036	2.20E+03
	Residual	1.45E+01	1.77E+03	1.28E+04	5.49E+02	<0.036	7.87E+02
	Exchangeable	2.89E+01	7.17E+01	1.25E+05	1.17E+01	6.19E+00	1.95E+04
	Carbonate	3.03E+01	1.32E+02	8.48E+03	1.03E+02	<0.036	<0.1
	Fe, Mn Oxides	<0.009	3.05E+01	7.11E+02	1.51E+01	<0.036	<0.1
	Organic Matter	<0.009	2.85E+01	5.58E+02	1.67E+01	<0.036	1.65E+03
	Residual	1.50E+01	1.97E+03	1.27E+04	5.82E+02	1.06E+01	8.16E+02
	Exchangeable	<0.009	9.38E+01	1.33E+05	1.17E+01	8.05E+00	2.04E+04
	Carbonate	<0.009	1.66E+02	5.83E+03	1.22E+02	<0.036	<0.1
	Fe, Mn Oxides	<0.009	3.64E+01	4.72E+02	1.40E+01	<0.036	<0.1
	Organic Matter	<0.009	2.63E+01	4.72E+02	1.56E+01	3.63E+00	1.43E+03
	Exchangeable	<0.009	1.40E+02	1.26E+05	1.17E+01	7.87E+00	<0.1
	Carbonate	<0.009	1.59E+02	5.10E+03	1.20E+02	<0.036	<0.1
	Fe, Mn Oxides	<0.009	3.11E+01	3.42E+02	1.24E+01	<0.036	<0.1
	Organic Matter	7.61E+00	1.14E+01	4.02E+02	1.42E+01	3.45E+00	1.06E+03
	Residual	1.72E+01	9.56E+02	1.27E+04	6.10E+02	3.80E+01	5.20E+02

		Exchangeable	2.29E+01	1.30E+02	1.29E+05	1.22E+01	7.43E+00	<0.1
		Carbonate	<0.009	1.46E+02	5.49E+03	1.08E+02	<0.036	<0.1
		Fe, Mn Oxides	<0.009	3.06E+01	2.85E+02	1.07E+01	<0.036	<0.1
		Organic Matter	<0.009	1.98E+01	3.85E+02	1.48E+01	<0.036	1.17E+03
		Residual	1.21E+01	1.50E+03	1.03E+04	4.65E+02	<0.036	4.79E+02
		Exchangeable	2.41E+01	1.31E+02	1.25E+05	1.23E+01	7.26E+00	<0.1
		Carbonate	<0.009	1.42E+02	6.22E+03	1.15E+02	<0.036	<0.1
		Fe, Mn Oxides	<0.009	1.94E+01	2.80E+02	1.07E+01	<0.036	<0.1
		Organic Matter	<0.009	3.00E+01	3.93E+02	1.49E+01	<0.036	1.28E+03
		Residual	1.58E+01	8.62E+02	1.24E+04	5.25E+02	<0.036	4.97E+02
Total Digestions								
Core ID	Extraction	Hg	K	Mg	Mn	Mo	Na	
Core S1		2.67E+01	2.26E+03	1.98E+04	9.82E+02	7.08E+00	2.59E+03	
		5.22E+01	4.30E+03	4.10E+04	1.92E+03	1.37E+01	4.71E+03	
		2.46E+01	2.93E+03	1.82E+04	1.01E+03	5.57E+00	9.65E+02	
		2.16E+01	2.75E+03	1.50E+04	8.36E+02	5.39E+00	8.39E+02	
		2.00E+02	8.20E+03	4.11E+04	1.95E+03	<0.036	1.81E+03	
		4.78E+02	8.05E+03	3.84E+04	1.81E+03	<0.036	1.71E+03	
Core S2		4.11E+01	5.72E+03	3.70E+04	1.88E+03	<0.036	1.74E+03	
		5.09E+01	8.35E+03	4.49E+04	2.36E+03	<0.036	2.32E+03	
		5.24E+01	6.79E+03	4.33E+04	2.42E+03	<0.036	2.05E+03	
		4.82E+01	6.14E+03	4.24E+04	2.34E+03	<0.036	1.89E+03	
		4.69E+02	8.89E+03	4.00E+04	2.11E+03	<0.036	1.56E+03	
		4.24E+01	8.26E+03	3.90E+04	2.06E+03	<0.036	2.04E+03	
Core S3		1.43E+01	2.02E+03	1.12E+04	5.40E+02	1.57E+01	5.32E+02	
		1.65E+01	2.54E+03	1.50E+04	6.83E+02	<0.036	5.84E+02	
		1.66E+01	2.60E+03	1.43E+04	6.56E+02	<0.036	5.66E+02	
		2.02E+01	2.15E+03	1.85E+04	8.66E+02	6.53E+00	1.36E+03	
		1.98E+01	1.27E+03	1.54E+04	7.25E+02	8.80E+00	6.13E+02	
		1.72E+01	3.70E+03	1.99E+04	1.01E+03	6.64E+00	9.38E+02	
Core S4		3.15E+01	5.83E+03	2.92E+04	1.50E+03	8.83E+00	1.48E+03	
		4.19E+01	3.81E+03	3.48E+04	1.47E+03	1.17E+01	1.45E+03	
		3.05E+01	2.35E+03	2.97E+04	1.21E+03	8.28E+00	1.02E+03	
		4.49E+01	2.95E+03	3.86E+04	1.39E+03	2.07E+01	9.73E+02	
		5.47E+01	5.19E+03	4.58E+04	1.69E+03	2.61E+01	1.59E+03	
		4.55E+01	7.31E+03	3.58E+04	1.55E+03	1.42E+01	1.15E+03	
Core S5		2.47E+02	6.43E+03	3.70E+04	1.63E+03	1.28E+01	1.14E+03	
		3.94E+01	6.28E+03	3.74E+04	1.63E+03	2.18E+01	1.21E+03	
		4.65E+01	6.39E+03	4.05E+04	1.68E+03	1.69E+01	1.28E+03	
		3.00E+01	5.95E+03	3.10E+04	1.52E+03	1.04E+01	1.46E+03	
		3.80E+01	6.76E+03	3.67E+04	1.77E+03	1.17E+01	1.78E+03	
		4.05E+01	2.29E+03	3.12E+04	1.34E+03	1.66E+01	1.53E+03	
		4.31E+01	5.09E+03	3.56E+04	1.67E+03	1.89E+01	2.02E+03	
		3.28E+01	4.36E+03	3.02E+04	1.54E+03	1.10E+01	1.47E+03	
		3.76E+01	5.31E+03	3.38E+04	1.73E+03	1.06E+01	1.72E+03	

Core ID	Extraction	Ni	P	Pb	Rb	S	Sb	Sc	Se	Si
Core S1	Exchangeable	1.01E+01	<0.268	<0.213	<0.32	3.24E+02	3.04E+01	3.54E-01	2.09E+01	1.19E+02
	Carbonate	6.95E+01	<0.268	1.91E+02	<0.32	9.56E+02	2.24E+01	1.42E+00	<0.213	1.93E+02
	Fe, Mn Oxides	5.60E+01	3.38E+01	1.07E+02	3.80E+01	8.36E+01	6.97E+01	2.30E+00	<0.213	1.17E+03
	Organic Matter	7.43E+01	5.72E+01	4.23E+01	<0.32	1.62E+03	<0.167	1.15E+00	<0.213	5.11E+02
	Residual	7.70E+01	6.28E+02	3.85E+01	<0.32	5.01E+02	2.11E+01	2.80E+01	<0.213	1.83E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	3.79E+02	4.35E+01	7.08E-01	2.63E+01	1.14E+02
	Carbonate	5.61E+01	<0.268	1.88E+02	<0.32	9.64E+02	2.52E+01	1.42E+00	<0.213	1.74E+02
	Fe, Mn Oxides	5.00E+01	3.37E+01	1.02E+02	<0.32	7.49E+01	6.21E+01	1.95E+00	<0.213	1.13E+03
	Organic Matter	3.91E+01	<0.268	3.44E+01	<0.32	1.59E+03	<0.167	3.54E-01	<0.213	4.76E+02
	Residual	7.16E+01	5.66E+02	3.31E+01	<0.32	4.58E+02	1.99E+01	2.62E+01	<0.213	2.65E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	2.25E+03	<0.167	<0.002	2.28E+01	9.64E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	2.97E+02	<0.167	<0.002	2.65E+01	5.68E+01
	Carbonate	1.69E+01	<0.268	4.49E+01	<0.32	2.50E+02	<0.167	6.19E-01	<0.213	1.70E+02
	Carbonate	6.37E+00	<0.268	3.34E+01	4.06E+01	1.34E+02	<0.167	1.77E-01	<0.213	1.34E+02
	Fe, Mn Oxides	<0.059	1.68E+02	3.56E+01	<0.32	1.43E+02	<0.167	9.73E-01	<0.213	4.06E+02
	Fe, Mn Oxides	<0.059	3.25E+01	<0.213	<0.32	5.21E+01	<0.167	<0.002	<0.213	2.18E+02
	Organic Matter	5.84E+00	<0.268	4.13E+01	<0.32	2.72E+03	<0.167	4.42E-01	<0.213	5.94E+02
	Organic Matter	9.56E+00	1.55E+02	<0.213	<0.32	3.72E+02	<0.167	4.42E-01	<0.213	3.97E+02
	Residual	4.30E+01	3.35E+02	3.46E+01	<0.32	6.11E+02	<0.167	2.04E+01	<0.213	3.07E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	7.59E+02	<0.167	<0.002	<0.213	6.72E+01
	Carbonate	1.99E+01	<0.268	4.38E+01	<0.32	1.09E+03	<0.167	1.77E-01	1.96E+01	1.19E+02
	Fe, Mn Oxides	<0.059	1.98E+02	5.42E+01	<0.32	2.04E+02	1.92E+01	6.19E-01	<0.213	4.24E+02
	Organic Matter	1.31E+01	6.12E+01	3.11E+01	<0.32	1.61E+03	<0.167	1.77E-01	<0.213	2.10E+02
	Residual	4.20E+01	2.83E+02	4.47E+01	<0.32	7.69E+02	<0.167	2.08E+01	<0.213	2.49E+01
	Exchangeable	<0.059	<0.268	<0.213	3.08E+01	2.75E+02	<0.167	<0.002	2.67E+01	2.32E+02
	Carbonate	<0.059	<0.268	7.25E+01	<0.32	4.72E+02	<0.167	7.08E-01	<0.213	2.68E+02
	Fe, Mn Oxides	<0.059	<0.268	1.90E+01	<0.32	<0.568	<0.167	4.42E-01	<0.213	3.47E+02
	Organic Matter	<0.059	1.31E+02	4.52E+01	<0.32	1.30E+03	<0.167	2.65E-01	<0.213	2.76E+02
	Residual	4.67E+01	1.96E+02	4.43E+01	<0.32	8.57E+02	<0.167	2.32E+01	<0.213	1.75E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	2.58E+02	<0.167	1.77E-01	2.22E+01	2.45E+02
	Carbonate	2.19E+01	<0.268	8.34E+01	<0.32	4.94E+02	<0.167	7.08E-01	<0.213	2.32E+02
	Fe, Mn Oxides	<0.059	<0.268	2.40E+01	3.80E+01	7.54E+01	<0.167	5.31E-01	<0.213	3.56E+02
	Organic Matter	1.17E+01	6.77E+01	3.90E+01	3.39E+01	1.22E+03	<0.167	1.77E-01	<0.213	1.74E+02
	Residual	4.54E+01	2.85E+02	4.93E+01	<0.32	9.64E+02	1.48E+01	2.19E+01	<0.213	1.68E+01
Core ID	Extraction	Ni	P	Pb	Rb	S	Sb	Sc	Se	Si
Core S2	Exchangeable	<0.059	<0.268	2.74E+01	<0.32	5.76E+02	<0.167	2.65E-01	<0.213	1.81E+02
	Carbonate	1.44E+01	<0.268	9.29E+01	<0.32	2.67E+02	<0.167	5.31E-01	<0.213	2.11E+02
	Fe, Mn Oxides	6.02E+00	<0.268	2.43E+01	4.36E+01	5.19E+01	<0.167	4.42E-01	<0.213	2.71E+02
	Organic Matter	1.45E+01	2.33E+02	<0.213	<0.32	5.15E+02	<0.167	7.08E-01	<0.213	2.45E+02
	Residual	4.65E+01	1.90E+02	2.51E+01	<0.32	6.14E+02	1.66E+01	2.60E+01	<0.213	1.59E+01
	Exchangeable	<0.059	<0.268	2.32E+01	<0.32	5.54E+02	<0.167	<0.002	<0.213	1.35E+02
	Carbonate	1.36E+01	<0.268	9.03E+01	<0.32	2.31E+02	<0.167	4.42E-01	<0.213	1.84E+02
	Fe, Mn Oxides	8.94E+00	<0.268	2.66E+01	3.05E+01	7.16E+01	<0.167	5.31E-01	<0.213	2.72E+02
	Organic Matter	<0.059	1.73E+02	<0.213	<0.32	5.79E+02	<0.167	3.54E-01	<0.213	2.93E+02
	Residual	4.67E+01	1.94E+02	2.23E+01	<0.32	6.08E+02	<0.167	2.52E+01	<0.213	1.78E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	2.73E+02	<0.167	<0.002	2.26E+01	3.18E+02
	Carbonate	1.86E+01	<0.268	6.92E+01	<0.32	4.70E+02	<0.167	6.19E-01	<0.213	2.96E+02
	Fe, Mn Oxides	<0.059	<0.268	<0.213	<0.32	6.93E+01	<0.167	4.42E-01	<0.213	4.26E+02
	Organic Matter	<0.059	1.73E+02	<0.213	<0.32	7.87E+02	<0.167	2.65E-01	<0.213	2.32E+02
	Residual	4.41E+01	2.04E+02	3.83E+01	<0.32	7.02E+02	1.61E+01	2.36E+01	<0.213	2.17E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	2.38E+02	<0.167	6.19E-01	2.52E+01	3.53E+02
	Carbonate	1.63E+01	<0.268	6.76E+01	<0.32	4.65E+02	<0.167	6.19E-01	<0.213	2.21E+02
	Fe, Mn Oxides	<0.059	1.36E+02	<0.213	<0.32	7.49E+02	<0.167	2.65E-01	<0.213	2.27E+02
	Organic Matter	<0.059	<0.268	1.88E+01	3.85E+01	6.81E+01	<0.167	4.42E-01	<0.213	3.85E+02
	Residual	3.90E+01	2.04E+02	2.93E+01	<0.32	5.95E+02	<0.167	2.27E+01	<0.213	2.31E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	4.19E+02	<0.167	<0.002	<0.213	1.27E+02
	Carbonate	1.81E+01	<0.268	5.48E+01	<0.32	4.62E+02	<0.167	8.85E-01	<0.213	1.34E+02
	Fe, Mn Oxides	<0.059	<0.268	<0.213	<0.32	5.12E+01	<0.167	4.42E-01	<0.213	4.30E+02
	Organic Matter	<0.059	1.77E+02	3.23E+01	<0.32	9.29E+02	<0.167	1.77E-01	<0.213	2.18E+02
	Residual	4.80E+01	2.60E+02	5.23E+01	<0.32	7.87E+02	<0.167	1.89E+01	<0.213	1.98E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	2.35E+02	<0.167	1.77E-01	2.55E+01	2.59E+02
	Carbonate	1.98E+01	<0.268	4.58E+01	<0.32	4.98E+02	<0.167	5.31E-01	<0.213	1.18E+02
	Fe, Mn Oxides	<0.059	<0.268	<0.213	<0.32	<0.568	<0.167	1.06E+00	<0.213	3.64E+02
	Organic Matter	<0.059	1.30E+02	4.18E+01	<0.32	8.69E+02	<0.167	1.77E-01	<0.213	2.26E+02
	Residual	5.47E+01	2.98E+02	5.26E+01	<0.32	1.11E+03	1.58E+01	2.25E+01	<0.213	3.58E+01
Core ID	Extraction	Ni	P	Pb	Rb	S	Sb	Sc	Se	Si
Core S3	Exchangeable	<0.059	<0.268	<0.213	<0.32	3.79E+02	1.72E+01	4.42E-01	2.45E+01	3.03E+02
	Exchangeable	<0.059	<0.268	<0.213	<0.32	8.26E+01	<0.167	<0.002	2.59E+01	2.75E+02
	Carbonate	2.04E+01	<0.268	5.72E+01	<0.32	1.65E+02	<0.167	1.77E-01	<0.213	1.50E+02
	Carbonate	1.03E+01	<0.268	2.34E+01	3.99E+01	1.18E+02	<0.167	1.77E-01	<0.213	1.41E+02
	Fe, Mn Oxides	1.36E+01	7.73E+01	2.80E+01	3.99E+01	7.53E+01	<0.167	5.31E-01	<0.213	3.73E+02
	Fe, Mn Oxides	<0.059	2.77E+01	<0.213	<0.32	6.87E+01	<0.167	1.77E-01	<0.213	2.78E+02
	Organic Matter	<0.059	<0.268	<0.213	<0.32	1.57E+03	<0.167	5.31E-01	<0.213	6.50E+02
	Organic Matter	<0.059	1.83E+02	<0.213	3.84E+01	2.20E+02	<0.167	<0.002	<0.213	3.85E+02
	Exchangeable	8.76E+00	<0.268	<0.213	<0.32	3.81E+02	<0.167	<0.002	<0.213	9.56E+01
	Carbonate	4.23E+01	<0.268	9.03E+01	<0.32	2.29E+02	<0.167	1.77E-01	<0.213	1.07E+02
	Fe, Mn Oxides	5.26E+01	1.48E+02	8.57E+01	<0.32	1.25E+02	1.99E+01	6.19E-01	<0.213	4.61E+02
	Organic Matter	8.32E+00	4.54E+01	<0.213	3.03E+01	1.05E+03	<0.167	1.77E-01	<0.213	2.65E+02
	Residual	4.82E+01	2.31E+02	2.61E+01	<0.32	6.49E+02	<0.167	1.73E+01	<0.213	2.97E+01
	Exchangeable	5.84E+00	<0.268	3.23E+01	<0.32	5.22E+02	<0.167	<0.002	<0.213	1.25E+02
	Carbonate	<0.059	<0.268	1.31E+02	<0.32	7.34E+02	<0.167	1.06E+00	<0.213	1.87E+02
	Fe, Mn Oxides	<0.059	<0.268	3.49E+01	3.69E+01	7.03E+01	<0.167	6.19E-01	<0.213	3.94E+02
	Organic Matter	2.19E+01	9.91E+01	2.46E+01	<0.32	1.13E+03	<0.167	1.77E-01	<0.213	2.90E+02

	Residual	5.49E+01	2.11E+02	2.85E+01	<0.32	4.93E+02	<0.167	1.81E+01	<0.213	3.45E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	2.63E+02	<0.167	1.77E-01	2.19E+01	2.11E+02
	Exchangeable	<0.059	<0.268	<0.213	<0.32	9.29E+01	<0.167	<0.002	2.22E+01	2.58E+02
	Carbonate	6.19E+00	<0.268	8.34E+01	3.24E+01	5.48E+02	<0.167	7.96E-01	<0.213	1.43E+02
	Carbonate	<0.059	<0.268	2.94E+01	3.84E+01	1.47E+02	<0.167	4.42E-01	<0.213	2.44E+02
	Fe, Mn Oxides	<0.059	<0.268	<0.213	<0.32	<0.568	<0.167	2.65E-01	<0.213	3.23E+02
	Fe, Mn Oxides	<0.059	<0.268	<0.213	3.31E+01	<0.568	<0.167	1.77E-01	<0.213	2.91E+02
	Organic Matter	1.59E+01	<0.268	3.37E+01	3.54E+01	1.28E+03	<0.167	5.31E-01	<0.213	5.55E+02
	Organic Matter	<0.059	1.75E+02	<0.213	4.19E+01	1.81E+02	<0.167	<0.002	<0.213	2.80E+02
	Residual	3.15E+01	1.50E+02	<0.213	<0.32	2.19E+02	<0.167	1.50E+01	<0.213	3.11E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	1.14E+03	3.37E+01	<0.002	<0.213	4.47E+01
	Carbonate	1.49E+01	<0.268	1.29E+02	<0.32	6.16E+02	<0.167	1.77E-01	<0.213	2.19E+02
	Fe, Mn Oxides	<0.059	6.55E+01	1.57E+02	<0.32	4.84E+02	3.23E+01	2.21E+00	<0.213	9.20E+02
	Organic Matter	<0.059	<0.268	1.50E+02	3.51E+01	6.61E+03	<0.167	1.24E+00	<0.213	1.29E+03
	Residual	3.58E+01	2.73E+02	4.57E+01	<0.32	6.44E+02	<0.167	1.24E+01	<0.213	1.50E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	1.01E+03	3.33E+01	<0.002	2.65E+01	6.12E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	2.51E+02	1.94E+01	<0.002	2.37E+01	6.26E+01
	Carbonate	4.75E+01	<0.268	1.43E+02	<0.32	8.83E+02	<0.167	4.42E-01	<0.213	2.07E+02
	Carbonate	2.54E+01	<0.268	6.49E+01	4.89E+01	2.12E+02	<0.167	7.08E-01	<0.213	2.07E+02
	Fe, Mn Oxides	<0.059	6.90E+01	7.30E+01	<0.32	1.32E+02	5.85E+01	2.04E+00	<0.213	9.03E+02
	Fe, Mn Oxides	<0.059	5.04E+01	2.14E+01	3.54E+01	6.66E+01	<0.167	8.85E-01	<0.213	5.03E+02
	Organic Matter	1.85E+02	<0.268	6.14E+01	<0.32	4.34E+03	<0.167	7.96E-01	<0.213	9.64E+02
	Organic Matter	<0.059	<0.268	3.19E+01	<0.32	8.64E+02	<0.167	2.65E-01	<0.213	4.96E+02
	Residual	1.18E+02	5.13E+02	8.09E+01	<0.32	8.50E+02	1.93E+01	1.88E+01	<0.213	3.41E+01
Core ID	Extraction	Ni	P	Pb	Rb	S	Sb	Se	Si	
Core S4	Exchangeable	<0.059	<0.268	2.26E+01	<0.32	3.42E+02	<0.167	7.96E-01	2.54E+01	2.08E+02
	Carbonate	1.81E+01	<0.268	1.91E+02	<0.32	4.59E+02	<0.167	1.24E+00	<0.213	2.61E+02
	Fe, Mn Oxides	<0.059	<0.268	2.72E+01	<0.32	5.56E+01	<0.167	3.54E-01	<0.213	3.50E+02
	Organic Matter	7.26E+00	2.32E+02	2.72E+01	<0.32	9.82E+02	<0.167	<0.002	<0.213	1.56E+02
	Residual	1.97E+02	4.62E+02	6.26E+01	<0.32	5.78E+02	3.36E+01	2.09E+01	<0.213	4.16E+01
	Exchangeable	<0.059	<0.268	2.04E+01	<0.32	3.49E+02	<0.167	<0.002	2.48E+01	1.28E+02
	Carbonate	2.05E+01	<0.268	2.06E+02	<0.32	5.26E+02	<0.167	9.73E-01	<0.213	3.06E+02
	Fe, Mn Oxides	<0.059	<0.268	2.27E+01	<0.32	<0.568	<0.167	4.42E-01	<0.213	3.80E+02
	Organic Matter	<0.059	1.88E+02	3.20E+01	<0.32	9.91E+02	<0.167	<0.002	<0.213	2.23E+02
	Residual	4.31E+01	6.09E+02	5.80E+01	<0.32	7.44E+02	<0.167	2.49E+01	<0.213	2.33E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	1.71E+02	<0.167	5.31E-01	2.65E+01	1.72E+02
	Carbonate	2.34E+01	<0.268	6.80E+01	<0.32	3.67E+02	<0.167	7.96E-01	<0.213	3.57E+02
	Fe, Mn Oxides	<0.059	<0.268	<0.213	<0.32	<0.568	<0.167	3.54E-01	<0.213	3.69E+02
	Organic Matter	9.56E+00	2.11E+02	2.80E+01	<0.32	7.95E+02	<0.167	2.65E-01	<0.213	2.97E+02
	Residual	5.21E+01	4.85E+02	6.44E+01	<0.32	8.01E+02	1.57E+01	1.73E+01	<0.213	6.21E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	1.71E+02	<0.167	6.19E-01	2.52E+01	2.89E+02
	Carbonate	2.01E+01	<0.268	6.15E+01	<0.32	3.53E+02	<0.167	1.15E+00	<0.213	2.61E+02
	Fe, Mn Oxides	<0.059	<0.268	<0.213	3.01E+01	<0.568	<0.167	3.54E-01	<0.213	3.72E+02
	Organic Matter	3.14E+01	2.70E+02	2.83E+01	<0.32	7.54E+02	<0.167	<0.002	<0.213	1.92E+02
	Residual	4.44E+01	5.13E+02	6.24E+01	<0.32	7.17E+02	1.59E+01	1.83E+01	<0.213	2.88E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	2.46E+02	<0.167	<0.002	2.46E+01	1.60E+02
	Carbonate	2.34E+01	<0.268	5.60E+01	<0.32	3.20E+02	<0.167	6.19E-01	<0.213	3.61E+02
	Fe, Mn Oxides	<0.059	<0.268	<0.213	<0.32	<0.568	<0.167	7.96E-01	<0.213	3.86E+02
	Organic Matter	2.52E+01	2.73E+02	<0.213	<0.32	6.80E+02	<0.167	1.77E-01	<0.213	2.82E+02
	Residual	1.48E+03	4.31E+02	5.73E+01	<0.32	9.11E+02	2.01E+02	1.51E+01	<0.213	1.98E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	2.11E+02	<0.167	<0.002	2.44E+01	9.56E+01
	Carbonate	1.98E+01	<0.268	4.91E+01	<0.32	3.07E+02	<0.167	6.19E-01	<0.213	2.29E+02
	Fe, Mn Oxides	<0.059	<0.268	<0.213	<0.32	6.12E+01	<0.167	1.06E+00	<0.213	4.20E+02
	Organic Matter	<0.059	2.37E+02	<0.213	<0.32	3.65E+02	<0.167	8.85E-01	<0.213	1.23E+02
	Residual	6.77E+01	4.49E+02	5.51E+01	<0.32	9.20E+02	1.68E+01	1.80E+01	<0.213	2.95E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	3.09E+02	2.04E+01	1.77E-01	2.31E+01	1.95E+02
	Carbonate	1.16E+01	<0.268	6.51E+01	<0.32	3.98E+02	1.53E+01	7.96E-01	<0.213	3.32E+02
	Fe, Mn Oxides	<0.059	<0.268	<0.213	4.85E+01	6.58E+01	<0.167	3.54E-01	<0.213	4.33E+02
	Organic Matter	1.83E+01	3.92E+02	<0.213	<0.32	5.27E+02	<0.167	<0.002	<0.213	1.04E+02
	Residual	9.64E+02	3.61E+02	4.57E+01	<0.32	8.08E+02	1.51E+02	1.76E+01	<0.213	7.74E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	3.11E+02	2.11E+01	<0.002	2.32E+01	1.95E+02
	Carbonate	1.52E+01	<0.268	5.77E+01	<0.32	3.88E+02	<0.167	7.08E-01	<0.213	2.36E+02
	Fe, Mn Oxides	<0.059	<0.268	<0.213	<0.32	<0.568	<0.167	9.73E-01	<0.213	4.21E+02
	Organic Matter	1.23E+01	1.74E+02	<0.213	3.43E+01	1.08E+03	<0.167	<0.002	<0.213	1.88E+02
	Residual	5.72E+01	6.43E+02	5.52E+01	<0.32	1.09E+03	2.30E+01	1.99E+01	<0.213	3.06E+01
Core ID	Extraction	Ni	P	Pb	Rb	S	Sb	Se	Si	
Core S5	Exchangeable	8.41E+00	<0.268	<0.213	<0.32	3.54E+02	<0.167	4.42E-01	2.12E+01	2.88E+02
	Carbonate	1.04E+01	<0.268	9.11E+01	<0.32	4.88E+02	<0.167	1.24E+00	<0.213	1.76E+02
	Fe, Mn Oxides	<0.059	<0.268	<0.213	<0.32	<0.568	<0.167	3.54E-01	<0.213	3.12E+02
	Organic Matter	<0.059	2.04E+02	3.01E+01	<0.32	1.30E+03	<0.167	1.77E-01	<0.213	4.01E+02
	Residual	4.27E+01	5.44E+02	3.86E+01	<0.32	7.57E+02	<0.167	1.96E+01	<0.213	2.81E+01
	Exchangeable	<0.059	<0.268	<0.213	<0.32	3.64E+02	<0.167	5.31E-01	2.44E+01	2.09E+02
	Carbonate	2.04E+01	<0.268	8.66E+01	<0.32	4.15E+02	<0.167	9.73E-01	<0.213	1.60E+02
	Fe, Mn Oxides	<0.059	<0.268	2.08E+01	3.39E+01	7.56E+01	<0.167	3.54E-01	<0.213	3.09E+02
	Organic Matter	1.31E+01	2.92E+02	2.53E+01	<0.32	1.51E+03	<0.167	<0.002	<0.213	2.53E+02
	Residual	2.83E+02	6.19E+02	4.88E+01	<0.32	8.73E+02	4.36E+01	2.02E+01	<0.213	7.50E+01
	Exchangeable	8.32E+00	<0.268	<0.213	<0.32	2.60E+02	<0.167	1.77E-01	<0.213	2.21E+02
	Carbonate	2.62E+01	<0.268	8.08E+01	<0.32	4.95E+02	<0.167	8.85E-01	<0.213	2.39E+02
	Fe, Mn Oxides	<0.059	<0.268	<0.213	<0.32	<0.568	<0.167	4.42E-01	<0.213	3.57E+02
	Organic Matter	3.05E+01	1.39E+02	5.10E+01	<0.32	1.94E+03	<0.167	1.77E-01	<0.213	2.71E+02
	Exchangeable	7.79E+00	<0.268	<0.213	<0.32	2.66E+02	<0.167	2.65E-01	1.96E+01	2.03E+02
	Carbonate	2.74E+01	<0.268	8.17E+01	<0.32	4.99E+02	<0.167	7.96E-01	<0.213	2.00E+02
	Fe, Mn Oxides	<0.059	<0.268	<0.213	<0.32	5.15E+01	<0.167	3.54E-01	<0.213	4.00E+02
	Organic Matter	3.78E+01	1.12E+02	4.57E+01	<0.32	2.02E+03	<0.167	7.96E-01	<0.213	1.78E+02
	Residual	9.82E+02	6.09E+02	7.92E+01	<0.32	1.10E+03	1.39E+02	1.79E+01	<0.213	4.90E+01

		Exchangeable	<0.059	<0.268	2.49E+01	<0.32	2.37E+02	<0.167	1.77E-01	2.24E+01	1.66E+02
		Carbonate	2.78E+01	<0.268	6.15E+01	<0.32	4.26E+02	<0.167	7.08E-01	<0.213	1.98E+02
		Fe, Mn Oxides	<0.059	<0.268	<0.213	<0.32	<0.568	<0.167	2.65E-01	<0.213	3.03E+02
		Organic Matter	1.87E+01	1.66E+02	2.85E+01	3.61E+01	1.24E+03	<0.167	1.77E-01	<0.213	2.28E+02
		Residual	4.30E+01	4.39E+02	4.50E+01	<0.32	8.29E+02	<0.167	1.50E+01	<0.213	2.68E+01
		Exchangeable	<0.059	<0.268	2.45E+01	<0.32	2.24E+02	<0.167	1.77E-01	2.40E+01	2.18E+02
		Carbonate	1.12E+01	<0.268	6.61E+01	<0.32	4.50E+02	<0.167	7.08E-01	<0.213	2.94E+02
		Fe, Mn Oxides	<0.059	<0.268	<0.213	<0.32	<0.568	<0.167	2.65E-01	<0.213	3.03E+02
		Organic Matter	1.79E+01	1.49E+02	2.73E+01	<0.32	1.48E+03	<0.167	<0.002	<0.213	2.19E+02
		Residual	7.85E+01	5.01E+02	6.18E+01	<0.32	9.91E+02	<0.167	1.44E+01	<0.213	5.72E+01
Total Digestions											
Core ID	Extraction	Ni	P	Pb	Rb	S	Sb	Sc	Se	Si	
Core S1		2.98E+02	6.11E+02	2.85E+02	<0.32	4.07E+03	2.68E+01	2.89E+01	<0.213	1.41E+02	
		5.59E+02	1.19E+03	5.51E+02	<0.32	6.37E+03	4.54E+01	5.80E+01	<0.213	1.17E+02	
		1.65E+02	5.63E+02	2.26E+02	<0.32	7.09E+03	1.73E+01	2.84E+01	<0.213	8.63E+01	
		1.36E+02	2.99E+02	1.84E+02	<0.32	5.71E+03	<0.167	2.37E+01	<0.213	2.50E+01	
		2.90E+02	1.19E+03	5.22E+02	<0.32	9.31E+03	<0.167	6.80E+01	<0.213	6.25E+01	
		2.76E+02	1.03E+03	4.74E+02	<0.32	8.90E+03	<0.167	6.23E+01	<0.213	2.21E+02	
Core S2		2.96E+02	1.01E+03	3.04E+02	<0.32	4.57E+03	<0.167	6.24E+01	<0.213	8.37E+01	
		2.66E+02	1.21E+03	3.65E+02	<0.32	5.35E+03	<0.167	7.99E+01	<0.213	1.62E+02	
		2.92E+02	6.35E+02	3.84E+02	<0.32	7.06E+03	<0.167	7.43E+01	<0.213	8.49E+01	
		2.89E+02	9.03E+02	3.83E+02	<0.32	7.28E+03	4.29E+01	7.36E+01	<0.213	6.90E+02	
		3.16E+02	5.21E+02	4.35E+02	<0.32	7.11E+03	4.30E+01	6.22E+01	<0.213	2.31E+02	
		3.32E+02	6.21E+02	4.07E+02	<0.32	6.94E+03	<0.167	6.00E+01	<0.213	1.27E+02	
Core S3		4.98E+02	2.62E+02	2.39E+01	<0.32	4.75E+02	7.36E+01	1.88E+01	<0.213	5.25E+01	
		1.92E+02	2.99E+02	1.66E+02	<0.32	2.42E+03	<0.167	2.17E+01	<0.213	6.93E+01	
		1.83E+02	2.86E+02	1.69E+02	<0.32	2.41E+03	<0.167	2.11E+01	<0.213	4.52E+01	
		1.63E+02	5.09E+02	2.41E+02	<0.32	3.62E+03	<0.167	2.68E+01	<0.213	5.86E+01	
		1.38E+02	4.45E+02	2.01E+02	<0.32	3.11E+03	1.87E+01	2.17E+01	<0.213	6.23E+01	
		2.23E+02	5.19E+02	4.87E+02	<0.32	1.11E+04	3.11E+01	2.53E+01	<0.213	7.84E+01	
Core S4		2.95E+02	7.75E+02	7.21E+02	<0.32	1.60E+04	4.48E+01	3.73E+01	<0.213	5.03E+02	
		1.91E+02	1.10E+03	5.61E+02	<0.32	6.23E+03	3.36E+01	5.74E+01	<0.213	6.99E+01	
		1.64E+02	9.11E+02	4.88E+02	<0.32	5.40E+03	3.29E+01	4.50E+01	<0.213	2.19E+02	
		3.18E+02	1.20E+03	4.97E+02	<0.32	6.97E+03	4.24E+01	4.77E+01	<0.213	1.25E+02	
		3.66E+02	1.36E+03	5.27E+02	<0.32	7.88E+03	5.01E+01	6.29E+01	<0.213	1.31E+02	
		2.98E+02	1.17E+03	2.78E+02	<0.32	6.78E+03	<0.167	5.07E+01	<0.213	8.82E+01	
Core S5		3.18E+02	1.36E+03	3.41E+02	<0.32	6.88E+03	4.29E+01	5.12E+01	<0.213	1.36E+02	
		3.67E+02	1.42E+03	3.37E+02	<0.32	7.80E+03	7.04E+01	5.32E+01	<0.213	7.63E+01	
		3.70E+02	1.28E+03	3.06E+02	<0.32	7.89E+03	5.90E+01	5.67E+01	<0.213	1.27E+02	
		2.48E+02	9.67E+02	3.81E+02	<0.32	7.49E+03	3.54E+01	4.93E+01	<0.213	7.34E+01	
		2.94E+02	1.17E+03	4.40E+02	<0.32	8.90E+03	4.44E+01	5.94E+01	<0.213	6.86E+01	
		3.08E+02	1.01E+03	4.76E+02	<0.32	9.89E+03	4.01E+01	4.07E+01	<0.213	1.01E+02	
		3.34E+02	1.14E+03	5.07E+02	<0.32	1.09E+04	5.07E+01	5.79E+01	<0.213	5.31E+01	
		2.81E+02	1.05E+03	3.54E+02	<0.32	8.00E+03	6.33E+01	4.34E+01	<0.213	6.89E+01	
		3.40E+02	1.11E+03	4.18E+02	<0.32	8.33E+03	3.87E+01	4.91E+01	<0.213	4.31E+01	

Core ID	Extraction	Sr	Th	Ti	U	Zn	Zr
Core S1	Exchangeable	5.22E+00	<33.2	7.96E-01	<0.868	<0.006	6.19E-01
	Carbonate	1.73E+01	<33.2	1.77E-01	<0.868	1.55E+01	<0.004
	Fe, Mn Oxides	9.73E-01	<33.2	1.49E+01	<0.868	5.37E+01	2.57E+00
	Organic Matter	1.59E+00	<33.2	3.10E+00	<0.868	1.10E+02	7.08E-01
	Residual	1.59E+01	<33.2	1.60E+03	2.61E+02	8.82E+01	3.83E-01
	Exchangeable	5.84E+00	<33.2	9.73E-01	<0.868	<0.006	7.08E-01
	Carbonate	1.67E+01	<33.2	6.19E-01	<0.868	1.47E+01	1.95E-00
	Fe, Mn Oxides	1.15E+00	<33.2	1.45E+01	<0.868	5.03E+01	2.57E-00
	Organic Matter	7.96E-01	<33.2	2.65E-01	<0.868	9.56E+01	<0.004
	Residual	2.27E+01	<33.2	1.42E+03	1.83E+02	7.89E+01	2.03E-01
	Exchangeable	2.57E+00	<33.2	1.77E-01	<0.868	<0.006	<0.004
	Exchangeable	6.19E-01	<33.2	3.54E-01	<0.868	<0.006	5.31E-01
	Carbonate	2.65E+00	<33.2	5.31E-01	<0.868	2.93E+01	<0.004
	Carbonate	9.73E-01	<33.2	2.12E+00	<0.868	1.61E+01	<0.004
	Fe, Mn Oxides	3.54E-01	<33.2	4.34E+00	<0.868	1.63E+01	6.19E-01
	Fe, Mn Oxides	3.54E-01	<33.2	1.50E+00	<0.868	4.87E+00	<0.004
	Organic Matter	5.31E-01	<33.2	1.00E+01	<0.868	1.40E+02	<0.004
	Organic Matter	8.85E-01	<33.2	6.46E+00	<0.868	3.03E+01	7.08E-01
	Residual	1.65E+01	<33.2	1.63E+03	8.80E+01	4.47E+01	2.38E+01
	Exchangeable	7.96E-01	<33.2	2.65E-01	<0.868	<0.006	<0.004
	Carbonate	4.51E+00	<33.2	<0.002	<0.868	1.48E+01	<0.004
	Fe, Mn Oxides	7.08E-01	<33.2	3.89E+00	<0.868	2.59E+01	4.42E-01
	Organic Matter	7.96E-01	<33.2	7.96E-01	<0.868	7.56E+01	<0.004
	Residual	1.70E+01	<33.2	1.81E+03	9.82E+01	7.57E+01	2.37E+01
	Exchangeable	1.50E+00	<33.2	1.95E+00	<0.868	<0.006	<0.004
	Carbonate	6.02E+00	<33.2	2.12E+00	<0.868	1.44E+01	<0.004
	Fe, Mn Oxides	9.73E-01	9.64E+03	3.89E+00	<0.868	1.48E+01	6.19E-01
	Organic Matter	1.15E+00	<33.2	2.74E+00	<0.868	6.85E+01	<0.004
	Residual	1.88E+01	<33.2	1.51E+03	1.19E+02	1.02E+02	2.54E+01
	Exchangeable	1.33E+00	<33.2	2.39E+00	<0.868	<0.006	<0.004
	Carbonate	6.55E+00	<33.2	1.33E+00	<0.868	1.89E+01	<0.004
	Fe, Mn Oxides	7.96E-01	<33.2	3.72E+00	<0.868	1.89E+01	8.85E-01
	Organic Matter	8.85E-01	<33.2	1.06E+00	<0.868	7.18E+01	<0.004
	Residual	1.92E+01	<33.2	1.99E+03	1.19E+02	9.29E+01	2.40E+01
Core S2	Exchangeable	3.19E+00	<33.2	2.21E+00	<0.868	1.30E+01	5.31E-01
	Carbonate	2.30E+00	<33.2	1.59E+00	<0.868	2.32E+01	6.19E-01
	Fe, Mn Oxides	5.31E-01	<33.2	3.10E+00	<0.868	3.70E+01	<0.004
	Organic Matter	1.33E+00	<33.2	2.04E+00	<0.868	2.52E+01	6.19E-01
	Residual	2.05E+01	<33.2	2.27E+03	1.50E+02	6.57E+01	2.43E+01
	Exchangeable	3.10E+00	<33.2	2.04E+00	<0.868	1.10E+01	2.04E+00
	Carbonate	1.95E+00	<33.2	1.86E+00	<0.868	2.29E+01	<0.004
	Fe, Mn Oxides	5.31E-01	<33.2	3.80E+00	<0.868	4.29E+01	6.19E-01
	Organic Matter	9.73E-01	<33.2	1.86E+00	<0.868	2.52E+01	<0.004
	Residual*	2.01E+01	<33.2	1.66E+03	1.51E+02	6.35E+01	2.34E+01
	Exchangeable	1.24E+00	<33.2	4.78E+00	<0.868	<0.006	<0.004
	Carbonate	6.02E+00	<33.2	2.74E+00	<0.868	2.16E+01	<0.004
	Fe, Mn Oxides	7.96E-01	<33.2	5.93E+00	<0.868	2.61E+01	<0.004
	Organic Matter	1.06E+00	<33.2	1.50E+00	<0.868	3.49E+01	<0.004
	Residual	1.91E+01	<33.2	2.00E+03	1.05E+02	6.92E+01	2.33E+01
	Exchangeable	1.24E+00	<33.2	4.60E+00	<0.868	<0.006	6.19E-01
	Carbonate	5.93E+00	<33.2	2.74E+00	<0.868	1.95E+01	<0.004
	Fe, Mn Oxides	8.85E-01	<33.2	1.42E+00	<0.868	3.50E+01	<0.004
	Organic Matter	7.96E-01	<33.2	4.87E+00	<0.868	2.68E+01	7.96E-01
	Residual	1.77E+01	<33.2	2.20E+03	1.11E+02	5.92E+01	2.09E+01
	Exchangeable	3.19E+00	<33.2	1.86E+00	<0.868	3.27E+00	<0.004
	Carbonate	5.31E+00	<33.2	1.06E+00	<0.868	9.91E+00	8.85E-01
	Fe, Mn Oxides	7.08E-01	<33.2	4.69E+00	<0.868	1.18E+01	5.31E-01
	Organic Matter	1.15E+00	<33.2	1.15E+00	<0.868	4.59E+01	<0.004
	Residual	2.15E+01	<33.2	2.11E+03	1.27E+02	9.11E+01	2.51E+01
	Exchangeable	1.42E+00	<33.2	4.07E+00	<0.868	<0.006	6.19E-01
	Carbonate	5.57E+00	<33.2	3.54E-01	<0.868	3.98E+00	<0.004
	Fe, Mn Oxides	7.08E-01	<33.2	5.22E+00	<0.868	1.19E+01	9.73E-01
	Organic Matter	8.85E-01	<33.2	1.59E+00	<0.868	4.90E+01	<0.004
	Residual	2.52E+01	<33.2	1.62E+03	1.12E+02	1.27E+02	2.87E+01
Core S3	Exchangeable	3.10E+00	<33.2	3.63E+00	<0.868	<0.006	7.08E-01
	Exchangeable	8.85E-01	<33.2	2.65E+00	<0.868	<0.006	<0.004
	Carbonate	1.95E+00	<33.2	1.59E+00	<0.868	3.54E+01	<0.004
	Carbonate	1.06E+00	<33.2	2.92E+00	<0.868	2.54E+01	<0.004
	Fe, Mn Oxides	5.31E-01	<33.2	5.31E+00	<0.868	4.03E+01	5.31E-01
	Fe, Mn Oxides	4.42E-01	<33.2	4.96E+00	<0.868	1.43E+01	6.19E-01
	Organic Matter	7.96E-01	<33.2	2.71E+01	<0.868	6.08E+01	<0.004
	Organic Matter	8.85E-01	<33.2	6.37E+00	<0.868	1.50E+01	8.85E-01
	Exchangeable	4.25E+00	<33.2	4.42E-01	<0.868	1.08E+01	<0.004
	Carbonate	2.65E+00	<33.2	6.19E-01	<0.868	4.90E+01	6.19E-01
	Fe, Mn Oxides	8.85E-01	<33.2	6.37E+00	<0.868	9.03E+01	8.85E-01
	Organic Matter	1.24E+00	<33.2	1.33E+00	<0.868	3.40E+01	<0.004
	Residual	1.71E+01	<33.2	9.73E+02	9.47E+01	6.57E+01	2.72E+01
	Exchangeable	3.89E+00	<33.2	1.15E+00	<0.868	1.78E+01	<0.004
	Carbonate	1.02E+01	<33.2	3.54E-01	<0.868	1.75E+01	<0.004
	Fe, Mn Oxides	7.08E-01	<33.2	3.89E+00	<0.868	2.56E+01	8.85E-01
	Organic Matter	1.06E+00	<33.2	1.50E+00	<0.868	4.72E+01	<0.004

	Residual	6.11E+00	<33.2	1.34E+03	1.17E+02	7.03E+01	2.56E+01
	Exchangeable	1.42E+00	<33.2	2.21E+00	<0.868	<0.006	<0.004
	Organic Matter	7.96E-01	<33.2	2.57E+00	<0.868	<0.006	<0.004
	Carbonate	8.14E+00	<33.2	1.24E+00	<0.868	1.77E+01	<0.004
	Carbonate	1.24E+00	<33.2	4.16E+00	<0.868	1.43E+01	<0.004
	Fe, Mn Oxides	2.65E-01	<33.2	3.80E+00	<0.868	1.17E+01	7.96E-01
	Fe, Mn Oxides	3.54E-01	<33.2	3.10E+00	<0.868	4.42E+00	<0.004
	Organic Matter	4.42E-01	<33.2	1.22E+01	<0.868	6.01E+01	<0.004
	Organic Matter	4.42E-01	<33.2	4.60E+00	<0.868	1.67E+01	<0.004
	Residual	4.78E+00	<33.2	9.47E+02	8.57E+01	3.58E+01	2.64E+01
	Exchangeable	3.05E+01	<33.2	6.19E-01	<0.868	4.87E+00	<0.004
	Carbonate	1.45E+01	<33.2	<0.002	<0.868	4.02E+01	<0.004
	Fe, Mn Oxides	4.96E+00	<33.2	8.58E+00	<0.868	5.32E+01	1.95E+00
	Organic Matter	1.95E+00	<33.2	2.21E+00	<0.868	1.65E+02	7.08E-01
	Residual	1.62E+01	<33.2	5.48E+02	8.70E+01	5.27E+01	3.45E+00
	Exchangeable	1.08E+01	<33.2	1.06E+00	<0.868	<0.006	4.42E-01
	Exchangeable	3.01E+00	<33.2	2.65E-01	<0.868	<0.006	4.42E-01
	Carbonate	1.62E+01	<33.2	6.19E-01	<0.868	4.10E+01	9.73E-01
	Carbonate	2.30E+00	<33.2	2.74E+00	<0.868	3.69E+01	6.19E-01
	Fe, Mn Oxides	8.85E-01	<33.2	1.37E+01	<0.868	6.37E+01	3.63E+00
	Fe, Mn Oxides	6.19E-01	<33.2	6.19E+00	<0.868	1.44E+01	1.33E+00
	Organic Matter	7.08E-01	<33.2	1.30E+01	<0.868	2.74E+02	7.08E-01
	Organic Matter	7.08E-01	<33.2	4.07E+00	<0.868	8.52E+01	<0.004
	Residual	2.01E+01	<33.2	5.87E+02	1.43E+02	6.55E+01	3.27E+01
Core ID	Extraction	Sr	Th	Ti	U	Zn	Zr
Core S4	Exchangeable	1.50E+00	<33.2	2.39E+00	<0.868	<0.006	7.96E-01
	Carbonate	6.64E+00	<33.2	2.30E+00	<0.868	5.43E+01	7.96E-01
	Fe, Mn Oxides	7.08E-01	<33.2	3.89E+00	<0.868	2.33E+01	5.31E-01
	Organic Matter	8.85E-01	<33.2	3.27E+00	<0.868	9.29E+01	<0.004
	Residual	1.10E+01	<33.2	1.40E+03	1.26E+02	7.63E+01	1.83E+01
	Exchangeable	1.42E+00	<33.2	2.74E+00	<0.868	<0.006	4.42E-01
	Carbonate	7.79E+00	<33.2	2.57E+00	<0.868	5.03E+01	<0.004
	Fe, Mn Oxides	7.96E-01	<33.2	4.25E+00	<0.868	2.49E+01	<0.004
	Organic Matter	8.85E-01	<33.2	4.78E+00	<0.868	9.20E+01	<0.004
	Residual	1.35E+01	<33.2	1.66E+03	1.30E+02	1.06E+02	2.25E+01
	Exchangeable	1.24E+00	<33.2	2.12E+00	<0.868	<0.006	5.31E-01
	Carbonate	5.31E+00	<33.2	3.72E+00	<0.868	2.06E+01	<0.004
	Fe, Mn Oxides	7.96E-01	<33.2	5.22E+00	<0.868	1.04E+01	7.08E-01
	Organic Matter	7.96E-01	<33.2	6.19E+00	<0.868	5.02E+01	<0.004
	Residual	1.10E+01	<33.2	1.25E+03	1.04E+02	7.52E+01	2.19E+01
	Exchangeable	1.24E+00	<33.2	3.63E+00	<0.868	<0.006	4.42E-01
	Carbonate	5.04E+00	<33.2	3.72E+00	<0.868	2.19E+01	5.31E-01
	Fe, Mn Oxides	7.96E-01	<33.2	5.40E+00	<0.868	9.64E+00	5.31E-01
	Organic Matter	7.08E-01	<33.2	3.19E+00	<0.868	5.01E+01	<0.004
	Residual	1.30E+01	<33.2	1.63E+03	1.05E+02	5.95E+01	2.35E+01
	Exchangeable	1.15E+00	<33.2	2.30E+00	<0.868	<0.006	<0.004
	Carbonate	4.87E+00	<33.2	4.69E+00	<0.868	1.56E+01	5.31E-01
	Fe, Mn Oxides	7.08E-01	<33.2	6.81E+00	<0.868	6.55E+00	1.06E+00
	Organic Matter	8.85E-01	<33.2	6.90E+00	<0.868	6.88E+01	4.42E-01
	Residual	1.04E+01	<33.2	1.14E+03	1.26E+02	5.49E+01	2.05E+01
	Exchangeable	9.73E-01	<33.2	1.06E+00	<0.868	<0.006	4.42E-01
	Carbonate	4.42E+00	<33.2	3.01E+00	<0.868	1.43E+01	6.19E-01
	Fe, Mn Oxides	7.08E-01	<33.2	7.17E+00	<0.868	7.26E+00	1.06E+00
	Organic Matter	6.19E-01	<33.2	4.60E+00	<0.868	2.18E+01	4.42E-01
	Residual	1.14E+01	<33.2	1.43E+03	1.21E+02	5.04E+01	2.42E+01
	Exchangeable	1.15E+00	<33.2	2.39E+00	<0.868	<0.006	5.31E-01
	Carbonate	6.28E+00	<33.2	3.72E+00	<0.868	2.13E+01	<0.004
	Fe, Mn Oxides	7.96E-01	<33.2	6.72E+00	<0.868	8.94E+00	4.42E-01
	Organic Matter	7.96E-01	<33.2	2.39E+00	<0.868	4.52E+01	<0.004
	Residual	1.25E+01	<33.2	1.27E+03	1.11E+02	4.23E+01	3.06E+01
	Exchangeable	1.24E+00	<33.2	2.39E+00	<0.868	<0.006	<0.004
	Carbonate	5.13E+00	<33.2	2.12E+00	<0.868	1.97E+01	<0.004
	Fe, Mn Oxides	7.08E-01	<33.2	6.28E+00	<0.868	9.38E+00	1.06E+00
	Organic Matter	7.96E-01	<33.2	3.54E+00	<0.868	3.41E+01	<0.004
	Residual	1.42E+01	<33.2	1.59E+03	1.29E+02	6.92E+01	2.57E+01
Core ID	Extraction	Sr	Th	Ti	U	Zn	Zr
Core S5	Exchangeable	1.33E+00	<33.2	2.48E+00	<0.868	<0.006	6.19E-01
	Carbonate	5.49E+00	<33.2	1.15E+00	<0.868	2.12E+01	5.31E-01
	Fe, Mn Oxides	7.96E-01	<33.2	4.07E+00	<0.868	1.34E+01	<0.004
	Organic Matter	1.15E+00	<33.2	3.54E+00	<0.868	6.10E+01	<0.004
	Residual	1.83E+01	<33.2	1.95E+03	1.38E+02	6.65E+01	2.56E+01
	Exchangeable	1.24E+00	<33.2	2.21E+00	<0.868	<0.006	7.08E-01
	Carbonate	5.13E+00	<33.2	1.59E+00	<0.868	2.06E+01	7.08E-01
	Fe, Mn Oxides	7.96E-01	<33.2	3.63E+00	<0.868	1.64E+01	<0.004
	Organic Matter	1.24E+00	<33.2	5.75E+00	<0.868	7.35E+01	4.42E-01
	Residual	1.86E+01	<33.2	1.96E+03	1.62E+02	6.34E+01	2.71E+01
	Exchangeable	1.06E+00	<33.2	2.92E+00	<0.868	<0.006	<0.004
	Carbonate	6.37E+00	<33.2	2.48E+00	<0.868	1.42E+01	<0.004
	Fe, Mn Oxides	7.96E-01	<33.2	4.96E+00	<0.868	9.11E+00	5.31E-01
	Organic Matter	8.85E-01	<33.2	4.60E+00	<0.868	1.02E+02	<0.004
	Exchangeable	1.24E+00	<33.2	2.48E+00	<0.868	<0.006	5.31E-01
	Carbonate	6.28E+00	<33.2	1.95E+00	<0.868	1.38E+01	<0.004
	Fe, Mn Oxides	6.19E-01	<33.2	5.31E+00	<0.868	9.82E+00	5.31E-01
	Organic Matter	7.08E-01	<33.2	2.21E+00	<0.868	1.06E+02	4.42E-01
	Residual	1.49E+01	<33.2	1.50E+03	1.26E+02	8.80E+01	1.96E+01

	Exchangeable	1.15E+00	<33.2	2.57E+00	<0.868	<0.006	5.31E-01
	Carbonate	5.31E+00	<33.2	2.30E+00	<0.868	2.38E+01	4.42E-01
	Fe, Mn Oxides	5.31E-01	<33.2	4.07E+00	<0.868	1.27E+01	<0.004
	Organic Matter	7.96E-01	<33.2	3.36E+00	<0.868	7.64E+01	<0.004
	Residual	1.40E+01	<33.2	1.29E+03	8.83E+01	6.98E+01	2.04E+01
	Exchangeable	1.15E+00	<33.2	2.30E+00	<0.868	<0.006	<0.004
	Carbonate	5.66E+00	<33.2	3.19E+00	<0.868	2.73E+01	<0.004
	Fe, Mn Oxides	5.31E-01	<33.2	3.89E+00	<0.868	1.39E+01	<0.004
	Organic Matter	7.96E-01	<33.2	3.27E+00	<0.868	7.97E+01	<0.004
	Residual	1.16E+01	<33.2	1.18E+03	1.33E+02	8.55E+01	1.90E+01
Total Digestions							
Core ID	Extraction	Sr	Th	Ti	U	Zn	Zr
Core S1		2.87E+01	<33.2	1.31E+03	2.35E+02	2.82E+02	2.75E+01
		5.23E+01	<33.2	2.42E+03	4.28E+02	4.37E+02	2.06E+01
		2.97E+01	<33.2	1.45E+03	1.76E+02	2.80E+02	3.06E+01
		2.47E+01	<33.2	9.19E+02	1.63E+02	2.43E+02	2.57E+01
		6.96E+01	<33.2	1.54E+03	4.46E+02	6.53E+02	7.08E+01
		6.67E+01	<33.2	1.62E+03	2.78E+02	5.82E+02	7.22E+01
Core S2		5.91E+01	<33.2	9.07E+02	3.09E+02	3.57E+02	6.28E+01
		7.31E+01	<33.2	8.40E+02	4.93E+02	4.36E+02	7.78E+01
		7.46E+01	<33.2	4.19E+03	3.81E+02	4.70E+02	7.24E+01
		7.08E+01	<33.2	5.28E+03	4.03E+02	4.49E+02	6.62E+01
		7.97E+01	<33.2	1.57E+03	3.85E+02	4.62E+02	8.47E+01
		7.80E+01	<33.2	3.18E+03	3.56E+02	4.05E+02	7.78E+01
Core S3		1.60E+01	<33.2	1.37E+03	9.97E+01	4.23E+01	2.80E+01
		2.54E+01	<33.2	7.91E+02	1.34E+02	2.36E+02	3.14E+01
		2.41E+01	<33.2	6.46E+02	1.28E+02	2.30E+02	3.07E+01
		2.31E+01	<33.2	1.39E+03	1.93E+02	2.05E+02	4.08E+01
		1.82E+01	<33.2	1.25E+03	1.31E+02	1.71E+02	3.05E+01
		5.87E+01	<33.2	1.23E+03	1.27E+02	3.82E+02	3.13E+01
Core S4		8.83E+01	<33.2	1.59E+03	2.65E+02	5.61E+02	4.78E+01
		4.61E+01	<33.2	3.45E+03	3.92E+02	6.14E+02	5.30E+01
		3.74E+01	<33.2	2.69E+03	2.60E+02	5.19E+02	4.04E+01
		4.62E+01	<33.2	3.35E+03	3.75E+02	4.17E+02	5.80E+01
		6.19E+01	<33.2	4.22E+03	3.91E+02	5.40E+02	8.08E+01
		4.73E+01	<33.2	3.64E+03	3.31E+02	3.71E+02	6.73E+01
Core S5		4.91E+01	<33.2	3.94E+03	3.56E+02	5.74E+02	7.02E+01
		4.98E+01	<33.2	3.81E+03	3.14E+02	4.04E+02	7.25E+01
		5.02E+01	<33.2	3.87E+03	3.63E+02	5.02E+02	7.57E+01
		5.80E+01	<33.2	4.06E+03	2.68E+02	4.02E+02	6.07E+01
		6.92E+01	<33.2	4.67E+03	4.13E+02	4.78E+02	6.78E+01
		4.47E+01	<33.2	3.14E+03	2.87E+02	5.42E+02	4.39E+01
		6.37E+01	<33.2	4.55E+03	4.20E+02	5.92E+02	6.57E+01
		5.04E+01	<33.2	3.85E+03	2.77E+02	4.73E+02	5.19E+01
		5.66E+01	<33.2	3.82E+03	2.87E+02	5.55E+02	6.08E+01

[illegible]

Table B5: Acid Producing Bacteria, Sulfate Reducing Bacteria, and Iron Reducing Bacteria Populations Measured from September 2004 Cores

Location	Depth (cm)	WC	APB	IRB	SRB	DW (g)	APB	IRB	SRB
Core S1	25	0.295	1.10E+05	1.70E+04	2.20E+02	0.705	1.56E+05	2.41E+04	3.12E+02
	50	0.393	7.00E+06	2.20E+04	7.90E+05	0.607	1.15E+07	3.62E+04	1.30E+06
	75	0.219	3.30E+04	1.10E+03	1.30E+05	0.781	4.23E+04	1.41E+03	1.66E+05
Core S2	25	0.22	4.90E+04	1.40E+04	2.20E+03	0.78	6.28E+04	1.79E+04	2.82E+03
	50	0.201	4.90E+02	1.70E+03	4.90E+03	0.799	6.13E+02	2.13E+03	6.13E+03
	75	0.222	4.90E+03	1.40E+02	7.90E+02	0.778	6.30E+03	1.80E+02	1.02E+03
Core S3	25	0.159	3.30E+04	2.30E+04	2.20E+05	0.841	3.92E+04	2.73E+04	2.62E+05
	50	0.191	1.30E+04	4.60E+02	3.30E+04	0.809	1.61E+04	5.69E+02	4.08E+04
	75	0.652	1.30E+05	1.10E+04	4.90E+04	0.348	3.74E+05	3.16E+04	1.41E+05
Core S4	25	0.146	7.90E+03	7.90E+02	2.20E+02	0.854	9.25E+03	9.25E+02	2.58E+02
	50	0.100	2.30E+04	7.90E+02	1.10E+02	0.900	2.55E+04	8.77E+02	1.22E+02
	75	0.115	4.90E+04	1.30E+02	2.80E+04	0.885	5.54E+04	1.47E+02	3.16E+04
	100	0.171	7.90E+04	3.30E+02	2.30E+04	0.829	9.53E+04	3.98E+02	2.77E+04
Core S5	25	0.239	1.30E+05	1.80E+03	3.50E+04	0.761	1.71E+05	2.37E+03	4.60E+04
	50	0.225	2.30E+03	3.30E+02	2.20E+03	0.775	2.97E+03	4.26E+02	2.84E+03
	75	0.198	7.90E+02	1.30E+02	2.20E+03	0.802	9.85E+02	1.62E+02	2.74E+03

Notes:

WC - Water Content

APB - Acid producing bacteria

SRB - Sulfate reducing bacteria

IRB - Iron reducing bacteria

DW - Dry weight

Table B6: Acid Volatile Sulfide (AVS) and Chromium Reducible Sulfide (CRS)Sediment Extractions for September 2004 Cores

Location	Depth (cm)	AVS (ppm)	CRS (ppm)
Core S1	25	2.78	56
	50	2.74	70.3
	75	2.76	46.5
Core S2	25	2.73	55.4
	50	2.76	46.2
	75	2.76	46.3
Core S3	25	2.76	28.8
	50	2.76	46.5
	75	2.76	72.2
Core S4	25	2.74	56.3
	50	2.77	46.3
	75	2.74	28.3
	100	2.94	55.8
Core S5	25	2.82	28.7
	50	2.74	29.3
	75	3.14	56.7

Table B7: Porewater Dissolved Metals Concentrations Collected from June and September 2004 Cores and all Onsite Monitoring Wells Installed in June 2004 and Sampled in September 2004.

Core ID	Depth (cm)	Al ppm	Ag ppm	As ppm	Au ppm	B ppm	Ba ppm	Be ppm	Bi ppm	Ca ppm	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe ppm	Hg ppm
Core S1	1.50E+01	5.53E+00	< 0.0135	8.40E+00	< 0.0186	1.22E-01	9.20E-02	< 0.0001	< 0.4216	4.92E+01	< 0.0056	3.75E-01	2.00E-02	1.61E-01	4.83E+00	< 0.0087
	4.50E+01	1.36E+01	3.60E-02	5.03E+00	< 0.0186	1.56E-01	8.46E+02	1.00E-03	< 0.4216	6.10E+01	< 0.0056	< 0.0071	7.90E-02	3.25E-01	1.79E+01	< 0.0087
	4.85E+01	1.78E-01	< 0.0135	6.49E-01	< 0.0186	7.30E-02	1.85E-01	< 0.0001	< 0.4216	3.41E+02	< 0.0056	3.64E-01	< 0.0156	< 0.0118	6.40E-02	< 0.0087
	7.15E+01	7.98E-01	< 0.0135	5.20E+00	< 0.0186	5.60E-02	2.70E-02	< 0.0001	< 0.4216	4.52E+01	< 0.0056	2.50E-02	< 0.0156	1.50E-02	9.80E-01	< 0.0087
	8.50E+01	4.61E+00	3.10E-02	8.95E+00	< 0.0186	8.10E-02	2.18E+00	< 0.0001	< 0.4216	7.40E+01	< 0.0056	3.94E-01	2.30E-02	1.73E-01	6.88E+00	< 0.0087
	1.30E+02	2.14E+01	2.90E-02	2.94E+00	< 0.0186	1.61E-01	9.37E-01	1.00E-03	< 0.4216	4.99E+01	< 0.0056	3.13E-01	8.90E-02	2.26E-01	2.09E+01	< 0.0087
Core S2	1.50E+01	1.15E+01	< 0.0135	5.80E-01	< 0.0186	9.50E-02	1.26E-01	< 0.0001	< 0.4216	5.04E+01	< 0.0056	1.78E-01	4.90E-02	7.20E-02	1.10E+01	< 0.0087
	2.35E+01	3.30E+00	< 0.0135	2.95E-01	< 0.0186	3.60E-02	3.70E-02	< 0.0001	< 0.4216	3.88E+01	< 0.0056	1.17E-01	< 0.0156	7.40E-02	3.08E+00	< 0.0087
	7.15E+01	4.58E+00	< 0.0135	9.86E-01	< 0.0186	1.20E-01	3.20E-02	< 0.0001	< 0.4216	3.26E+01	< 0.0056	1.51E-01	3.30E-02	4.40E-02	5.51E+00	1.85E+00
	7.50E+01	4.46E+01	< 0.0135	2.05E+00	< 0.0186	3.23E-01	3.59E-01	< 0.0001	< 0.4216	5.11E+01	< 0.0056	3.77E-01	1.92E-01	1.49E-01	4.36E+01	< 0.0087
	1.35E+02	2.73E+01	3.60E-02	2.08E+00	< 0.0186	2.00E-01	1.43E+01	1.00E-03	< 0.4216	5.08E+01	< 0.0056	2.95E-01	1.27E-01	1.02E-01	2.84E+01	< 0.0087
Core S3	2.35E+01	4.55E-01	< 0.0135	3.82E-01	< 0.0186	8.40E-02	6.80E-02	< 0.0001	< 0.4216	8.42E+01	< 0.0056	2.06E-01	< 0.0156	5.10E-02	4.52E-01	< 0.0087
	5.00E+01	9.41E+00	7.20E-02	3.85E+00	< 0.0186	1.21E-01	2.04E-01	< 0.0001	< 0.4216	7.53E+01	< 0.0056	3.27E-01	4.40E-02	1.87E-01	1.17E+01	< 0.0087
	7.65E+01	8.35E-01	< 0.0135	2.01E+00	< 0.0186	5.70E-02	3.30E-02	< 0.0001	< 0.4216	5.60E+01	< 0.0056	2.90E-02	2.40E-02	2.40E-02	8.10E-01	< 0.0087
Core S4	2.35E+01	6.02E+00	< 0.0135	1.61E+00	< 0.0186	1.49E-01	7.10E-02	< 0.0001	< 0.4216	8.43E+01	< 0.0056	3.24E-01	3.30E-02	9.00E-02	8.86E+00	< 0.0087
	5.00E+01	6.29E+00	2.70E-02	3.31E+00	< 0.0186	2.85E-01	7.10E-02	< 0.0001	< 0.4216	1.04E+02	< 0.0056	8.21E-01	3.10E-02	1.03E-01	8.53E+00	1.37E+00
	8.75E+01	3.95E+00	2.60E-02	1.34E+00	< 0.0186	3.45E-01	6.00E-02	< 0.0001	< 0.4216	4.00E+01	< 0.0056	2.03E-01	2.00E-02	6.30E-02	4.14E+00	< 0.0087
	1.21E+02	8.47E-01	< 0.0135	2.20E+00	< 0.0186	3.91E-01	4.60E-02	< 0.0001	< 0.4216	4.83E+01	< 0.0056	8.10E-02	< 0.0156	1.70E-02	9.10E-01	< 0.0087
Core S5	2.35E+01	1.65E+00	< 0.0135	1.11E+00	< 0.0186	5.30E-02	1.35E-01	< 0.0001	< 0.4216	1.19E+02	< 0.0056	4.99E-01	< 0.0156	5.40E-02	1.45E+00	< 0.0087
	5.00E+01	1.34E+01	4.00E-02	2.70E+00	< 0.0186	1.82E-01	6.90E-02	< 0.0001	< 0.4216	4.83E+01	< 0.0056	4.31E-01	7.70E-02	1.45E-01	1.78E+01	< 0.0087
	7.65E+01	4.65E+00	2.60E-02	1.69E+00	< 0.0186	1.80E-01	9.70E-02	< 0.0001	< 0.4216	3.35E+01	< 0.0056	1.92E-01	2.70E-02	1.08E-01	5.79E+00	1.65E+00
MW-1		6.10E-01	< 0.0135	4.34E-01	< 0.0186	5.30E-02	5.60E-02	< 0.0001	< 0.4216	6.62E+01	< 0.0056	4.10E-02	< 0.0156	< 0.0118	2.97E-01	< 0.0087
MW-2		9.30E-02	< 0.0135	2.10E+00	< 0.0186	9.10E-02	8.70E-02	< 0.0001	< 0.4216	1.50E+02	< 0.0056	1.89E-01	< 0.0156	< 0.0118	8.60E+00	< 0.0087
MW-3		1.32E+00	< 0.0135	1.96E-01	< 0.0186	5.00E-02	3.70E-02	< 0.0001	< 0.4216	6.61E+01	< 0.0056	4.70E-02	< 0.0156	4.90E-02	8.75E-01	< 0.0087
MW-4		1.38E-01	< 0.0135	2.77E-01	< 0.0186	7.10E-02	2.40E-02	< 0.0001	< 0.4216	8.89E+01	< 0.0056	7.70E-02	< 0.0156	< 0.0118	9.23E-01	2.05E+00
MW-5		7.73E-01	< 0.0135	9.24E+00	< 0.0186	9.10E-02	1.90E-02	< 0.0001	< 0.4216	1.03E+02	< 0.0056	5.88E-01	< 0.0156	6.30E-02	9.11E-01	2.12E-01
MW-6		1.37E-01	< 0.0135	7.25E-01	< 0.0186	8.30E-02	4.40E-02	< 0.0001	< 0.4216	1.08E+02	< 0.0056	1.62E-01	< 0.0156	< 0.0118	1.90E-01	< 0.0087
MW-7		1.60E-01	< 0.0135	1.30E+00	< 0.0186	9.40E-02	5.60E-02	< 0.0001	< 0.4216	1.47E+02	< 0.0056	1.30E-01	< 0.0156	< 0.0118	7.85E+00	< 0.0087

Core ID	Depth (cm)	K ppm	Mg ppm	Mn ppm	Mo ppm	Na ppm	Ni ppm	P ppm	Pb ppm	Rb ppm	Si ppm	Sc ppm	Se ppm	Sr ppm	S ppm
Core S1	1.50E+01	2.15E+00	8.61E+00	2.56E-01	< 0.036	9.50E+00	< 0.059	< 0.268	< 0.213	< 0.320	1.67E+01	7.00E-03	< 0.213	9.10E-02	3.51E+01
	4.50E+01	2.07E+00	1.25E+01	6.10E-01	< 0.036	3.35E+01	< 0.059	< 0.268	5.49E-01	< 0.320	2.83E+01	6.00E-03	< 0.213	1.23E-01	1.18E+01
	4.85E+01	1.71E+01	2.01E+01	4.00E-03	< 0.036	1.14E+01	< 0.059	< 0.268	< 0.213	< 0.320	9.80E+00	< 0.002	< 0.213	3.84E-01	6.58E+02
	7.15E+01	3.95E+00	5.36E+00	5.90E-02	< 0.036	4.53E+02	< 0.059	< 0.268	< 0.213	< 0.320	8.44E+00	< 0.002	< 0.213	1.03E-01	6.94E+01
	8.50E+01	2.05E+00	1.11E+01	3.37E-01	< 0.036	1.30E+01	< 0.059	< 0.268	< 0.213	< 0.320	1.54E+01	< 0.002	< 0.213	1.38E-01	1.21E+01
Core S2	1.30E+02	2.97E+00	1.58E+01	4.67E-01	< 0.036	1.36E+01	< 0.059	4.14E-01	< 0.213	< 0.320	4.48E+01	5.00E-03	< 0.213	1.23E-01	1.41E+01
	1.50E+01	2.64E+00	1.06E+01	3.46E-01	< 0.036	3.98E+00	< 0.059	< 0.268	< 0.213	< 0.320	2.12E+01	4.00E-03	< 0.213	9.20E-02	2.15E+01
	2.35E+01	2.11E+00	5.98E+00	7.90E-02	< 0.036	1.19E+00	< 0.059	< 0.268	< 0.213	< 0.320	9.51E+00	< 0.002	< 0.213	6.00E-02	5.31E+01
	7.15E+01	1.19E+01	6.44E+00	1.89E-01	< 0.036	4.89E+00	< 0.059	6.66E+00	< 0.213	5.52E-01	1.16E+01	5.00E-03	< 0.213	4.20E-02	4.36E+01
	7.50E+01	6.47E+00	2.52E+01	1.13E+00	< 0.036	5.46E+00	< 0.059	9.91E-01	3.67E-01	3.24E-01	3.75E+01	2.10E-02	< 0.213	1.21E-01	1.76E+01
Core S3	1.35E+02	3.38E+00	1.86E+01	9.56E-01	< 0.036	3.72E+00	< 0.059	4.25E-01	4.25E-01	< 0.320	3.81E+01	1.20E-02	< 0.213	6.70E-02	6.89E+00
	2.35E+01	3.33E+00	5.74E+00	2.08E-01	1.28E-01	4.72E+00	< 0.059	< 0.268	< 0.213	4.19E-01	5.50E+00	< 0.002	< 0.213	8.80E-02	1.17E+02
	5.00E+01	2.32E+00	1.15E+01	3.79E-01	4.63E-01	5.53E+00	< 0.059	< 0.268	2.69E-01	< 0.320	1.84E+01	4.00E-03	< 0.213	9.10E-02	1.32E+02
Core S4	7.65E+01	3.22E+00	9.38E+00	1.78E-01	< 0.036	4.71E+00	< 0.059	< 0.268	< 0.213	< 0.320	5.18E+00	< 0.002	< 0.213	1.71E-01	7.15E+01
	2.35E+01	6.17E+00	1.38E+01	2.64E-01	8.50E-02	8.59E+00	< 0.059	< 0.268	2.56E-01	3.71E-01	1.61E+01	2.00E-03	< 0.213	1.74E-01	1.51E+02
	5.00E+01	7.83E+00	1.54E+01	4.31E-01	2.96E-01	8.00E+00	< 0.059	< 0.268	< 0.213	3.62E-01	1.56E+01	7.00E-03	< 0.213	2.16E-01	2.17E+02
	8.75E+01	9.18E+00	8.89E+00	1.02E-01	1.24E-01	8.59E+00	< 0.059	< 0.268	< 0.213	< 0.320	1.17E+01	< 0.002	< 0.213	7.50E-02	8.49E+01
Core S5	1.21E+02	8.24E+00	8.83E+00	5.30E-02	5.47E-01	9.22E+00	< 0.059	< 0.268	< 0.213	< 0.320	5.35E+00	< 0.002	< 0.213	8.00E-02	1.23E+02
	2.35E+01	4.53E+00	1.01E+01	1.36E-01	< 0.036	7.12E+00	< 0.059	< 0.268	< 0.213	3.25E-01	8.80E+00	< 0.002	< 0.213	1.35E-01	2.02E+02
	5.00E+01	4.96E+00	1.44E+01	4.52E-01	< 0.036	5.98E+00	< 0.059	2.79E-01	4.05E-01	< 0.320	2.36E+01	6.00E-03	< 0.213	5.50E-02	5.27E+01
	7.65E+01	6.02E+00	8.23E+00	1.58E-01	< 0.036	7.71E+00	< 0.059	< 0.268	< 0.213	< 0.320	1.15E+01	5.00E-03	< 0.213	4.40E-02	6.65E+01
MW-1		8.90E-01	1.25E+01	2.82E-01	< 0.036	5.96E+00	< 0.059	< 0.268	< 0.213	< 0.320	8.47E+00	< 0.002	< 0.213	1.55E-01	7.70E+00
MW-2		3.06E+00	1.43E+01	1.15E+00	< 0.036	1.15E+01	< 0.059	< 0.268	< 0.213	< 0.320	1.00E+01	< 0.002	< 0.213	2.26E-01	8.78E+00
MW-3		1.12E+00	9.13E+00	1.90E-01	< 0.036	6.51E+00	< 0.059	< 0.268	< 0.213	< 0.320	9.56E+00	< 0.002	< 0.213	1.27E-01	7.41E+00
MW-4		3.87E-01	9.27E+00	2.19E-01	< 0.036	4.74E+00	< 0.059	< 0.268	< 0.213	< 0.320	1.05E+01	4.00E-03	< 0.213	1.40E-01	7.48E+00
MW-5		3.60E+00	9.44E+00	6.77E-01	4.00E-02	5.03E+00	< 0.059	< 0.268	< 0.213	3.98E-01	6.66E+00	< 0.002	< 0.213	1.58E-01	2.68E+01
MW-6		2.50E+00	5.38E+00	4.02E-01	< 0.036	5.10E+00	< 0.059	< 0.268	< 0.213	< 0.320	7.43E+00	< 0.002	< 0.213	1.34E-01	1.91E+01
MW-7		2.12E+00	1.47E+01	1.40E+00	< 0.036	7.90E+00	< 0.059	< 0.268	< 0.213	4.86E-01	1.23E+01	< 0.002	< 0.213	2.35E-01	9.48E+00

Core ID	Depth (cm)	Sb ppm	Th ppm	Ti ppm	U ppm	Zr ppm	Zn ppm
Core S1	1.50E+01	4.94E-01	< 33.2	5.80E-02	< 0.868	7.00E-03	1.65E-01
	4.50E+01	5.92E-01	< 33.2	1.76E-01	< 0.868	5.00E-03	5.66E-01
	4.85E+01	3.08E-01	< 33.2	< 0.0019	< 0.868	< 0.004	< 0.006
	7.15E+01	3.52E+00	< 33.2	7.00E-03	< 0.868	< 0.004	2.90E-02
	8.50E+01	5.20E-01	< 33.2	5.50E-02	< 0.868	7.00E-03	1.42E-01
Core S2	1.30E+02	3.45E-01	< 33.2	4.11E-01	< 0.868	1.20E-02	2.88E-01
	1.50E+01	2.85E-01	< 33.2	4.52E-01	< 0.868	8.00E-03	1.81E-01
	2.35E+01	5.35E-01	< 33.2	7.30E-02	< 0.868	< 0.004	6.80E-02
	7.15E+01	6.21E-01	< 33.2	8.70E-02	< 0.868	1.20E-02	1.38E-01
	7.50E+01	1.67E-01	< 33.2	1.86E+00	< 0.868	3.30E-02	3.54E-01
Core S3	1.35E+02	3.59E-01	< 33.2	5.89E-01	< 0.868	9.00E-03	3.50E-01
	2.35E+01	1.43E+00	< 33.2	9.00E-03	< 0.868	6.00E-03	5.10E-02
	5.00E+01	4.01E+00	< 33.2	8.70E-02	< 0.868	7.00E-03	1.97E-01
Core S4	7.65E+01	3.16E+00	< 33.2	1.60E-02	< 0.868	< 0.004	3.38E-01
	2.35E+01	9.44E-01	< 33.2	1.11E-01	< 0.868	< 0.004	1.70E-01
	5.00E+01	1.28E+00	< 33.2	9.10E-02	< 0.868	6.00E-03	2.01E-01
	8.75E+01	2.51E+00	< 33.2	1.35E-01	< 0.868	7.00E-03	1.75E-01
Core S5	1.21E+02	4.59E+00	< 33.2	1.80E-02	< 0.868	< 0.004	9.90E-02
	2.35E+01	9.99E-01	< 33.2	3.60E-02	< 0.868	< 0.004	1.29E-01
	5.00E+01	1.03E+00	< 33.2	2.93E-01	< 0.868	1.00E-02	2.46E-01
MW-1 MW-2 MW-3 MW-4 MW-5 MW-6 MW-7	7.65E+01	1.96E+00	< 33.2	9.30E-02	< 0.868	6.00E-03	1.37E-01
		< 0.167	< 33.2	1.00E-02	< 0.868	< 0.004	< 0.006
		< 0.167	< 33.2	< 0.002	< 0.868	< 0.004	6.00E-03
		< 0.167	< 33.2	1.30E-02	< 0.868	< 0.004	3.20E-02
		< 0.167	< 33.2	3.00E-03	< 0.868	< 0.004	6.00E-03
		< 0.167	< 33.2	1.10E-02	< 0.868	< 0.004	1.43E-01
		< 0.167	< 33.2	4.00E-03	< 0.868	< 0.004	1.10E-02
		< 0.167	< 33.2	2.00E-03	< 0.868	< 0.004	1.20E-02

Table B8a: Porewater Field Chemistry Collected from September 2004 Cores

Location	Depth (cm)	Sulfate (ppm)	Sulfide (ppm)	Fe(II) (ppm)	Alkalinity (mg H ₂ CO ₃ /L)	Alkalinity (mg CaCO ₃ /L)	DO (ppm)	pH
Core S1	25.5	125	0.10	0.10	nm	nm	1.87	7.15
	45.0	375	nd	nd	10.6	17.1	2.10	7.10
	75.0	250	nd	nd	29.1	46.8	1.90	6.80
Core S2	15.0	313	nd	nd	421	679	1.95	6.18
	45.0	238	nd	nd	87.2	141	2.00	7.32
	75.0	213	0.10	nd	65.2	105	2.00	7.21
	105	200	nd	nd	150	242	2.50	7.20
	130	50.0	nd	nd	146	235	1.00	7.48
Core S3	15.0	325	0.20	nd	13.1	21.1	2.00	7.70
	45.0	313	0.20	0.10	39.6	63.9	1.49	7.90
	75.0	438	0.10	0.50	76.8	123.8	0.69	7.97
	105	214	0.70	nd	10.7	17.2	2.15	6.96
Core S4	23.5	525	0.60	0.10			2.00	7.60
	45.0	438	0.15	0.20	16.5	26.6	1.68	7.64
	75.0	588	0.10	0.10	45.8	73.8	1.49	7.78
	105	163	0.10	0.30	15.8	25.4	1.50	7.78
Core S5	23.5	425	nd	nd			2.00	5.36
	45.0	350	0.10	nd	22.5	36.3	1.60	5.42
	75.0	166	0.50	nd	8.32	13.4	0.900	5.92
	105	100	0.70	nd	12.4	19.9	0.680	6.24

Table B8b: Groundwater Field Chemistry Collected from all Onsite Monitoring Wells Installed in June 2004 and Sampled in September 2004

MWID	MW1	MW2	MW3	MW4	MW5	MW6	MW7
HS	0.400	nd	0.1	0.1	nm	0.15	0.100
Fe(II)	1.00	nd	0.05	2.00	0.100	nd	0.80
SO ₄	1750	100	125	50.0	>200	150	50.0
DO	2.23	0.34	0.25	3.52	3.68	2.92	4.98
cond	349	346	80	53.0	198	386	593
pH	6.93	6.59	6.66	6.48	7.60	7.55	7.40
temp	11.3	13.5	19.5	16.9	20.5	16.2	16.3
alk	230	266	130	423	nm	178	nm
Cl	nm	90	15	2.20	7.5	30.0	nm

Notes

nm Not measured
nd Not detected

Table B9: Monitoring Well Details

MW ID	Total Depth (m)	Screened Interval (m)	Water Elevation (maal)	Vertical Gradient
MW1	0.65	0.341-0.646	97.25	-1.08
MW2	1.02	0.719-1.021	98.26	-0.03
MW3	0.96	0.657-0.962	98.29	0.01
MW4	0.85	0.238-0.543	98.29	0.01
MW5	0.43	0.127-0.432	101.03	ND
MW6	0.79	0.184-0.489	98.30	0.02
MW7	1.21	0.901-1.206	98.67	0.01

Notes

nd Not determined

Table B10: Sediment Metal Concentrations Extracted from *typha latifolia* Leaf Samples Collected in September 2004 Cores

Sample ID	Wt (g)	Al	Ag	As	Au	B	Ba	Be	Bi
INLET(1)	0.200	13.00	< 0.0135	0.291	< 0.019	0.063	0.082	< 0.001	< 0.422
INLET(2)	0.200	0.711	0.069	< 0.124	< 0.019	0.040	0.022	< 0.001	< 0.422
P-C1(1)	0.200	0.154	0.083	< 0.124	< 0.019	0.085	0.009	< 0.001	< 0.422
P-C1(2)	0.200	0.150	0.215	< 0.124	< 0.019	0.079	0.012	< 0.001	< 0.422
P-C3(1)	0.200	0.280	0.363	0.252	< 0.019	0.042	0.018	< 0.001	< 0.422
P-C3(2)	0.200	0.362	< 0.014	0.215	< 0.019	0.050	0.018	< 0.001	< 0.422
P-MW1	0.200	0.189	< 0.014	< 0.124	< 0.019	0.064	0.010	< 0.001	< 0.422
P-MW1(2)	0.200	0.165	0.157	< 0.124	< 0.019	0.060	0.009	< 0.001	< 0.422
P-MW3	0.200	0.275	0.354	< 0.124	< 0.019	0.060	0.014	< 0.001	< 0.422
P-MW3(2)	0.200	0.167	< 0.014	0.295	< 0.019	0.042	0.014	< 0.001	< 0.422
P-MW6	0.200	0.319	0.543	< 0.124	< 0.019	0.057	0.009	< 0.001	< 0.422
P-MW6(1)	0.200	2.47	4.29	< 0.124	< 0.019	0.075	0.013	< 0.001	< 0.422
P-MW7(1)	0.200	0.525	0.146	< 0.124	< 0.019	0.056	0.015	< 0.001	< 0.422
P-MW7(2)	0.200	0.440	0.397	0.128	< 0.019	0.030	0.015	< 0.001	< 0.422

Sample ID	Ca	Cd	Co	Cr	Cu	Fe	Hg
INLET(1)	38.7	< 0.006	0.533	0.049	0.044	8.920	<0.009
INLET(2)	35.5	< 0.006	0.015	0.023	0.019	0.739	<0.009
P-C1(1)	12.2	< 0.006	< 0.0071	< 0.016	0.015	0.219	195
P-C1(2)	18.8	< 0.006	< 0.0071	< 0.016	0.029	0.244	110
P-C3(1)	33.6	< 0.006	0.014	< 0.016	0.020	0.501	<0.009
P-C3(2)	32.2	< 0.006	0.016	0.018	0.018	0.572	<0.009
P-MW1	18.8	< 0.006	< 0.007	< 0.016	0.014	0.290	23.8
P-MW1(2)	18.9	< 0.006	< 0.007	0.021	0.019	0.285	16.3
P-MW3	34.9	< 0.006	< 0.007	0.016	0.012	0.324	8.13
P-MW3(2)	33.1	< 0.006	< 0.007	< 0.016	< 0.012	0.354	<0.009
P-MW6	21.4	< 0.006	< 0.007	< 0.016	0.018	0.455	<0.009
P-MW6(1)	22.6	< 0.006	0.037	0.024	0.028	2.910	21.9
P-MW7(1)	33.0	< 0.006	0.022	< 0.016	0.020	0.659	<0.009
P-MW7(2)	36.5	< 0.006	0.021	< 0.016	0.030	0.558	8.75

Sample ID	K	Mg	Mn	Mo	Na	Ni	P	Pb	Rb
INLET(1)	12500	4430	669	<0.036	2210	242	1480	<0.213	<0.32
INLET(2)	12100	2380	656	<0.036	1570	<0.059	1710	<0.213	<0.32
P-C1(1)	19300	1000	268	<0.036	2170	<0.059	2240	<0.213	<0.32
P-C1(2)	28000	1500	404	<0.036	2610	<0.059	3200	<0.213	<0.32
P-C3(1)	16200	1370	681	<0.036	1380	<0.059	3010	<0.213	229
P-C3(2)	16600	1340	675	<0.036	1500	<0.059	3050	<0.213	<0.32
P-MW1	22600	1360	227	<0.036	2240	<0.059	2720	<0.213	223
P-MW1(2)	20300	1340	231	<0.036	2200	<0.059	2590	<0.213	<0.32
P-MW3	9250	1750	389	<0.036	1640	<0.059	1930	<0.213	<0.32
P-MW3(2)	8560	1730	361	<0.036	1830	<0.059	1780	<0.213	202
P-MW6	20100	694	418	<0.036	1440	<0.059	2690	<0.213	<0.32
P-MW6(1)	19600	1520	457	<0.036	258	<0.059	2540	<0.213	<0.32
P-MW7(1)	11400	1150	211	<0.036	2580	<0.059	3360	<0.213	<0.32
P-MW7(2)	12100	1200	225	<0.036	3390	<0.059	3440	<0.213	<0.32

Sample ID	S	Sb	Sc	Se	Si	Sr	Th	Ti	U	Zn	Zr
INLET(1)	1.83E+04	<0.167	4.38	<0.213	178	37.5	<33.1	409	<0.868	141	3.75
INLET(2)	1.98E+04	<0.167	<0.002	<0.213	253	28.1	<33.1	243	<0.868	55.6	<0.004
P-C1(1)	5.14E+03	<0.167	3.75	<0.213	228	11.9	<33.1	9.38	<0.868	49.4	17.5
P-C1(2)	7.44E+03	<0.167	3.75	<0.213	206	17.5	<33.1	6.88	<0.868	55.0	8.75
P-C3(1)	6.88E+03	<0.167	<0.002	<0.213	254	18.8	<33.1	90.6	<0.868	48.8	<0.004
P-C3(2)	7.06E+03	<0.167	<0.002	<0.213	248	17.5	<33.1	184	<0.868	67.5	<0.004
P-MW1	6.69E+03	<0.167	<0.002	<0.213	296	23.8	<33.1	6.25	<0.868	68.8	<0.004
P-MW1(2)	6.44E+03	<0.167	1.25	<0.213	326	23.8	<33.1	71.9	<0.868	64.4	5.00
P-MW3	5.18E+03	<0.167	<0.002	<0.213	203	31.3	<33.1	6.88	<0.868	49.4	<0.004
P-MW3(2)	5.00E+03	<0.167	<0.002	<0.213	181	30.0	<33.1	134	<0.868	51.3	<0.004
P-MW6	6.01E+03	<0.167	<0.002	<0.213	298	13.1	<33.1	16.9	<0.868	73.8	<0.004
P-MW6(1)	5.61E+03	<0.167	1.88	<0.213	274	14.4	<33.1	74.4	<0.868	56.9	5.63
P-MW7(1)	7.75E+03	<0.167	<0.002	<0.213	331	20.0	<33.1	16.3	<0.868	71.9	3.13
P-MW7(2)	8.00E+03	<0.167	1.25	<0.213	226	23.1	<33.1	33.1	<0.868	78.1	<0.004

APPENDIX C
MODELLING RESULTS
RAW DATA

MW1 - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	1.000E-07	-7.000	2.818E-08
30	Al+3	2.239E-05	-4.650	2.261E-05
61	H3AsO4	5.754E-06	-5.240	5.793E-06
90	H3BO3	4.898E-06	-5.310	4.903E-06
100	Ba+2	4.074E-07	-6.390	4.078E-07
150	Ca+2	1.660E-03	-2.780	1.652E-03
200	Co+2	6.918E-07	-6.160	6.957E-07
280	Fe+2	5.370E-06	-5.270	5.318E-06
410	K+1	2.291E-05	-4.640	2.276E-05
460	Mg+2	5.129E-04	-3.290	5.144E-04
470	Mn+2	5.129E-06	-5.290	5.133E-06
500	Na+1	2.570E-04	-3.590	2.592E-04
770	H4SiO4	3.020E-04	-3.520	3.015E-04
800	Sr+2	1.778E-06	-5.750	1.769E-06
731	S	2.399E-04	-3.620	2.401E-04
871	Tl(OH)3	2.089E-07	-6.680	2.089E-07
732	SO4-2	1.738E+03	3.240	1.822E-03
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
730	HS-1	1.000E-07	-7.000	1.209E-05
870	Tl+1	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
140	CO3-2	2.291E-04	-3.640	2.300E-04
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 4.709E-03 Sum of ANIONS = 4.116E-03

PERCENT DIFFERENCE = 6.721E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED		SORBED		PRECIPITATED	
		mol/L	percent	mol/L	percent	mol/L	percent
140	CO3-2	2.300E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
30	Al+3	2.261E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
471	Mn+3	1.215E-37	100.0	0.000E+00	0.0	0.000E+00	0.0
90	H3BO3	4.903E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
100	Ba+2	4.078E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
150	Ca+2	1.652E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
200	Co+2	6.957E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
280	Fe+2	5.316E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	2.276E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	5.144E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	5.133E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	2.592E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	3.015E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	1.769E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
731	S	2.401E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
61	H3AsO4	3.485E-09	100.0	0.000E+00	0.0	0.000E+00	0.0
730	HS-1	1.059E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
871	Tl(OH)3	5.511E-37	100.0	0.000E+00	0.0	0.000E+00	0.0
732	SO4-2	1.823E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
2	H2O	1.129E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
1	E-1	-3.372E-75	100.0	0.000E+00	0.0	0.000E+00	0.0
281	Fe+3	1.522E-09	100.0	0.000E+00	0.0	0.000E+00	0.0
60	H3AsO3	5.789E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
330	H+1	1.317E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
870	Tl+1	2.089E-07	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 4.000E-03 Sum of ANIONS 3.407E-03

PERCENT DIFFERENCE = 8.008E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 7.116E-03

EQUILIBRIUM pH = 9.393

EQUILIBRIUM pe = -6.080 or Eh = -353.63 mv

Saturation indices

ID No	Name	SI
1006000	ORPIMENT	7.709
1020001	CoS (alpha)	5.109
1020002	CoS (beta)	8.739
1028000	FeS (ppt)	1.598
1028001	GREIGITE	6.962
1028002	MACKINAWITE	2.281
1028003	PYRITE	9.542
2077002	QUARTZ	0.451
2003001	BOEHMITE	0.198
2003002	DIASPORE	1.947
2003003	GIBBSITE	0.552
2028000	WUSTITE	1.405
2028102	GOETHITE	2.584
3020002	CoFe ₂ O ₄	21.657
3028000	MAGNETITE	15.589
3028001	HERCYNITE	7.527
3028100	HEMATITE	7.545
3028101	MAGHEMITE	0.127
3028102	LEPIDOCROCITE	1.885
3046001	MAGNESIOFERRITE	4.105
5047000	RHODOCHROSITE	0.294
5015000	ARAGONITE	0.512
5015001	CALCITE	0.666
5015002	DOLOMITE (ordered)	0.918
5015004	DOLOMITE (disordered)	0.348
6010000	BARITE	0.535
7210000	Ba ₃ (AsO ₄) ₂	9.234
8603000	HALLOYSITE	0.907
8603001	KAOLINITE	3.147
8628000	GREENALITE	11.266
8646000	CHRYSOTILE	5.840
8646003	SEPIOLITE	3.623
8646004	SEPIOLITE (A)	0.944

MW2 - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	1.000E-07	-7.000	2.512E-07
30	Al+3	3.467E-06	-5.460	3.447E-06
61	H ₃ AsO ₄	2.818E-05	-4.550	2.803E-05
90	H ₃ BO ₃	8.511E-06	-5.070	8.418E-06
100	Ba+2	6.310E-07	-6.200	6.335E-07
150	Ca+2	3.715E-03	-2.430	3.743E-03
200	Co+2	3.236E-06	-5.490	3.207E-06
280	Fe+2	1.549E-04	-3.810	1.540E-04
410	K+1	7.762E-05	-4.110	7.826E-05
460	Mg+2	5.888E-04	-3.230	5.885E-04
470	Mn+2	2.089E-05	-4.680	2.093E-05
500	Na+1	5.012E-04	-3.300	5.002E-04
770	H ₄ SiO ₄	3.548E-04	-3.450	3.560E-04
800	Sr+2	2.570E-06	-5.590	2.579E-06
731	S	2.754E-04	-3.560	2.738E-04

950 Zn+2	9.120E-08	-7.040	9.177E-08
732 SO4-2	1.047E-03	-2.980	1.041E-03
180 Cl-1	2.512E-03	-2.600	2.539E-03
140 CO3-2	2.239E-03	-2.650	2.260E-03
281 Fe+3	1.000E-07	-7.000	0.000E+00
1 E-1	1.000E-07	-7.000	0.000E+00
60 H3AsO3	1.000E-07	-7.000	0.000E+00
471 Mn+3	1.000E-07	-7.000	0.000E+00
730 HS-1	1.000E-07	-7.000	0.000E+00
201 Co+3	1.000E-07	-7.000	0.000E+00
2 H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 9.615E-03 Sum of ANIONS = 9.141E-03

PERCENT DIFFERENCE = 2.527E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED mol/L percent	SORBED mol/L percent	PRECIPITATED mol/L percent
330	H+1	-1.614E-05 100.0	0.000E+00 0.0	0.000E+00 0.0
30	Al+3	3.447E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
732	SO4-2	1.041E-03 100.0	0.000E+00 0.0	0.000E+00 0.0
90	H3BO3	8.418E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
100	Ba+2	6.335E-07 100.0	0.000E+00 0.0	0.000E+00 0.0
150	Ca+2	3.743E-03 100.0	0.000E+00 0.0	0.000E+00 0.0
200	Co+2	3.207E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
280	Fe+2	1.376E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
410	K+1	7.826E-05 100.0	0.000E+00 0.0	0.000E+00 0.0
460	Mg+2	5.885E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
470	Mn+2	2.093E-05 100.0	0.000E+00 0.0	0.000E+00 0.0
500	Na+1	5.002E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
770	H4SiO4	3.560E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
800	Sr+2	2.579E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
731	S	2.738E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
950	Zn+2	9.177E-08 100.0	0.000E+00 0.0	0.000E+00 0.0
61	H3AsO4	1.983E-05 100.0	0.000E+00 0.0	0.000E+00 0.0
180	Cl-1	2.539E-03 100.0	0.000E+00 0.0	0.000E+00 0.0
140	CO3-2	2.260E-03 100.0	0.000E+00 0.0	0.000E+00 0.0
471	Mn+3	1.951E-36 100.0	0.000E+00 0.0	0.000E+00 0.0
2	H2O	5.034E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
201	Co+3	1.068E-36 100.0	0.000E+00 0.0	0.000E+00 0.0
281	Fe+3	1.639E-05 100.0	0.000E+00 0.0	0.000E+00 0.0
60	H3AsO3	8.197E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
1	E-1	-1.914E-66 100.0	0.000E+00 0.0	0.000E+00 0.0
730	HS-1	3.116E-17 100.0	0.000E+00 0.0	0.000E+00 0.0

Charge Balance: SPECIATED

Sum of CATIONS = 7.004E-03 Sum of ANIONS 6.530E-03

PERCENT DIFFERENCE = 3.501E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 1.136E-02

EQUILIBRIUM pH = 10.126

EQUILIBRIUM pe = -5.502 or Eh = -320.03 mv

Saturation indices

ID No	Name	SI
2077002	QUARTZ	0.242
2003002	DIASPORE	0.389
2020002	Co(OH)2	0.065
2028000	WUSTITE	3.423
2028001	Fe(OH)2	1.587
2028100	FERRIHYDRITE	3.204
2028101	Fe3(OH)8	8.158
2028102	GOETHITE	
3020002	CoFe2O4	29.442
3028000	MAGNETITE	24.354
3028001	HERCYNITE	6.460
3028100	HEMATITE	14.262
3028101	MAGHEMITE	6.843
3028102	LEPIDOCROCITE	5.244
3046001	MAGNESIOFERRITE	12.260
4128100	Fe(OH)2.7Cl.3	5.824
5028000	SIDERITE	1.662
5047000	RHODOCHROSITE	2.186
5046002	MAGNESITE	0.562
5015000	ARAGONITE	2.105
5015001	CALCITE	2.259
5015002	DOLOMITE (ordered)	3.828
5015004	DOLOMITE (disordered)	3.257
5015003	HUNTITE	2.586
6010000	BARITE	0.335
7247000	Mn3(AsO4)2.8H2O	1.413
7210000	Ba3(AsO4)2	18.432
8628000	GREENALITE	16.994
8646000	CHRYSOTILE	9.735
8646003	SEPIOLITE	5.872
8646004	SEPIOLITE (A)	3.193

MW3 - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	2.188E-07	-6.660	2.188E-07
30	Al+3	4.898E-05	-4.310	4.893E-05
61	H3AsO4	2.630E-06	-5.580	2.616E-06
90	H3BO3	4.677E-06	-5.330	4.625E-06
100	Ba+2	2.692E-07	-6.570	2.694E-07
150	Ca+2	1.660E-03	-2.780	1.649E-03
200	Co+2	7.943E-07	-6.100	7.976E-07
280	Fe+2	1.585E-05	-4.800	1.567E-05
410	K+1	2.884E-05	-4.540	2.864E-05
460	Mg+2	3.715E-04	-3.430	3.757E-04
470	Mn+2	3.467E-06	-5.460	3.458E-06
500	Na+1	2.818E-04	-3.550	2.832E-04
770	H4SiO4	3.388E-04	-3.470	3.403E-04
800	Sr+2	1.445E-06	-5.840	1.449E-06
731	S	2.291E-04	-3.640	2.311E-04
871	Ti(OH)3	2.692E-07	-6.570	2.715E-07
950	Zn+2	4.898E-07	-6.310	4.894E-07
730	HS-1	3.020E-06	-5.520	3.023E-06
732	SO4-2	1.288E-03	-2.890	1.301E-03
180	Cl-1	4.266E-04	-3.370	4.231E-04
140	CO3-2	1.288E-03	-2.890	6.499E-04
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 4.553E-03 Sum of ANIONS = 4.328E-03

PERCENT DIFFERENCE = 2.529E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED		SORBED		PRECIPITATED	
		mol/L	percent	mol/L	percent	mol/L	percent
61	H3AsO4	6.303E-09	100.0	0.000E+00	0.0	0.000E+00	0.0
30	Al+3	4.893E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
471	Mn+3	3.671E-38	100.0	0.000E+00	0.0	0.000E+00	0.0
90	H3BO3	4.625E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
100	Ba+2	2.694E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
150	Ca+2	1.649E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
200	Co+2	7.976E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
280	Fe+2	1.563E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	2.864E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	3.757E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	3.458E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	2.832E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	3.403E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	1.449E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
731	S	2.311E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
871	Ti(OH)3	2.715E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
950	Zn+2	4.894E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
730	HS-1	2.375E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
732	SO4-2	1.302E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
180	Cl-1	4.231E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
140	CO3-2	6.499E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
2	H2O	2.607E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
1	E-1	-1.100E-73	100.0	0.000E+00	0.0	0.000E+00	0.0
281	Fe+3	3.567E-08	100.0	0.000E+00	0.0	0.000E+00	0.0
60	H3AsO3	2.610E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
330	H+1	8.311E-07	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 3.725E-03 Sum of ANIONS 3.500E-03

PERCENT DIFFERENCE = 3.108E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 6.541E-03

EQUILIBRIUM pH = 9.772

EQUILIBRIUM pc = -6.415 or Eh = -373.13 mv

Saturation indices

ID No	Name	SI
1006000	ORPIMENT	2.795
1095000	ZnS (am)	1.829
1095001	SPHALERITE	4.271
1095002	WURTZITE	1.745
1020001	CoS (alpha)	4.218
1020002	CoS (beta)	7.848
1028000	FeS (ppt)	1.348
1028001	GREIGITE	5.054
1028002	MACKINAWITE	2.031
1028003	PYRITE	8.134
2077002	QUARTZ	0.398
2003001	BOEHMITE	0.156
2003002	DIASPORE	1.905

2003003 GIBBSITE	0.510
2028000 WUSTITE	2.389
2028001 Fe(OH)2	0.535
2028100 FERRIHYDRITE	0.886
2028101 Fe3(OH)8	2.469
2028102 GOETHITE	3.624
3020002 CoFe2O4	24.092
3028000 MAGNETITE	18.665
3028001 HERCYNITE	8.439
3028100 HEMATITE	9.625
3028101 MAGHEMITE	2.206
3028102 LEPIDOCROCITE	2.925
3046001 MAGNESIOFERRITE	6.806
4128100 Fe(OH)2.7Cl3	3.381
5028000 SIDERITE	0.696
5047000 RHODOCHROSITE	0.845
5015000 ARAGONITE	1.230
5015001 CALCITE	1.384
5015002 DOLOMITE (ordered)	2.223
5015004 DOLOMITE (disordered)	1.652
6010000 BARITE	0.212
7210000 Ba3(AsO4)2	9.952
8603000 HALLOYSITE	0.716
8603001 KAOLINITE	2.956
8628000 GREENALITE	14.148
8646000 CHRYSOTILE	7.597
8646003 SEPIOLITE	4.706
8646004 SEPIOLITE (A)	2.027

MW4 - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	3.311E-07	-6.480	3.311E-07
30	Al+3	5.129E-06	-5.290	5.115E-06
61	H3AsO4	3.715E-06	-5.430	3.697E-06
90	H3BO3	6.607E-06	-5.180	6.568E-06
150	Ca+2	2.239E-03	-2.650	2.218E-03
200	Co+2	1.318E-06	-5.880	1.307E-06
280	Fe+2	1.660E-05	-4.780	1.653E-05
410	K+1	1.000E-05	-5.000	9.898E-06
460	Mg+2	3.802E-04	-3.420	3.815E-04
470	Mn+2	3.981E-06	-5.400	3.986E-06
500	Na+1	2.042E-04	-3.690	2.062E-04
770	H4SiO4	3.715E-04	-3.430	3.738E-04
800	Sr+2	1.585E-06	-5.800	1.598E-06
731	S	2.344E-04	-3.630	2.332E-04
871	Ti(OH)3	6.310E-08	-7.200	6.266E-08
950	Zn+2	9.120E-08	-7.040	9.177E-08
730	HS-1	3.020E-06	-5.520	3.023E-06
732	SO4-2	5.248E-04	-3.280	5.205E-04
180	Cl-1	6.166E-05	-4.210	6.206E-05
140	CO3-2	4.266E-03	-2.370	2.500E-03
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
100	Ba+2	1.738E-07	-6.760	1.748E-07
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 5.478E-03 Sum of ANIONS = 6.106E-03

PERCENT DIFFERENCE = 5.421E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED		SORBED		PRECIPITATED	
		mol/L	percent	mol/L	percent	mol/L	percent
330	H+1	1.134E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
30	Al+3	5.115E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
61	H3AsO4	2.974E-08	100.0	0.000E+00	0.0	0.000E+00	0.0
90	H3BO3	6.568E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
150	Ca+2	2.218E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
200	Co+2	1.307E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
280	Fe+2	1.643E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	9.898E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	3.815E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	3.986E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	2.062E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	3.738E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	1.598E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
731	S	2.332E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
871	Ti(OH)3	6.266E-08	100.0	0.000E+00	0.0	0.000E+00	0.0
950	Zn+2	9.177E-08	100.0	0.000E+00	0.0	0.000E+00	0.0
730	HS-1	2.119E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
732	SO4-2	5.214E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
180	Cl-1	6.206E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
140	CO3-2	2.500E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
100	Ba+2	1.748E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
2	H2O	3.016E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
1	E-1	-1.549E-71	100.0	0.000E+00	0.0	0.000E+00	0.0
281	Fe+3	1.015E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
60	H3AsO3	3.667E-06	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 3.401E-03 Sum of ANIONS 4.029E-03

PERCENT DIFFERENCE = 8.452E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 6.720E-03

EQUILIBRIUM pH = 10.471

EQUILIBRIUM pe = -7.268 or Eh = -422.73 mv

Saturation indices

ID No	Name	SI
1006000	ORPIMENT	0.224
1095000	ZnS (am)	0.960
1095001	SPHALERITE	3.402
1095002	WURTZITE	0.875
1020001	CoS (alpha)	4.071
1020002	CoS (beta)	7.701
1028000	FeS (ppt)	0.733
1028001	GREIGITE	2.346
1028002	MACKINAWITE	1.416
1028003	PYRITE	6.657
2003002	DIASPORE	0.226
2028000	WUSTITE	2.404
2028001	Fe(OH)2	0.473
2028100	FERRIHYDRITE	0.669
2028101	Fe3(OH)8	1.974
2028102	GOETHITE	3.408
2046000	BRUCITE	0.014
3020002	CoFe2O4	24.065
3028000	MAGNETITE	18.170
3028001	HERCYNITE	5.019
3028100	HEMATITE	9.192
3028101	MAGHEMITE	1.773
3028102	LEPIDOCROCITE	2.709

3046001	MAGNESIOFERRITE	7.665
4128100	Fe(OH)2.7Cl.3	2.705
5028000	SIDERITE	0.122
5047000	RHODOCHROSITE	1.701
5046000	ARTINITE	0.330
5046002	MAGNESITE	0.611
5015000	ARAGONITE	2.099
5015001	CALCITE	2.253
5015002	DOLOMITE (ordered)	3.870
5015004	DOLOMITE (disordered)	3.300
5015003	HUNTITE	2.727
5080000	STRONTIANITE	0.037
7210000	Ba3(AsO4)2	11.816
8628000	GREENALITE	13.232
8646000	CHRYSOTILE	10.741
8646003	SEPIOLITE	6.193
8646004	SEPIOLITE (A)	3.514

MW5 - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	2.512E-08	-7.600	2.512E-08
30	Al+3	2.884E-05	-4.540	2.865E-05
61	H3AsO4	1.230E-04	-3.910	1.233E-04
90	H3BO3	8.511E-06	-5.070	8.418E-06
100	Ba+2	1.380E-07	-6.860	1.384E-07
150	Ca+2	2.570E-03	-2.590	2.570E-03
200	Co+2	1.000E-05	-5.000	9.978E-06
280	Fe+2	1.622E-05	-4.790	1.631E-05
410	K+1	9.120E-05	-4.040	9.207E-05
460	Mg+2	3.890E-04	-3.410	3.885E-04
470	Mn+2	1.230E-05	-4.910	1.232E-05
500	Na+1	2.188E-04	-3.660	2.188E-04
770	H4SiO4	2.344E-04	-3.630	2.371E-04
800	Sr+2	1.778E-06	-5.750	1.769E-06
731	S	8.318E-04	-3.080	8.357E-04
871	Ti(OH)3	2.291E-07	-6.640	2.297E-07
950	Zn+2	2.188E-06	-5.660	2.187E-06
732	SO4-2	2.630E-03	-2.580	2.602E-03
180	Cl-1	2.138E-04	-3.670	2.116E-04
140	CO3-2	1.000E-03	-3.000	1.000E-03
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
730	HS-1	1.000E-07	-7.000	0.000E+00
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 6.399E-03 Sum of ANIONS = 7.416E-03

PERCENT DIFFERENCE = 7.357E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED	SORBED	PRECIPITATED
		mol/L percent	mol/L percent	mol/L percent
330	H+1	-4.220E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
30	Al+3	2.865E-05 100.0	0.000E+00 0.0	0.000E+00 0.0
732	SO4-2	2.602E-03 100.0	0.000E+00 0.0	0.000E+00 0.0
90	H3BO3	8.418E-06 100.0	0.000E+00 0.0	0.000E+00 0.0

100	Ba+2	1.384E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
150	Ca+2	2.570E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
200	Co+2	9.978E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
280	Fe+2	1.207E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	9.207E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	3.885E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	1.232E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	2.188E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	2.371E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	1.769E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
731	S	8.357E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
871	Ti(OH)3	2.297E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
950	Zn+2	2.187E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
61	H3AsO4	1.212E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
180	Cl-1	2.116E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
140	CO3-2	1.000E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
471	Mn+3	1.802E-35	100.0	0.000E+00	0.0	0.000E+00	0.0
2	H2O	2.130E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
730	HS-1	1.398E-23	100.0	0.000E+00	0.0	0.000E+00	0.0
281	Fe+3	4.245E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
60	H3AsO3	2.122E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
1	E-1	-2.028E-64	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 4.872E-03 Sum of ANIONS 5.889E-03

PERCENT DIFFERENCE = 9.445E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 1.013E-02

EQUILIBRIUM pH = 9.803

EQUILIBRIUM pe = -4.292 or Eh = -249.61 mv

Saturation indices

ID No	Name	SI
2077002	QUARTZ	0.226
2003002	DIASPORE	1.634
2003003	GIBBSITE	0.239
2095003	Zn(OH)2 (gamma)	0.203
2095004	Zn(OH)2 (epsilon)	0.158
2095005	ZnO (active)	0.483
2095006	ZINCITE	0.335
2020002	Co(OH)2	0.434
2028000	WUSTITE	2.284
2028001	Fe(OH)2	0.421
2028100	FERRIHYDRITE	2.926
2028101	Fe3(OH)8	6.435
2028102	GOETHITE	5.664
3020002	CoFe2O4	29.254
3028000	MAGNETITE	22.632
3028001	HERCYNITE	7.784
3028100	HEMATITE	13.705
3028101	MAGHEMITE	6.287
3028102	LEPIDOCROCITE	4.965
3046001	MAGNESIOFERRITE	10.898
4128100	Fe(OH)2.7Cl3	5.320
4147000	MnCl2.4H2O	-15.370
4150000	HALITE	-9.020
5095000	SMITHSONITE	-1.596
5028000	SIDERITE	0.692
5047000	RHODOCHROSITE	1.512
5015000	ARAGONITE	1.522
5015001	CALCITE	1.677
5015002	DOLOMITE (ordered)	2.637
5015004	DOLOMITE (disordered)	2.066
5015003	HUNTITE	0.178

6010000 BARITE	0.145
7247000 Mn3(AsO4)2·8H2O	1.712
7210000 Ba3(AsO4)2	17.537
8603001 KAOLINITE	2.072
8628000 GREENALITE	13.463
8646000 CHRYSOTILE	7.290
8646003 SEPIOLITE	4.215
8646004 SEPIOLITE (A)	1.536

MW6 - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	2.818E-08	-7.550	2.818E-08
30	Al+3	5.129E-06	-5.290	5.078E-06
61	H3AsO4	9.772E-06	-5.010	9.677E-06
90	H3BO3	7.762E-06	-5.110	7.678E-06
100	Ba+2	3.236E-07	-6.490	3.204E-07
150	Ca+2	2.692E-03	-2.570	2.695E-03
200	Co+2	2.754E-06	-5.560	2.749E-06
280	Fe+2	3.388E-06	-5.470	3.402E-06
410	K+1	6.457E-05	-4.190	6.394E-05
460	Mg+2	2.239E-04	-3.650	2.214E-04
470	Mn+2	7.244E-06	-5.140	7.317E-06
500	Na+1	2.188E-04	-3.660	2.208E-04
770	H4SiO4	2.630E-04	-3.580	2.645E-04
800	Sr+2	1.514E-06	-5.820	1.529E-06
731	S	5.888E-04	-3.230	5.956E-04
871	Ti(OH)3	8.318E-08	-7.080	8.354E-08
950	Zn+2	1.698E-07	-6.770	1.682E-07
730	HS-1	4.571E-06	-5.340	4.534E-06
732	SO4-2	1.549E-03	-2.810	1.561E-03
180	Cl-1	8.511E-04	-3.070	8.463E-04
140	CO3-2	1.778E-03	-2.750	1.500E-03
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 6.164E-03 Sum of ANIONS = 6.973E-03

PERCENT DIFFERENCE = 6.159E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED mol/L	percent	SORBED mol/L	percent	PRECIPITATED mol/L	percent
61	H3AsO4	8.046E-08	100.0	0.000E+00	0.0	0.000E+00	0.0
30	Al+3	5.078E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
471	Mn+3	1.595E-38	100.0	0.000E+00	0.0	0.000E+00	0.0
90	H3BO3	7.678E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
100	Ba+2	3.204E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
150	Ca+2	2.695E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
200	Co+2	2.749E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
280	Fe+2	3.379E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	6.394E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	2.214E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	7.316E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	2.208E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	2.645E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	1.529E-06	100.0	0.000E+00	0.0	0.000E+00	0.0

731 S	5.956E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
871 Ti(OH)3	8.354E-08	100.0	0.000E+00	0.0	0.000E+00	0.0
950 Zn+2	1.682E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
730 HS-1	2.138E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
732 SO4-2	1.563E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
180 Cl-1	8.463E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
140 CO3-2	1.500E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
2 H2O	2.064E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
1 E-1	-1.739E-71	100.0	0.000E+00	0.0	0.000E+00	0.0
281 Fe+3	2.319E-08	100.0	0.000E+00	0.0	0.000E+00	0.0
60 H3AsO3	9.596E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
330 H+1	2.402E-06	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 4.415E-03 Sum of ANIONS 5.225E-03

PERCENT DIFFERENCE = 8.393E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 8.681E-03

EQUILIBRIUM pH = 10.336

EQUILIBRIUM pe = -7.057 or Eh = -410.44 mv

Saturation indices

ID No	Name	SI
1006000	ORPIMENT	1.601
1095000	ZnS (am)	1.254
1095001	SPHALERITE	3.696
1095002	WURTZITE	1.170
1020001	CoS (alpha)	4.485
1020002	CoS (beta)	8.115
1028000	FeS (ppt)	0.241
1028001	GREIGITE	1.123
1028002	MACKINAWITE	0.924
1028003	PYRITE	6.417
2003002	DIASPORE	0.352
2020002	Co(OH)2	0.073
2028000	WUSTITE	1.831
2028100	FERRIHYDRITE	0.156
2028101	Fe3(OH)8	0.356
2028102	GOETHITE	2.894
3020002	CoFe2O4	23.352
3028000	MAGNETITE	16.552
3028001	HERCYNITE	4.682
3028100	HEMATITE	8.164
3028101	MAGHEMITE	0.746
3028102	LEPIDOCROCITE	2.195
3046001	MAGNESIOFERRITE	6.165
4128100	Fe(OH)2.7Cl3	2.571
5047000	RHODOCHROSITE	1.658
5046002	MAGNESITE	0.103
5015000	ARAGONITE	1.929
5015001	CALCITE	2.083
5015002	DOLOMITE (ordered)	3.192
5015004	DOLOMITE (disordered)	2.622
5015003	HUNTITE	1.033
6010000	BARITE	0.288
7210000	Ba3(AsO4)2	13.266
8628000	GREENALITE	11.353
8646000	CHRYSOTILE	9.220
8646003	SEPIOLITE	5.090
8646004	SEPIOLITE (A)	2.411

MW7 - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	2.512E-07	-6.600	2.512E-07
30	Al+3	5.888E-06	-5.230	5.930E-06
61	H3AsO4	1.738E-05	-4.760	1.735E-05
90	H3BO3	8.710E-06	-5.060	8.696E-06
100	Ba+2	4.074E-07	-6.390	4.078E-07
150	Ca+2	3.631E-03	-2.440	3.668E-03
200	Co+2	2.188E-06	-5.660	2.206E-06
280	Fe+2	1.413E-04	-3.850	1.406E-04
410	K+1	5.370E-05	-4.270	5.422E-05
460	Mg+2	6.026E-04	-3.220	6.049E-04
470	Mn+2	2.570E-05	-4.590	2.548E-05
500	Na+1	3.467E-04	-3.460	3.436E-04
770	H4SiO4	4.365E-04	-3.360	4.379E-04
800	Sr+2	2.692E-06	-5.570	2.682E-06
731	S	2.951E-04	-3.530	2.956E-04
871	Ti(OH)3	4.169E-08	-7.380	4.177E-08
950	Zn+2	1.820E-07	-6.740	1.835E-07
730	HS-1	3.020E-06	-5.520	3.023E-06
732	SO4-2	2.291E-03	-2.640	2.290E-03
180	Cl-1	2.138E-04	-3.670	2.116E-04
140	CO3-2	4.786E-03	-2.320	2.500E-03
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 9.305E-03 Sum of ANIONS = 9.795E-03

PERCENT DIFFERENCE = 2.565E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED	SORBED	PRECIPITATED
		mol/L percent	mol/L percent	mol/L percent
61	H3AsO4	2.917E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
30	Al+3	5.930E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
471	Mn+3	5.155E-37 100.0	0.000E+00 0.0	0.000E+00 0.0
90	H3BO3	8.696E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
100	Ba+2	4.078E-07 100.0	0.000E+00 0.0	0.000E+00 0.0
150	Ca+2	3.668E-03 100.0	0.000E+00 0.0	0.000E+00 0.0
200	Co+2	2.206E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
280	Fe+2	1.359E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
410	K+1	5.422E-05 100.0	0.000E+00 0.0	0.000E+00 0.0
460	Mg+2	6.049E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
470	Mn+2	2.548E-05 100.0	0.000E+00 0.0	0.000E+00 0.0
500	Na+1	3.436E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
770	H4SiO4	4.379E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
800	Sr+2	2.682E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
731	S	2.956E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
871	Ti(OH)3	4.177E-08 100.0	0.000E+00 0.0	0.000E+00 0.0
950	Zn+2	1.835E-07 100.0	0.000E+00 0.0	0.000E+00 0.0
730	HS-1	2.459E-12 100.0	0.000E+00 0.0	0.000E+00 0.0
732	SO4-2	2.293E-03 100.0	0.000E+00 0.0	0.000E+00 0.0
180	Cl-1	2.116E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
140	CO3-2	2.500E-03 100.0	0.000E+00 0.0	0.000E+00 0.0
2	H2O	4.976E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
1	E-1	-1.877E-68 100.0	0.000E+00 0.0	0.000E+00 0.0
281	Fe+3	4.681E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
60	H3AsO3	1.443E-05 100.0	0.000E+00 0.0	0.000E+00 0.0

330 H+1 -1.407E-06 100.0 0.000E+00 0.0 0.000E+00 0.0

Charge Balance: SPECIATED

Sum of CATIONS = 6.116E-03 Sum of ANIONS 6.606E-03

PERCENT DIFFERENCE = 3.851E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 1.175E-02

EQUILIBRIUM pH = 10.186

EQUILIBRIUM pe = -6.138 or Eh = -356.98 mv

Saturation indices

ID No	Name	SI
1095001	SPHALERITE	0.459
1020002	CoS (beta)	2.237
2077002	QUARTZ	0.295
2003002	DIASPORE	0.564
2028000	WUSTITE	3.403
2028001	Fe(OH)2	1.559
2028100	FERRIHYDRITE	2.601
2028101	Fe3(OH)8	6.925
2028102	GOETHITE	5.340
3020002	CoFe2O4	28.087
3028000	MAGNETITE	23.121
3028001	HERCYNITE	6.783
3028100	HEMATITE	13.056
3028101	MAGHEMITE	5.638
3028102	LEPIDOCROCITE	4.641
3046001	MAGNESIOFERRITE	11.144
4128100	Fe(OH)2.7Cl3	4.879
5028000	SIDERITE	1.600
5047000	RHODOCHROSITE	2.323
5046002	MAGNESITE	0.618
5015000	ARAGONITE	2.132
5015001	CALCITE	2.287
5015002	DOLOMITE (ordered)	3.911
5015004	DOLOMITE (disordered)	3.340
5015003	HUNTITE	2.781
5080000	STRONTIANITE	0.045
6010000	BARITE	0.485
7247000	Mn3(AsO4)2.8H2O	0.008
7210000	Ba3(AsO4)2	16.264
8603001	KAOLINITE	0.070
8628000	GREENALITE	17.017
8646000	CHRYSOTILE	10.112
8646003	SEPIOLITE	6.212
8646004	SEPIOLITE (A)	3.533

Core S1 - 45cm Depth - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	1.000E-07	-7.000	7.943E-08
30	Al+3	5.012E-04	-3.300	5.041E-04
61	H3AsO4	6.761E-05	-4.170	6.714E-05
150	Ca+2	1.514E-03	-2.820	1.522E-03
280	Fe+2	3.236E-04	-3.490	3.205E-04
410	K+1	5.248E-05	-4.280	5.294E-05
460	Mg+2	5.129E-04	-3.290	5.144E-04

470 Mn+2	1.122E-05	-4.950	1.110E-05
500 Na+1	1.445E-03	-2.840	1.457E-03
770 H4SiO4	1.000E-03	-3.000	1.007E-03
800 Sr+2	1.413E-06	-5.850	1.404E-06
731 S	3.715E-04	-3.430	3.679E-04
871 Ti(OH)3	3.715E-06	-5.430	3.676E-06
950 Zn+2	8.710E-06	-5.060	8.657E-06
730 HS-1	3.020E-06	-5.520	3.023E-06
732 SO4-2	3.890E-03	-2.410	3.903E-03
140 CO3-2	1.413E-04	-3.850	1.400E-04
231 Cu+2	5.129E-06	-5.290	5.114E-06
740 Sb(OH)3	4.898E-06	-5.310	4.862E-06
281 Fe+3	1.000E-07	-7.000	0.000E+00
1 E-1	1.000E-07	-7.000	0.000E+00
60 H3AsO3	1.000E-07	-7.000	0.000E+00
741 Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471 Mn+3	1.000E-07	-7.000	0.000E+00
2 H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 7.789E-03 Sum of ANIONS = 8.089E-03

PERCENT DIFFERENCE = 1.892E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED	SORBED	PRECIPITATED
		mol/L percent	mol/L percent	mol/L percent
61	H3AsO4	5.173E-05 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
30	Al+3	5.041E-04 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
471	Mn+3	3.543E-28 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
150	Ca+2	1.522E-03 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
280	Fe+2	3.205E-04 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
410	K+1	5.294E-05 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
460	Mg+2	5.144E-04 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
470	Mn+2	1.110E-05 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
500	Na+1	1.457E-03 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
770	H4SiO4	1.007E-03 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
800	Sr+2	1.404E-06 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
731	S	3.679E-04 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
871	Ti(OH)3	3.676E-06 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
950	Zn+2	8.657E-06 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
730	HS-1	8.518E-04 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
732	SO4-2	3.906E-03 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
140	CO3-2	1.400E-04 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
231	Cu+2	5.114E-06 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
740	Sb(OH)3	1.546E-06 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
2	H2O	2.040E-04 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
330	H+1	6.403E-06 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
281	Fe+3	1.343E-08 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
60	H3AsO3	1.541E-05 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
741	Sb(OH)6-	3.316E-06 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
1	E-1	-3.402E-71 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0

Charge Balance: SPECIATED

Sum of CATIONS = 5.909E-03 Sum of ANIONS 6.209E-03

PERCENT DIFFERENCE = 2.479E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 1.122E-02

EQUILIBRIUM pH = 5.301

EQUILIBRIUM pe = 3.027 or Eh = 176.05 mv

Saturation indices

ID No	Name	SI
2074102	SbO2	5.736
2074001	Sb2O4	0.839
2077000	CHALCEDONY	0.613
2077001	CRISTOBALITE	0.414
2077002	QUARTZ	1.071
2003000	Al(OH)3 (am)	0.110
2003001	BOEHMITE	2.312
2003002	DIASPORE	4.061
2003003	GIBBSITE	2.666
2087100	AVICENNITE	2.133
2087101	Ti(OH)3	0.007
2028102	GOETHITE	1.303
3003000	Al2O3	2.059
3028000	MAGNETITE	6.732
3028001	HERCYNITE	5.460
3028100	HEMATITE	4.983
3028102	LEPIDOCROCITE	0.604
3023100	CUPRIC FERRITE	2.350
6003000	Al(OH)SO4	1.168
6003001	Al(OH)10SO4	8.964
8603000	HALLOYSITE	6.375
8603001	KAOLINITE	8.615

Core S1 - 45cm Depth - Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	1.000E-07	-7.000	7.943E-08
30	Al+3	5.012E-04	-3.300	5.041E-04
61	H3AsO4	6.761E-05	-4.170	6.714E-05
150	Ca+2	1.514E-03	-2.820	1.522E-03
280	Fe+2	3.236E-04	-3.490	3.205E-04
410	K+1	5.248E-05	-4.280	5.294E-05
460	Mg+2	5.129E-04	-3.290	5.144E-04
470	Mn+2	1.122E-05	-4.950	1.110E-05
500	Na+1	1.445E-03	-2.840	1.457E-03
770	H4SiO4	1.000E-03	-3.000	1.007E-03
800	Sr+2	1.413E-06	-5.850	1.404E-06
731	S	3.715E-04	-3.430	3.679E-04
950	Zn+2	8.710E-06	-5.060	8.657E-06
730	HS-1	3.020E-06	-5.520	3.023E-06
732	SO4-2	3.890E-03	-2.410	3.903E-03
140	CO3-2	1.413E-04	-3.850	1.400E-04
231	Cu+2	5.129E-06	-5.290	5.114E-06
740	Sb(OH)3	4.898E-06	-5.310	4.862E-06
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
741	Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
811	ADSITYP1	1.000E+00	0.000	0.000E+00
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 7.789E-03 Sum of ANIONS = 8.089E-03

PERCENT DIFFERENCE = 1.892E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED		SORBED		PRECIPITATED	
		mol/L	percent	mol/L	percent	mol/L	percent
471	Mn+3	3.502E-28	100.0	0.000E+00	0.0	0.000E+00	0.0
30	Al+3	5.041E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
61	H3AsO4	5.100E-05	98.6	7.362E-07	1.4	0.000E+00	0.0
150	Ca+2	1.522E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
280	Fe+2	3.205E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	5.294E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	5.144E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	1.110E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	1.457E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	1.007E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	1.404E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
731	S	3.679E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
950	Zn+2	7.426E-08	0.9	8.583E-06	99.1	0.000E+00	0.0
730	HS-1	9.041E-40	100.0	0.000E+00	0.0	0.000E+00	0.0
732	SO4-2	3.906E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
140	CO3-2	1.400E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
231	Cu+2	1.995E-08	0.4	5.094E-06	99.6	0.000E+00	0.0
740	Sb(OH)3	1.560E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
2	H2O	2.048E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
60	H3AsO3	1.540E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
741	Sb(OH)6-	3.302E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
1	E-1	-3.333E-71	100.0	0.000E+00	0.0	0.000E+00	0.0
330	H+1	6.391E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
281	Fe+3	1.336E-08	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 5.886E-03 Sum of ANIONS 6.213E-03

PERCENT DIFFERENCE = 2.708E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 1.120E-02

EQUILIBRIUM pH = 5.302

EQUILIBRIUM pe = 3.022 or Eh = 175.78 mv

Saturation indices

ID No	Name	SI
2074102	SbO2	5.737
2074001	Sb2O4	0.840
2074004	Sb(OH)3	1.098
2074006	SENARMONTITE	0.254
2077000	CHALCEDONY	0.613
2077001	CRISTOBALITE	0.414
2077002	QUARTZ	1.071
2003000	Al(OH)3 (am)	0.113
2003001	BOEHMITE	2.315
2003002	DIASPORE	4.064
2003003	GIBBSITE	2.669
2028102	GOETHITE	1.302
3003000	Al2O3	2.065
3028000	MAGNETITE	6.732
3028001	HERCYNITE	5.468
3028100	HEMATITE	4.981
3028102	LEPIDOCROCITE	0.603
6003000	AlOHSO4	1.169
6003001	Al4(OH)10SO4	8.974
8603000	HALLOYSITE	6.381

8603001 KAOLINITE 8.621

Core S1 - 75cm Depth - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	1.585E-07	-6.800	1.585E-07
30	Al+3	2.951E-05	-4.530	2.958E-05
61	H3AsO4	6.918E-05	-4.160	6.941E-05
150	Ca+2	1.122E-03	-2.950	1.128E-03
200	Co+2	1.000E+00	0.000	4.242E-07
280	Fe+2	1.738E-05	-4.760	1.755E-05
410	K+1	1.000E-04	-4.000	1.010E-04
460	Mg+2	2.188E-04	-3.660	2.206E-04
470	Mn+2	1.072E-06	-5.970	1.074E-06
770	H4SiO4	3.020E-04	-3.520	3.005E-04
800	Sr+2	1.175E-06	-5.930	1.176E-06
731	S	2.188E-03	-2.660	2.164E-03
871	Ti(OH)3	1.445E-07	-6.840	1.462E-07
950	Zn+2	4.467E-07	-6.350	4.436E-07
732	SO4-2	2.630E-03	-2.580	2.602E-03
140	CO3-2	4.677E-04	-3.330	4.667E-04
231	Cu+2	2.344E-07	-6.630	2.360E-07
740	Sb(OH)3	2.884E-05	-4.540	2.891E-05
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
741	Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
730	HS-1	1.000E-07	-7.000	0.000E+00
500	Na+1	1.950E-03	-2.710	3.000E-03
90	H3BO3	5.129E-06	-5.290	5.180E-06
100	Ba+2	1.950E-07	-6.710	1.966E-07
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 5.929E-03 Sum of ANIONS = 6.137E-03

PERCENT DIFFERENCE = 1.725E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED mol/L	percent	SORBED mol/L	percent	PRECIPITATED mol/L	percent
330	H+1	1.168E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
30	Al+3	2.958E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
90	H3BO3	5.180E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
150	Ca+2	1.128E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
200	Co+2	4.242E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
280	Fe+2	1.632E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	1.010E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	2.206E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	1.074E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	3.005E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	1.176E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
731	S	2.164E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
871	Ti(OH)3	1.462E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
950	Zn+2	4.436E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
732	SO4-2	2.602E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
140	CO3-2	4.667E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
231	Cu+2	2.360E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
740	Sb(OH)3	2.667E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	3.000E-03	100.0	0.000E+00	0.0	0.000E+00	0.0

471	Mn+3	3.472E-36	100.0	0.000E+00	0.0	0.000E+00	0.0
61	H3AsO4	6.655E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
100	Ba+2	1.966E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
2	H2O	1.356E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
730	HS-1	1.997E-23	100.0	0.000E+00	0.0	0.000E+00	0.0
281	Fe+3	1.231E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
60	H3AsO3	2.855E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
741	Sb(OH)6-	2.239E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
1	E-1	-1.176E-66	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 5.238E-03 Sum of ANIONS 5.446E-03

PERCENT DIFFERENCE = 1.948E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 8.884E-03

EQUILIBRIUM pH = 9.480

EQUILIBRIUM pe = -3.942 or Eh = -229.30 mv

Saturation indices

ID No	Name	SI
2074102	SbO2	4.182
2074004	Sb(OH)3	2.330
2074006	SENARMONTITE	2.717
2077002	QUARTZ	0.430
2003001	BOEHMITE	0.224
2003002	DIASPORE	1.973
2003003	GIBBSITE	0.578
2023100	Cu(OH)2	0.493
2023101	TENORITE	1.498
2028000	WUSTITE	1.990
2028001	Fe(OH)2	0.147
2028100	FERRIHYDRITE	2.678
2028101	Fe3(OH)8	5.666
2028102	GOETHITE	5.417
3020002	CoFe2O4	27.153
3028000	MAGNETITE	21.863
3028001	HERCYNITE	8.188
3028100	HEMATITE	13.210
3028101	MAGHEMITE	5.792
3028102	LEPIDOCROCITE	4.718
3046001	MAGNESIOFERRITE	9.534
3023100	CUPRIC FERRITE	14.897
5023101	MALACHITE	0.866
5028000	SIDERITE	0.563
5015000	ARAGONITE	0.691
5015001	CALCITE	0.845
5015002	DOLOMITE (ordered)	1.081
5015004	DOLOMITE (disordered)	0.510
6010000	BARITE	0.365
7210000	Ba3(AsO4)2	16.927
8603000	HALLOYSITE	0.918
8603001	KAOLINITE	3.158
8628000	GREENALITE	13.049
8646000	CHRYSOTILE	5.090
8646003	SEPIOLITE	3.088
8646004	SEPIOLITE (A)	0.409

Core S1 - 75cm Depth - Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
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330 H+1	1.585E-07	-6.800	1.585E-07
30 Al+3	2.951E-05	-4.530	2.958E-05
61 H3AsO4	6.918E-05	-4.160	6.941E-05
150 Ca+2	1.122E-03	-2.950	1.128E-03
200 Co+2	1.000E+00	0.000	4.242E-07
280 Fe+2	1.738E-05	-4.760	1.755E-05
410 K+1	1.000E-04	-4.000	1.010E-04
460 Mg+2	2.188E-04	-3.660	2.206E-04
470 Mn+2	1.072E-06	-5.970	1.074E-06
770 H4SiO4	3.020E-04	-3.520	3.005E-04
800 Sr+2	1.175E-06	-5.930	1.176E-06
731 S	2.188E-03	-2.660	2.164E-03
950 Zn+2	4.467E-07	-6.350	4.436E-07
732 SO4-2	2.630E-03	-2.580	2.602E-03
140 CO3-2	4.677E-04	-3.330	4.667E-04
231 Cu+2	2.344E-07	-6.630	2.360E-07
740 Sb(OH)3	2.884E-05	-4.540	2.891E-05
281 Fe+3	1.000E-07	-7.000	0.000E+00
1 E-1	1.000E-07	-7.000	0.000E+00
60 H3AsO3	1.000E-07	-7.000	0.000E+00
741 Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471 Mn+3	1.000E-07	-7.000	0.000E+00
730 HS-1	1.000E-07	-7.000	0.000E+00
500 Na+1	1.950E-03	-2.710	3.000E-03
90 H3BO3	5.129E-06	-5.290	5.180E-06
100 Ba+2	1.950E-07	-6.710	1.966E-07
811 ADSITYP1	1.000E+00	0.000	0.000E+00
2 H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 5.929E-03 Sum of ANIONS = 6.137E-03

PERCENT DIFFERENCE = 1.725E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED		SORBED		PRECIPITATED	
		mol/L	percent	mol/L	percent	mol/L	percent
330 H+1		1.142E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
30 Al+3		2.958E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
471 Mn+3		3.420E-36	100.0	0.000E+00	0.0	0.000E+00	0.0
150 Ca+2		1.128E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
200 Co+2		3.715E-10	0.1	4.238E-07	99.9	0.000E+00	0.0
280 Fe+2		1.630E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
410 K+1		1.010E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
460 Mg+2		2.206E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470 Mn+2		1.074E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
770 H4SiO4		3.005E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800 Sr+2		1.176E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
731 S		2.164E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
950 Zn+2		2.969E-09	0.7	4.406E-07	99.3	0.000E+00	0.0
90 H3BO3		5.180E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
140 CO3-2		4.667E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
231 Cu+2		2.228E-08	9.4	2.137E-07	90.6	0.000E+00	0.0
740 Sb(OH)3		2.668E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
100 Ba+2		1.966E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
500 Na+1		3.000E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
61 H3AsO4		6.655E-05	100.0	1.122E-13	0.0	0.000E+00	0.0
732 SO4-2		2.602E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
2 H2O		1.346E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
741 Sb(OH)6-		2.231E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
1 E-1		-1.187E-66	100.0	0.000E+00	0.0	0.000E+00	0.0
730 HS-1		2.081E-23	100.0	0.000E+00	0.0	0.000E+00	0.0
281 Fe+3		1.248E-06	100.0	0.000E+00	0.0	0.000E+00	0.0

60 H3AsO3 2.855E-06 100.0 0.000E+00 0.0 0.000E+00 0.0

Charge Balance: SPECIATED

Sum of CATIONS = 5.237E-03 Sum of ANIONS 5.447E-03

PERCENT DIFFERENCE = 1.968E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 8.884E-03

EQUILIBRIUM pH = 9.484

EQUILIBRIUM pe = -3.949 or Eh = -229.68 mv

Saturation indices

ID No	Name	SI
2074102	SbO2	4.179
2074004	Sb(OH)3	2.330
2074006	SENARMONTITE	2.717
2077002	QUARTZ	0.429
2003001	BOEHMITE	0.221
2003002	DIASPORE	1.969
2003003	GIBBSITE	0.574
2023101	TENORITE	0.475
2028000	WUSTITE	1.996
2028001	Fe(OH)2	0.152
2028100	FERRIHYDRITE	2.681
2028101	Fe3(OH)8	5.677
2028102	GOETHITE	5.419
3020002	CoFe2O4	24.104
3028000	MAGNETITE	21.873
3028001	HERCYNITE	8.186
3028100	HEMATITE	13.216
3028101	MAGHEMITE	5.797
3028102	LEPIDOCROCITE	4.720
3046001	MAGNESIOFERRITE	9.547
3023100	CUPRIC FERRITE	13.879
5028000	SIDERITE	0.564
5015000	ARAGONITE	0.694
5015001	CALCITE	0.848
5015002	DOLOMITE (ordered)	1.087
5015004	DOLOMITE (disordered)	0.516
7210000	Ba3(AsO4)2	16.934
8603000	HALLOYSITE	0.909
8603001	KAOLINITE	3.149
8628000	GREENALITE	13.063
8646000	CHRYSOTILE	5.110
8646003	SEPIOLITE	3.100
8646004	SEPIOLITE (A)	0.421

COre S2 - 15cm depth - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	1.000E-07	-7.000	6.607E-07
30	Al+3	4.266E-04	-3.370	4.262E-04
61	H3AsO4	7.762E-06	-5.110	7.742E-06
90	H3BO3	8.710E-06	-5.060	8.788E-06
100	Ba+2	9.120E-07	-6.040	9.175E-07
150	Ca+2	1.259E-03	-2.900	1.257E-03
200	Co+2	3.020E-06	-5.520	3.021E-06
231	Cu+2	1.122E-06	-5.950	1.133E-06
280	Fe+2	1.950E-04	-3.710	1.970E-04

410 K+1	6.761E-05	-4.170	6.752E-04
460 Mg+2	4.365E-04	-3.360	4.362E-04
470 Mn+2	6.310E-06	-5.200	6.298E-06
500 Na+1	1.738E-04	-3.760	5.731E-04
770 H4SiO4	7.586E-04	-3.120	7.547E-04
800 Sr+2	1.047E-06	-5.980	1.050E-06
731 S	6.761E-04	-3.170	6.704E-04
871 Ti(OH)3	9.333E-06	-5.030	9.440E-06
950 Zn+2	2.754E-06	-5.560	2.768E-06
732 SO4-2	3.236E-03	-2.490	3.253E-03
140 CO3-2	6.761E-03	-2.170	6.770E-04
740 Sb(OH)3	2.344E-06	-5.630	2.341E-06
281 Fe+3	1.000E-07	-7.000	0.000E+00
1 E-1	1.000E-07	-7.000	0.000E+00
60 H3AsO3	1.000E-07	-7.000	0.000E+00
741 Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471 Mn+3	1.000E-07	-7.000	0.000E+00
730 HS-1	1.000E-07	-7.000	0.000E+00
2 H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 6.338E-03 Sum of ANIONS = 7.860E-03

PERCENT DIFFERENCE = 1.072E+01 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED	SORBED	PRECIPITATED
		mol/L percent	mol/L percent	mol/L percent
330 H+1	2.202E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
30 Al+3	4.262E-04	100.0	0.000E+00	0.0 0.000E+00 0.0
471 Mn+3	6.645E-30	100.0	0.000E+00	0.0 0.000E+00 0.0
90 H3BO3	8.788E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
100 Ba+2	9.175E-07	100.0	0.000E+00	0.0 0.000E+00 0.0
150 Ca+2	1.257E-03	100.0	0.000E+00	0.0 0.000E+00 0.0
200 Co+2	3.021E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
231 Cu+2	1.133E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
280 Fe+2	1.970E-04	100.0	0.000E+00	0.0 0.000E+00 0.0
410 K+1	6.752E-04	100.0	0.000E+00	0.0 0.000E+00 0.0
460 Mg+2	4.362E-04	100.0	0.000E+00	0.0 0.000E+00 0.0
470 Mn+2	6.298E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
500 Na+1	5.731E-04	100.0	0.000E+00	0.0 0.000E+00 0.0
770 H4SiO4	7.547E-04	100.0	0.000E+00	0.0 0.000E+00 0.0
800 Sr+2	1.050E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
731 S	6.704E-04	100.0	0.000E+00	0.0 0.000E+00 0.0
871 Ti(OH)3	9.440E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
950 Zn+2	2.768E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
61 H3AsO4	6.163E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
140 CO3-2	6.770E-04	100.0	0.000E+00	0.0 0.000E+00 0.0
740 Sb(OH)3	7.745E-07	100.0	0.000E+00	0.0 0.000E+00 0.0
732 SO4-2	3.253E-03	100.0	0.000E+00	0.0 0.000E+00 0.0
2 H2O	1.022E-03	100.0	0.000E+00	0.0 0.000E+00 0.0
730 HS-1	1.022E-37	100.0	0.000E+00	0.0 0.000E+00 0.0
281 Fe+3	2.533E-08	100.0	0.000E+00	0.0 0.000E+00 0.0
60 H3AsO3	1.579E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
741 Sb(OH)6-	1.566E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
1 E-1	-1.519E-69	100.0	0.000E+00	0.0 0.000E+00 0.0

Charge Balance: SPECIATED

Sum of CATIONS = 4.546E-03 Sum of ANIONS 6.068E-03

PERCENT DIFFERENCE = 1.434E+01 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 9.668E-03

EQUILIBRIUM pH = 6.271

EQUILIBRIUM pe = 1.560 or Eh = 90.76 mv

Saturation indices

ID No	Name	SI
2074102	SbO2	4.940
2074004	Sb(OH)3	0.794
2077000	CHALCEDONY	0.488
2077001	CRISTOBALITE	0.289
2077002	QUARTZ	0.946
2003000	Al(OH)3 (am)	1.582
2003001	BOEHMITE	3.784
2003002	DIASPORE	5.533
2003003	GIBBSITE	4.138
2087100	AVICENNITE	2.952
2087101	Ti(OH)3	0.417
2028102	GOETHITE	2.549
3003000	Al2O3	5.003
3020002	CoFe2O4	16.244
3028000	MAGNETITE	10.965
3028001	HERCYNITE	10.146
3028100	HEMATITE	7.475
3028101	MAGHEMITE	0.056
3028102	LEPIDOCROCITE	1.850
3023100	CUPRIC FERRITE	6.099
6003001	Al4(OH)10SO4	12.890
7210000	Ba3(AsO4)2	9.107
8603000	HALLOYSITE	9.069
8603001	KAOLINITE	11.308

Core S2 - 45cm Depth - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	6.310E-08	-7.200	6.310E-08
30	Al+3	1.698E-04	-3.770	1.698E-04
61	H3AsO4	1.318E-05	-4.880	1.316E-05
150	Ca+2	8.128E-04	-3.090	1.000E-03
200	Co+2	2.570E-06	-5.590	2.562E-06
231	Cu+2	6.918E-07	-6.160	6.924E-07
280	Fe+2	9.772E-05	-4.010	9.866E-05
410	K+1	3.020E-04	-3.520	3.043E-04
460	Mg+2	2.630E-04	-3.580	2.650E-04
470	Mn+2	3.467E-06	-5.460	3.440E-06
500	Na+1	2.138E-04	-3.670	2.127E-04
770	H4SiO4	4.169E-04	-3.380	4.130E-04
800	Sr+2	4.786E-07	-6.320	4.793E-07
731	S	1.349E-03	-2.870	1.360E-03
740	Sb(OH)3	5.129E-06	-5.290	5.101E-06
871	Ti(OH)3	1.820E-06	-5.740	1.817E-06
950	Zn+2	2.089E-06	-5.680	2.111E-06
730	HS-1	3.020E-06	-5.520	3.023E-06
732	SO4-2	2.188E-03	-2.660	2.212E-03
140	CO3-2	2.399E-03	-2.620	8.000E-05
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
741	Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 3.772E-03 Sum of ANIONS = 4.587E-03

PERCENT DIFFERENCE = 9.746E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED mol/L	percent	SORBED mol/L	percent	PRECIPITATED mol/L	percent
61	H3AsO4	8.535E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
30	Al+3	1.698E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
471	Mn+3	7.999E-30	100.0	0.000E+00	0.0	0.000E+00	0.0
150	Ca+2	1.000E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
200	Co+2	2.562E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
231	Cu+2	6.924E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
280	Fe+2	9.866E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	3.043E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	2.650E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	3.440E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	2.127E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	4.130E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	4.793E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
731	S	1.360E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
740	Sb(OH)3	4.887E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
871	Ti(OH)3	1.817E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
950	Zn+2	2.111E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
730	HS-1	6.993E-33	100.0	0.000E+00	0.0	0.000E+00	0.0
732	SO4-2	2.215E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
140	CO3-2	8.000E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
2	H2O	1.469E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
330	H+1	3.299E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
281	Fe+3	8.347E-10	100.0	0.000E+00	0.0	0.000E+00	0.0
60	H3AsO3	1.231E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
741	Sb(OH)6-	2.141E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
1	E-1	-1.101E-74	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 3.018E-03 Sum of ANIONS 3.832E-03

PERCENT DIFFERENCE = 1.189E+01 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 6.543E-03

EQUILIBRIUM pH = 5.480

EQUILIBRIUM pe = 1.919 or Eh = 111.62 mv

Saturation indices

ID No	Name	SI
2074102	SbO2	5.307
2074004	Sb(OH)3	1.594
2074006	SENARMONTITE	1.244
2077000	CHALCEDONY	0.226
2077001	CRISTOBALITE	0.026
2077002	QUARTZ	0.683
2003000	Al(OH)3 (am)	0.170
2003001	BOEHMITE	2.372
2003002	DIASPORE	4.120

2003003 GIBBSITE	2.725
2087100 AVICENNITE	1.520
2028102 GOETHITE	0.285
3003000 Al2O3	2.178
3020002 CoFe2O4	10.115
3028000 MAGNETITE	4.607
3028001 HERCYNITE	5.490
3028100 HEMATITE	2.947
6003000 AlOHSO4	0.705
6003001 Al4(OH)10SO4	8.679
8603000 HALLOYSITE	5.719
8603001 KAOLINITE	7.959

Core S2 - 45cm Depth - Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	6.310E-08	-7.200	6.310E-08
30	Al+3	1.698E-04	-3.770	1.698E-04
61	H3AsO4	1.318E-05	-4.880	1.316E-05
150	Ca+2	8.128E-04	-3.090	1.000E-03
200	Co+2	2.570E-06	-5.590	2.562E-06
231	Cu+2	6.918E-07	-6.160	6.924E-07
280	Fe+2	9.772E-05	-4.010	9.866E-05
410	K+1	3.020E-04	-3.520	3.043E-04
460	Mg+2	2.630E-04	-3.580	2.650E-04
470	Mn+2	3.467E-06	-5.460	3.440E-06
500	Na+1	2.138E-04	-3.670	2.127E-04
770	H4SiO4	4.169E-04	-3.380	4.130E-04
800	Sr+2	4.786E-07	-6.320	4.793E-07
731	S	1.349E-03	-2.870	1.360E-03
740	Sb(OH)3	5.129E-06	-5.290	5.101E-06
950	Zn+2	2.089E-06	-5.680	2.111E-06
730	HS-1	3.020E-06	-5.520	3.023E-06
732	SO4-2	2.188E-03	-2.660	2.212E-03
140	CO3-2	2.399E-03	-2.620	8.000E-05
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
741	Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
811	ADSITYP1	1.000E+00	0.000	0.000E+00
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 3.772E-03 Sum of ANIONS = 4.587E-03

PERCENT DIFFERENCE = 9.746E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED	SORBED	PRECIPITATED
		mol/L percent	mol/L percent	mol/L percent
61	H3AsO4	8.238E-07 95.7	3.669E-08 4.3	0.000E+00 0.0
30	Al+3	1.698E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
471	Mn+3	7.854E-30 100.0	0.000E+00 0.0	0.000E+00 0.0
150	Ca+2	1.000E-03 100.0	0.000E+00 0.0	0.000E+00 0.0
200	Co+2	4.312E-09 0.2	2.558E-06 99.8	0.000E+00 0.0
231	Cu+2	4.801E-10 0.1	6.919E-07 99.9	0.000E+00 0.0
280	Fe+2	9.866E-05 100.0	0.000E+00 0.0	0.000E+00 0.0
410	K+1	3.043E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
460	Mg+2	2.650E-04 100.0	0.000E+00 0.0	0.000E+00 0.0

470	Mn+2	3.440E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	2.127E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	4.130E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	4.793E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
731	S	1.360E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
740	Sb(OH)3	4.894E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
950	Zn+2	4.400E-09	0.2	2.107E-06	99.8	0.000E+00	0.0
730	HS-1	8.048E-33	100.0	0.000E+00	0.0	0.000E+00	0.0
732	SO4-2	2.215E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
140	CO3-2	8.000E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
2	H2O	1.470E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
741	Sb(OH)6-	2.071E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
1	E-1	-1.027E-74	100.0	0.000E+00	0.0	0.000E+00	0.0
330	H+1	3.291E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
281	Fe+3	8.205E-10	100.0	0.000E+00	0.0	0.000E+00	0.0
60	H3AsO3	1.230E-05	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 3.008E-03 Sum of ANIONS 3.834E-03

PERCENT DIFFERENCE = 1.206E+01 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 6.535E-03

EQUILIBRIUM pH = 5.480

EQUILIBRIUM pe = 1.911 or Eh = 111.16 mv

Saturation indices

ID No	Name	SI
2074102	SbO2	5.300
2074004	Sb(OH)3	1.594
2074006	SENARMONTITE	1.246
2077000	CHALCEDONY	0.226
2077001	CRISTOBALITE	0.026
2077002	QUARTZ	0.683
2003000	Al(OH)3 (am)	0.170
2003001	BOEHMITE	2.372
2003002	DIASPORE	4.121
2003003	GIBBSITE	2.726
2028102	GOETHITE	0.278
3003000	Al2O3	2.178
3020002	CoFe2O4	7.327
3028000	MAGNETITE	4.593
3028001	HERCYNITE	5.491
3028100	HEMATITE	2.933
6003000	Al(OH)SO4	0.705
6003001	Al4(OH)10SO4	8.680
8603000	HALLOYSITE	5.720
8603001	KAOLINITE	7.960

S2 - 130cm Depth - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	3.311E-08	-7.480	3.311E-08
30	Al+3	1.023E-03	-2.990	1.012E-03
61	H3AsO4	2.754E-05	-4.560	2.776E-05
90	H3BO3	1.862E-05	-4.730	1.850E-05
100	Ba+2	1.047E-04	-3.980	1.041E-04
150	Ca+2	1.259E-03	-2.900	1.267E-03
200	Co+2	5.012E-06	-5.300	5.006E-06

231 Cu+2	1.622E-06	-5.790	1.605E-06
280 Fe+2	5.129E-04	-3.290	5.085E-04
410 K+1	8.710E-05	-4.060	8.645E-05
460 Mg+2	7.586E-04	-3.120	5.650E-04
470 Mn+2	1.738E-05	-4.760	1.740E-05
500 Na+1	1.622E-04	-3.790	1.618E-04
770 H4SiO4	1.349E-03	-2.870	1.356E-03
800 Sr+2	7.586E-07	-6.120	7.647E-07
731 S	2.138E-04	-3.670	2.148E-04
740 Sb(OH)3	2.951E-06	-5.530	2.949E-06
871 Ti(OH)3	1.230E-05	-4.910	1.230E-05
950 Zn+2	5.370E-06	-5.270	5.353E-06
732 SO4-2	5.248E-04	-3.280	5.205E-04
140 CO3-2	2.344E-03	-2.630	2.995E-03
281 Fe+3	1.000E-07	-7.000	0.000E+00
1 E-1	1.000E-07	-7.000	0.000E+00
60 H3AsO3	1.000E-07	-7.000	0.000E+00
741 Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471 Mn+3	1.000E-07	-7.000	0.000E+00
730 HS-1	1.000E-07	-7.000	0.000E+00
2 H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 8.234E-03 Sum of ANIONS = 7.031E-03

PERCENT DIFFERENCE = 7.879E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED	SORBED	PRECIPITATED
		mol/L percent	mol/L percent	mol/L percent
330 H+1	2.072E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
30 Al+3	1.012E-03	100.0	0.000E+00	0.0 0.000E+00 0.0
471 Mn+3	2.826E-30	100.0	0.000E+00	0.0 0.000E+00 0.0
90 H3BO3	1.850E-05	100.0	0.000E+00	0.0 0.000E+00 0.0
100 Ba+2	1.041E-04	100.0	0.000E+00	0.0 0.000E+00 0.0
150 Ca+2	1.267E-03	100.0	0.000E+00	0.0 0.000E+00 0.0
200 Co+2	5.006E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
231 Cu+2	1.605E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
280 Fe+2	5.083E-04	100.0	0.000E+00	0.0 0.000E+00 0.0
410 K+1	8.645E-05	100.0	0.000E+00	0.0 0.000E+00 0.0
460 Mg+2	5.650E-04	100.0	0.000E+00	0.0 0.000E+00 0.0
470 Mn+2	1.740E-05	100.0	0.000E+00	0.0 0.000E+00 0.0
500 Na+1	1.618E-04	100.0	0.000E+00	0.0 0.000E+00 0.0
770 H4SiO4	1.356E-03	100.0	0.000E+00	0.0 0.000E+00 0.0
800 Sr+2	7.647E-07	100.0	0.000E+00	0.0 0.000E+00 0.0
731 S	2.148E-04	100.0	0.000E+00	0.0 0.000E+00 0.0
740 Sb(OH)3	6.843E-07	100.0	0.000E+00	0.0 0.000E+00 0.0
871 Ti(OH)3	1.230E-05	100.0	0.000E+00	0.0 0.000E+00 0.0
950 Zn+2	5.353E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
61 H3AsO4	2.538E-05	100.0	0.000E+00	0.0 0.000E+00 0.0
140 CO3-2	2.995E-03	100.0	0.000E+00	0.0 0.000E+00 0.0
732 SO4-2	5.205E-04	100.0	0.000E+00	0.0 0.000E+00 0.0
2 H2O	3.568E-03	100.0	0.000E+00	0.0 0.000E+00 0.0
730 HS-1	6.139E-38	100.0	0.000E+00	0.0 0.000E+00 0.0
281 Fe+3	2.264E-07	100.0	0.000E+00	0.0 0.000E+00 0.0
60 H3AsO3	2.378E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
741 Sb(OH)6-	2.265E-06	100.0	0.000E+00	0.0 0.000E+00 0.0
1 E-1	-2.449E-67	100.0	0.000E+00	0.0 0.000E+00 0.0

Charge Balance: SPECIATED

Sum of CATIONS = 5.097E-03 Sum of ANIONS 3.894E-03

PERCENT DIFFERENCE = 1.338E+01 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 7.271E-03

EQUILIBRIUM pH = 6.907

EQUILIBRIUM pe = 0.717 or Eh = 41.71 mv

Saturation indices

ID No	Name	SI
2074004	Sb(OH)3	0.740
2077000	CHALCEDONY	0.742
2077001	CRISTOBALITE	0.543
2077002	QUARTZ	1.200
2003000	Al(OH)3 (am)	1.959
2003001	BOEHMITE	4.161
2003002	DIASPORE	5.910
2003003	GIBBSITE	4.515
2087100	AVICENNITE	3.181
2087101	Ti(OH)3	0.532
2028100	FERRIHYDRITE	1.389
2028102	GOETHITE	4.128
3003000	Al2O3	5.756
3020002	CoFe2O4	20.945
3028000	MAGNETITE	15.909
3028001	HERCYNITE	12.686
3028100	HEMATITE	10.632
3028101	MAGHEMITE	3.214
3028102	LEPIDOCROCITE	3.429
3046001	MAGNESIOFERRITE	2.294
3023100	CUPRIC FERRITE	10.217
5023101	MALACHITE	0.046
5028000	SIDERITE	0.573
6003001	Al4(OH)10SO4	12.321
6010000	BARITE	2.377
7210000	Ba3(AsO4)2	18.652
8603000	HALLOYSITE	10.330
8603001	KAOLINITE	12.570
8628000	GREENALITE	4.463

Core S3 - 45cm Depth - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	1.259E-08	-7.900	1.259E-08
30	Al+3	3.467E-04	-3.460	3.488E-04
61	H3AsO4	5.129E-05	-4.290	5.139E-05
150	Ca+2	1.862E-03	-2.730	1.879E-03
200	Co+2	5.495E-06	-5.260	5.549E-06
231	Cu+2	2.951E-06	-5.530	2.943E-06
280	Fe+2	2.089E-04	-3.680	2.095E-04
410	K+1	5.888E-05	-4.230	5.934E-05
460	Mg+2	4.786E-04	-3.320	6.733E-04
470	Mn+2	6.918E-06	-5.160	6.898E-06
500	Na+1	2.399E-04	-3.620	2.405E-04
770	H4SiO4	6.607E-04	-3.180	6.550E-04
800	Sr+2	1.047E-06	-5.980	1.039E-06
731	S	4.074E-03	-2.390	4.116E-03
740	Sb(OH)3	3.311E-05	-4.480	3.294E-05
871	Ti(OH)3	1.820E-06	-5.740	1.817E-06
950	Zn+2	3.020E-06	-5.520	3.013E-06
730	HS-1	6.026E-06	-5.220	6.046E-06
732	SO4-2	3.236E-03	-2.490	3.253E-03
140	CO3-2	6.310E-04	-3.200	6.369E-04
281	Fe+3	1.000E-07	-7.000	0.000E+00

1 E-1	1.000E-07	-7.000	0.000E+00
60 H3AsO3	1.000E-07	-7.000	0.000E+00
741 Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471 Mn+3	1.000E-07	-7.000	0.000E+00
2 H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 6.909E-03 Sum of ANIONS = 7.786E-03

PERCENT DIFFERENCE = 5.969E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED mol/L percent	SORBED mol/L percent	PRECIPITATED mol/L percent
61	H3AsO4	1.955E-05 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
30	Al+3	3.488E-04 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
471	Mn+3	2.101E-30 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
150	Ca+2	1.879E-03 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
200	Co+2	5.549E-06 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
231	Cu+2	2.943E-06 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
280	Fe+2	2.095E-04 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
410	K+1	5.934E-05 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
460	Mg+2	6.733E-04 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
470	Mn+2	6.898E-06 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
500	Na+1	2.405E-04 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
770	H4SiO4	6.550E-04 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
800	Sr+2	1.039E-06 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
731	S	4.116E-03 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
740	Sb(OH)3	2.529E-05 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
871	Ti(OH)3	1.817E-06 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
950	Zn+2	3.013E-06 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
730	HS-1	3.107E-34 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
732	SO4-2	3.259E-03 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
140	CO3-2	6.369E-04 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
2	H2O	8.668E-04 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
330	H+1	1.369E-05 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
281	Fe+3	1.165E-08 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
60	H3AsO3	3.184E-05 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
741	Sb(OH)6-	7.648E-06 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0
1	E-1	-5.709E-71 100.0	0.000E+00 0.0	0.0 0.000E+00 0.0

Charge Balance: SPECIATED

Sum of CATIONS = 4.974E-03 Sum of ANIONS 5.851E-03

PERCENT DIFFERENCE = 8.103E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 1.037E-02

EQUILIBRIUM pH = 6.363

EQUILIBRIUM pe = 1.009 or Eh = 58.69 mv

Saturation indices

ID No	Name	SI
2074102	SbO2	5.995
2074001	Sb2O4	1.355
2074004	Sb(OH)3	2.308
2074006	SENARMONTITE	2.673
2077000	CHALCEDONY	0.426

2077001 CRISTOBALITE	0.227
2077002 QUARTZ	0.884
2003000 Al(OH)3 (am)	1.541
2003001 BOEHMITE	3.743
2003002 DIASPORE	5.492
2003003 GIBBSITE	4.096
2087100 AVICENNITE	1.521
2028102 GOETHITE	2.301
3003000 Al2O3	4.920
3020002 CoFe2O4	16.197
3028000 MAGNETITE	10.682
3028001 HERCYNITE	10.275
3028100 HEMATITE	6.980
3028102 LEPIDOCROCITE	1.603
3023100 CUPRIC FERRITE	6.193
6003000 AlOHSO4	0.428
6003001 Al4(OH)10SO4	12.515
8603000 HALLOYSITE	8.863
8603001 KAOLINITE	11.102

Core S3 - 45cm Depth - Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	1.259E-08	-7.900	1.259E-08
30	Al+3	3.467E-04	-3.460	3.488E-04
61	H3AsO4	5.129E-05	-4.290	5.139E-05
150	Ca+2	1.862E-03	-2.730	1.879E-03
200	Co+2	5.495E-06	-5.260	5.549E-06
231	Cu+2	2.951E-06	-5.530	2.943E-06
280	Fe+2	2.089E-04	-3.680	2.095E-04
410	K+1	5.888E-05	-4.230	5.934E-05
460	Mg+2	4.786E-04	-3.320	6.733E-04
470	Mn+2	6.918E-06	-5.160	6.898E-06
500	Na+1	2.399E-04	-3.620	2.405E-04
770	H4SiO4	6.607E-04	-3.180	6.550E-04
800	Sr+2	1.047E-06	-5.980	1.039E-06
731	S	4.074E-03	-2.390	4.116E-03
740	Sb(OH)3	3.311E-05	-4.480	3.294E-05
950	Zn+2	3.020E-06	-5.520	3.013E-06
730	HS-1	6.026E-06	-5.220	6.046E-06
732	SO4-2	3.236E-03	-2.490	3.253E-03
140	CO3-2	6.310E-04	-3.200	6.369E-04
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
741	Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
811	ADSITYPI	1.000E+00	0.000	0.000E+00
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 6.909E-03 Sum of ANIONS = 7.786E-03

PERCENT DIFFERENCE = 5.969E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED	SORBED	PRECIPITATED
		mol/L percent	mol/L percent	mol/L percent
61	H3AsO4	1.954E-05 99.9	1.151E-08 0.1	0.000E+00 0.0

30	Al+3	3.488E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
471	Mn+3	2.096E-30	100.0	0.000E+00	0.0	0.000E+00	0.0
150	Ca+2	1.879E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
200	Co+2	2.337E-08	0.4	5.526E-06	99.6	0.000E+00	0.0
231	Cu+2	8.550E-09	0.3	2.934E-06	99.7	0.000E+00	0.0
280	Fe+2	2.095E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	5.934E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	6.733E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	6.898E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	2.405E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	6.550E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	1.039E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
731	S	4.116E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
740	Sb(OH)3	2.530E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
950	Zn+2	1.218E-08	0.4	3.001E-06	99.6	0.000E+00	0.0
730	HS-1	3.124E-34	100.0	0.000E+00	0.0	0.000E+00	0.0
732	SO4-2	3.259E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
140	CO3-2	6.369E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
2	H2O	8.670E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
741	Sb(OH)6-	7.644E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
1	E-1	-5.715E-71	100.0	0.000E+00	0.0	0.000E+00	0.0
330	H+1	1.369E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
281	Fe+3	1.165E-08	100.0	0.000E+00	0.0	0.000E+00	0.0
60	H3AsO3	3.183E-05	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 4.955E-03 Sum of ANIONS 5.855E-03

PERCENT DIFFERENCE = 8.326E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 1.035E-02

EQUILIBRIUM pH = 6.364

EQUILIBRIUM pe = 1.008 or Eh = 58.64 mv

Saturation indices

ID No	Name	SI
2074102	SbO2	5.994
2074001	Sb2O4	1.355
2074004	Sb(OH)3	2.308
2074006	SENARMONTITE	2.673
2077000	CHALCEDONY	0.426
2077001	CRISTOBALITE	0.227
2077002	QUARTZ	0.884
2003000	Al(OH)3 (am)	1.541
2003001	BOEHMITE	3.743
2003002	DIASPORE	5.492
2003003	GIBBSITE	4.097
2028102	GOETHITE	2.302
3003000	Al2O3	4.920
3020002	CoFe2O4	13.823
3028000	MAGNETITE	10.684
3028001	HERCYNITE	10.276
3028100	HEMATITE	6.981
3028102	LEPIDOCROCITE	1.603
3023100	CUPRIC FERRITE	3.658
6003000	AlOHSO4	0.427
6003001	Al4(OH)10SO4	12.515
8603000	HALLOYSITE	8.863
8603001	KAOLINITE	11.103

Core S3 - 75cm Depth - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	1.072E-08	-7.970	1.072E-08
30	Al+3	3.090E-05	-4.510	3.095E-05
61	H3AsO4	2.692E-05	-4.570	2.683E-05
150	Ca+2	1.413E-03	-2.850	2.687E-03
200	Co+2	4.898E-07	-6.310	4.921E-07
231	Cu+2	3.802E-07	-6.420	3.777E-07
280	Fe+2	1.445E-05	-4.840	1.450E-05
410	K+1	8.318E-05	-4.080	9.200E-05
460	Mg+2	3.890E-04	-3.410	8.000E-04
470	Mn+2	3.236E-06	-5.490	3.240E-06
500	Na+1	2.042E-04	-3.690	4.000E-04
770	H4SiO4	1.862E-04	-3.730	1.844E-04
800	Sr+2	1.950E-06	-5.710	1.952E-06
731	S	2.239E-03	-2.650	2.229E-03
740	Sb(OH)3	2.570E-05	-4.590	2.595E-05
871	Tl(OH)3	3.311E-07	-6.480	3.342E-07
950	Zn+2	5.129E-06	-5.290	5.170E-06
730	HS-1	3.020E-06	-5.520	3.023E-06
732	SO4-2	4.571E-03	-2.340	3.500E-03
140	CO3-2	1.230E-03	-2.910	1.200E-04
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
741	Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 7.610E-03 Sum of ANIONS = 7.243E-03

PERCENT DIFFERENCE = 2.473E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED mol/L	percent	SORBED mol/L	percent	PRECIPITATED mol/L	percent
61	H3AsO4	1.094E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
30	Al+3	3.095E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
471	Mn+3	7.255E-32	100.0	0.000E+00	0.0	0.000E+00	0.0
150	Ca+2	2.687E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
200	Co+2	4.921E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
231	Cu+2	3.777E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
280	Fe+2	1.450E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	9.200E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	8.000E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	3.240E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	4.000E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	1.844E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	1.952E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
731	S	2.229E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
740	Sb(OH)3	2.215E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
871	Tl(OH)3	3.342E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
950	Zn+2	5.170E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
730	HS-1	1.268E-31	100.0	0.000E+00	0.0	0.000E+00	0.0
732	SO4-2	3.503E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
140	CO3-2	1.200E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
2	H2O	9.167E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
330	H+1	6.834E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
281	Fe+3	1.363E-09	100.0	0.000E+00	0.0	0.000E+00	0.0
60	H3AsO3	1.589E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
741	Sb(OH)6-	3.802E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
1	E-1	-1.978E-70	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 6.140E-03 Sum of ANIONS 5.773E-03

PERCENT DIFFERENCE = 3.083E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 1.160E-02

EQUILIBRIUM pH = 7.045

EQUILIBRIUM pe = -0.137 or Eh = -7.98 mv

Saturation indices

ID No	Name	SI
2074102	SbO2	5.472
2074001	Sb2O4	0.311
2074004	Sb(OH)3	2.250
2074006	SENARMONTITE	2.558
2077002	QUARTZ	0.333
2003000	Al(OH)3 (am)	0.353
2003001	BOEHMITE	2.555
2003002	DIASPORE	4.304
2003003	GIBBSITE	2.909
2087100	AVICENNITE	0.051
2028102	GOETHITE	2.031
3003000	Al2O3	2.545
3020002	CoFe2O4	15.961
3028000	MAGNETITE	10.336
3028001	HERCYNITE	8.094
3028100	HEMATITE	6.439
3028102	LEPIDOCROCITE	1.332
3023100	CUPRIC FERRITE	6.057
6003001	Al4(OH)10SO4	6.409
8603000	HALLOYSITE	5.386
8603001	KAOLINITE	7.626

Core S3 - 75cm Depth - Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	1.072E-08	-7.970	1.072E-08
30	Al+3	3.090E-05	-4.510	3.095E-05
61	H3AsO4	2.692E-05	-4.570	2.683E-05
150	Ca+2	1.413E-03	-2.850	2.687E-03
200	Co+2	4.898E-07	-6.310	4.921E-07
231	Cu+2	3.802E-07	-6.420	3.777E-07
280	Fe+2	1.445E-05	-4.840	1.450E-05
410	K+1	8.318E-05	-4.080	9.200E-05
460	Mg+2	3.890E-04	-3.410	8.000E-04
470	Mn+2	3.236E-06	-5.490	3.240E-06
500	Na+1	2.042E-04	-3.690	4.000E-04
770	H4SiO4	1.862E-04	-3.730	1.844E-04
800	Sr+2	1.950E-06	-5.710	1.952E-06
731	S	2.239E-03	-2.650	2.229E-03
740	Sb(OH)3	2.570E-05	-4.590	2.595E-05
950	Zn+2	5.129E-06	-5.290	5.170E-06
730	HS-1	3.020E-06	-5.520	3.023E-06
732	SO4-2	4.571E-03	-2.340	3.500E-03
140	CO3-2	1.230E-03	-2.910	1.200E-04
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
741	Sb(OH)6-	1.000E-07	-7.000	0.000E+00

471 Mn+3	1.000E-07	-7.000	0.000E+00
811 ADS1TYP1	1.000E+00	0.000	0.000E+00
2 H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 7.610E-03 Sum of ANIONS = 7.243E-03

PERCENT DIFFERENCE = 2.473E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED		SORBED		PRECIPITATED	
		mol/L	percent	mol/L	percent	mol/L	percent
61	H3AsO4	1.436E-05	100.0	4.809E-09	0.0	0.000E+00	0.0
30	Al+3	3.095E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
471	Mn+3	1.048E-31	100.0	0.000E+00	0.0	0.000E+00	0.0
150	Ca+2	2.687E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
200	Co+2	1.431E-10	0.0	4.920E-07	100.0	0.000E+00	0.0
231	Cu+2	1.237E-10	0.0	3.776E-07	100.0	0.000E+00	0.0
280	Fe+2	1.450E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	9.200E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	8.000E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	3.240E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	4.000E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	1.844E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	1.952E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
731	S	2.229E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
740	Sb(OH)3	1.236E-06	4.8	2.435E-05	95.2	0.000E+00	0.0
950	Zn+2	2.023E-08	0.4	5.150E-06	99.6	0.000E+00	0.0
730	HS-1	1.189E-32	100.0	0.000E+00	0.0	0.000E+00	0.0
732	SO4-2	3.503E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
140	CO3-2	1.200E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
2	H2O	1.115E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
1	E-1	-5.295E-70	100.0	0.000E+00	0.0	0.000E+00	0.0
330	H+1	3.395E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
281	Fe+3	1.739E-09	100.0	0.000E+00	0.0	0.000E+00	0.0
60	H3AsO3	1.246E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
741	Sb(OH)6-	3.689E-07	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 6.130E-03 Sum of ANIONS 5.775E-03

PERCENT DIFFERENCE = 2.984E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 1.159E-02

EQUILIBRIUM pH = 7.018

EQUILIBRIUM pc = 0.023 or Eh = 1.31 mv

Saturation indices

ID No	Name	SI
2074102	SbO2	4.352
2074004	Sb(OH)3	0.997
2074006	SENARMONTITE	0.051
2077002	QUARTZ	0.333
2003000	Al(OH)3 (am)	0.371
2003001	BOEHMITE	2.573
2003002	DIASPORE	4.322
2003003	GIBBSITE	2.926

2028102 GOETHITE	2.112
3003000 Al2O3	2.580
3020002 CoFe2O4	12.533
3028000 MAGNETITE	10.444
3028001 HERCYNITE	8.077
3028100 HEMATITE	6.600
3028102 LEPIDOCROCITE	1.413
3023100 CUPRIC FERRITE	2.687
6003001 Al4(OH)10SO4	6.533
8603000 HALLOYSITE	5.421
8603001 KAOLINITE	7.661

Core S4 - 23cm Depth - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	2.512E-08	-7.600	2.512E-08
30	Al+3	2.239E-04	-3.650	2.231E-04
61	H3AsO4	2.138E-05	-4.670	2.149E-05
150	Ca+2	2.089E-03	-2.680	2.103E-03
200	Co+2	5.495E-06	-5.260	5.498E-06
231	Cu+2	1.413E-06	-5.850	1.416E-06
280	Fe+2	1.585E-04	-3.800	1.586E-04
410	K+1	1.585E-04	-3.800	1.578E-04
460	Mg+2	5.623E-04	-3.250	7.700E-04
470	Mn+2	4.786E-06	-5.320	4.805E-06
500	Na+1	3.715E-04	-3.430	3.736E-04
770	H4SiO4	5.754E-04	-3.240	5.732E-04
800	Sr+2	1.995E-06	-5.700	1.986E-06
731	S	4.677E-03	-2.330	4.708E-03
740	Sb(OH)3	7.762E-06	-5.110	7.754E-06
871	Tl(OH)3	2.344E-06	-5.630	2.318E-06
950	Zn+2	2.570E-06	-5.590	2.600E-06
730	HS-1	1.820E-05	-4.740	1.814E-05
732	SO4-2	5.495E-03	-2.260	3.300E-03
140	CO3-2	1.514E-03	-2.820	1.000E-04
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
741	Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 7.297E-03 Sum of ANIONS = 6.818E-03

PERCENT DIFFERENCE = 3.389E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED		SORBED		PRECIPITATED	
		mol/L	percent	mol/L	percent	mol/L	percent
61	H3AsO4	8.052E-13	100.0	0.000E+00	0.0	0.000E+00	0.0
30	Al+3	2.231E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
471	Mn+3	7.856E-33	100.0	0.000E+00	0.0	0.000E+00	0.0
150	Ca+2	2.103E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
200	Co+2	5.498E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
231	Cu+2	1.416E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
280	Fe+2	1.586E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	1.578E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	7.700E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
60	H3AsO3	2.149E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	3.736E-04	100.0	0.000E+00	0.0	0.000E+00	0.0

770	H4SiO4	5.732E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	1.986E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
731	S	4.708E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
740	Sb(OH)3	7.754E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
871	Ti(OH)3	2.318E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
950	Zn+2	2.600E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
741	Sb(OH)6-	7.256E-14	100.0	0.000E+00	0.0	0.000E+00	0.0
732	SO4-2	3.305E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
140	CO3-2	1.000E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
2	H2O	1.743E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
730	HS-1	1.277E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
281	Fe+3	9.211E-13	100.0	0.000E+00	0.0	0.000E+00	0.0
1	E-1	-4.815E-87	100.0	0.000E+00	0.0	0.000E+00	0.0
330	H+1	5.397E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	4.805E-06	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 5.755E-03 Sum of ANIONS 5.276E-03

PERCENT DIFFERENCE = 4.337E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 1.070E-02

EQUILIBRIUM pH = 5.512

EQUILIBRIUM pe = -1.269 or Eh = -73.79 mv

Saturation indices

ID No	Name	SI
1006000	ORPIMENT	11.098
1095000	ZnS (am)	0.362
1095001	SPHALERITE	2.804
1095002	WURTZITE	0.278
1023101	COVELLITE	12.958
1023102	CHALCOPYRITE	19.127
1020002	CoS (beta)	2.671
1028003	PYRITE	6.295
2074102	SbO2	1.951
2074004	Sb(OH)3	1.394
2074006	SENARMONTITE	0.845
2077000	CHALCEDONY	0.368
2077001	CRISTOBALITE	0.169
2077002	QUARTZ	0.826
2003000	Al(OH)3 (am)	0.294
2003001	BOEHMITE	2.496
2003002	DIASPORE	4.245
2003003	GIBBSITE	2.849
2087100	AVICENNITE	1.732
3003000	Al2O3	2.426
3020002	CoFe2O4	4.596
3028001	HERCYNITE	5.960
6003000	AlOHSO4	0.867
6003001	Al4(OH)10SO4	9.213
8603000	HALLOYSITE	6.253
8603001	KAOLINITE	8.493

Core S4 - 23cm Depth - Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	2.512E-08	-7.600	2.512E-08
30	Al+3	2.239E-04	-3.650	2.231E-04
61	H3AsO4	2.138E-05	-4.670	2.149E-05

150	Ca+2	2.089E-03	-2.680	2.103E-03
200	Co+2	5.495E-06	-5.260	5.498E-06
231	Cu+2	1.413E-06	-5.850	1.416E-06
280	Fe+2	1.585E-04	-3.800	1.586E-04
410	K+1	1.585E-04	-3.800	1.578E-04
460	Mg+2	5.623E-04	-3.250	7.700E-04
470	Mn+2	4.786E-06	-5.320	4.805E-06
500	Na+1	3.715E-04	-3.430	3.736E-04
770	H4SiO4	5.754E-04	-3.240	5.732E-04
800	Sr+2	1.995E-06	-5.700	1.986E-06
731	S	4.677E-03	-2.330	4.708E-03
740	Sb(OH)3	7.762E-06	-5.110	7.754E-06
950	Zn+2	2.570E-06	-5.590	2.600E-06
730	HS-1	1.820E-05	-4.740	1.814E-05
732	SO4-2	5.495E-03	-2.260	3.300E-03
140	CO3-2	1.514E-03	-2.820	5.000E-05
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
741	Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
811	ADSITYP1	1.000E+00	0.000	0.000E+00
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 7.297E-03 Sum of ANIONS = 6.718E-03

PERCENT DIFFERENCE = 4.127E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED mol/L percent	SORBED mol/L percent	PRECIPITATED mol/L percent
61	H3AsO4	5.195E-13 96.1	2.098E-14 3.9	0.000E+00 0.0
30	Al+3	2.231E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
471	Mn+3	1.343E-32 100.0	0.000E+00 0.0	0.000E+00 0.0
150	Ca+2	2.103E-03 100.0	0.000E+00 0.0	0.000E+00 0.0
200	Co+2	2.206E-08 0.4	5.476E-06 99.6	0.000E+00 0.0
231	Cu+2	1.090E-08 0.8	1.405E-06 99.2	0.000E+00 0.0
280	Fe+2	1.586E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
410	K+1	1.578E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
460	Mg+2	7.700E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
470	Mn+2	4.805E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
500	Na+1	3.736E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
770	H4SiO4	5.732E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
800	Sr+2	1.986E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
731	S	4.708E-03 100.0	0.000E+00 0.0	0.000E+00 0.0
740	Sb(OH)3	7.754E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
950	Zn+2	6.544E-09 0.3	2.593E-06 99.7	0.000E+00 0.0
730	HS-1	1.277E-05 100.0	0.000E+00 0.0	0.000E+00 0.0
732	SO4-2	3.305E-03 100.0	0.000E+00 0.0	0.000E+00 0.0
140	CO3-2	5.000E-05 100.0	0.000E+00 0.0	0.000E+00 0.0
2	H2O	8.374E-05 100.0	0.000E+00 0.0	0.000E+00 0.0
741	Sb(OH)6-	2.342E-14 100.0	0.000E+00 0.0	0.000E+00 0.0
1	E-1	-7.704E-88 100.0	0.000E+00 0.0	0.000E+00 0.0
330	H+1	5.398E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
281	Fe+3	5.838E-13 100.0	0.000E+00 0.0	0.000E+00 0.0
60	H3AsO3	2.149E-05 100.0	0.000E+00 0.0	0.000E+00 0.0

Charge Balance: SPECIATED

Sum of CATIONS = 5.767E-03 Sum of ANIONS 5.207E-03

PERCENT DIFFERENCE = 5.098E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 1.066E-02

EQUILIBRIUM pH = 5.296

EQUILIBRIUM pe = -1.036 or Eh = -60.27 mv

Saturation indices

ID No	Name	SI
1095001	SPHALERITE	0.067
1023101	COVELLITE	10.517
1023102	CHALCOPYRITE	16.550
1020002	CoS (beta)	0.138
1028003	PYRITE	6.485
2074102	SbO2	1.659
2074004	Sb(OH)3	1.085
2074006	SENARMONTITE	0.228
2077000	CHALCEDONY	0.368
2077001	CRISTOBALITE	0.169
2077002	QUARTZ	0.826
2003001	BOEHMITE	1.990
2003002	DIASPORE	3.739
2003003	GIBBSITE	2.344
3003000	Al2O3	1.414
3020002	CoFe2O4	0.942
3028001	HERCYNITE	4.518
6003000	AlOHSO4	0.788
6003001	Al4(OH)10SO4	7.617
8603000	HALLOYSITE	5.241
8603001	KAOLINITE	7.481

Core S4 - 45cm Depth - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	2.291E-08	-7.640	2.291E-08
30	Al+3	2.344E-04	-3.630	2.331E-04
61	H3AsO4	4.467E-05	-4.350	4.418E-05
150	Ca+2	2.570E-03	-2.590	2.595E-03
200	Co+2	1.380E-05	-4.860	1.393E-05
231	Cu+2	1.622E-06	-5.790	1.621E-06
280	Fe+2	1.514E-04	-3.820	1.527E-04
410	K+1	1.995E-04	-3.700	2.003E-04
460	Mg+2	6.310E-04	-3.200	6.337E-04
470	Mn+2	7.762E-06	-5.110	7.845E-06
500	Na+1	3.467E-04	-3.460	3.480E-04
770	H4SiO4	5.495E-04	-3.260	5.554E-04
800	Sr+2	2.455E-06	-5.610	2.465E-06
731	S	6.761E-03	-2.170	6.766E-03
740	Sb(OH)3	1.047E-05	-4.980	1.051E-05
871	Ti(OH)3	1.905E-06	-5.720	1.901E-06
950	Zn+2	3.090E-06	-5.510	3.074E-06
730	HS-1	4.571E-06	-5.340	4.534E-06
732	SO4-2	4.571E-03	-2.340	4.554E-03
140	CO3-2	2.630E-04	-3.580	2.650E-04
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
741	Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 8.068E-03 Sum of ANIONS = 9.643E-03

PERCENT DIFFERENCE = 8.889E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED		SORBED		PRECIPITATED	
		mol/L	percent	mol/L	percent	mol/L	percent
61	H3AsO4	2.218E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
30	Al+3	2.331E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
471	Mn+3	1.310E-29	100.0	0.000E+00	0.0	0.000E+00	0.0
150	Ca+2	2.595E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
200	Co+2	1.393E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
231	Cu+2	1.621E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
280	Fe+2	1.527E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	2.003E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	6.337E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	7.845E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	3.480E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	5.554E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	2.465E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
731	S	6.766E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
740	Sb(OH)3	6.645E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
871	Ti(OH)3	1.901E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
950	Zn+2	3.074E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
730	HS-1	4.470E-36	100.0	0.000E+00	0.0	0.000E+00	0.0
732	SO4-2	4.558E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
140	CO3-2	2.650E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
2	H2O	4.011E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
330	H+1	8.393E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
281	Fe+3	6.786E-09	100.0	0.000E+00	0.0	0.000E+00	0.0
60	H3AsO3	2.200E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
741	Sb(OH)6-	3.865E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
1	E-1	-3.671E-71	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 5.980E-03 Sum of ANIONS 7.554E-03

PERCENT DIFFERENCE = 1.163E+01 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 1.312E-02

EQUILIBRIUM pH = 5.969

EQUILIBRIUM pe = 1.740 or Eh = 101.22 mv

Saturation indices

ID No	Name	SI
2074102	SbO2	5.751
2074001	Sb2O4	0.868
2074004	Sb(OH)3	1.728
2074006	SENARMONTITE	1.513
2077000	CHALCEDONY	0.355
2077001	CRISTOBALITE	0.156
2077002	QUARTZ	0.813
2003000	Al(OH)3 (am)	1.037
2003001	BOEHMITE	3.239
2003002	DIASPORE	4.988
2003003	GIBBSITE	3.593
2087100	AVICENNITE	1.561
2028102	GOETHITE	1.670
3003000	Al2O3	3.913
3020002	CoFe2O4	14.510

3028000	MAGNETITE	8.452
3028001	HERCYNITE	8.300
3028100	HEMATITE	5.717
3028102	LEPIDOCROCITE	0.971
3023100	CUPRIC FERRITE	3.886
6003000	Al(OH)SO4	0.831
6003001	Al(OH)10SO4	11.407
8603000	HALLOYSITE	7.713
8603001	KAOLINITE	9.953

Core S4 - 45cm Depth - Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	2.291E-08	-7.640	2.291E-08
30	Al+3	2.344E-04	-3.630	2.331E-04
61	H3AsO4	4.467E-05	-4.350	4.418E-05
150	Ca+2	2.570E-03	-2.590	2.595E-03
200	Co+2	1.380E-05	-4.860	1.393E-05
231	Cu+2	1.622E-06	-5.790	1.621E-06
280	Fe+2	1.514E-04	-3.820	1.527E-04
410	K+1	1.995E-04	-3.700	2.003E-04
460	Mg+2	6.310E-04	-3.200	6.337E-04
470	Mn+2	7.762E-06	-5.110	7.845E-06
500	Na+1	3.467E-04	-3.460	3.480E-04
770	H4SiO4	5.495E-04	-3.260	5.554E-04
800	Sr+2	2.455E-06	-5.610	2.465E-06
731	S	6.761E-03	-2.170	6.766E-03
740	Sb(OH)3	1.047E-05	-4.980	1.051E-05
950	Zn+2	3.090E-06	-5.510	3.074E-06
730	HS-1	4.571E-06	-5.340	4.534E-06
732	SO4-2	4.571E-03	-2.340	4.554E-03
140	CO3-2	2.630E-04	-3.580	2.650E-04
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
741	Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
811	ADSITYP1	1.000E+00	0.000	0.000E+00
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 8.068E-03 Sum of ANIONS = 9.643E-03

PERCENT DIFFERENCE = 8.889E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED		SORBED		PRECIPITATED	
		mol/L	percent	mol/L	percent	mol/L	percent
61	H3AsO4	2.204E-05	99.3	1.493E-07	0.7	0.000E+00	0.0
30	Al+3	2.331E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
471	Mn+3	1.303E-29	100.0	0.000E+00	0.0	0.000E+00	0.0
150	Ca+2	2.595E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
200	Co+2	6.143E-08	0.4	1.387E-05	99.6	0.000E+00	0.0
231	Cu+2	2.416E-09	0.1	1.619E-06	99.9	0.000E+00	0.0
280	Fe+2	1.527E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	2.003E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	6.337E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	7.845E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	3.480E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	5.554E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	2.465E-06	100.0	0.000E+00	0.0	0.000E+00	0.0

731 S	6.766E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
740 Sb(OH)3	6.659E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
950 Zn+2	1.174E-08	0.4	3.062E-06	99.6	0.000E+00	0.0
730 HS-1	4.585E-36	100.0	0.000E+00	0.0	0.000E+00	0.0
732 SO4-2	4.559E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
140 CO3-2	2.650E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
2 H2O	4.013E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
741 Sb(OH)6-	3.851E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
1 E-1	-3.638E-71	100.0	0.000E+00	0.0	0.000E+00	0.0
330 H+1	8.402E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
281 Fe+3	6.771E-09	100.0	0.000E+00	0.0	0.000E+00	0.0
60 H3AsO3	2.199E-05	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 5.949E-03 Sum of ANIONS 7.560E-03

PERCENT DIFFERENCE = 1.193E+01 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 1.310E-02

EQUILIBRIUM pH = 5.969

EQUILIBRIUM pe = 1.738 or Eh = 101.11 mv

Saturation indices

ID No	Name	SI
2074102	SbO2	5.751
2074001	Sb2O4	0.867
2074004	Sb(OH)3	1.729
2074006	SENARMONTITE	1.515
2077000	CHALCEDONY	0.355
2077001	CRISTOBALITE	0.156
2077002	QUARTZ	0.813
2003000	Al(OH)3 (am)	1.038
2003001	BOEHMITE	3.240
2003002	DIASPORE	4.988
2003003	GIBBSITE	3.593
2028102	GOETHITE	1.670
3003000	Al2O3	3.914
3020002	CoFe2O4	12.155
3028000	MAGNETITE	8.452
3028001	HERCYNITE	8.302
3028100	HEMATITE	5.716
3028102	LEPIDOCROCITE	0.971
3023100	CUPRIC FERRITE	1.059
6003000	Al(OH)SO4	0.831
6003001	Al4(OH)10SO4	11.409
8603000	HALLOYSITE	7.714
8603001	KAOLINITE	9.954

Core S5 - 23cm Depth - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	3.802E-06	-5.420	3.802E-06
30	Al+3	6.166E-05	-4.210	6.116E-05
61	H3AsO4	1.479E-05	-4.830	1.482E-05
150	Ca+2	2.951E-03	-2.530	2.969E-03
200	Co+2	8.511E-06	-5.070	8.468E-06
231	Cu+2	8.511E-07	-6.070	8.497E-07
280	Fe+2	2.570E-05	-4.590	2.596E-05
410	K+1	1.148E-04	-3.940	2.160E-04
460	Mg+2	4.169E-04	-3.380	6.170E-04
470	Mn+2	2.455E-06	-5.610	2.475E-06

500 Na+1	3.090E-04	-3.510	3.097E-04
770 H4SiO4	3.162E-04	-3.500	3.133E-04
800 Sr+2	1.549E-06	-5.810	1.541E-06
731 S	6.310E-03	-2.200	6.299E-03
740 Sb(OH)3	8.128E-06	-5.090	8.205E-06
871 Ti(OH)3	7.586E-07	-6.120	7.519E-07
950 Zn+2	1.995E-06	-5.700	1.973E-06
732 SO4-2	4.467E-03	-2.350	3.400E-03
140 CO3-2	3.631E-04	-3.440	3.612E-04
281 Fe+3	1.000E-07	-7.000	0.000E+00
1 E-1	1.000E-07	-7.000	0.000E+00
60 H3AsO3	1.000E-07	-7.000	0.000E+00
741 Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471 Mn+3	1.000E-07	-7.000	0.000E+00
730 HS-1	1.000E-07	-7.000	0.000E+00
2 H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 7.968E-03 Sum of ANIONS = 7.522E-03

PERCENT DIFFERENCE = 2.874E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED mol/L percent	SORBED mol/L percent	PRECIPITATED mol/L percent
330	H+1	4.389E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
30	Al+3	6.116E-05 100.0	0.000E+00 0.0	0.000E+00 0.0
471	Mn+3	5.751E-35 100.0	0.000E+00 0.0	0.000E+00 0.0
150	Ca+2	2.969E-03 100.0	0.000E+00 0.0	0.000E+00 0.0
200	Co+2	8.468E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
231	Cu+2	8.497E-07 100.0	0.000E+00 0.0	0.000E+00 0.0
280	Fe+2	2.576E-05 100.0	0.000E+00 0.0	0.000E+00 0.0
410	K+1	2.160E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
460	Mg+2	6.170E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
470	Mn+2	2.475E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
500	Na+1	3.097E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
770	H4SiO4	3.133E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
800	Sr+2	1.541E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
731	S	6.299E-03 100.0	0.000E+00 0.0	0.000E+00 0.0
740	Sb(OH)3	7.416E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
871	Ti(OH)3	7.519E-07 100.0	0.000E+00 0.0	0.000E+00 0.0
950	Zn+2	1.973E-06 100.0	0.000E+00 0.0	0.000E+00 0.0
61	H3AsO4	1.393E-05 100.0	0.000E+00 0.0	0.000E+00 0.0
140	CO3-2	3.612E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
732	SO4-2	3.400E-03 100.0	0.000E+00 0.0	0.000E+00 0.0
2	H2O	2.542E-04 100.0	0.000E+00 0.0	0.000E+00 0.0
730	HS-1	2.624E-25 100.0	0.000E+00 0.0	0.000E+00 0.0
281	Fe+3	2.023E-07 100.0	0.000E+00 0.0	0.000E+00 0.0
60	H3AsO3	8.901E-07 100.0	0.000E+00 0.0	0.000E+00 0.0
741	Sb(OH)6-	7.889E-07 100.0	0.000E+00 0.0	0.000E+00 0.0
1	E-1	-3.986E-67 100.0	0.000E+00 0.0	0.000E+00 0.0

Charge Balance: SPECIATED

Sum of CATIONS = 6.340E-03 Sum of ANIONS 5.895E-03

PERCENT DIFFERENCE = 3.638E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 1.176E-02

EQUILIBRIUM pH = 8.964

EQUILIBRIUM pe = -3.120 or Eh = -181.49 mv

Saturation indices

ID No	Name	SI
2074102	SbO2	3.933
2074004	Sb(OH)3	1.775
2074006	SENARMONTITE	1.607
2077000	CHALCEDONY	0.067
2077002	QUARTZ	0.525
2003001	BOEHMITE	1.050
2003002	DIASPORE	2.798
2003003	GIBBSITE	1.403
2087100	AVICENNITE	0.753
2095005	ZnO (active)	0.099
2023100	Cu(OH)2	0.840
2023101	TENORITE	1.845
2028000	WUSTITE	1.251
2028100	FERRIHYDRITE	2.262
2028101	Fe3(OH)8	4.109
2028102	GOETHITE	5.000
3020002	CoFe2O4	26.867
3028000	MAGNETITE	20.306
3028001	HERCYNITE	9.115
3028100	HEMATITE	12.376
3028101	MAGHEMITE	4.958
3028102	LEPIDOCROCITE	4.301
3046001	MAGNESIOFERRITE	8.097
3023100	CUPRIC FERRITE	14.410
5023101	MALACHITE	2.006
5028000	SIDERITE	0.286
5015000	ARAGONITE	0.509
5015001	CALCITE	0.663
5015002	DOLOMITE (ordered)	0.742
5015004	DOLOMITE (disordered)	0.171
6023101	BROCHANTITE	2.215
6023102	LANGITE	0.060
8603000	HALLOYSITE	2.758
8603001	KAOLINITE	4.998
8628000	GREENALITE	11.070
8646000	CHRYSOTILE	3.470
8646003	SEPIOLITE	2.167

Core S5 - 23cm Depth - Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	3.802E-06	-5.420	3.802E-06
30	Al+3	6.166E-05	-4.210	6.116E-05
61	H3AsO4	1.479E-05	-4.830	1.482E-05
150	Ca+2	2.951E-03	-2.530	2.969E-03
200	Co+2	8.511E-06	-5.070	8.468E-06
231	Cu+2	8.511E-07	-6.070	8.497E-07
280	Fe+2	2.570E-05	-4.590	2.596E-05
410	K+1	1.148E-04	-3.940	2.160E-04
460	Mg+2	4.169E-04	-3.380	6.170E-04
470	Mn+2	2.455E-06	-5.610	2.475E-06
500	Na+1	3.090E-04	-3.510	3.097E-04
770	H4SiO4	3.162E-04	-3.500	3.133E-04
800	Sr+2	1.549E-06	-5.810	1.541E-06
731	S	6.310E-03	-2.200	6.299E-03
740	Sb(OH)3	8.128E-06	-5.090	8.205E-06
950	Zn+2	1.995E-06	-5.700	1.973E-06
732	SO4-2	4.467E-03	-2.350	3.400E-03
140	CO3-2	3.631E-04	-3.440	3.612E-04
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00

60 H3AsO3	1.000E-07	-7.000	0.000E+00
741 Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471 Mn+3	1.000E-07	-7.000	0.000E+00
730 HS-1	1.000E-07	-7.000	0.000E+00
811 ADS1TYP1	1.000E+00	0.000	0.000E+00
2 H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 7.968E-03 Sum of ANIONS = 7.522E-03

PERCENT DIFFERENCE = 2.874E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED mol/L	percent	SORBED mol/L	percent	PRECIPITATED mol/L	percent
330	H+1	4.343E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
30	Al+3	6.116E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
61	H3AsO4	1.394E-05	100.0	9.811E-13	0.0	0.000E+00	0.0
150	Ca+2	2.969E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
200	Co+2	6.497E-08	0.8	8.403E-06	99.2	0.000E+00	0.0
231	Cu+2	4.622E-08	5.4	8.035E-07	94.6	0.000E+00	0.0
280	Fe+2	2.573E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	2.160E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	6.170E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	2.475E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	3.097E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	3.133E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	1.541E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
731	S	6.299E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
740	Sb(OH)3	7.439E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
950	Zn+2	1.028E-08	0.5	1.963E-06	99.5	0.000E+00	0.0
471	Mn+3	5.121E-35	100.0	0.000E+00	0.0	0.000E+00	0.0
140	CO3-2	3.612E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
732	SO4-2	3.400E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
2	H2O	2.511E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
741	Sb(OH)6-	7.663E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
1	E-1	-4.263E-67	100.0	0.000E+00	0.0	0.000E+00	0.0
730	HS-1	3.636E-25	100.0	0.000E+00	0.0	0.000E+00	0.0
281	Fe+3	2.258E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
60	H3AsO3	8.792E-07	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 6.323E-03 Sum of ANIONS 5.900E-03

PERCENT DIFFERENCE = 3.459E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 1.175E-02

EQUILIBRIUM pH = 8.993

EQUILIBRIUM pe = -3.170 or Eh = -184.39 mv

Saturation indices

ID No	Name	SI
2074102	SbO2	3.913
2074004	Sb(OH)3	1.776
2074006	SENARMONTITE	1.610
2077000	CHALCEDONY	0.065
2077002	QUARTZ	0.523

2003001 BOEHMITE	1.021
2003002 DIASPORE	2.770
2003003 GIBBSITE	1.375
2023101 TENORITE	0.599
2028000 WUSTITE	1.304
2028100 FERRIHYDRITE	2.293
2028101 Fe3(OH)8	4.226
2028102 GOETHITE	5.032
3020002 CoFe2O4	24.865
3028000 MAGNETITE	20.422
3028001 HERCYNITE	9.111
3028100 HEMATITE	12.440
3028101 MAGHEMITE	5.021
3028102 LEPIDOCROCITE	4.333
3046001 MAGNESIOFERRITE	8.218
3023100 CUPRIC FERRITE	13.228
5028000 SIDERITE	0.309
5015000 ARAGONITE	0.536
5015001 CALCITE	0.690
5015002 DOLOMITE (ordered)	0.796
5015004 DOLOMITE (disordered)	0.225
8603000 HALLOYSITE	2.696
8603001 KAOLINITE	4.936
8628000 GREENALITE	11.224
8646000 CHRYSOTILE	3.637
8646003 SEPIOLITE	2.274

Core S5 - 75cm Depth - No Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	1.202E-06	-5.920	1.202E-06
30	Al+3	1.738E-04	-3.760	1.723E-04
61	H3AsO4	2.239E-05	-4.650	2.256E-05
150	Ca+2	8.318E-04	-3.080	8.358E-04
200	Co+2	3.236E-06	-5.490	3.258E-06
231	Cu+2	1.698E-06	-5.770	1.699E-06
280	Fe+2	1.047E-04	-3.980	1.037E-04
410	K+1	1.549E-04	-3.810	1.540E-04
460	Mg+2	3.388E-04	-3.470	3.387E-04
470	Mn+2	2.884E-06	-5.540	2.876E-06
500	Na+1	3.388E-04	-3.470	3.354E-04
770	H4SiO4	4.074E-04	-3.390	4.094E-04
800	Sr+2	5.012E-07	-6.300	5.022E-07
731	S	2.089E-03	-2.680	2.074E-03
740	Sb(OH)3	1.622E-05	-4.790	1.610E-05
871	Ti(OH)3	1.950E-06	-5.710	1.942E-06
950	Zn+2	2.089E-06	-5.680	2.095E-06
730	HS-1	1.514E-05	-4.820	1.511E-05
732	SO4-2	1.738E-03	-2.760	1.727E-03
140	CO3-2	1.349E-04	-3.870	1.336E-04
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
741	Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 3.585E-03 Sum of ANIONS = 3.736E-03

PERCENT DIFFERENCE = 2.070E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED		SORBED		PRECIPITATED	
		mol/L	percent	mol/L	percent	mol/L	percent
61	H3AsO4	1.145E-12	100.0	0.000E+00	0.0	0.000E+00	0.0
30	Al+3	1.723E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
471	Mn+3	2.827E-33	100.0	0.000E+00	0.0	0.000E+00	0.0
150	Ca+2	8.358E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
200	Co+2	3.258E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
231	Cu+2	1.699E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
280	Fe+2	1.037E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	1.540E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	3.387E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	2.876E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	3.354E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	4.094E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	5.022E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
731	S	2.074E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
740	Sb(OH)3	1.610E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
871	Ti(OH)3	1.942E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
950	Zn+2	2.095E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
730	HS-1	9.470E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
732	SO4-2	1.733E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
140	CO3-2	1.336E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
2	H2O	2.253E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
330	H+1	6.838E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
281	Fe+3	9.855E-13	100.0	0.000E+00	0.0	0.000E+00	0.0
60	H3AsO3	2.256E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
741	Sb(OH)6-	3.916E-13	100.0	0.000E+00	0.0	0.000E+00	0.0
1	E-1	-1.234E-86	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 2.902E-03 Sum of ANIONS 3.053E-03

PERCENT DIFFERENCE = 2.545E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 5.645E-03

EQUILIBRIUM pH = 5.681

EQUILIBRIUM pe = -1.454 or Eh = -84.54 mv

Saturation indices

ID No	Name	SI
1095000	ZnS (am)	0.275
1095001	SPHALERITE	2.716
1095002	WURTZITE	0.190
1023101	COVELLITE	13.431
1023102	CHALCOPYRITE	19.421
1020002	CoS (beta)	2.446
1028003	PYRITE	5.680
2074102	SbO2	2.542
2074004	Sb(OH)3	2.001
2074006	SENARMONTITE	2.059
2077000	CHALCEDONY	0.222
2077001	CRISTOBALITE	0.023
2077002	QUARTZ	0.680
2003000	Al(OH)3 (am)	0.582
2003001	BOEHMITE	2.784
2003002	DIASPORE	4.533
2003003	GIBBSITE	3.137
2087100	AVICENNITE	1.578
3003000	Al2O3	3.002
3020002	CoFe2O4	5.193

3028001	HERCYNITE	6.761
6003000	Al(OH)SO4	0.623
6003001	Al(OH)10SO4	9.833
8603000	HALLOYSITE	6.536
8603001	KAOLINITE	8.775

Core S5 - 75cm Depth - Adsorption

INPUT DATA BEFORE TYPE MODIFICATIONS

ID	Name	ACTIVITY GUESS	log GUESS	ANAL TOTAL
330	H+1	1.202E-06	-5.920	1.202E-06
30	Al+3	1.738E-04	-3.760	1.723E-04
61	H3AsO4	2.239E-05	-4.650	2.256E-05
150	Ca+2	8.318E-04	-3.080	8.358E-04
200	Co+2	3.236E-06	-5.490	3.258E-06
231	Cu+2	1.698E-06	-5.770	1.699E-06
280	Fe+2	1.047E-04	-3.980	1.037E-04
410	K+1	1.549E-04	-3.810	1.540E-04
460	Mg+2	3.388E-04	-3.470	3.387E-04
470	Mn+2	2.884E-06	-5.540	2.876E-06
500	Na+1	3.388E-04	-3.470	3.354E-04
770	H4SiO4	4.074E-04	-3.390	4.094E-04
800	Sr+2	5.012E-07	-6.300	5.022E-07
731	S	2.089E-03	-2.680	2.074E-03
740	Sb(OH)3	1.622E-05	-4.790	1.610E-05
950	Zn+2	2.089E-06	-5.680	2.095E-06
730	HS-1	1.514E-05	-4.820	1.511E-05
732	SO4-2	1.738E-03	-2.760	1.727E-03
140	CO3-2	1.349E-04	-3.870	1.336E-04
281	Fe+3	1.000E-07	-7.000	0.000E+00
1	E-1	1.000E-07	-7.000	0.000E+00
60	H3AsO3	1.000E-07	-7.000	0.000E+00
741	Sb(OH)6-	1.000E-07	-7.000	0.000E+00
471	Mn+3	1.000E-07	-7.000	0.000E+00
811	ADSITYP1	1.000E+00	0.000	0.000E+00
2	H2O	1.000E+00	0.000	0.000E+00

Charge Balance: UNSPECIATED

Sum of CATIONS= 3.585E-03 Sum of ANIONS = 3.736E-03

PERCENT DIFFERENCE = 2.070E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

----- EQUILIBRATED MASS DISTRIBUTION -----

IDX	Name	DISSOLVED mol/L	percent	SORBED mol/L	percent	PRECIPITATED mol/L	percent
61	H3AsO4	1.119E-12	98.7	1.442E-14	1.3	0.000E+00	0.0
30	Al+3	1.723E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
471	Mn+3	2.766E-33	100.0	0.000E+00	0.0	0.000E+00	0.0
150	Ca+2	8.358E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
200	Co+2	6.659E-09	0.2	3.251E-06	99.8	0.000E+00	0.0
231	Cu+2	3.851E-09	0.2	1.695E-06	99.8	0.000E+00	0.0
280	Fe+2	1.037E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
410	K+1	1.540E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
460	Mg+2	3.387E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
470	Mn+2	2.876E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
500	Na+1	3.354E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
770	H4SiO4	4.094E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
800	Sr+2	5.022E-07	100.0	0.000E+00	0.0	0.000E+00	0.0
731	S	2.074E-03	100.0	0.000E+00	0.0	0.000E+00	0.0
740	Sb(OH)3	1.610E-05	100.0	0.000E+00	0.0	0.000E+00	0.0
950	Zn+2	3.854E-09	0.2	2.091E-06	99.8	0.000E+00	0.0
730	HS-1	9.470E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
732	SO4-2	1.733E-03	100.0	0.000E+00	0.0	0.000E+00	0.0

140	CO3-2	1.336E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
2	H2O	2.235E-04	100.0	0.000E+00	0.0	0.000E+00	0.0
741	Sb(OH)6-	3.493E-13	100.0	0.000E+00	0.0	0.000E+00	0.0
1	E-1	-1.192E-86	100.0	0.000E+00	0.0	0.000E+00	0.0
330	H+1	6.840E-06	100.0	0.000E+00	0.0	0.000E+00	0.0
281	Fe+3	9.770E-13	100.0	0.000E+00	0.0	0.000E+00	0.0
60	H3AsO3	2.256E-05	100.0	0.000E+00	0.0	0.000E+00	0.0

Charge Balance: SPECIATED

Sum of CATIONS = 2.890E-03 Sum of ANIONS 3.056E-03

PERCENT DIFFERENCE = 2.785E+00 (ANIONS - CATIONS)/(ANIONS + CATIONS)

EQUILIBRIUM IONIC STRENGTH (m) = 5.636E-03

EQUILIBRIUM pH = 5.683

EQUILIBRIUM pe = -1.463 or Eh = -85.08 mv

Saturation indices

ID No	Name	SI
1006000	ORPIMENT	10.067
1095001	SPHALERITE	0.033
1023101	COVELLITE	10.769
1023102	CHALCOPYRITE	16.812
1028003	PYRITE	5.766
2074102	SbO2	2.496
2074004	Sb(OH)3	1.961
2074006	SENARMONTITE	1.980
2077000	CHALCEDONY	0.222
2077001	CRISTOBALITE	0.023
2077002	QUARTZ	0.680
2003000	Al(OH)3 (am)	0.586
2003001	BOEHMITE	2.788
2003002	DIASPORE	4.537
2003003	GIBBSITE	3.142
3003000	Al2O3	3.011
3020002	CoFe2O4	2.507
3028001	HERCYNITE	6.775
6003000	AlOHSO4	0.622
6003001	Al4(OH)10SO4	9.846
8603000	HALLOYSITE	6.544
8603001	KAOLINITE	8.784