WOLVERINE PROJECT
ACID ROCK DRAINAGE AND METAL LEACHING ASSESSMENT OF MINE ROCK AND PREDICTED WATER QUALITY OF THE UNDERGROUND WORKINGS AT CLOSURE

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EXECUTIVE SUMMARY

AMEC Earth & Environmental, a division of AMEC Americas Limited (AMEC) was retained by Yukon Zinc Corporation (YZC) to conduct an Acid Rock Drainage and Metal Leaching (ARD/ML) Assessment as part of the Environmental Assessment for YZC's Wolverine Project. The objective of this report was to summarize all analytical findings to date on the static and kinetic geochemical testing of mine rock types, and to develop a prediction of the mine water quality expected at Closure of the mine.

The Wolverine Project is located within the Finlayson District in the southeastern Yukon, approximately 280 km east of Whitehorse, 190 km northwest of Watson Lake and 135 km southeast of Ross River, near the headwaters of the Wolverine Lake watershed. The proposed Wolverine Project is an underground mining project to produce zinc concentrates with an expected daily throughput of 1,250 tonnes or ore per day

Six major rock types were identified in the deposit, consisting of varieties of argillites, exhalites and rhyolites. All analyses discussed in the current report were conducted during two programs in 1996-97 and 2005-06. Static test analyses carried included acid-base accounting, ICP metal scans on the sample solids, shake flask extraction tests and mineralogy using XRD. Kinetic testing included four humidity cells operated in 1997, and the ongoing operation of 19 humidity cells initiated between December 2005 and February 2006.

Based on the analytical results, the major findings of the ARD/ML assessment work are as follows:

- Sobek-NP exceeded carbonate-NP for all rock types except type 4 (iron formation and silica-pyrite exhalite) suggesting that type 4 samples contain some iron-rich carbonates (e.g. siderite and/or ankerite) that do not contribute to alkalinity;
- Average NP:AP ratios ranged from 0.13 to 2.37 indicating that the mine rock at the site is acid generating to possibly acid generating;
- The average total concentrations of Ag, Sb, As, Cd, Cu, Mo, Pb, Zn and Se in the rock samples were higher by at least one order of magnitude, compared to average crustal abundances;
- The average concentration of Al, Fe, Ca, Mg, Na, K P and Ti were less than average crustal abundances;
- The concentrations of S in all Rock Types exceeded background concentrations;
- All measured concentrations for As, Cu, Pb, Ni and Zn in shake flask extracts were much lower than the Metal Mining Effluent Regulation (MMER) concentrations;
- The concentrations of As, Zn, Mo, Cr, Ni and Hg in the shake flask extracts were below CCME guidelines for fresh water;
- The concentrations of Cd, Cu, Pb and Se in extracts from most samples exceeded CCME guidelines for fresh water; and
- The concentration of Se did not exceed effluent discharge objectives of 0.5 mg/L for the Province of British Colombia (Price, 1997).

A water quality model was developed to predict the expected metal concentrations of the flooded mine at Closure. The model utilized the current mine model and available geochemical

data to predict the loads of metals that may be released into the mine once it floods. The model used conservative assumptions regarding the geochemistry of the mine in order to provide a 'worst-case' estimate of the mine water quality. The unequilibrated 'Mass-Loading' estimate was assessed using the MINTEQA2 program to estimate equilibrium concentrations in the mine water following flooding.

Based on the findings of the water quality prediction, elevated concentrations of metals are predicted to occur in the mine water following flooding of the mine. The predicted Mass-Loading and Base Case concentrations were used to represent the potential range of concentrations expected in the mine following Closure, and are summarized below:

Parameter	Mass-Loading Model (mg/L)	Base Case Model (mg/L)
Sulphate	776	852
Aluminum	1.16	0.001
Arsenic	0.275	0.277
Cadmium	0.0537	0.0560
Copper	0.358	0.020
Iron	5.10	0.00001
Lead	0.459	0.045
Molybdenum	0.099	0.096
Nickel	0.635	0.632
Selenium	0.509	0.505
Silver	0.161	0.161
Zinc	6.06	1.50

The predicted concentrations are similar to those observed at existing mine sites with a similar geological and mineralogical setting. Equilibrium modeling of the predicted (mass-loading) concentrations suggests that expected metals concentrations will be reduced due to solubility constraints on several of the metals, namely Al, Cu, Fe Pb and Zn. However, this reduction is pH dependent and will occur only at circum-neutral pH values.

The model utilizes worst-case assumptions and is therefore highly conservative. As a result, concentrations at Closure may be significantly lower than predicted by the model. Conversely, some geochemical factors not accounted for in the model could result in increased metal loads to the mine water at Closure.

Ongoing laboratory and field monitoring will be used to further refine the water quality estimate. Laboratory testing of humidity cells containing representative samples of mine rock, ore, float rock and backfill will be used to determine the metal release and oxidation rates for the mine materials. On-site monitoring and studies will be utilized to refine the geochemical rates and estimates of mine water quality at Closure.

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1.0 INTRODUCTION

AMEC Earth & Environmental, a division of AMEC Americas Limited (AMEC) was retained by Yukon Zinc Corporation (YKZ) to conduct an Acid Rock Drainage and Metal Leaching (ARD/ML) Assessment as part of the Environmental Assessment for YZC's Wolverine Project. YZC is currently conducting advanced exploration at the Wolverine Project, which includes rock sampling and testing to determine geochemical characteristics of rocks excavated during the advanced exploration program.

The objective of the current report was to summarize all analytical findings to date on the static geochemical testing of rock types identified at the proposed mine As per the Wolverine Project ARD/ML Assessment Workplan, static characterization was to include data on acid-base accounting (ABA), sulphide and carbonate mineralogy, elemental composition (including Hg and Se) and leachate quality.

2.0 SITE DESCRIPTION

2.1 History

The property was originally staked as the Fetish claims in July 1973 and restaked as the Kink claims in September 1982. By July 1993, only one Kink claim remained and Atna Resources Ltd. (Atna) re-staked the rest of the property as the Foot claims. In 1995, the property was optioned by Westmin Resources Limited (Westmin) who conducted a drilling program that resulted in the discovery of the Wolverine deposit on the Kink Claims. In 1995, Westmin entered into a 60/40 joint venture with Atna. The airstrip was constructed near the deposit in 1996. Drilling programs significantly expanded the known area of mineralization in 1996 and 1997. In March 1999, Expatriate Resources Ltd. acquired the 60% interest in the Wolverine Joint Venture from Boliden Westmin (Canada) Limited. In May 2004, Expatriate (now Yukon Zinc Corporation) purchased Atna's interest in the Wolverine Joint Venture and now owns 100% of Wolverine.

2.2 Background

The Wolverine Project is located within the Finlayson District in the southeastern Yukon, approximately 280 km east of Whitehorse, 190 km northwest of Watson Lake and 135 km southeast of Ross River, near the headwaters of the Wolverine Lake watershed. The Finlayson area is within the Kaska First Nation traditional territory. Traditional use of the project area is within the territory of the Ross River Dene Council.

The site is located in the Campbell Range, at the easternmost limit of the Pelly Mountains and abuts the broad Yukon Plateau to the north and east. The terrain consists of rolling, glacially scoured mountains with no significant peaks separated by wide U-shaped valleys. Elevations on the property range between 1,200 and 1,300 m. Glacial till covers the majority of the lower lying valleys and there is significant infilling by post-glacial sediments.

The proposed Wolverine Project is an underground mining project to produce zinc, copper and lead concentrates. The mine will include an airstrip, mine access road, underground mine, tailings storage facility, temporary waste rock storage, process mill and ancillary buildings and equipment. The mine and mill operations are expected to employ up to 150 people and operate for twelve years based on known ore reserves.

2.3 Geology and Mineralization

The Wolverine Deposit consists of two lenses of massive sulphide mineralization, having strike length of 800 m and dip length of up to 500 m. The sequence is sandwiched between underlying phyllite and overlying andesite. The proposed mining area has two distinct zones identified as the Wolverine and Lynx Zones, where mineralization thickens to 8 m and 15 m, respectively. The massive sulphide lenses in the Wolverine and Lynx Zones are thought to form a continuous body with the thickest cores in each Zone flanked by thinner massive sulphide material. The main ore body strikes northwest with dip that ranges from near horizontal to 25 to 45 degrees to the northeast. The ore sequence is comprised of carbonaceous sedimentary units, felsic volcanics, and volcaniclastics, argillaceous volcaniclastics, rhyolitic volcanic and volcaniclastics and feldspar-quartz phyric rhyolite volcanic rocks and subvolcanic intrusions. The massive sulphide layer lies in the lower portion of the ore sequence situated below calcite-pyrite exhalites and two or more intervals of banded magnetite formation

2.4 Mineralogy

Based on previous work (YKC/AXYS, 2005) carbonate alteration occurs throughout the deposit consisting of calcite ($CaCO_3$), dolomite ($Ca,Mg(CO_3)_2$), siderite ($FeCO_3$) and ankerite ($Ca(Fe,Mg)(CO_3)_2$). The massive sulphide mineralization is composed mostly of pyrite (FeS_2) with major amounts of sphalerite (ZnS), galena (PbS), and chalcopyrite ($CuFeS_2$). Pyrite and sphalerite are abundant in all samples of massive and replacement sulphides. Many sphalerite grains are completely encapsulated in pyrite. Pyrrhotite ($Fe_{1-X}S$) marcasite (FeS_2), arsenopyrite (FeAsS) and sulphosalts (tetrahedrite, meneghinite, and boulangirite) occur in lesser amounts. The average sulphide sulphur content of the ore feed is 35%. The massive sulphide mineralization averages about 50% with may contain up to 75% sulphide minerals with quartz and carbonate gangue minerals.

2.5 Identified Rock Types

Six major rock types were identified in the deposit, consisting of varieties of argillites, exhalites and rhyolites. A brief description of each rock type along with assigned codes and approximate tonnages are provided in Table 2-1. A seventh rock type (andesite) assigned Rock Type code 6 was also identified in the Wolverine Project Environmental Assessment Report (2005), but constituted less than 1% of the deposit and was not considered further. Subsequently, the numbering sequence for the identified Rock Types was revised to remove andesite as Rock Type 6.

2.6 Mining Method

The stopes will be mined in 4 m high horizontal lifts from footwall to hangingwall, and filled with paste backfill and loose waste from the development program. Loose waste will be encapsulated within the paste backfill. The mining direction will be up-dip. When one lift is mined and filled, the next will be mined at an elevation 4 m higher and the backfill of the previous lift will form the floor of the stope. Each stope will be comprised of five - 4 m lifts.

A simplistic plan view of each lift can be represented by an elongated barbell, bulging out for both the Lynx and Wolverine orebodies, with a thinner portion of ore connecting them (the hump zone). The extremities of both orebodies appear to taper in ore width.

The stope access crosscut will be located at the center between the orebodies in the hump zone. A footwall stope drift will be driven from the stope access crosscut along the footwall contact parallel to the strike in both directions through the two ore bodies to the economic extremities of the two ore zones.

Drift and fill is the mining method selected for the project. Three distinct variants of the drift and fill mining will be employed: Drift and Fill with a Side Slash (DFSS), Drift and Fill with Retreat Panels (DFRP), and Drift and Fill with Primary and Secondary Panels (DFPS). Mining method selection will be determined by horizontal ore thickness, as shown below:

Horizontal Ore Thickness (m)	Mining Method
> 7	Drift and Fill with Side Slash (DFSS)
4 to 7	Drift and Fill with Retreat Panels (DFSS)
< 4	Drift and Fill with Primary and Secondary Panels (DFPS)

3.0 SAMPLING AND ANALYTICAL METHODS

All analyses discussed in the current report were conducted in two previous work programs in 1996 and 2005. Six major rock types have been identified in the deposit that will be excavated during mining (see Table 2-1).

3.1 Sample Collection

Samples collected during the 1996 program were selected from five drillholes that included rock types from above and below the ore body including the massive sulphide mineralization. Static test analyses conducted included acid-base accounting (EPA 600/2-78-054) and 30 element ICP metal scans on the sample solids. Neutralization potential was determined using the Sobek method. The database consisted of ABA and metals data for 49 discrete samples.

Samples collected during the 2005 program included discrete samples selected for the six major lithologies present in the deposit, and several composite samples of rock and massive sulphide selected from eighteen drillholes advanced in 2005. Static test analyses completed in 2005 included acid-base accounting and 35 element ICP-MS analysis for metals. Neutralization potential was determined using the Modified Sobek method. Thirty-seven samples representing the six major rock types were analyzed for ABA and metals.

Figures showing the location of these samples within the deposit are shown in Appendix A.

Samples of ore and DMS float rock were collected for ABA and metals testing. Ore material was obtained from the bulk ore sampling program conducted in 2005 by SGS Lakefield. Ore samples were collected from the Wolverine, Hump and Lynx mineralized zones within the deposit. DMS float rock consists of the processed reject material from the dense media separation (DMS) stage of the ore processing. The material consists of low density, non-sulphide bearing fraction of the ore which will be placed underground as backfill.

3.2 Static testing

3.2.1 Mineralogy

Mineralogy of the rock samples was determined using the Reitveld XRD method. This method provides a quantitative analysis of the sample mineralogy, down to a detection limit of approximately 1%. Eight rock samples from the 2005 dataset were selected for analysis based on the results of the acid-base accounting and metals analysis.

3.2.2 Sulphur Speciation

Sulphur speciation consisted of analysis of total sulphur, sulphate sulphur, and sulphide sulphur by difference (Sulphide-S = Total-S minus Sulphate-S). Total sulphur was analyzed by Leco furnace. Sulphate sulphur was determined following a weak hydrochloric acid digestion.

3.2.3 Neutralization Potential

Neutralization potential (NP) was determined using the modified Sobek method. Carbonate neutralization potential (Carb-NP) was determined by measuring the total inorganic carbon (TIC) content of the sample.

3.2.4 Elemental Analysis

Trace element concentrations of the samples were determined by ICP-MS following an aqua regia digestion. This digestion results in the complete dissolution of almost all minerals within a sample; however, resistate minerals and some silicates (such as feldspars) are usually incompletely dissolved.

3.2.5 Leachate testing

Leachable metals were determined using the 'Shake Flask Extraction' or modified SWEP method (Price, 1997). A 3:1 water to solid ratio was used for the rock samples, whereas a 20:1 ratio was used for the ore and DMS samples.

3.3 Kinetic Testing

Kinetic testing consisted of selected samples of rock, ore and DMS float samples set up in conventional humidity cells. One kilogram of each sample was placed in a separate cell. Each week the cells were subjected to a 3-day wet cycle, a 3-day dry cycle and flood leached on the seventh day using 500 mL of deionized water. The leachate volume was recorded and the leachate was analyzed for pH, conductivity, sulphate, acidity and alkalinity. Metals were analyzed on a filtered acidified subsample by ICP-MS.

4.0 STATIC TESTING RESULTS

Laboratory analytical results of the static testing program are given in Appendix B.

4.1 Mineralogy

Quantitative analyses of powder X-ray diffraction patterns representing all rock types is summarized in Table 4-1. Quartz (α-SiO_2) was the dominant mineral (>60%) in all rock types. Muscovite ($KAl_2AlSi_3O_{10}(OH)_2$), ankerite ($Ca(Fe^{2+},Mg,Mn)(CO_3)_2$) and pyrite ($FeS_2$) in decreasing order of abundance were also identified in all rock types. Potassium feldspar was detected in all but Rock Type 3 and calcite was not detected in Rock Types 2 and 3. The phyllosilicates biotite, clinochlore, talc, and kaolinite, were detected in some samples. Barite, magnetite, and celsian (barium feldspar) were detected in some rock types. The zeolite harmotome ($(Ba_{0.5},Ca_{0.5},K,Na)_5[Al_5Si_{11}O_{32}]\cdot 12H_2O$) was reported in Rock Type 5. In contrast to previous reports carbonate minerals dolomite ($Ca,Mg(CO_3)_2$), and siderite ($FeCO_3$) were not detected in the samples. Sulphide minerals sphalerite (ZnS), galena (PbS), and chalcopyrite ($CuFeS_2$). pyrrhotite ($Fe_{1-X}S$) marcasite (FeS_2), arsenopyrite (FeAsS) and sulphosalts reported previously in ore samples were also not detected in any of the samples analyzed here.

4.2 Forms of Sulphur

Mineralogical (XRD) analyses indicate that the dominant form of sulphur in the samples is pyrite (FeS_2) averaging 1.7% (Table 4-1). Sulphur was also reported as barite ($BaSO_4$) in Rock Types 3 and 4. The content of total sulphur in samples ranged from <0.01 to 37.2%. A plot of sulphide sulphur vs. total sulphur (Figure 4-1) indicates that sulphur occurs almost completely (average = 97%) in the form of sulphides in all rock types. Results of the Reitveld XRD analysis indicated that the primary sulphur form is pyrite.

4.3 Forms of Neutralization Potential

X-ray diffraction analyses indicate that the dominant forms of carbonate in the samples are ankerite ($Ca(Fe^{2+},Mg,Mn)(CO_3)_2$) and calcite ($CaCO_3$) which contribute most of the neutralizing potential (NP) in the rock. The content of ankerite in the samples averaged 3.2%, the content of calcite averaged 0.6%. Although the total content of phylosilicates; in the samples (muscovite, biotite, clinochlore, talc, and kaolinite) was higher that the carbonates, they are expected to contribute only minor amounts of neutralizing potential. A plot of paste pH values vs. Sobek-NP (Figure 4-2) indicates that the presence of some unavailable NP in the range of about 30 kg $CaCO_3$/tonne which may be associated with the phyllosilicates and the iron content of the ankerite.

4.4 Acid Base Accounting (ABA)

A summary of ABA results for all samples (1996 and 2005 programs) is provided in Tables 4-2A and 4-2B. Values for neutralization potential (NP) vs. acid potential (AP) for all samples are plotted in Figure 4-3.

The results of the ABA tests were interpreted by comparison with guidelines and recommended methods for British Colombia (Price, 1997). Lines representing NP:AP ratios of 1:1 and 4:1 are included in Figure 4-3. Waste rock with NP:AP ratios of less than or equal to one are potentially acid generating. Waste rock with NP:AP ratios greater than 4 in are considered to be non-acid generating. Waste rock with an NP:AP ratio between 1 and 4 are considered have an uncertain acid generating potential.

The NP:AP values for most of the rock samples occur either to the right of the 1:1 line indicating the material is acid generating, or between the 1:1 line and 4:1 lines indicating that the materials are possibly acid generating.

The acid generation potential differed between the six assigned rock types ranging from net acid generating to net non-acid generating (see Tables 4-2A and 4-2B) The highest content of sulphide was observed in the carbonaceous argillite (rock type 2) samples which averaged 8.78% sulphide. The lowest sulphide-S concentrations (0.98%) were observed in the interbedded rhyolite/argillite (rock type 5). Although the calcite-pyrite exhalite (rock type 3) samples contained the second highest concentrations of sulphide-S (average 3.96%) the samples contained the highest values for NP (average carbonate-NP = 2.86 kg $CaCO_3$/tonne) and thus had the highest value for NNP (average 163 kg $CaCO_3$/tonne). Sobek-NP exceeded carbonate-NP for all rock types except type 4 (iron formation and silica-pyrite exhalite) suggesting that the type 4 samples contain some iron-rich carbonates (e.g. siderite and/or ankerite) that do not contribute to alkalinity. In terms of NNP the rock types were ranked 3>5>4>6>1>2. The average NP:AP values ranged from 0.13 to 2.37 indicating that the waste rock at the site is possibly acid generating at best.

4.4.1 Ore Samples

ABA analyses for three ore samples from the Lynx, Wolverine and Hump zones are summarized in Table 4-3. Sulphide content of the ore ranged from 13% to 29%, with an average of 19.5%. All NNP values were strongly negative (-300 to -800 mg $CaCO_3$/kg) with NP/AP ratios less than 1.0, indicating that the ore is strongly acid generating.

4.4.2 DMS Float Samples

ABA analyses for three samples the light mineral fraction (float) derived from a pilot scale dense mineral separation (DMS) process are summarized in Table 4-4. The average content of sulphide-S was 1.4% with <0.07% sulphate-S. The average maximum acidification potential (MAP) for the samples was 44.7 kg $CaCO_3$/tonne with and average NP value of 148 kg $CaCO_3$/tonne. The NP/AP ratios for the samples ranged from 2.4 to 4.4. Based on these three samples the DMS float samples appear to be non-acid generating.

4.5 Elemental Content

4.5.1 Elements of Interest

The total concentrations of elements in all samples are summarized in Tables 4-5A and 4-5B. The concentrations of Ag, Sb, As, Cd, Cu, Mo, Pb, Zn and Se were higher by at least one order of magnitude, compared to average crustal abundances. The concentrations of all other elements of interest (Ba, B, Cr, Co, V, Ni, Sn, and Hg) were generally similar to, or lower, than average crustal abundance values. Statistical analyses used to compare the average values for elements in all samples for the 2005 program compared to the 1996 program indicated no significant difference (95% probability level) between the concentration of any element except for Sb, As, Ba and Hg (Tables 4-5A and 4-5B). These differences were attributed to four samples for Rock Type 2 collected and analysed during the 1996 program. The concentrations of As, Sb and Hg were several orders of magnitude higher in the four samples compared to all other samples. In contrast, the concentration of Ba in the four samples was lower compared to all other samples.

4.5.2 Major and Minor Elements

The total concentrations of major and minor elements in all samples are summarized in Tables 4-6A and 4-6B. The average concentration of all major elements (Al, Fe, Ca, Mg, Na, and K) and P and Ti were less than average crustal abundances. Exceptions for individual Rock Types were the concentration of Fe in Rock Type 4 and the concentration of Ca in Rock Type 3 which exceeded average crustal concentrations. The concentrations of S in all Rock Types exceeded background concentrations. The concentrations of total Mn in the samples were similar to background concentrations.

The total concentration of major and minor elements in three ore samples from the Wolverine, Hump and Lynx orebodies is provided in Table 4-7 The concentrations of Al, Mg, Na, K, P, Ti and Mn were less than background (average crustal) concentrations. The total concentrations of Fe, sulphur, and siderophyllic elements, silver, (Ag), antimony (Sb), arsenic (As), cadmium (Cd), copper (Cu), molybdenum (Mo), lead (Pb), tin (Sn), selenium (Se), zinc (Zn), and mercury (Hg), were highly elevated (10X to >100X) compared to background crustal abundance.

The total concentration of selected major and minor elements in the three DMS Float samples are provided in Table 4-8. The concentrations of Al, Fe, Mg, Na, K, Ti, Ba, B, and Co, in the samples were less than background crustal averages. The concentration of Ca, S, Ag, Sb, As, Cd, Cu, Pb, Zn, Mo, Se, and Hg were enriched in the samples relative to background crustal averages.

4.5.3 Other Elements

The total concentration of other elements (Be, Bi, Ce, Cs, Ga, Ge, Hf, In, La, Li, Nb, Rb, Re, Sc, Sr, Ta, Te Th, Tl, U, W, Y, and Zr) in samples collected and analyzed during the 2005 program are summarized in Table 4-9 and included here for completeness. The average concentrations for these elements in the samples were less than average background concentrations.

4.6 Metal Leaching

The concentrations for the elements of interest in extracts from the shake flask extraction tests are present in Table 4-10. The concentrations for major elements and other elements are summarized in Table 4-11. The test provides an index for the solubility and release of elements, in this case, during initial stages of weathering. Concentrations were compared to MMER and CCME values; although these results cannot be directly compared against these values, the exercise provides an indication of the magnitude of release of elements from rock when compared to expected guidelines for fresh water. It should be noted that all measured concentrations for As, Cu, Pb, Ni and Zn were much lower than the Metal Mining Effluent Regulation (MMER) concentrations for discharge established under the Fisheries Act.

The concentrations of As, Zn, Mo, Cr, Ni and Hg in the extracts were below CCME guidelines for fresh water. The concentrations of Ag and Al in several samples (Tables 4-10 and 4-11) exceeded CCME guidelines for fresh water. The concentrations of Cd, Cu, Pb and Se in extracts from most samples exceeded CCME guidelines for fresh water, however values were typically within the same order of magnitude as the guidelines with the exception of Se. The concentration of Se in the extracts exceeded the CCME guideline of 0.001 mg/L by up to 100 times, but did not exceed effluent discharge objectives of 0.5 mg/L for the Province of British Colombia (Price, 1997).

The concentration of selected elements in shake flask extractions of DMS Float samples is provided in Table 4-12. The concentration of As, Cu, Pb, Ni and Zn in the extracts were lower than the Metal Mining Effluent Regulation (MMER) concentrations for discharge established under the Fisheries Act. Concentrations of Al, As, Fe, Mo, Ni, and Ag, were lower compared to CCME guidelines, while concentrations for Cd, Cu, Pb, Se, and Zn were higher compared to CCME guidelines but typically on the same order of magnitude.

4.7 Summary of Static Testing Findings

Based on the analytical results presented above, the major findings of this work are as follows:

- Acid generation potentials differed between the six assigned rock types ranging from net acid generating to net non-acid generating;
- The highest content of sulphide was observed in the carbonaceous argillite (Rock Type 2) samples which averaged 8.78% sulphide;
- Sobek-NP exceeded carbonate-NP for all rock types except type 4 (iron formation and silica-pyrite exhalite) suggesting that the iron formation / silica-pyrite exhalite rocks contain some iron-rich carbonates (e.g. siderite and/or ankerite) that do not contribute to alkalinity;
- Average NP:AP ratios ranged from 0.13 to 2.37 indicating that the waste rock at the site is acid generating to possibly acid generating at best;
- The weighted NNP was -29.2 kg $CaCO_3$ / tonne and NP:AP ratio was 0.67 indicating that acidification potential exceeds the neutralization potential when all rock at the site is considered. Consequently, there is insufficient NP within the proposed mine rock to neutralize the expected AP from the waste rock at the Wolverine Site;
- The average total concentrations of Ag, Sb, As, Cd, Cu, Mo, Pb, Zn and Se in the rock samples were higher by at least one order of magnitude, compared to average crustal abundances;
- Differences in average concentrations of Sb, As, Ba and Hg elements between the 2005 program compared to the 1996 program were attributed to four samples for Rock Type 2 collected and analyzed during the 1996 program;
- The average concentration of Al, Fe, Ca, Mg, Na, K P and Ti were less than average crustal abundances;
- The concentrations of S in all Rock Types exceeded background concentrations;
- All measured concentrations for As, Cu, Pb, Ni and Zn in shake flask extracts were much lower than the Metal Mining Effluent Regulation (MMER) concentrations;

- The concentrations of As, Zn, Mo Cr Ni and Hg in the shake flask extracts were below CCME guidelines for fresh water;
- The concentrations of Cd, Cu, Pb and Se in extracts from most samples exceeded CCME guidelines for fresh water; and
- The concentration of Se in the shake flask extracts did not exceed effluent discharge objectives of 0.5 mg/L for the Province of British Columbia (Price, 1997).

5.0 KINETIC TESTING PROGRAM

5.1 Introduction

A kinetic testing program for mine rock using humidity cells was initiated in December 2005. Thirteen humidity cells of mine rock samples are currently in operation. Three humidity cells containing ore materials and three cells containing DMS float were initiated in February 2006.

The objectives of the program are to determine the weathering characteristics of the six mine rock types, including rates of sulphide oxidation, neutralization potential consumption, and metal release. These rate determinations will be used to help estimate the time to sulphide and NP exhaustion and the resulting future geochemical conditions of the mine rock. Metal release rates from the cells will also be used to estimate water quality of the flooded mine at Closure.

5.2 Methods

The design and operation of the cells follows the methods described in the Draft BC ARD Guidelines (Price 1997). These cells will be operated indefinitely until stable leaching rates are observed. The shutdown of each cell will include the closedown procedure described in the Draft BC ARD Guidelines (Price 1997).

Leachates from the humidity cells will be analyzed weekly for pH, sulphate, conductivity, acidity, alkalinity and metals, including low level selenium and mercury. A complete listing of parameters and their detection limits are provided in Table 5-1.

5.3 Sample Selection

Representative samples of the six mine rock types were selected for testing. In general, two samples were selected from each rock type. One sample was selected to best represent the median characteristics of the rock type, whereas the second sample was selected to best represent the 'worst case' characteristics. Individual selections were based on consideration of the sample's NP:AP ratio, NP and AP values, and their metal concentrations. Summary data on the 13 selected samples are shown in Table 5-2.

Representative subsamples of ore material and DMS float were obtained from SGS Lakefield following completion of their testing program. Ore material consisted of subsamples from the Wolverine, Lynx and Hump zones. DMS float samples consisted of the reject material from the test ore processing program; the material consisted of a mixture of waste rock with a specific gravity of less than 2.8. Summary data for these samples is shown in Table 5-2.

5.4 Preliminary Results

Initial test results from the 13 mine rock humidity cells are given in Appendix B. As of February 22, 2006, eight weeks of data was available for cells HC1 to HC8, and three weeks of data for cells HC9 to HC13. Shown below is a comparison of the average rates for these cells compared to the average rates of the 1997 humidity cells. Although the results are preliminary, there appears to be significantly lower metal release rates from the 2006 humidity cells compared to the 1997 humidity cells. The elements As, Cd, Cu, Fe, Pb, Ag and Zn show metal release rates one to two orders of magnitude higher in the 1997 data than the 2006 data. This may be a function of the number of detection limit values in the 1997 dataset, and the significantly lower detection limits (generally one to two orders of magnitude) used in the 2006 data. Notably, sulphate rates are approximately five times higher than and selenium rates equivalent to, the 2006 cells. This may be a function of the rock types selected for testing, or more likely the result of early stage sulphate/metals release from the 2006 cells as accumulated oxidation products are flushed from the cells.

Parameter		SO_4	As	Cd	Cu	Fe	Pb	Mo	Ni	Se	Ag	Zn
Average Rates (mg/kg/wk)	1997	27.1	**0.014**	0.0036	0.018	0.213	**0.024**	**0.005**	0.031	**0.025**	**0.009**	0.1929
	2006	133.97	0.0009	0.00005	0.0012	0.010	0.0002	0.00143	0.010	0.023	0.00005	0.0107
Ratio (1997/2006)		0.2	15	73	16	21	159	3.5	3.0	1.1	195	18

Note: Bold numbers indicates rates calculated with detection limit values

Additional monitoring will be required to fully assess the release rates from the 2006 humidity cells; accumulated oxidation products need to be flushed and stable leaching rates need to be attained prior to accurately determining the actual metal release rates from the rock types.

6.0 WATER QUALITY PREDICTION

6.1 Introduction

A preliminary water quality prediction was made to estimate the expected water quality of the mine at Closure. The prediction was based on a spreadsheet model developed using available data regarding the mine plan, groundwater quality, and metal release rates for mine rock and backfill. Details of the model are provided in the following sections.

6.2 Approach and Methodology

6.2.1 General Model Description

The current closure plan for the mine involves sealing the surface openings and allowing the mine to flood through the inflow of groundwater into the mine. Current estimates indicate that the mine will flood relatively quickly, likely within a few months of sealing the openings. The resulting quality of the mine water will be a result of loadings from three sources:

- Water quality of the inflowing groundwater,
- Dissolution of accumulated soluble oxidation products on mine rock surfaces, and
- Dissolution of accumulated soluble oxidation products on cemented backfill surfaces.

Inflowing groundwater will leach the soluble oxidation products from the exposed mine rock and backfill surfaces. Therefore, loadings from waste rock and backfill will be dependent upon the exposed surface areas of these materials and the rate at which they oxidize and release metals. Larger surface areas will result in greater accumulations of soluble products which will be released to the mine water upon flooding. Mine rock surfaces were divided into development rock, stopes, backfill and loose waste. Loose waste consisted of backfilled waste rock and processed DMS float rock materials.

Estimated mine rock surface areas also included an allowance for their irregular surface, plus natural and blast-induced fractures within the rock. The soluble oxidation products were assumed to accumulate on the mine surfaces throughout the mine operation with no losses due to ongoing leaching of the mine surfaces. The accumulated metals would then be completely released to the mine water when flooded.

The final flood volume of the workings was based upon the current mine model estimates for void space at Closure. Surface areas of the six rock types exposed within the workings were also estimated from the mine model, as were the areas of exposed backfill within the mined stopes.

Estimates of the accumulation of oxidation products on the mine surfaces were based upon the results of laboratory humidity cell testing of Wolverine mine rock and tailings, field measurements of metal release from waste rock, and published data on metal release rates for backfill similar in composition to that proposed at Wolverine. The total estimated accumulated load for each metal was determined for each rock type and the backfill. Oxygen was assumed to be readily available in the mine workings throughout the mine operation.

To estimate the mine water quality at Closure, the accumulated metal loads on the mine surfaces were mixed with the groundwater filling the mine. The loads were assumed to mix freely and completely throughout the void space of the mine resulting in a single homogeneous water quality for the mine. No account was made for stratification or site specific water qualities due to hydrologically isolated zones within the mine. No temperature corrections were made to account for the colder temperature within the mine versus a laboratory. This resulting concentration was then evaluated using the MINTEQA2 model to account for potential concentration reductions due to thermodynamic equilibrium constraints.

6.2.2 Model Data Sources

Data sources for the model included the following:

- Estimated mine volumes and surface areas, based on the mine model prepared by Yukon Zinc in January 2006.
- Wolverine exploration adit groundwater seepage data, June-November 2005
- Mine rock metal release rates measured in humidity cells of Wolverine mine rock during the 1997 testing program.
- Backfill metal release rates measured from laboratory studies of the Crandon Mine backfill, and published by Chapman et. al, 2003.
- Metal release rates determined from monitoring of the Temporary Waste Rock Storage Pad, July-November 2005.
- Metal release rates from Wolverine humidity cell tailings samples, operated from July 2005 onwards.

Data from these sources are provided in Appendix C and Appendix D.

As of February 2006, 13 humidity cells containing representative samples of the six rock types from the Wolverine deposit were under operation. Humidity cell testing of three ore samples and three DMS float samples was begun in February 2006. Kinetic testing of Wolverine backfill is expected to begin in March 2006 once material is available from the geotechnical testing program. Results from these tests will be applied to the model when available.

6.2.3 Mine Rock Surfaces

Mine rock surfaces are defined as those rock surfaces exposed in the development rock (ramps) and stope areas. In order to estimate loadings from mine rock surfaces, humidity cell data was utilized to estimate the metal release rates. Development rock and stope release rates were determined from the 1997 testing program and the 2005-06 tailings humidity cell data. Non-ore bearing rock used the 1997 rates whereas the massive sulphide exposures used the 2005-06 tailings data. The measured humidity cell release rates (in units of mg/kg/wk) were converted into units of $mg/m^2/wk$ to allow for comparison to the estimated mine surface areas. Grain size data was not available for the 1997 humidity cell samples; therefore an estimated surface area of 1 m^2/kg was used. This value is at the conservative end of surface areas for humidity cell samples, which generally range from 1 to 10 m^2/kg.

Detection limits from the 1997 humidity cells were generally high, resulting in many of leachate analyses reporting concentrations at or below detection limit for several of the metals. For the purpose of the water quality model, humidity cell leachate concentrations at or below their detection limit were reported as detection limit values. This is a highly conservative estimate and will result in the significant over estimation of the concentration of several elements in the model. Detection limits from the 2005-06 tailings humidity cells were significantly lower than the

1997 humidity cells. However, any below detection limit values were reported as detection limit values for consistency.

For both the 1997 and 2005-06 humidity cells, metal release rates were determined for each cell using the adjusted leachate concentrations. An average weekly release rate was estimated using data from the entire monitoring period. This also includes the initial 10-12 weeks of cell data, which often display higher metal release rates due to the discharge of accumulated oxidation products prior to the start of testing. The highest average rate of the four cells was selected for each parameter, and used for each rock type.

Surface areas of the mine rock (wall, floor and roof) derived from the mine model were multiplied by a ‘fracture surface factor’ to account for the uneven surfaces and fractures in the rock, both naturally occurring fractures and those caused by blasting. A factor of 30 was used (i.e. 1 m^2 of mine surface area has an actual effective surface area of 30 m^2) for most of the rock types in the deposit, whereas a factor of 50 was used for the argillite (carbonaceous and non-carbonaceous) rocks and massive sulphides. A study carried out on three open pits by Morin and Hutt (1997) found the ratio of actual effective surface areas to mine surface areas to range from 27:1 to 161:1. However, considering that the confined conditions of underground workings likely restrict fracturing compared to open pit conditions, a fracture surface density ratio at the lower end of the range measured by Morin and Hutt (1997) is a reasonable assumption.

Tonnages, volumes and areas of rock mined from the development areas and stopes on an annual basis were obtained from the YZC mine model.

Development area rock surfaces exposed in a given year were assumed to oxidize until flooded (at Closure). Stope rock surfaces exposed (after backfilling, see below) in a given year were assumed to oxidize until flooded. Secondary minerals produced from sulphide oxidation were assumed to accumulate on the rock surfaces until flooded. Potential load losses due to ongoing flushing of the mine surfaces by groundwater seepage during mine operations were not considered.

6.2.4 Backfill

Under the mine plan, backfilled stopes and ramps are assumed to be nearly completely filled. An estimated 95% of the stopes will be filled by surface area, with only 5% of the backfill being exposed. However, to account for potential gaps, joints and void spaces in and surrounding the backfill following filling, it was assumed for the model that 20% of the stope backfill surfaces (and adjacent mine rock) would be exposed to weathering.

Data from Crandon Mine (Chapman et. al, 2003) on cemented backfill metal release rates was utilized to determine leaching rates by area (mg/m2/wk). Crandon is a massive sulphide zinc-copper deposit generally similar to the mineralization found at Wolverine. Mineralization at Crandon consists of massive sulphides predominantly comprised almost entirely of pyrite (FeS2) and sphalerite (ZnS) with lesser chalcopyrite (CuFeS2) and galena (PbS). Minor amounts of native silver and gold have also been detected in the mineral deposit. Gangue (non-metal bearing) minerals include quartz, chlorite, and minor sericite (muscovite) and dolomite.

The Crandon metal release rates were based upon column studies of simulated cemented paste backfill materials. The material consisted of a pyrite concentrate paste amended with five per cent Portland cement. Composition of the simulated Crandon tailings and paste backfill are shown below, as well as the average composition of the Wolverine tailings.

Sample	Total-S (%)	Sulphide-S (%)	Sulphate-S (%)	Modified Sobek NP	AP	NNP
Crandon Pyrite Concentrate	40	40	<0.4%	16	1250	-1234
Crandon Paste Backfill	35.9	34.5	3.1	26	1078	-1052
Wolverine Tailings (mean)	24.9	22.9	2.04	83	715	-633

Testing of the simulated backfill operated for up to 107 weeks. Pyrite concentrate samples produced acidic leachates within three weeks of testing. However, acid generation in the simulated backfill was delayed significantly; results from this study indicated that the backfill cement significantly contributed to acid neutralization and delayed the onset of acidic conditions for over one year (Chapman, et. al, 2003). Dissection of the backfill samples after testing indicated that oxidation penetrated approximately 0.64 mm into the backfill; further, the accumulation of secondary mineral phases within the oxidation rind may have contributed to lower oxidation rates by limiting oxygen diffusion (Chapman, et. al, 2003). Based on these findings, Chapman et. al. (2003) determined that acid generation in the Crandon backfill was expected to be minimal.

Comparison of the Crandon results with the Wolverine tailings indicates that the Wolverine tailings have a lower sulphide content and higher NP than the Crandon test material. This suggests that the Wolverine tailings, once amended with cement to form paste backfill, will take a longer period of time to generate acid than the Crandon paste backfill.

Oxidation products were assumed to accumulate on the backfill surfaces throughout the mine operation; potential load losses due to flushing of the exposed backfill surfaces during operation were not considered in the model. Further, the model does not account for the potential alkalinity addition from the backfill cement to the mine water during flooding.

6.2.5 Groundwater

At Closure, flooding of the mine is assumed to take place by the inflow of groundwater into the mine following the sealing of all the mine openings. Local groundwater contains naturally occurring concentrations of dissolved metals and other parameters (such as sulphate). Therefore, the groundwater will add to the mine water metal load as the mine floods. Based on the current mine and groundwater models, the mine is assumed to flood in approximately 13 years. The void space of the mine filled with groundwater at Closure is estimated to be 130,000 m^3.

For the purposes of this model, groundwater quality at Closure is assumed to be equivalent to the average concentrations of the 2005 underground seepage monitoring data. These data represent water collected from seepages at the rock face during development of the exploration adit. Dissolved metals data was used. These data are provided in Appendix C.

6.3 Model Results

Two sets of results were generated with the model. Firstly, initial concentrations were calculated using the spreadsheet model to provide unequilibrated concentrations, where no allowance was made for potential solubility constraints on the estimated concentrations. Secondly, the initial concentration estimate was modeled using MINTEQA2, a geochemical assessment/speciation program to determine the concentrations under the potential equilibrium conditions in the flooded mine.

Detailed data tables and spreadsheets outlining the model predictions are provided in Appendix C. Descriptions and discussion of the model results are provided below.

6.3.1 Initial Concentration Estimate

The initial estimate of the mine water quality was made using the mass loading approach of the model. For each parameter, the predicted concentration of the mine water at Closure was estimated as follows:

$$\text{Mine Water Concentration (mg/L)} = \frac{\text{[Total Soluble Load on Rock Surfaces +Backfill (mg)] + [Groundwater Load (mg)]}}{\text{[Mine water Volume (L)]}}$$

Estimated unequilibrated concentrations for the key parameters and elements of concern (Sulphate, As, Cd, Cu, Fe, Pb, Mo, Ni, Se, Ag and Zn) are shown in Table 6-1. A full listing of the predicted unequilibrated element concentrations is given in Appendix C.

In general the estimated concentrations for the elements of concern are very high. Many of these high concentrations are the result of the elevated detection limits of the 1997 humidity cell database. Elements which reported less than detection limit values for all leachate analyses included Sb, As, Pb, Mo, Se and Ag. The remaining elements (Cd, Cu, Fe, Ni and Zn) generally reported leachate concentrations above the detection limit (i.e. Ni and Zn), or a combination of above and below detection limit values (i.e. Cd, Cu and Fe). Other notable elements, such as thallium (Tl) and mercury (Hg) reported high modeled concentrations due to the high detection limit values used in the model.

Source loadings for the model concentrations are shown in Table 6-2. Development rock contributes the greatest loadings to the calculated concentrations, accounting for approximately 80% to 98% of the total metal load.

6.3.2 Equilibrated Concentrations

Equilibrated concentrations were estimated using VisualMINTEQ version 2.40 based on MINETQA2 version 4.0 (Allison et al., 1991). Results of the initial concentration prediction (Section 6.3.1 above) were modeled under estimated equilibrium conditions to determine the expected mine water metal concentrations at Closure.

The base case was modeled assuming a solution containing the initial concentration estimate and minerals were identified that were supersaturated with respect to the composition of the solution. Minerals with positive saturation indices (indicating supersaturation) were selected as possible phases for precipitation as secondary minerals. Equilibrium conditions for the base case were set as follows:

- pH calculated from mass balance in the no precipitation case and fixed in all other cases;
- pO_2 fixed at 10^{-35} atmospheres as a control for redox potential;
- Redox couples specified for Fe^{2+}/Fe^{3+}, $Sb(OH)_3/Sb(OH)_6^-$, H_3AsO_3/AsO_4 and $SeO_4^{2-}/HSeO_3^-$
- The influence of atmospheric CO_2 (pCO_2) was ignored;
- Alkalinity input set to measured value of 185 mg/L as $CaCO_3$;
- Temperature was fixed at 10°C; and
- Total concentration of SO_4^{2-} was varied to maintain a charge balance difference of <1%.

Secondary mineral precipitates were selected based on minerals likely to occur within the Wolverine mine environment. Possible secondary minerals that were identified for possible precipitation were:

Gypsum ($CaSO_4 \cdot 2H_2O$)
Calcite ($CaCO_3$)
Barite ($BaSO_4$)
$Al(OH)_3$ (amorphous)
Otavite ($CdCO_3$)
Calcite ($CaCO_3$)
Malachite ($Cu(OH)_2CO_3$)
Goethite (FeOOH)
Ferrihydrite($Fe(OH)_3.xH_2O$)
Hydrocerrusite ($Pb_3(OH)_2(CO_3)_2$)
Rhodochrosite ($MnCO_3$)
K-Jarosite ($KFe_3(SO_4)_2(OH)_6$)
Imogolite ($Al_2SiO_3(OH)_4$)
Hydroxyapatite ($Ca_5(PO_4)_3(OH)$)
Hydrozincite ($Zn_5(OH)_6(CO_3)_2$)

Simulations were completed for no precipitation, a base case with pH 8.0, and pH values fixed at 6.0 and 4.0. The 'base case' simulation represented a scenario where the mine was flooded by local groundwater with a pH equivalent to that measured in mine groundwater seepage. Simulations using pH values of 6.0 and 4.0 were completed to model flooding by waters of increasing acidity.

The concentrations of beryllium, bismuth, chromium, cobalt, lithium, mercury, strontium, thallium and vanadium were not included in the modeling.

Predicted concentrations of the modeling runs are summarized in Tables 6-3. Complete MINTEQ output files are attached in Appendix D.

6.3.2.1 Base Case

Initial concentrations calculated from the mass-loading model were used as input concentrations for the initial case with no precipitation to identify possible solids for precipitation (see Section 6.3.2 above). Reactions were not specified for adsorption, coprecipitation or precipitation of solids with partial isomorphous substitution.

The pH value was then set to 8.0 and selected secondary minerals selected as possible solids (for precipitation). The charge balance difference was adjusted to <1% by decreasing the input value for concentration of sulphate. The resulting ionic strength for the solution was 0.026 mol/L with a redox potential of +300 mV (pe=5.3). Under these equilibrium conditions the model predicted supersaturation of the solution with respect to barite, calcite, amorphous $Al(OH)_3$, malachite, ferrihydrite, hydrocerrusite, rhodochrosite hydroxyapatite, imogolite and hydrozincite, suggesting overestimation of the initial concentrations of alkalinity, aluminum, barium, calcium, copper, iron, lead, manganese, phosphorous, silicon and zinc. The concentrations of arsenic, antimony, boron, cadmium, magnesium, molybdenum, nickel, potassium, selenium, silver, and sodium were not supersaturated with respect to secondary minerals expected to precipitate from mine water of similar sources.

6.3.2.2 pH fixed at 6.0

Predicted concentrations of metals in solution at pH 6.0 are summarized in Table 6-3. Decreasing the pH of the modeled system to 6.0 and adjusting the charge balance by addition of sulphate reduce the number of possible precipitated phases from 10 in the base case to four (barite, $Al(OH)_3$, ferrihydrite and hydroxyapatite). Carbonate phases that were supersaturated at pH 8.0 became undersaturated when the pH was reduced to 6.0. The ionic strength increased to 0.030 mol/L and the redox potential increased to +413 mV (pe = 7.35) following by the Nernst relationship for Eh with respect to pH.

6.3.2.3 pH fixed at 4.0

Predicted concentrations of metals in solution at pH 4.0 are summarized in Table 6-3. Under these conditions the solubility product for barite was exceeded and jarosite (K-jarosite) formed in response to the increased redox potential of 525 mV (pe = 9.3) and concentration of sulphate of 1038 mg/L. In all cases (base case, pH = 6.0 and 4.0) predicted concentrations of sulphate in solution were undersaturated with respect to gypsum.

6.4 Comparison to Other Mines

Results of the model estimates were compared to water quality data from mines with similar mineralization styles to the Wolverine deposit. These included:

- Myra Falls Mine, Vancouver Island, BC;
- Britannia Mine, located north of Vancouver BC; and
- Holden Mine, Washington State.
- Mine 12, New Brunswick

The Myra Falls orebodies consist of massive sulphide lenses hosted within argillites and rhyolites (Dirom, 2000). Sulphide minerals consist mainly of sphalerite (ZnS), chalcopyrite ($CuFeS_2$) and galena (PbS) with minor amounts of tennantite [$(Cu,Fe_{12})As_4S_{13}$] and tetrahedrite [$(Cu,Fe_{12})Sb_4S_{13}$]. The mineralization also contains approximately 15% pyrite (FeS_2).

Mineralization at the Britannia mine consists of massive sulphide and stringer ore contained within volcanic (dacite-andesite) and sedimentary (shale-siltstone) rocks (MINFILE). Sulphide minerals consist of chalcopyrite and sphalerite with lesser galena. Pyrite and lesser pyrrhotite are found within the massive sulphide lenses. The main nonmetallic minerals include quartz and muscovite plus chlorite, anhydrite and siderite.

Holden Mine mineralization consists of disseminated to massive ore hosted within a pyritic sericite-quartz schist sequence (Kilburn and Smith, 1998). Principal ore and ore-related sulphide minerals include pyrite, pyrrhotite, chalcopyrite, and sphalerite. Galena, magnetite and molybdenite are found in lesser amounts as accessory minerals.

Mine 12 is a stratiform massive sulphide deposit consisting of massive to disseminated ore hosted within volcanic and sedimentary rocks. Principal ore and ore-related sulphides are pyrite, sphalerite, galena, silver, pyrrhotite and chalcopyrite.

All four mines are characterized by extensive workings and a long mining history. Each produces poor quality drainage. Myra Falls is the most geologically similar to Wolverine, whereas Mine 12, Britannia and Holden Mine are less similar. Both Britannia and Holden generally have higher concentrations of copper mineralization and a more disseminated-style mineralization.

Table 6-4 Presents a summary of mine water quality data from Wolverine, Myra Falls, Britannia, Holden Mine, and Mine 12. Also shown are the model-predicted unequilibrated (Mass-Load) and equilibrated (Base Case) concentrations for the flooded Wolverine mine at Closure. Generally the predicted concentrations fall within the ranges observed at the other mine sites. Exceptions to this are metals (As, Pb, Mo, Se and Ag) which consistently reported below detection limit values in the 1997 humidity cells, suggesting that the estimated concentrations overestimate the actual concentrations. The predicted nickel concentration is also significantly higher than levels at the other sites, suggesting that the model overestimates the concentration, or loadings from the humidity cells do not represent typical nickel release rates observed in mine rock.

6.5 Potential Factors Effecting Mine Water Quality

Several factors may potentially influence the predicted water quality of the mine at Closure. These factors include:

- Sensitivity of the model predictions due to assumptions regarding the physical characteristics of the mine, or the geochemical behavior of the mine rock and backfill;
- Acidification of potentially acid generating mine rock during operation;
- Effects of cemented backfill alkalinity on metals solubility; and
- Geochemical effects on metal solubility due to flooding

6.5.1 Model Sensitivities

Significant sensitivities in the mass-loading model include the following:

- Scaling of estimated loading rates for mine rock, based on the 1997 humidity cells;
- Surface area estimates based on the ‘fracture factor’ estimate;

Scaling of the humidity cell data to represent mine surfaces was based on the assumption that the metal release rates for the humidity cells could be translated to metal release rates for the mine surfaces using a simple area to area conversion. However, humidity cells represent rock samples that are fully flushed of their oxidation products on a weekly basis, whereas flushing of rock surfaces in a natural environment is generally incomplete. The incomplete flushing results in the accumulation of oxidation products, and can also inhibit further oxidation and leaching. When coupled with lower temperatures found in a mine, this can result in significantly lower metal release rates under actual conditions than measured in the laboratory.

Shown below are the average release rates (mg/kg/wk) for sulphate and zinc for the 1997 humidity cells compared to the estimated release rates from the Temporary Waste Rock Storage pad.

Parameter	**Laboratory Rate** 1997 Humidity Cells mean value (mg/kg/wk)	**Field Rate** Temporary Waste Rock Storage Pad (mg/kg/wk)	Ratio (Laboratory/Field)	Model Predicted (Mass-Load) Concentration (mg/L)	Predicted Concentration using Field Rate (mg/L)
Sulphate	35.4	0.911	39	776	172
Selenium	0.026	0.000104	250	0.509	0.072
Zinc	0.3296	0.0000082	40290	6.06	0.15

These data suggest that laboratory determined leaching rates can significantly overestimate the degree of metal release from materials in the field. To account for this, measurements of field kinetic rates will be carried out using wall washing stations and test pad sampling.

Fracture factor estimates were based upon studies conducted by Morin and Hutt (1997) who estimated the available surface area of mine rock ranged from 27 to 161 times the observed surface area. However, this study was conducted at three open pit mines; comparable studies of underground mines have not been completed. The Wolverine model utilized fracture factors of 30 and 50 for the various rock types, assuming that fracturing of rock in an underground mine would be lower due to differences in the mining style and the confining pressures of the surrounding rock. Shown below are recalculated concentrations based on the minimum and maximum ranges of fracturing estimated by Morin and Hutt (1997).

Parameter	Model Predicted Concentration (mg/L)	Fracture Factor = 27 Concentration (mg/L)	Fracture Factor = 161 Concentration (mg/L)
Sulphate	776	578	2694
Selenium	0.51	0.36	1.89
Zinc	6.06	4.17	24.14

The available surface area will significantly influence the predicted concentrations. Revisions to the model will include geologic determinations of average fracture densities for the various rock units.

6.5.2 Acidification of Potentially Acid Generating Rock

During mine's operational phase, ongoing oxidation of sulphides from particular rock units or mineralized zones on the exposed mine rock surfaces may produce weakly acidic to acidic leachates that interact with the surrounding rock. These leachates may dissolve neutralizing minerals in the surrounding rock, causing the accelerated depletion of neutralizing potential from the mine walls. A potential outcome of this is the formation of acidic conditions within the mine, resulting in the increased release of acidity and metals, ultimately leading to higher than predicted mine water concentrations at Closure.

This potential effect will be assessed through the use of wall washing stations to monitor metals release from different rock units in the mine. Laboratory testing using simulated leaching of PAG rock by weakly acidic solutions may also be employed to assess the potential for this to occur in the mine.

6.5.3 Effects of Cemented Backfill Alkalinity on Metals Solubility

Not currently factored into the model is the potential effect of alkalinity on the solubility of oxyanions of metals such as selenium, arsenic and molybdenum. Experience at other underground mines suggests that leachates with elevated pH levels commonly seep from cemented backfill. Leaching of the backfill cement both during the operational phase and during mine flooding may result in the formation of high pH zones adjacent to the backfill that would increase the solubility of these metals. A potential outcome of this could be the addition of increased mine water loads of Se, As, and Mo, both during flooding and potentially as a longer term effect post-Closure.

Kinetic testing will be used to determine the alkalinity and metals leaching rates of the backfill material. These data will be used to assess the extent of oxyanion solubility in the backfill, and its' potential impact on the mine water quality at Closure.

6.5.4 Geochemical Effects of Flooding

The model assumes that the mine flooding will cause the accumulated oxidation products to enter into solution instantaneously. However, these secondary minerals have a wide range of solubilities. It is possible that the initial period of highly-soluble secondary mineral dissolution and metal release during flooding could be followed by a sustained period of metal release from less-soluble oxidation products. This could result in the gradual increase of metal concentrations within the mine water over time. As well the potential formation of reducing conditions within the mine water following flooding could result in dissolution of certain minerals (such as iron-oxyhydroxides, a common product of pyrite oxidation) which form under oxidizing conditions but are unstable in reducing environments.

6.6 Conclusions

Based on the findings of the water quality prediction, the following conclusions can be made:

- Elevated concentrations of metals are predicted to occur in the mine water following flooding of the mine. The predicted Mass-Loading and Base Case concentrations were used to represent the potential range of concentrations expected in the mine following Closure, and are summarized below:

	Mass-Loading Model (mg/L)	Base Case Model (mg/L)
Sulphate	776	852
Aluminum	1.16	0.001
Arsenic	0.275	0.277
Cadmium	0.0537	0.0560
Copper	0.358	0.020
Iron	5.10	0.00001
Lead	0.459	0.045
Molybdenum	0.099	0.096
Nickel	0.635	0.632
Selenium	0.509	0.505
Silver	0.161	0.161
Zinc	6.06	1.50

- The predicted concentrations are similar to those observed at existing mine sites with a similar geological and mineralogical setting;
- Equilibrium modeling of the predicted (mass-loading) concentrations suggests that expected metals concentrations will be reduced due to solubility constraints on several of the metals, namely Al, Cu, Fe Pb and Zn. However, this reduction is pH dependent and will occur only at circum-neutral pH values.

However, the model utilizes worst-case assumptions and is therefore highly conservative. Key features of the model where worst-case assumptions were made include:

- 1997 humidity cell data – many of the elements reports some or all of their results as below detection limit. These values were set at their respective detection limits to calculate loadings. Comparison with the 2006 humidity cells suggests that many of the metal release rates used in the model may overestimate leaching by one or possibly two orders of magnitude.
- Scaling Effects and Surface Area – the model extrapolated the humidity cell data to the mine surfaces. However no account was made for scaling effects which result in slower metal release rates from natural surfaces. Comparison of the humidity cells with waste rock in the field suggests that natural weathering may be several orders of magnitude slower than in the laboratory. Further, estimates of mine surface areas may not accurately represent field conditions.

These features suggest that the actual concentrations at Closure will be significantly lower than the predicted concentrations.

Conversely, several factors may result in elevated concentrations in the mine water at closure. These include:

- Acid generation from specific areas of mineralization or alternation within the mine.

- Alkaline conditions caused by backfill cement leachates which result in increased solubility of metals such as As, Se, Mo.
- Dissolution of iron-oxyhydroxide precipitates in the reduced waters of the flooded mine, which results in the release of metals.

Ongoing laboratory and field monitoring will be used to further refine the water quality estimate. Laboratory testing of humidity cells containing representative samples of mine rock, ore, float rock and backfill will be used to determine the metal release and oxidation rates for the mine materials. On-site monitoring of mine water quality, wall washing stations (see Appendix D) and field test pads will be utilized to refine the geochemical rates and estimates of mine water quality at Closure.

7.0 CLOSURE

The findings and recommendations presented in this report were based on test results from previous reports, laboratory analyses and information provided by the Client. If conditions are encountered that appear to be different from those shown and described in this report, or if the assumptions stated herein are not in keeping with the proposed project, this office should be notified in order that the recommendations can be reviewed and adjusted, if necessary. Field conditions, by their nature, can be highly variable across a site. A contingency should always be included in any project to allow for the possibility of condition variations, which may result in modification of the design and construction procedures. This report was prepared exclusively for Yukon Zinc Corporation and their agents, for the proposed project as described in the report. The data and recommendations provided herein should not be used for any other purpose, or by any other parties, without review and advice from qualified personnel. The findings and recommendations of this report were prepared in accordance with generally accepted professional scientific principles and practice. No other warranty, expressed or implied, is given.

This report was prepared by Dr. Jim Warren, P.Geo and Steve Sibbick, P.Geo. Senior review was provided by Larry Connell, P.Eng. If you have any questions or comments regarding this work, please do not hesitate to contact the undersigned.

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TABLES

Table 2-1: Rock Types Identified in the Wolverine Deposit

Rock Type	Designation	Description	Estimated Tonnage	Percentage
1	Argillites (non-carbonaceous)	Aphanitic, hard, siliceous (cherty) black argillite. Commonly with a minor tuffaceous	611,799	32%
2	Argillite (carbonaceous)	Aphanitic, massive, carbonaceous to strongly graphitic black argillite. May or may	317,587	16%
3	Calcite-Pyrite Exhalite	Distinctive unit containing up to 30% fine grained pyrite within a matrix of white calcite, both occurring as swirly cm scale bands. Generally occurs in the proximal hanging wall to the sulphide zone in the Wolverine stratigraphy.	106,632	5%
4	Iron Formation and Silica-Pyrite Exhalite	Magnetite iron formation commonly ranges from 10% to 80% disseminated to banded magnetite within a fine grained siliceous matrix. Silica dominated exhalite or chert with or without pyrite and/or calcite. Often chloritic and usually well banded. Addition of small amounts of fine carbonaceous sedimentary rocks that forms a dark grey to black variety of this unit.	188,722	10%
5	Interbedded Rhyolite/Argillite	Intimately interbedded black argillite (carbonaceous, siliceous, tuffaceous) and massive to tuffaceous rhyolite. Ranges from cm scale interbeds to mm scale argillite bands within massive rhyolite.	350,742	18%
6	Rhyolite and Rhyolite Fragmental	Grey rhyolite with distinctive fragmental texture defined by wispy sub mm dark	343,445	18%
Total			1,918,827	99%

Notes: The remaining 1% of the deposit volume consists primarily of andesite
Source: YZC/AXYS, 2005

Table 4-2A: ABA Analyses for Waste Rock Samples

Sample		Rock	Paste	Total Sulphur	Sulphate-S	Sulphide-S[3]	CO_2	(kg $CaCO_3$/tonne)						NP/AP
ID	Year	Type	pH	(%)	(%)	(%)	(%)	AP[4]	MAP[5]	NP[6]	Carb-NP[7]	Non-Carb-NP[8]	NNP	ratio
105831	1996	1	7.7	3.31	<0.01	3.31		103	103	17.8			-85.6	0.2
172344	1996	1	8.1	1.72	<0.01	1.72		53.8	53.8	16.9			-36.9	0.3
172412	1996	1	8.2	1.16	<0.01	1.16		36.3	36.3	155			119	4.3
172414	1996	1	8.3	2.12	<0.01	2.12		66.3	66.3	65.2			-1.1	1
172424	1996	1	8.1	1.6	<0.01	1.6		50	50	249			199	5
172451	1996	1	7.4	4.04	<0.01	4.04		126	126	83.7			-42.6	0.7
172454	1996	1	7.1	2.64	<0.01	2.64		82.5	82.5	5.1			-77.4	0.1
172460	1996	1	8.4	1.7	<0.01	1.7		53.1	53.1	345			291.9	6.5
175605	1996	1	7.7	2.06	<0.01	2.06		64.4	64.4	23.6			-40.8	0.4
175613	1996	1	5.8	2.19	<0.01	2.19		68.4	68.4	22.2			-46.2	0.3
A083503	2005	1	8.1	0.53	0.01	0.52	0.9	16.3	16.6	15	20	5.5	-2	0.9
A083513	2005	1	8.6	0.25	0.01	0.24	1	7.5	7.8	26	23	-3.3	18	3.5
A083518	2005	1	8	1.44	<0.01	1.44	2.9	45	45	82	66	-16	37	1.8
A083526	2005	1	7.9	1.24	0.05	1.19	1.2	37.2	38.8	29	27	-1.7	-10	0.8
A083529	2005	1	7.9	0.95	<0.01	0.95	1.1	29.7	29.7	22	25	3	-8	0.7
A083537	2005	1	8.1	3.84	0.04	3.8	4.2	119	120	102	96	-6.5	-18	0.9
ARGILLITE-1	2005	1	8.5	1.72	0.01	1.71	1.2	53.4	53.8	29	28	1.5	-24.4	0.5
ARGILLITE-2	2005	1	8	1.2	0.01	1.19	0.5	37.2	37.5	18	11	7.2	-19.2	0.5
ARGILLITE-3	2005	1	8.2	0.42	<0.01	0.42	0.7	13.1	13.1	14	16	-1.8	0.9	1.1
ARGILLITE-4	2005	1	8.1	1.69	0.02	1.67	1.4	52.2	52.8	32	33	-0.5	-20.2	0.6
ARGILLITE-5	2005	1	8.3	0.59	0.01	0.58	1.1	18.1	18.4	21	25	-4	2.9	1.2
105223	1996	2	7.4	2.99	<0.01	2.99		93.4	93.4	38.1			-55.3	0.4
105226	1996	2	6.4	9.77	0.06	9.71		303	305	29.4			-274	0.1
105926	1996	2	7.9	37.2	0.07	37.13		1160	1,163	70.5			-1090	0.1
105934	1996	2	7	30.5	0.03	30.47		952	953	18			-934	0
105950	1996	2	8.4	0.33	<0.01	0.33		10.3	10.3	221			211	21.4
A083508	2005	2	7.8	0.56	<0.01	0.56	1.1	17.5	17.5	25	25	0	8	1.4
A083515	2005	2	8.1	1.32	<0.01	1.32	1.9	41.3	41.3	35	43	8.2	-6	0.9
A083528	2005	2	8.7	0.54	0.03	0.51	2.1	15.9	16.9	68	48	-20.2	51	4.3
A083531	2005	2	8.1	1.68	0.01	1.67	1.7	52.2	52.5	31	39	7.7	-22	0.6
A083538	2005	2	7.4	3.12	0.02	3.1	0.9	96.9	97.5	21	20	-0.5	-77	0.2
A083510	2005	3	8.1	2.13	0.26	1.87	2.1	58.4	66.6	61	48	-13.2	-6	1
A083519	2005	3	8.2	2.04	0.47	1.57	6.9	49.1	63.8	174	157	-17.1	110	3.6
A083524	2005	3	7.8	8.03	<0.01	8.03	21.6	251	251	516	491	-24.8	265	2.1
A083530	2005	3	7.8	5.96	0.02	5.94	14.5	186	186	345	330	-15.2	159	1.9
A083539	2005	3	7.9	0.4	0.08	0.32	1.3	10	12.5	22	30	7.6	10	2.2
EXCP-1	2005	3	7.8	6.12	0.02	6.1	16.3	191	191	353	370	-17	162	1.9
EXCP-2	2005	3	8	4.43	0.01	4.42	10	138	138	227	227	0.3	88.9	1.6
EXCP-3	2005	3	7.7	4.44	0.02	4.42	16.4	138	139	350	373	-23.3	212	2.5
EXCP-4	2005	3	7.8	3.01	0.01	3	24.5	93.8	94.1	554	556	-1.8	460	5.9
105812	1996	4	7.7	2.14	<0.01	2.14		66.9	66.9	24.3			-42.6	0.4
172337	1996	4	7.4	0.73	0.16	0.57		17.8	22.8	41.6			23.8	2.3

Table 4-2B: ABA Analyses for Waste Rock Samples (continued)

Sample ID	Year	Rock Type	Paste pH	Total Sulphur (%)	Sulphate-S (%)	Sulphide-S[3] (%)	CO_2 (%)	(kg $CaCO_3$/tonne) AP[4]	MAP[5]	NP[6]	Carb-NP[7]	Non-Carb-NP[8]	NNP	NP/AP ratio
A083504	2005	4	7.8	1.79	0.34	1.45	4.7	45.3	55.9	89	107	17.9	33	2
A083509	2005	4	7.8	0.74	<0.01	0.74	4.6	23.1	23.1	80	105	24.6	57	3.5
A083517	2005	4	8.3	1.85	0.35	1.5	4.6	46.9	57.8	116	105	-11.4	58	2.5
A083523	2005	4	8.1	1.94	0.38	1.56	2.2	48.8	60.6	34	50	16	-27	0.7
A083525	2005	4	8.2	3.04	0.2	2.84	1.3	88.8	95	31	30	-1.4	-64	0.4
A083540	2005	4	8.1	0.89	0.01	0.88	2	27.5	27.8	37	45	8.5	9	1.4
EXMT	2005	4	8.1	3.2	1.82	1.38	3.4	43.1	100	99	78	20.7	55.9	2.3
105809	1996	5	7.4	0.79	0.02	0.77		24.1	24.7	14.1			-10	0.6
172411	1996	5	8.1	1.11	<0.01	1.11		34.7	34.7	234			199	6.8
172421	1996	5	7.9	0.82	<0.01	0.82		25.6	25.6	174			148	6.8
A083505	2005	5	8.2	0.91	0.04	0.87	1.7	27.2	28.4	21	39	17.7	-7	0.8
A083507	2005	5	8	0.57	0.01	0.56	1.7	17.5	17.8	33	39	5.7	15	1.9
A083511	2005	5	7.9	0.95	0.04	0.91	2.3	28.4	29.7	67	52	-14.7	37	2.4
A083520	2005	5	8.2	0.91	<0.01	0.91	7.1	28.4	28.4	173	161	-11.5	145	6.1
A083541	2005	5	8.1	2.16	0.31	1.85	3.1	57.8	67.5	48	71	22.5	-20	0.8
105235	1996	6	8.8	0.28	<0.01	0.28		8.8	8.8	49.5			40.8	5.7
105763	1996	6	8.2	3.3	<0.01	3.3		103	103	109			5.9	1.1
105777	1996	6	8.2	2.15	<0.01	2.15		67.2	67.2	21.5			-45.7	0.3
105816	1996	6	8.1	7.14	<0.01	7.14		223	223	375			152	1.7
105835	1996	6	8.2	0.11	<0.01	0.11		3.4	3.4	39.1			35.7	11.4
105944	1996	6	8.5	0.82	<0.01	0.82		25.6	25.6	145			119	5.7
172410	1996	6	8.3	0.56	<0.01	0.56		17.5	17.5	227			209	13
172420	1996	6	7.9	2.08	<0.01	2.08		65	65	28.2			-36.8	0.4
172464	1996	6	8.6	0.58	<0.01	0.58		18.1	18.1	28.7			10.6	1.6
175604	1996	6	8.1	1.59	<0.01	1.59		49.7	49.7	99.3			49.6	2
A083501	2005	6	8.5	0.18	0.01	0.17	0.6	5.3	5.6	17	14	-3.4	11	3.2
A083502	2005	6	8.6	0.53	0.02	0.51	3.9	15.9	16.6	89	89	-0.3	72	5.6
A083512	2005	6	8.2	1.35	0.02	1.33	3	41.6	42.2	80	68	-11.8	38	1.9
A083514	2005	6	8.8	0.32	<0.01	0.32	0.9	10	10	24	20	-3.5	14	2.4
A083516	2005	6	8.7	1.32	0.04	1.28	1.7	40	41.3	35	39	3.7	-6	0.9
A083522	2005	6	8.4	0.74	0.03	0.71	1.3	22.2	23.1	29	30	0.6	6	1.3
A083542	2005	6	8	0.94	0.05	0.89	2.8	27.8	29.4	56	64	7.7	27	2
SSS[1]-1	2005	6	8.4	0.59	0.01	0.58	1.5	18.1	18.4	33	35	-2	14.9	1.8
SSS[1]-2	2005	6	8.3	0.6	0.01	0.59	0.9	18.4	18.8	22	21	1.2	3.6	1.2
SSS[1]-3	2005	6	8.4	0.69	0.02	0.67	1.5	20.9	21.6	34	35	-1	13.1	1.6
SSS[1]-4	2005	6	8.2	0.64	0.01	0.63	1.4	19.7	20	33	32	1.3	13.3	1.7
SSS[1]-5	2005	6	8	0.23	<0.01	0.23	1.7	7.2	7.2	38	40	-2	30.8	5.3
F-RHYOLITE[2]-1	2005	6	7.1	4.11	0.02	4.09	<0.2	128	128	5	<4		-123	0
F-RHYOLITE[2]-2	2005	6	7.8	7.6	0.05	7.55	0.2	236	238	7	4	2.8	-229	0
F-RHYOLITE[2]-3	2005	6	7.6	3.61	0.02	3.59	0.7	112	113	19	16	3.2	-93.2	0.2
F-RHYOLITE[2]-4	2005	6	8.2	0.22	<0.01	0.22	1.5	6.9	6.9	38	33	4.7	31.1	5.5

Notes: [1] Siliceous Silt Stone [2] Footwall Rhyolite [3] Based on difference between total sulphur and sulphate-sulphur [4] Acidification Potential = sulphide-sulphur(%) *31.25 [5] maximum Acidification Potential = total sulphur(%) *31.25

[6] NP method used: Modified ABA Method (Lawrence, 1989) [7] Carb-NP = Carbonate NP = (CO_2 % / 44.01) X 100.09 X 10 [8] Non-Carbonate NP = NP – Carb-NP

Table 4-3: ABA Analyses for Ore Samples for the Wolverine Project

Sample ID	Year	Rock Type	Paste pH	Total Sulphur (%)	Sulphate-S (%)	Sulphide-S[3] (%)	CO_2 (%)	(kg $CaCO_3$/tonne) AP[4]	MAP[5]	NP[6]	TAP	TNNP	NNP	NP/AP ratio
HUMP FEED ORE	2006	Ore	8	13.2	0.03	13.15	1.35	413	412.5	113	412.5	-299.5	-300	
LYNX FEED ORE	2006	Ore	7.9	28.8	0.07	28.7	1.24	900	900	100	900	-800.0	-800	
WOLVERINE FEED ORE	2006	Ore	8	16.75	0.03	16.7	0.67	523	523.4	58	523.4375	-465.4	-465	

Tabel 4-4: ABA Analyses for DMS Samples for the Wolverine Project

Sample ID	Year	Rock Type	Paste pH	Total Sulphur (%)	Sulphate-S (%)	Sulphide-S[3] (%)	CO_2 (%)	($kg\ CaCO_3$/tonne) AP[4]	MAP[5]	NP[6]	TAP	TNNP	NNP	NP/AP ratio
Hump Float	2005		8.3	1.94	0.06	1.77	10.9	55.3	55.3	241	60.6	180.3	186	4.4
Wolverine Float	2005		7.9	1.17	0.07	0.90	3.77	28.1	28.1	84.4	36.6	47.8	56.3	3.0
Lynx Float	2005		8.4	1.78	0.06	1.62	5.84	50.6	50.6	121	55.6	65.3	70.3	2.4

Table 4-5A: Total Concentration of Elements of Interest in Samples of Waste Rock

Sample	Year	Rock Type	Elements of Interest (mg/kg = ppm)																
			Ag	Sb	As	Ba	Cd	Cu	Pb	Zn	B	Mo	Cr	Co	V	Ni	Sn	Se	Hg
105831	1996	1		32	52	18	4.7	123	59	691						58			<3
172344	1996	1		9	41	51	3.6	42	80	437						13			<3
172412	1996	1		8		84	2.8	89	58	383						30			<3
172414	1996	1		9	53	53	3.7	62	78	407						38			<3
172424	1996	1		25		77	1.3	94	117	222						41			<3
172451	1996	1		48	219	22	15.5	297	59	1250						123			<3
172454	1996	1		28	39	24	4.3	58	24	281						47			<3
172460	1996	1		65	67	109	53.6	786	401	4207						32			3
175605	1996	1		16	43	55	20.1	35	103	973						32			<3
175613	1996	1		28	28	73	13.9	78	117	876						107			<3
A083503	2005	1	0.19	1.56	4.8	330	0.15	69.2	16.1	132	<10	1.1	58	7.3	22	32.8	0.3	1.2	0.07
A083513	2005	1	0.11	0.16	6.3	1180	0.04	81.4	13.6	69	<10	1.56	66	11.4	19	45.5	0.4	0.9	0.02
A083518	2005	1	0.62	0.92	4.6	60	0.31	75.9	13.2	224	<10	3.72	49	12	17	108	0.3	5.5	0.05
A083526	2005	1	0.56	1.51	2.5	80	0.23	61.2	15.9	123	<10	3.03	52	8.4	14	54.6	0.5	4.1	0.03
A083529	2005	1	0.47	3.15	8.4	120	0.34	62.5	29.2	192	<10	2.26	118	4.9	16	36.8	0.3	2.4	0.06
105223	1996	2		23	66	34	19.9	75	334	2155						34			<3
105226	1996	2		439	369	6	376.3	2678	5585	37000						146			7
105926	1996	2		120	1867	5	673.8	11660	8170	81000						31			14
105934	1996	2		816	650	9	2849	7410	11117	250000						166			33
105950	1996	2		<5	<5	122	2.5	42	20	257						4			<3
A083508	2005	2	0.35	1.14	3.3	310	0.12	76.9	8.9	107	<10	1.26	81	6.3	13	42.7	0.3	2.1	0.04
A083515	2005	2	0.59	1.16	4.8	80	0.23	70.1	11.2	206	<10	2.54	77	10.2	17	87.5	0.3	4.9	0.07
A083528	2005	2	0.25	0.31	2.3	580	0.67	40.9	13.2	85	<10	3.05	46	8.4	19	36.9	0.4	1.8	0.01
A083531	2005	2	0.64	1.93	7.1	80	0.25	69.4	14.4	201	<10	3.84	94	10.5	17	83.8	0.3	5.1	0.07
A083510	2005	3	0.43	0.46	3.7	90	0.11	42.2	39.9	252	<10	35.9	77	6.2	70	46.4	0.4	4	0.13
A083519	2005	3	0.26	0.65	4.5	50	0.06	48.7	75.8	39	<10	7.15	54	3.2	32	15.2	0.3	2.1	0.03
A083524	2005	3	0.29	3.5	31	20	0.25	28.5	549	68	<10	12.1	12	2	26	7.2	0.2	4	0.03
A083530	2005	3	0.41	3.8	19	20	50.4	26	449	9240	<10	12.6	21	2.7	31	12.8	0.3	4.3	1.85
105812	1996	4		<5	<5	30	2	52	209	903						28			<3
172337	1996	4		<5	<5	177	<0.1	91	15	174						37			<3
A083504	2005	4	0.39	1.52	2.6	60	0.04	70.4	18.8	106	<10	3.36	71	6.1	45	35.2	0.4	4.3	0.08
A083509	2005	4	0.22	1.82	4.4	170	0.01	60.8	5	30	<10	5.71	49	2.7	43	14.6	0.3	1.1	0.02
A083517	2005	4	0.12	0.6	1.1	220	<0.01	26.8	5.8	23	<10	8.4	49	2.2	81	13.6	0.4	1.2	0.01
A083523	2005	4	0.23	1.53	5.4	130	<0.01	68.4	5.5	86	<10	9.33	58	12.3	78	40.8	0.4	1.5	0.04
A083525	2005	4	0.07	0.37	0.8	250	0.21	23.5	7.3	182	<10	8.43	65	3.8	104	15.8	0.5	1.5	0.01

Table 4-5B: Total Concentration of Elements of Interest in Samples of Waste

Sample	Year	Rock Type	Elements of Interest (mg/kg = ppm)																
			Ag	Sb	As	Ba	Cd	Cu	Pb	Zn	B	Mo	Cr	Co	V	Ni	Sn	Se	Hg
105809	1996	5		<5	<5	102	0.6	91	11	98						13			<3
172411	1996	5		8	5	80	4.3	120	77	556						21			<3
172421	1996	5		9	11	139	0.6	140	168	88						48			<3
A083505	2005	5	0.36	3.5	3.9	220	0.08	67.9	10.4	159	<10	1.14	103	9.6	17	57.8	0.3	2.3	0.07
A083507	2005	5	0.3	1.08	2.7	330	0.06	79.4	53.2	53	<10	1.89	60	7.2	17	39.7	0.3	1.9	0.02
A083511	2005	5	0.63	2.38	8.3	100	0.24	68.1	11.9	153	<10	2.48	81	9.4	24	74.9	0.3	4.4	0.03
A083520	2005	5	0.38	3.28	5.1	100	0.02	52.6	9.6	45	<10	8.37	54	10.4	24	32.5	0.4	1.4	0.05
105235	1996	6		<5	51	121	2.4	152	26	324						3			<3
105763	1996	6		65	98	28	106.9	585	160	10595						7			7
105777	1996	6		7	13	55	1.5	26	35	159						7			<3
105816	1996	6		277	94	22	233.5	661	111	22000						29			19
105835	1996	6		6	30	95	1	74	33	470						2			<3
105944	1996	6		<5	15	112	12.2	528	118	1478						4			<3
172410	1996	6		31	21	341	7.8	169	117	946						32			<3
172420	1996	6		17		44	1.6	149	58	436						70			<3
172464	1996	6		10	16	52	9.2	29	64	743						6			<3
175604	1996	6		6	9	88	6.5	15	57	448						3			<3
A083501	2005	6	0.14	0.15	4.7	520	0.06	79.4	6.1	61	<10	0.44	55	8.6	27	32	0.3	0.5	0.01
A083502	2005	6	0.12	1.86	4.6	210	0.05	25.2	9.6	35	<10	2.27	41	4.4	7	21.9	0.5	1.3	0.04
A083512	2005	6	8.33	4.84	219	80	2.29	2220	69.3	306	<10	2.61	39	12	20	59.3	2.2	108	0.22
A083514	2005	6	0.1	0.16	3.9	910	0.53	62.5	8.6	125	<10	0.99	56	9.3	17	30.1	0.3	0.8	0.04
A083516	2005	6	0.22	1.2	7.9	70	0.02	46.8	6.6	33	<10	1.34	48	7	14	40.4	0.3	2.4	0.04
A083522	2005	6	0.16	0.92	3.1	140	0.02	45.7	4.7	34	<10	1.26	54	6.4	11	34.1	0.2	1.2	0.04
Background[1]			0.07	0.2	1.8	425	0.2	55	12.5	70	10	1.5	100	25	950	75	2	0.05	0.08

Notes: 1 Average Crustal Abundance, (Bowen, 1979)

Table 4-6A: Total Concentrations of Major and Minor Elements in Samples of Waste Rock

Sample	Year	Rock Type	Major and Minor Elements (%)									
			Al	Fe	Ca	Mg	Na	K	P	Ti	S	Mn
105831	1996	1	0.2	3	0.67	0.036						0.01
172344	1996	1	0.18	1.64	0.59	0.051						0.013
172412	1996	1	0.21	1.57	5.7	0.12						0.103
172414	1996	1	0.25	2.18	2.61	0.075						0.045
172424	1996	1	0.63	4.34	5.9	1.19						0.35
172451	1996	1	0.26	3.4	3.6	0.26						0.048
172454	1996	1	0.19	2.4	0.44	0.04						0.006
172460	1996	1	0.54	2.59	6.6	4.13						0.062
175605	1996	1	0.18	1.79	0.9	0.06						0.009
175613	1996	1	0.32	1.85	1.64	0.035						0.005
A083503	2005	1	0.55	1.42	0.44	0.21	0.01	0.23	0.036	0.012	0.53	0.017
A083513	2005	1	1.01	1.94	0.64	0.6	0.02	0.39	0.034	0.055	0.27	0.185
A083518	2005	1	0.94	3.06	2.12	0.67	0.02	0.19	0.103	0.012	1.52	0.073
A083526	2005	1	1.13	2.6	0.86	0.57	0.02	0.18	0.067	0.008	1.16	0.023
A083529	2005	1	0.47	1.76	0.72	0.19	0.01	0.13	0.045	<0.005	0.92	0.022
105223	1996	2	0.22	2.39	1.49	0.078						0.021
105226	1996	2	0.32	7.2	1.21	0.044						0.016
105926	1996	2	0.07	19	2.37	0.058						0.053
105934	1996	2	0.08	18	0.19	0.065						0.017
105950	1996	2	0.32	1.01	7.1	0.53						0.052
A083508	2005	2	0.39	1.18	0.83	0.2	0.01	0.13	0.195	0.005	0.55	0.039
A083515	2005	2	0.74	2.68	0.96	0.55	0.01	0.19	0.072	0.016	1.32	0.034
A083528	2005	2	0.99	2.02	1.93	0.66	0.01	0.41	0.061	0.047	0.58	0.078
A083531	2005	2	0.61	2.96	0.92	0.4	0.01	0.18	0.069	0.005	1.74	0.036
A083510	2005	3	1.16	10.6	1.36	0.35	0.02	0.14	0.064	0.019	0.7	0.087
A083519	2005	3	0.78	3.31	6.11	0.19	0.02	0.12	0.057	0.008	1.33	0.09
A083524	2005	3	0.29	8.38	19.85	0.22	0.01	0.07	0.235	<0.005	9.02	0.24
A083530	2005	3	0.25	5.76	13.7	0.14	0.01	0.1	0.141	0.005	6.14	0.152
105812	1996	4	0.21	2.34	0.72	0.1						0.031
172337	1996	4	1.05	4.19	0.32	0.29						0.027
A083504	2005	4	0.89	4.92	2.62	0.44	0.02	0.21	0.08	0.016	1.3	0.402
A083509	2005	4	0.89	4.61	2.41	0.42	0.01	0.06	0.085	<0.005	0.63	0.164
A083517	2005	4	0.96	11.85	3.62	0.24	0.02	0.15	0.017	0.023	0.39	0.091
A083523	2005	4	1.36	13.05	0.98	0.28	0.01	0.14	0.046	0.03	0.47	0.38
A083525	2005	4	1.33	17.75	1	0.21	0.03	0.18	0.026	0.029	0.26	0.1

Table 4-6B: Total Concentrations of Major and Minor Elements in Samples of Waste Rock (continued)

Sample	Year	Rock Type	Major and Minor Elements (%)									
			Al	Fe	Ca	Mg	Na	K	P	Ti	S	Mn
105809	1996	5	1.2	3	0.28	0.23						0.01
172411	1996	5	0.13	1.34	8.3	0.11						0.111
172421	1996	5	0.27	1.5	5.3	0.19						0.283
A083505	2005	5	0.46	2.37	0.46	0.31	0.01	0.14	0.02	<0.005	0.92	0.028
A083507	2005	5	0.51	1.71	1.06	0.28	0.01	0.19	0.028	0.01	0.59	0.067
A083511	2005	5	1.18	2.6	1.48	0.69	0.02	0.24	0.072	0.027	0.83	0.044
A083520	2005	5	0.77	2.77	6.1	0.26	0.02	0.23	0.048	0.017	0.82	0.149
105235	1996	6	1.65	2.22	1.07	2.29						0.053
105763	1996	6	0.21	2.62	3.83	0.104						0.042
105777	1996	6	0.23	2.07	0.81	0.055						0.011
105816	1996	6	0.4	4.9	6.8	3.33						0.288
105835	1996	6	5	7	0.66	4.55						0.112
105944	1996	6	3.3	5.3	2.48	3.66						0.052
172410	1996	6	0.6	0.93	7.8	0.24						0.065
172420	1996	6	0.25	2.53	0.67	0.17						0.049
172464	1996	6	2.63	4.08	0.59	2.68						0.058
175604	1996	6	0.26	1.54	3.56	0.11						0.035
A083501	2005	6	1.08	1.64	0.42	0.7	0.01	0.21	0.015	0.015	0.18	0.064
A083502	2005	6	0.73	1.32	2.99	0.35	0.02	0.21	0.019	0.006	0.44	0.085
A083512	2005	6	1.5	3.63	1.44	1.62	0.02	0.42	0.027	0.024	1.47	0.05
A083514	2005	6	0.77	1.36	0.69	0.4	0.01	0.22	0.029	0.023	0.31	0.097
A083516	2005	6	0.71	1.53	1.05	0.29	0.02	0.19	0.012	0.005	1.1	0.023
A083522	2005	6	0.41	1.1	0.94	0.18	0.01	0.16	0.009	0.005	0.66	0.018
Background[1]			8.16	5.3	3.86	2.19	2.62	2.39	0.105	0.57	0.026	0.014

Notes: 1 Average Crustal Abundance, (Bowen, 1979)

Table 4-7: Total Concentration of Elements of Interest in Ore Samples

Sample	Year	Rock Type	Elements of Interest (mg/kg=ppm)																
			Ag	Sb	As	Ba	Cd	Cu	Pb	Zn	B	Mo	Cr	Co	V	Ni	Sn	Se	Hg
HUMP FEED ORE	2006	Ore	97	290	808	10	308	6430	3760	>10000	<10	27	198	22.7	35	40.6	14.3	540	10.35
LYNX FEED ORE	2006	Ore	>100	448	1555	<10	>500	9670	6480	>10000	<10	33.8	146	43.6	37	49.7	23.3	>1000	14.45
WOLVERINE FEED ORE	2006	Ore	>100	357	1610	10	>500	6090	6560	>10000	<10	28.4	224	25.7	26	41	25.1	760	15.4

Sample	Year	Rock Type	Major and Minor Elements (%)									
			Al	Fe	Ca	Mg	Na	K	P	Ti	S	Mn
HUMP FEED ORE	2006	Ore	1.09	10.45	3.41	1.1	0.01	0.21	0.096	0.008	13.2	0.0661
LYNX FEED ORE	2006	Ore	0.49	21.6	3.27	0.38	<0.01	0.14	0.058	0.007	28.8	0.0631
WOLVERINE FEED ORE	2006	Ore	1.58	14.6	1.88	1.19	0.01	0.2	0.061	0.006	16.75	0.0583

Table 4-8: Total concentration of elements of interest in DMS Samples

Sample	Year	Rock Type	Elements of Interest (mg/kg=ppm)																
			Ag	Sb	As	Ba	Cd	Cu	Pb	Zn	B	Mo	Cr	Co	V	Ni	Sn	Se	Hg
HLS Hump Floats ETC 139-144	2005		7	38.8	83.5	37	15.3	158	130.1	1229	2	18	194.6	4.6	79	44.6	< 0.0002	26.5	1.16
HLS Wolv Floats ETC 152-168	2005		14.7	36.8	92.7	60	13.8	567.8	140.8	1248	2	41	197.6	4.6	103	66.2	< 0.0002	37.2	0.67
HLS Lynx Floats ETC 169-173	2005		10.7	39	72.3	38	16.4	754.5	198.5	1577	3	28.6	289.5	5.1	73	49.2	< 0.0002	39.6	0.74

Sample	Year	Rock Type	Major and Minor Elements (%)									
			Al	Fe	Ca	Mg	Na	K	P	Ti	S	Mn
HLS Hump Floats ETC 139-144	2005		0.42	2.48	8.51	0.84	0.009	0.16	0.134	0.011	1.94	0.1334
HLS Wolv Floats ETC 152-168	2005		1.24	2.32	2.99	0.96	0.012	0.25	0.259	0.01	1.17	0.0688
HLS Lynx Floats ETC 169-173	2005		0.58	2.24	4.01	0.79	0.006	0.25	0.122	0.009	1.78	0.066

Table 4-9: Total Concentrations of Other Elements in Samples of Waste Rock

Sample	Year	Rock Type	Other Elements (mg/kg = ppm) Be	Bi	Ce	Cs	Ga	Ge	Hf	In	La	Li	Nb	Rb	Re	Sc	Sr	Ta	Te	Th	Tl	U	W	Y	Zr
A083503	2005	1	0.38	0.17	18.95	1.21	1.71	<0.05	0.15	0.012	10.3	5.9	0.09	13.2	0.001	1.8	28.1	<0.01	0.12	3	0.5	0.55	0.2	3.11	6.3
A083513	2005	1	0.23	0.24	39.7	2.87	4.18	0.06	0.38	0.015	19.1	12.2	0.41	27.3	<0.001	2.8	68.4	0.01	0.07	7.1	0.26	0.9	0.26	4.61	13.9
A083518	2005	1	0.12	0.16	19.05	2.01	1.86	0.07	0.51	0.019	11	3.9	0.05	14.8	0.009	2.2	316	<0.01	0.09	3.2	0.05	2.6	0.48	6.65	21.4
A083526	2005	1	0.33	0.18	47.8	4.23	3.03	0.08	0.44	0.017	24.5	6	0.05	13	0.007	1.7	103.5	<0.01	0.05	6.4	0.21	1.4	0.4	6.25	16.4
A083529	2005	1	0.34	0.15	15.25	0.63	1.41	<0.05	0.24	0.019	8.1	2.7	0.05	8.3	0.002	1.8	76.1	<0.01	0.04	3	0.41	0.56	0.43	3.48	9.5
A083508	2005	2	0.27	0.19	16.9	0.56	1.29	<0.05	0.23	0.016	8.1	2.6	<0.05	8.5	0.003	1.7	307	<0.01	0.06	2.1	0.26	0.68	0.18	7.87	9.4
A083515	2005	2	0.18	0.2	21.2	1.46	1.92	0.07	0.46	0.015	11.5	3.8	0.08	14.6	0.009	2.1	240	<0.01	0.07	3.4	0.09	2.19	0.16	4.65	20.8
A083528	2005	2	0.23	0.18	44.4	1.17	3.09	0.06	0.31	0.011	22.8	9.9	0.34	23.5	0.003	2	114	<0.01	0.07	9.3	0.12	1.81	0.44	10.65	11.5
A083531	2005	2	0.28	0.15	16.15	1.2	1.56	0.06	0.46	0.017	8.8	4.4	<0.05	13.1	0.009	1.8	158	<0.01	0.07	2.9	0.43	1.62	0.16	4.25	18.4
A083510	2005	3	1.47	0.08	9.56	0.92	3.85	0.17	0.16	0.015	5	7.2	0.16	8.7	0.006	4.3	164.5	<0.01	0.04	1.5	0.16	0.7	0.27	6.67	6.3
A083519	2005	3	1.01	0.11	8.88	0.95	2.27	0.05	0.08	0.015	4.2	3.7	0.08	8	<0.001	3.6	192.5	<0.01	0.04	1.2	0.4	0.26	0.22	7.52	3.2
A083524	2005	3	0.98	0.04	12.25	0.42	0.93	0.1	0.05	0.009	8.5	3.2	0.12	3.7	0.002	2.6	236	<0.01	0.04	1	0.87	0.32	0.17	15.75	2.3
A083530	2005	3	1.32	0.09	11.65	0.52	0.79	0.08	0.05	0.015	7.8	3.9	0.1	5.1	0.001	3.3	141.5	<0.01	0.07	1.1	1.23	0.38	0.28	13.85	2.4
A083504	2005	4	0.4	0.14	12.65	1.13	2.79	0.08	0.22	0.022	6	4.9	0.17	13.4	<0.001	4.6	163.5	<0.01	0.05	1.8	0.4	0.58	0.58	7.38	9.5
A083509	2005	4	0.47	0.08	16.05	0.97	3.03	0.06	0.1	0.019	8	3.2	<0.05	5	<0.001	4.1	152	<0.01	0.02	1.6	0.19	0.45	0.29	10.15	3.9
A083517	2005	4	1.36	0.07	10.65	1.65	3.81	0.26	0.07	0.011	5.1	3.5	0.23	9.7	<0.001	3.5	215	<0.01	0.03	1.2	0.14	0.28	0.19	5.07	2.8
A083523	2005	4	1.08	0.15	13.6	3.41	4.88	0.22	0.07	0.018	6.4	4.9	0.17	11.4	0.001	5.2	126	<0.01	0.06	2	0.34	0.78	0.44	5.4	3.2
A083525	2005	4	1.36	0.06	10.35	1.53	5.61	0.65	0.05	0.021	4.4	5.5	0.19	11.9	<0.001	4.7	138	<0.01	0.03	1.5	0.26	0.25	0.35	4.83	1.8
A083505	2005	5	0.23	0.13	21.3	0.94	1.64	0.05	0.2	0.016	11.2	2.7	<0.05	8.6	0.002	2.3	39.6	<0.01	0.05	4.3	0.3	1.03	0.45	3.68	8.8
A083507	2005	5	0.27	0.2	15.4	1.19	1.73	<0.05	0.18	0.015	8.5	4.1	0.09	13	0.002	2.5	99.9	<0.01	0.07	2.7	0.31	0.5	0.49	3.33	8.1
A083511	2005	5	0.23	0.16	22.8	4.11	2.25	0.06	0.59	0.016	11.8	5.1	0.11	18.9	0.009	2.7	261	<0.01	0.04	3.4	0.16	1.84	0.92	5.15	22.5
A083520	2005	5	0.63	0.14	10.85	4.42	2.46	<0.05	0.1	0.014	5.3	4.6	0.17	16.6	0.001	3.3	140	<0.01	0.07	2.2	0.7	0.65	6.25	7.87	4
A083501	2005	6	0.2	0.13	33.4	0.4	3.97	0.05	0.14	0.014	16.9	13.2	<0.05	10.4	<0.001	2.5	25.8	<0.01	0.04	4.3	0.02	0.36	0.13	4.22	5.5
A083502	2005	6	0.36	0.18	61.3	1.83	2.44	0.07	0.18	0.017	29.9	4.6	0.27	9.9	<0.001	2.3	140.5	<0.01	0.03	9.1	0.21	0.9	0.35	12	7.5
A083512	2005	6	0.24	4.11	29.4	8.8	5.44	0.39	0.62	0.485	15.3	19.1	0.14	33.1	0.005	2.6	131	<0.01	0.05	8.3	4.67	1.95	0.41	6.22	24.3
A083514	2005	6	0.15	0.19	22.7	1.19	2.88	<0.05	0.17	0.012	10	7.6	0.13	14.6	<0.001	2.1	62.2	<0.01	0.09	3.2	0.09	0.41	0.92	2.91	7.2
A083516	2005	6	0.15	0.18	12.85	0.67	1.88	<0.05	0.16	0.013	5.8	3.2	<0.05	11.2	0.001	2	91.5	<0.01	0.08	2.1	0.09	0.4	0.35	3.58	6.9
A083522	2005	6	0.16	0.18	14.35	0.6	1.21	<0.05	0.16	0.013	6.7	3.1	<0.05	10	0.001	1.8	87	<0.01	0.06	2.4	0.07	0.35	0.47	2.99	6.2
Background[1]			2.8	0.17	60	3	15	1.5	3	0.1	30	20	20	90		22	375	2		9.6	0.45	2.7	1.5	33	165

Notes: 1 Average Crustal Abundance, (Bowen, 1979)

Table 4-10: Concentration1 of Elements of Interest in Extracts from Shake Flask Tests for Selected Samples

Sample ID	Age[2]	Rock Type	Ag mg/L	Sb mg/L	As mg/L	Ba mg/L	Cd mg/L	Cu mg/L	Pb mg/L	Zn mg/L	B mg/L	Mo mg/L	Cr mg/L	Co mg/L	V mg/L	Ni mg/L	Li mg/L	Se mg/L	Hg mg/L
Argilite 1	F	1	0.000083	0.262	0.00096	0.0231	<0.000050	0.00355	0.000207	0.0022	<0.010	0.00759	<0.00050	<0.00010	<0.0010	0.00151	0.0061	0.0149	<0.0010
Argilite 2	F	1	0.000055	0.036	0.00087	0.0213	0.000071	0.00393	0.000107	0.0043	<0.010	0.00137	0.00058	0.00061	0.0014	0.0175	<0.0050	0.0191	<0.0010
Argilite 3	F	1	0.00007	0.00597	0.00034	0.0446	<0.000050	0.00482	0.000132	0.0034	0.012	0.0017	<0.00050	0.00096	<0.0010	0.0113	0.0065	0.00719	<0.0010
Argilite 4	F	1	0.000337	0.0423	0.00057	0.0523	<0.000050	0.00235	0.000287	0.0032	<0.010	0.00336	0.00072	0.00027	<0.0010	0.00679	0.0068	0.0188	<0.0010
Argilite 5	F	1	0.000235	0.0774	0.00051	0.118	<0.000050	0.00295	0.000195	0.0021	0.014	0.0126	<0.00050	0.00195	<0.0010	0.0113	0.0069	0.0156	<0.0010
A083503	A	1	0.000016	0.0183	0.00032	0.133	<0.000050	0.00153	0.000468	0.0059	<0.010	0.00474	<0.00050	0.00055	0.0011	0.00942	0.0059	0.00798	<0.0010
A083518	A	1	0.000279	0.00176	0.00024	0.0517	0.00007	0.00044	<0.000050	0.0049	<0.010	0.00871	<0.00050	0.00135	<0.0010	0.0289	<0.0050	0.0363	<0.0010
A083529	A	1	0.000055	0.00543	0.00032	0.0656	<0.000050	0.00091	0.000057	0.0033	<0.010	0.00208	<0.00050	0.00015	<0.0010	0.00309	<0.0050	0.0215	<0.0010
A083515	A	2	0.00006	0.0145	0.00043	0.114	<0.000050	0.00085	0.00009	0.0047	<0.010	0.0067	0.00058	0.00047	<0.0010	0.013	<0.0050	0.0207	<0.0010
A083531	A	2	0.000214	0.00442	0.00022	0.0979	0.00006	0.00029	<0.000050	0.0073	<0.010	0.0047	<0.00050	0.0019	<0.0010	0.0239	<0.0050	0.0275	<0.0010
EXCP 1	F	3	0.000074	0.0218	0.00021	0.306	<0.000050	0.00327	0.000508	0.0049	0.022	0.00694	<0.00050	0.00031	<0.0010	0.00497	0.0121	0.0197	<0.0010
EXCP 2	F	3	0.000029	0.0212	0.00023	0.257	<0.000050	0.00334	0.000393	0.0023	0.036	0.0051	<0.00050	0.0002	<0.0010	0.00171	0.0168	0.0183	<0.0010
EXCP 3	F	3	0.000059	0.0076	0.00022	0.254	<0.000050	0.00557	0.000342	0.0023	0.034	0.00579	<0.00050	0.00013	<0.0010	0.00293	0.0193	0.0084	<0.0010
EXCP 4	F	3	<0.000010	0.00751	0.00027	0.279	<0.000050	0.00424	0.000131	0.0017	<0.010	0.00391	<0.00050	<0.00010	<0.0010	<0.00050	0.0111	0.0042	<0.0010
A083510	A	3	0.000016	0.00107	0.0001	0.168	<0.000050	0.00237	0.000373	0.003	<0.010	0.0582	<0.00050	<0.00010	<0.0010	0.00162	<0.0050	0.0174	<0.0010
A083530	A	3	0.000016	0.00915	0.00024	0.0872	<0.000050	0.00039	0.00165	0.0255	<0.010	0.0153	<0.00050	0.00015	<0.0010	0.00492	0.0059	0.00737	<0.0010
EXMT	F	4	0.000011	0.0544	0.00018	0.223	<0.000050	0.00129	0.000527	0.0027	<0.010	0.00462	<0.00050	<0.00010	<0.0010	<0.00050	<0.0050	0.0574	<0.0010
A083504	A	4	0.000036	0.00071	<0.00020	0.0297	<0.00010	0.00097	<0.00010	0.0058	<0.020	0.0006	<0.0010	<0.00020	<0.0020	0.0047	<0.010	0.0134	<0.0010
A083525	A	4	<0.000010	<0.00010	<0.00010	0.127	<0.000050	0.00054	<0.000050	0.0027	<0.010	0.043	<0.00050	<0.00010	<0.0010	<0.00050	<0.0050	0.00345	<0.0010
A083505	A	5	0.000036	0.0305	<0.00010	0.0652	<0.000050	0.00115	0.000062	0.0075	<0.010	0.000874	<0.00050	0.00015	<0.0010	0.00303	<0.0050	0.0108	<0.0010
A083511	A	5	0.000164	0.00324	0.0007	0.0556	<0.000050	0.00144	0.000104	0.0054	<0.010	0.00604	<0.00050	0.00047	<0.0010	0.0112	<0.0050	0.0334	<0.0010
SSS[3]-1	F	6	0.00004	0.0618	0.00113	0.131	<0.000050	0.00195	0.000106	<0.0010	<0.010	0.0022	<0.00050	<0.00010	0.0035	0.00106	0.0052	0.00562	<0.0010
SSS[3]-2	F	6	0.000118	0.0676	0.00274	0.275	<0.000050	0.00565	0.000173	0.0051	<0.010	0.0231	<0.00050	<0.00010	0.0016	0.00528	0.0077	0.0144	<0.0010
SSS[3]-3	F	6	0.000061	0.0248	0.00074	0.126	<0.000050	0.00418	0.000065	0.0027	0.011	0.000834	<0.00050	<0.00010	0.0033	0.00137	<0.0050	0.00638	<0.0010
SSS[3]-4	F	6	0.00003	0.0256	0.0007	0.0866	<0.000050	0.00404	0.000096	0.0029	0.01	0.0015	<0.00050	<0.00010	0.0017	0.00253	<0.0050	0.00524	<0.0010
SSS[3]-5	F	6	0.000025	0.786	0.00081	0.0737	<0.000050	0.0022	<0.000050	0.0023	<0.010	0.00763	<0.00050	0.0002	0.0021	0.00735	<0.0050	0.00908	<0.0010
F-R[4]-1	F	6	<0.000010	0.00907	<0.00010	0.0515	0.000464	0.00375	0.000462	0.0065	<0.010	0.000165	<0.00050	0.00257	<0.0010	0.00271	0.0177	0.0873	<0.0010
F-R[4]-2	F	6	0.000304	0.0307	0.00031	0.0888	0.000065	0.00291	0.000258	0.0025	0.038	0.00266	<0.00050	<0.00010	<0.0010	<0.00050	0.0058	0.182	<0.0010
F-R[4]-3	F	6	0.000106	0.0151	0.00017	0.0767	<0.000050	0.00266	0.000086	0.0015	0.014	0.00217	<0.00050	<0.00010	<0.0010	<0.00050	0.0067	0.201	<0.0010
F-R[4]-4	F	6	<0.000010	0.0334	0.0004	0.0936	<0.000050	0.00198	<0.000050	0.0015	<0.010	0.00503	<0.00050	<0.00010	<0.0010	<0.00050	<0.0050	0.026	<0.0010
A083502	A	6	0.000017	0.0271	0.00178	0.191	<0.000050	0.00171	0.000803	0.0098	<0.010	0.00736	<0.00050	0.00015	0.0027	0.00145	<0.0050	0.00492	<0.0010
A083512	A	6	0.000052	0.0232	0.00081	0.0996	<0.000050	0.00279	0.000102	0.0044	<0.010	0.00374	<0.00050	0.00029	<0.0010	0.0087	0.0053	0.102	<0.0010
A083516	A	6	0.000028	0.0174	0.00144	0.33	<0.00010	0.00271	0.00076	0.0033	<0.020	0.00213	<0.0010	<0.00020	0.0093	0.005	<0.010	0.00993	<0.0010
CCME[5] (Fresh Water)			0.0001		0.005		0.000017	0.002	0.0001	0.03		0.073	0.0089 0.0017			0.025		0.001	
MMER[6]					0.5			0.3	0.2	0.5						0.5			

Notes: 1 Dissolved concentration after filtration with 0.45 um filter 2 F = fresh sample, A = aged sample (approx. 6 months) 3 Siliceous Silt Stone 4 F-R = Footwall Rhyolite 5 Canadian Council of Ministers of the Environment (CCME) 2003
6 Metal Mining Effluent Regulations (SOR 2002-222) Schedule 4 – Column 2, Mean Maximum Monthly Concentration. 7 Trivalent chromium (Cr(III)) and Hexavalent chromium (Cr(VI))

Table 4-11: Concentration1 of Major Elements and Other Elements in Extracts from Shake Flask Tests for Selected Samples

Sample ID	Age	Rock Type	pH	SO_4 mg/kg	Al mg/L	Fe mg/L	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	P mg/L	Ti mg/L	Si mg/L	Mn mg/L	Be mg/L	Bi mg/L	Sn mg/L	Sr mg/L	Tl mg/L	U mg/L
Argilite 1	F	1	7.88	135	0.187	0.046	28.9	3.27	<2.0	17.2	<0.30	<0.010	1.92	0.0139	<0.00050	<0.00050	<0.00010	0.107	0.00105	0.00397
Argilite 2	F	1	7.77	192	0.0848	<0.030	37.1	2.96	<2.0	10.9	<0.30	<0.010	1.97	0.15	<0.00050	<0.00050	0.00014	0.0654	0.0004	0.00171
Argilite 3	F	1	7.75	122	0.122	0.083	23.6	4.79	2.8	14.5	<0.30	<0.010	2.39	0.0407	<0.00050	<0.00050	<0.00010	0.0899	0.00028	0.000896
Argilite 4	F	1	7.78	251	0.1	0.049	43.5	8.38	<2.0	8.4	<0.30	<0.010	2.12	0.0975	<0.00050	<0.00050	0.00019	0.125	0.00044	0.00183
Argilite 5	F	1	7.61	657	0.135	<0.030	48.7	10.4	56.9	20.5	<0.30	<0.010	1.73	0.118	<0.00050	<0.00050	0.00012	0.203	0.00046	0.00274
A083503	A	1	7.95	104	0.209	0.157	34.7	8.34	5.5	15.3	<0.30	<0.010	3.3	0.085	<0.00050	<0.00050	<0.00010	0.135	0.00021	0.000767
A083518	A	1	7.15	245	0.0287	<0.030	70.9	30.9	11.9	8	<0.30	<0.010	2.76	0.33	<0.00050	<0.00050	<0.00010	0.38	<0.00010	0.00246
A083529	A	1	7.16	209	0.0408	<0.030	68.6	11.9	2.1	10.6	<0.30	<0.010	2.3	0.0762	<0.00050	<0.00050	<0.00010	0.211	0.00017	0.00045
A083515	A	2	6.96	148	0.0675	0.044	40.8	15.6	8.1	12.8	<0.30	<0.010	2.58	0.106	<0.00050	<0.00050	0.00012	0.367	<0.00010	0.00235
A083531	A	2	7.38	163	0.0369	<0.030	64	15	<2.0	11	<0.30	<0.010	2.31	0.204	<0.00050	<0.00050	<0.00010	0.256	<0.00010	0.00206
EXCP 1	F	3	7.77	299	0.0458	<0.030	83.4	10.2	6.5	7.8	<0.30	<0.010	1.53	0.103	<0.00050	<0.00050	<0.00010	0.327	0.00015	0.00605
EXCP 2	F	3	7.85	268	0.0879	<0.030	63.3	10.3	<2.0	11.3	<0.30	<0.010	1.79	0.0744	<0.00050	<0.00050	0.00013	0.28	0.00022	0.00282
EXCP 3	F	3	8.03	288	0.0367	<0.030	86.3	11.5	5.2	10.1	<0.30	<0.010	1.43	0.132	<0.00050	<0.00050	0.00013	0.423	0.00013	0.00618
EXCP 4	F	3	8.11	101	0.0362	<0.030	65.3	10.6	<2.0	11.3	<0.30	<0.010	2.66	0.0779	<0.00050	<0.00050	<0.00010	0.24	0.00017	0.00429
A083510	A	3	7.86	43	0.062	0.063	25.8	5.87	11.2	3.2	<0.30	<0.010	3.17	0.0733	<0.00050	<0.00050	<0.00010	0.217	<0.00010	0.00101
A083530	A	3	7.34	233	0.0139	<0.030	111	7.01	<2.0	4.1	<0.30	<0.010	2.12	0.0565	<0.00050	<0.00050	<0.00010	0.203	0.00029	0.00179
EXMT	F	4	7.52	54	0.194	<0.030	25.4	5.1	<2.0	<2.0	<0.30	<0.010	1.59	0.0207	<0.00050	<0.00050	0.00013	0.327	0.00019	0.000311
A083504	A	4	7.82	322	0.0211	<0.030	120	17	6.1	8.7	<0.30	<0.010	2.68	1.49	<0.0010	<0.0010	<0.00020	0.141	<0.00020	0.000731
A083525	A	4	7.35	30.3	0.0808	0.042	25.8	3.4	5.2	2.1	<0.30	<0.010	1.84	0.0316	<0.00050	<0.00050	<0.00010	0.174	<0.00010	0.0004
A083505	A	5	7.89	150	0.0547	<0.030	32.8	25.1	<2.0	8.8	<0.30	<0.010	1.29	0.0442	<0.00050	<0.00050	<0.00010	0.109	0.00012	0.00064
A083511	A	5	6.54	184	0.0502	<0.030	61.1	19.9	7.8	8.9	<0.30	<0.010	2.55	0.176	<0.00050	<0.00050	<0.00010	0.329	<0.00010	0.00336
SSS[3]-1	F	6	6.94	67	0.292	0.043	17	2.71	4.8	9.8	<0.30	<0.010	1.94	0.0121	<0.00050	<0.00050	<0.00010	0.0829	<0.00010	0.000363
SSS[3]-2	F	6	7.08	63	0.143	0.073	25.4	2.8	<2.0	6.8	<0.30	<0.010	2.42	0.0309	<0.00050	<0.00050	<0.00010	0.119	<0.00010	0.0004
SSS[3]-3	F	6	7.29	114	0.269	0.036	17.8	2.81	13.6	9.9	<0.30	<0.010	1.9	0.00773	<0.00050	<0.00050	0.00011	0.0892	<0.00010	0.00102
SSS[3]-4	F	6	7.35	240	0.151	<0.030	27.1	3.87	9.1	11.4	<0.30	<0.010	1.87	0.0124	<0.00050	<0.00050	<0.00010	0.151	0.0001	0.00188
SSS[3]-5	F	6	7.39	157	0.112	<0.030	30.8	4.71	<2.0	6.4	<0.30	<0.010	2.13	0.021	<0.00050	<0.00050	0.00012	0.151	<0.00010	0.0007
F-R[4]-1	F	6	7.19	192	0.0142	<0.030	53.2	13.5	<2.0	12.5	<0.30	<0.010	2.95	0.394	<0.00050	<0.00050	0.00015	0.201	0.00047	0.000394
F-R[4]-2	F	6	7.35	102	0.087	<0.030	26.1	4.79	7.1	6.2	<0.30	<0.010	2.63	0.00832	<0.00050	<0.00050	<0.00010	0.124	0.00048	0.000508
F-R[4]-3	F	6	7.5	127	0.0767	<0.030	25.6	5.9	2.1	9.1	<0.30	<0.010	2.35	0.0107	<0.00050	<0.00050	0.0001	0.138	0.0004	0.00317
F-R[4]-4	F	6	7.63	51	0.233	<0.030	16.2	4.9	<2.0	3.7	<0.30	<0.010	1.31	0.00217	<0.00050	<0.00050	<0.00010	0.101	0.00037	0.000384
A083502	A	6	8.27	31.5	0.686	0.463	12.6	4.45	12.8	7.3	<0.30	<0.010	4.5	0.0142	<0.00050	<0.00050	<0.00010	0.0892	<0.00010	0.00273
A083512	A	6	6.81	172	0.0581	<0.030	49.5	18.5	12.5	13.5	<0.30	<0.010	2.22	0.103	<0.00050	<0.00050	<0.00010	0.322	0.00023	0.00375
A083516	A	6	7.15	49.7	0.356	0.126	18.5	5.42	7.7	10.8	<0.30	<0.010	4.97	0.00801	<0.0010	<0.0010	<0.00020	0.106	<0.00020	0.0011
CCME[4] (Fresh Water)			6.5-9.0		0.1	0.3														

Notes: 1 Dissolved concentration after filtration with 0.45 um filter 2 F = fresh sample, A = aged sample (approx. 6 months) 3 SSS = Siliceous Silt Stone 4 F-R = Footwall Rhyolite
5 Canadian Council of Ministers of the Environment (CCME) 2003

Table 4-12: Concentration of Selected Elements in Shake Flask Extractions of DMS Float Samples

Sample ID			HLS Hump Floats ETC 139-144	HLS Wolv Floats ETC 152-168	HLS Lynx Floats ETC 169-173	Blank
Parameter	**Method**	**Units**				
nanopure water volume		mL	1000	1000	1000	1000
Sample Weight		g	50	50	50	-
pH	meter		7.56	7.33	7.4	5.33
Conductivity	meter	uS/cm	113	77	89	1
Acidity (to pH 4.5)	titration	mg CaCO3/L	#N/A	#N/A	#N/A	#N/A
Total Acidity (to pH 8.3)	titration	mg CaCO3/L	4	4	5	2.5
Alkalinity	titration	mg CaCO3/L	44.5	26.5	32.75	1.25
Sulphate	Turbidity	mg/L	15	15	12	<1
Ion Balance						
Major Anions	#N/A	#N/A	1.20	0.84	0.91	#N/A
Major Cations	#N/A	#N/A	1.17	0.88	0.97	#N/A
Diff. (%)	#N/A	#N/A	-1.5%	2.0%	3.5%	#N/A
Dissolved Metals						
Hardness CaCO3	ICP-MS	mg/L	57.1	42	46.5	< 0.2
Aluminum Al	ICP-MS	mg/L	0.019	0.009	0.005	0.001
Antimony Sb	ICP-MS	mg/L	0.029	0.024	0.026	< 0.0002
Arsenic As	ICP-MS	mg/L	0.0019	0.0033	0.0015	< 0.0002
Barium Ba	ICP-MS	mg/L	0.036	0.042	0.059	< 0.0002
Beryllium Be	ICP-MS	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Bismuth Bi	ICP-MS	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Boron B	ICP-MS	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
Cadmium Cd	ICP-MS	mg/L	0.0014	0.0042	0.003	< 0.00004
Calcium Ca	ICP-MS	mg/L	20.9	14.7	16.8	< 0.01
Chromium Cr	ICP-MS	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Cobalt Co	ICP-MS	mg/L	0.0015	0.0019	0.0036	< 0.0002
Copper Cu	ICP-MS	mg/L	0.0006	0.0022	0.0038	0.0013
Iron Fe	ICP-MS	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
Lead Pb	ICP-MS	mg/L	0.0018	0.0037	0.0058	< 0.0002
Lithium Li	ICP-MS	mg/L	0.0006	0.0006	0.0006	< 0.0002
Magnesium Mg	ICP-MS	mg/L	1.19	1.29	1.1	< 0.01
Manganese Mn	ICP-MS	mg/L	0.164	0.172	0.169	< 0.0002
Mercury Hg	CVAA	ug/L	< 0.02	< 0.02	< 0.02	< 0.02
Molybdenum Mo	ICP-MS	mg/L	0.001	0.0008	0.0017	< 0.0001
Nickel Ni	ICP-MS	mg/L	0.014	0.038	0.024	< 0.0002
Phosphorus PO4	ICP-MS	mg/L	< 0.03	< 0.03	< 0.03	< 0.03
Potassium K	ICP-MS	mg/L	0.63	0.71	0.81	< 0.02
Selenium Se	ICP-MS	mg/L	0.01	0.0083	0.019	< 0.0002
Silicon SiO2	ICP-MS	mg/L	0.34	0.35	0.29	< 0.05
Silver Ag	ICP-MS	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium Na	ICP-MS	mg/L	0.24	0.44	0.49	< 0.01
Strontium Sr	ICP-MS	mg/L	0.055	0.039	0.05	< 0.0002
Tellurium Te	ICP-MS	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Thallium Tl	ICP-MS	mg/L	0.0004	0.00025	0.002	< 0.00002
Thorium Th	ICP-MS	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Tin Sn	ICP-MS	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Titanium Ti	ICP-MS	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Uranium U	ICP-MS	mg/L	0.0008	0.0002	< 0.0001	< 0.0001
Vanadium V	ICP-MS	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Zinc Zn	ICP-MS	mg/L	0.064	0.3	0.21	< 0.001
Zirconium Zr	ICP-MS	mg/L	< 0.002	< 0.002	< 0.002	< 0.002

Table 5-1: Listing of Humidity Cell Analytical Parameters and their Detection Limits

Parameter	Detection Limit (mg/L)
Al	0.001
Sb	0.0001
As	0.0001
Ba	0.0001
Be	0.0002
Bi	0.0002
B	0.005
Cd	0.00004
Ca	0.01
Cr	0.0002
Co	0.0001
Cu	0.0001
Fe	0.01
Pb	0.00005
Li	0.0002
Mg	0.005
Mn	0.00005
Hg by CVAA	0.00005
Mo	0.00005
Ni	0.0001
K	0.02
Se	0.0002
Si	0.05
Ag	0.00005
Na	0.01
Sr	0.0001
Te	0.0002
Tl	0.00002
Th	0.0001
Sn	0.0001
Ti	0.0002
U	0.00005
V	0.0002
Zn	0.001

TABLE 5-2: Samples Selected for Humidity Cell Testing

Rock Type	Cell No.	Description		MPA kg $CaCO_3$/tonne	NP kg $CaCO_3$/tonne	NP/MPA -	Cd ppm	Cu ppm	Pb ppm	Se ppm	Zn ppm
1		Argillites (n=6)	Median	34.25	27.5	0.80	0.23	69.2	15.9	2.4	132
			90th Percentile	82.5	92	0.75	0.328	79.2	23.96	4.94	211.2
	HC9	A083503		16.6	15	0.91	0.15	69.2	16.1	1.2	132
	HC10	A083529		29.7	22	0.74	0.34	62.5	29.2	2.4	192
2		Carbonaceous argillites (n=10)	Median	39.4	27	0.69	0.25	58.9	19.7	2.7	107
			90th Percentile	58.17	38.3	0.45	2.334	71.46	41.12	5.28	420.6
	HC7	Argillite-2		37.5	18	0.48	2.55	54.8	19.7	6	855
	HC8	Argillite-4		52.8	32	0.61	0.35	44.2	34.9	2.7	40
3		Calcite-pyrite exhalite (n=9)	Median	138.4	345	2.49	0.29	45.45	184.25	3.4	164.5
			90th Percentile	203.24	523.6	1.50	19.705	75.91	479	4.42	4221
	HC5	EXCP-2		138.4	227	1.64	0.73	75.4	256	2.8	239
	HC6	EXCP-3		138.8	350	2.52	0.09	55.1	139	2.3	31
4		Magnetite iron formations and Silica-pyrite exhalite (n=7)	Median	57.8	80	1.38	0.125	44.9	6.55	1.5	96
			90th Percentile	97	105.8	0.47	26.033	69.4	176.4	8.8	1786
	HC11	A083504		55.9	89	1.59	0.04	70.4	18.8	4.3	106
	HC2	EXMT		100	99	0.99	37.1	29	334	13.3	3390
5		Interbedded rhyolite/argillites (n=5)	Median	28.4	48	1.69	0.07	68	11.15	2.1	103
			90th Percentile	52.38	130.6	0.72	0.192	76.01	40.81	3.77	157.2
	HC12	A083505		28.4	21	0.74	0.08	67.9	10.4	2.3	159
	HC13	A083511		29.7	67	2.26	0.24	68.1	11.9	4.4	153
6		Rhyolite and Rhyolite Fragmental (n=16)	Median	20.8	33	1.72	0.19	62.5	7.5	1.4	66
			90th Percentile	120.6	68	5.33	2.046	629.6	58.08	42.66	254.2
	HC1	Siliceous Siltstone-2		18.8	22	1.17	0.32	75.2	8.2	1.9	128
	HC3	Footwall Rhyolite-2		237.5	7	0.03	1.68	165.5	63.4	40.2	202
	HC4	Footwall Rhyolite-3		112.8	19	0.17	2.52	939	34	44.3	289
Ore Samples											
	HC14	Wolverine Feed Ore		523.4	58	0.11	>500	6090	6560	760	>10000
	HC15	Hump Feed Ore		412.5	113	0.27	308	6430	3760	540	>10000
	HC16	Lynx Feed Ore		900	100	0.11	>500	9670	6480	>1000	>10000
DMS Float Samples											
	HC17	Wolverine Float		28.1	84.4	3.00	13.8	567.8	140.8	37.2	1248
	HC18	Hump Float		55.3	241	4.36	15.3	158	130.1	26.5	1229
	HC19	Lynx Float		50.6	121	2.39	16.4	754.5	198.5	39.6	1577

Table 6-1: Mass-Loading Model Predicted Concentrations

Parameter	Concentration (mg/L)
Sulphate	776
Aluminum	1.16
Arsenic	0.275
Cadmium	0.05370
Copper	0.358
Iron	5.1
Lead	0.459
Molybdenum	0.099
Nickel	0.635
Selenium	0.509
Silver	0.1611
Zinc	6.06

Table 6-2: Percent Contributions by Load Source, Mass-Loading Model

	Load Sources - Percent Contributon				
Parameter	Groundwater	Paste Backfill	Mine Rock Surfaces	Loose Waste	Massive Sulphide
Sulphate	8.83%	0.20%	79.83%	10.53%	0.61%
Aluminum	4.67%	0.00%	92.76%	2.53%	0.05%
Arsenic	14.76%	7.17%	77.96%	0.05%	0.07%
Cadmium	3.81%	0.76%	89.85%	2.73%	2.85%
Copper	0.76%	1.20%	97.57%	0.41%	0.06%
Iron	3.48%	4.63%	91.78%	0.09%	0.03%
Lead	2.28%	0.64%	95.01%	1.60%	0.47%
Molybdenum	7.03%	0.00%	88.07%	4.87%	0.03%
Nickel	1.73%	0.00%	96.97%	1.15%	0.14%
Selenium	8.63%	0.15%	86.28%	1.83%	3.10%
Silver	1.25%	0.00%	97.73%	0.91%	0.11%
Zinc	0.13%	2.30%	95.12%	0.02%	2.43%

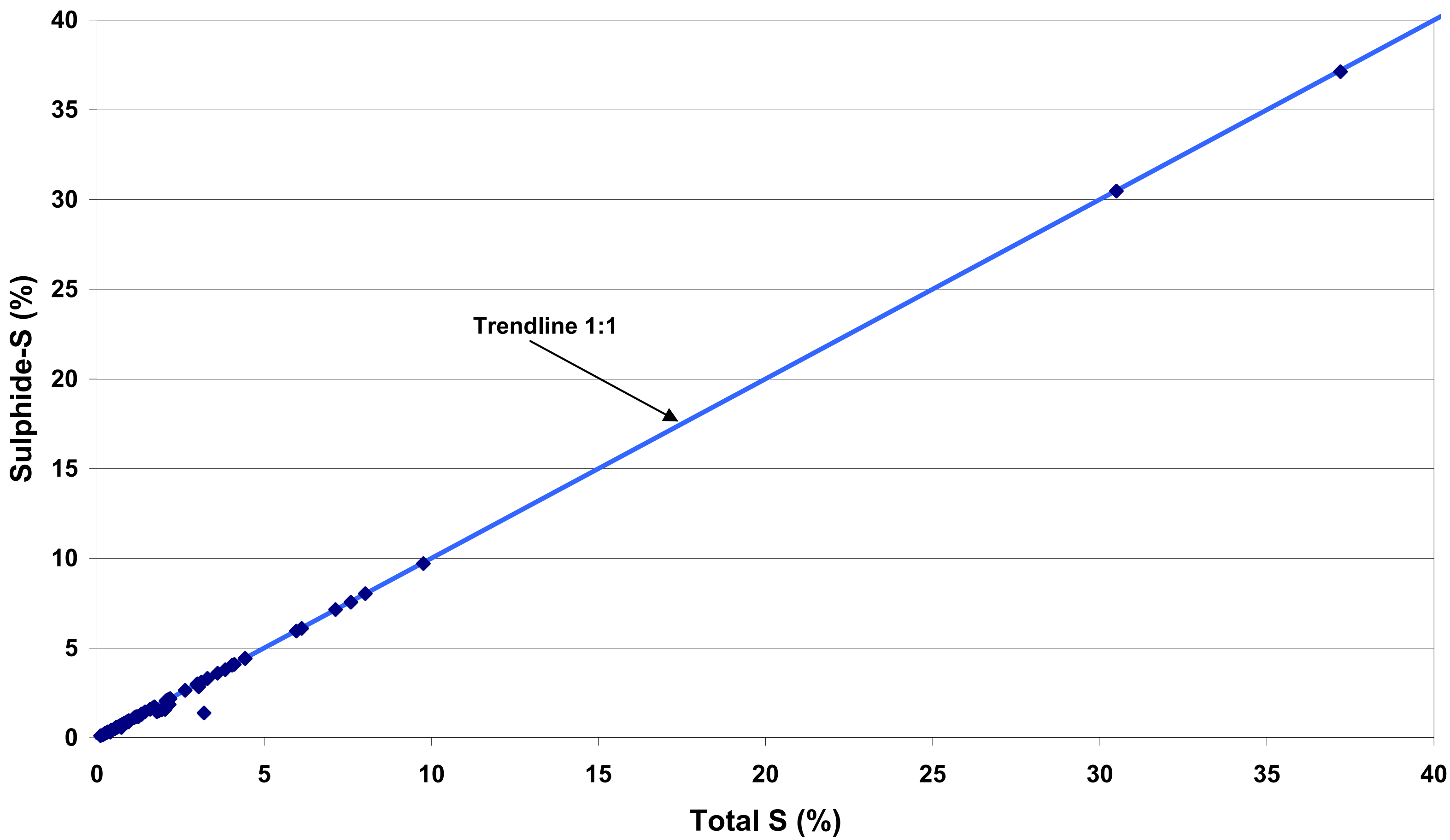
Table 6-3: Predicted Equilibrium Concentrations of Mine Water at Closure

Parameter	Initial Concentration (mg/L)	MINTEQA2 Simulations			
		No Precip (mg/L)	Base Case (mg/L)	pH = 6.0 (mg/L)	pH = 4.0 (mg/L)
Temperature		10^{o}C	10^{o}C	10^{o}C	10^{o}C
Final pH		9.72	8.00	6.00	4.00
Final Eh		203 mV	300 mV	413 mV	525 mV
Ionic Strength (M)		0.028	0.026	0.03	0.031
Sulphate	776	929	852	987	1039
Alkalinity	185	185	57	185	185
Aluminum	1.161	1.160	0.001	0.003	1.160
Arsenic	0.275	0.277	0.277	0.277	0.277
Cadmium	0.054	0.056	0.056	0.056	0.056
Copper	0.358	0.356	0.020	0.356	0.356
Iron	5.093	5.093	0.00001	0.0031	4.051
Lead	0.459	0.456	0.045	0.456	0.456
Molybdenum	0.099	0.096	0.096	0.096	0.096
Nickel	0.635	0.632	0.632	0.632	0.632
Selenium	0.509	0.505	0.505	0.505	0.505
Silver	0.161	0.162	0.162	0.162	0.162
Zinc	6.06	6.062	1.50	6.06	6.06

Table 6-4: Comparison of Measured and Predicted Wolverine Mine Waters with Measured Mine Waters at Similar Mineral Deposit Types

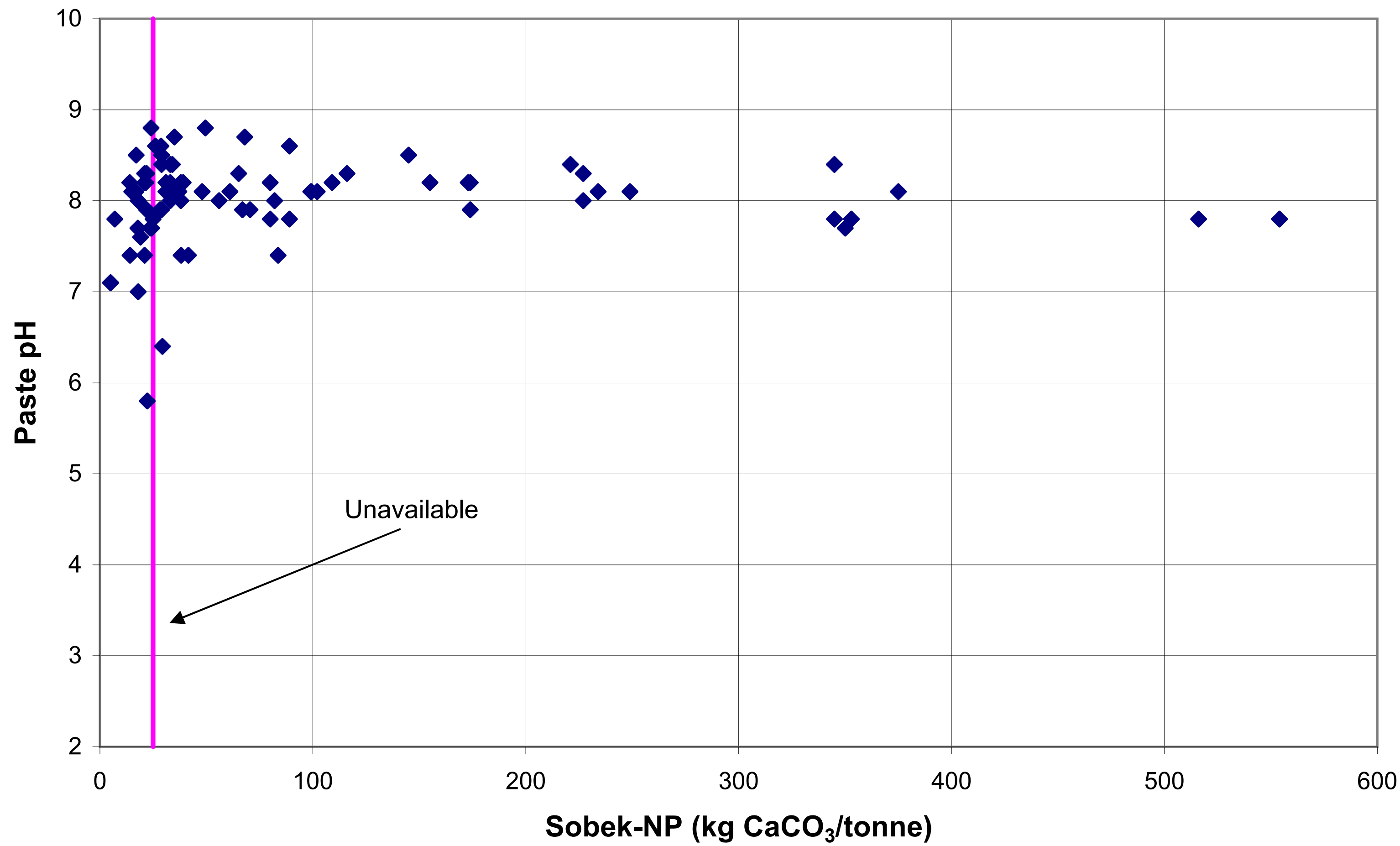
	Units	Wolverine Project				Lynx Mine		Britannia Mine		Holden Mine		Mine 12	
		2005 Underground Water		Unequilibrated 'Mass-Loading' Model Estimate	Equilibrated 'Base Case' Model Estimate	Portal 10E Discharge (1997-2001)		4100 Portal (2001-2002)		Portal Discharge (1995-1996)		Mine Dewatering (1989-1997)	
		Mean	90th Percentile			Mean	90th Percentile	Mean	90th Percentile	Mean	90th Percentile	Mean	90th Percentile
pH		8.0	8.2		**8.0**	6.9	7.5	3.6	4.0	5.1	5.7	3.0	3.2
Sulphate	mg/L	69.6	72.6	**776**	**852**	262	466	1359	1454	335	404	6793	8422
Dissolved Metals													
Aluminum	mg/L	0.0737	0.20	**1.16**	**0.001**	0.06	0.05	30.9	32.7	4.34	7.28		
Arsenic	mg/L	0.05759	0.20	**0.275**	**0.277**			0.001	0.001	0.000813	0.001700		
Cadmium	mg/L	0.003	0.010	**0.0537**	**0.0560**	0.05	0.09	0.113	0.119	0.031	0.053		
Copper	mg/L	0.004	0.010	**0.358**	**0.020**	0.21	0.23	23.1	24.0	1.50	3.04	7.26	11.07
Iron	mg/L	0.240	0.635	**5.10**	**0.00001**	0.04	0.07	4.20	6.54	0.742	1.20	856	1531
Lead	mg/L	0.0147	0.050	**0.459**	**0.045**	0.01	0.01	0.04	0.04	0.03	0.06	2.68	4.40
Molybdenum	mg/L	0.0094	0.0300	**0.099**	**0.096**			0.005	0.005	0.027	0.064		
Nickel	mg/L	0.0152	0.0500	**0.635**	**0.632**			0.05	0.05	0.01	0.02		
Selenium	mg/L	0.058	0.200	**0.509**	**0.505**			0.002	0.002				
Silver	mg/L	0.0029	0.010	**0.161**	**0.161**			0.0001	0.0001	0.0001	0.0001		
Zinc	mg/L	0.0094	0.0201	**6.06**	**1.50**	12.9	22.0	23.2	24.3	6.388	9.336	1483	2240

FIGURES



Plot of Sulphide S vs. Total S (%) AP For All Waste Rock Samples Wolverine Mine, YK	
Yukon Zinc Corporation	
January 2006	FIGURE 4-1

TC 53920



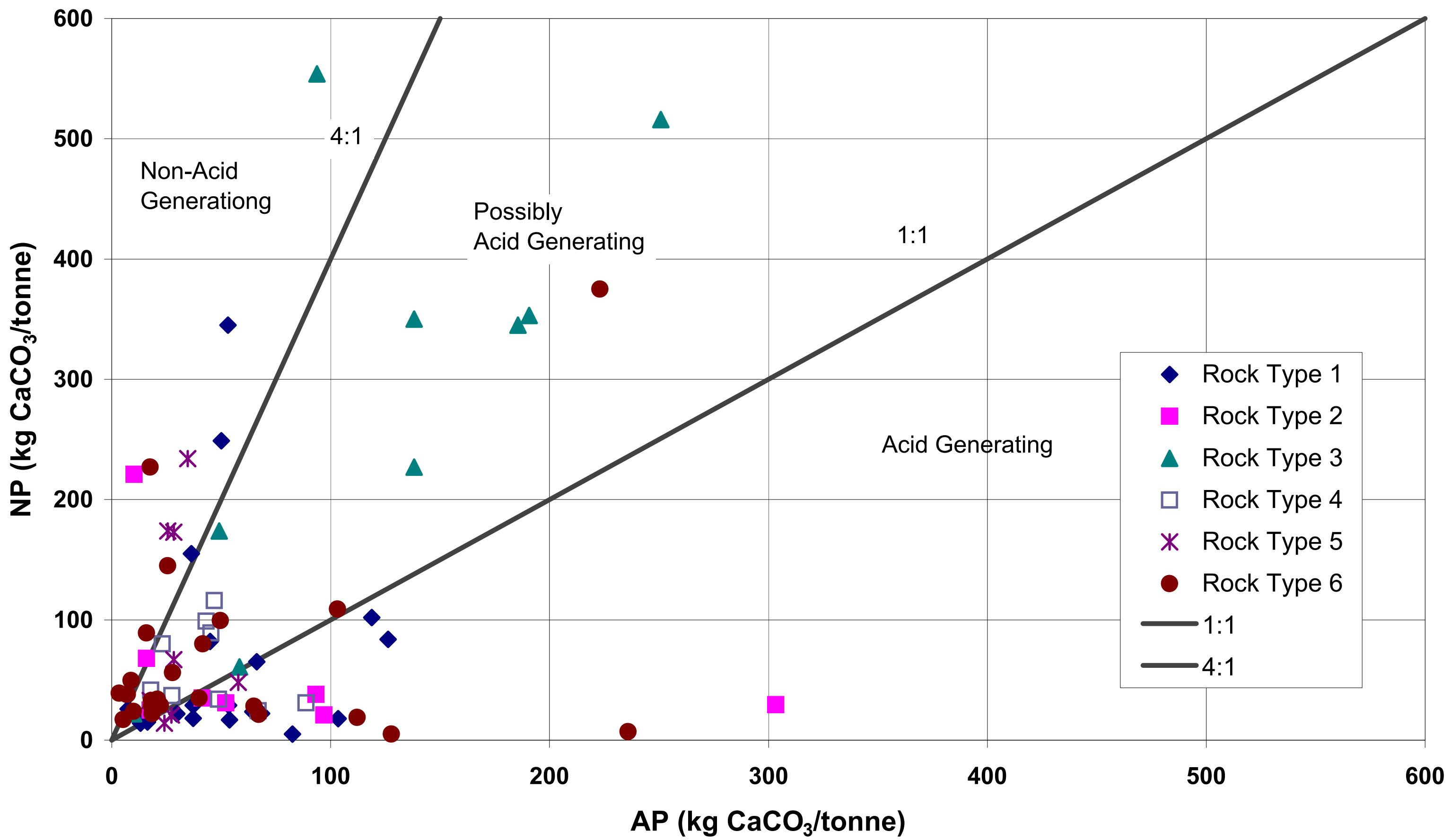
Plot of Paste pH vs. Sobek-NP
For Waste Rock Samples
Wolverine Mine, YK

Yukon Zinc Corporation

January 2006 | FIGURE 4-2

TC 53920

amec



Plot of NP vs. AP
For All Waste Rock Samples
Wolverine Mine, YK

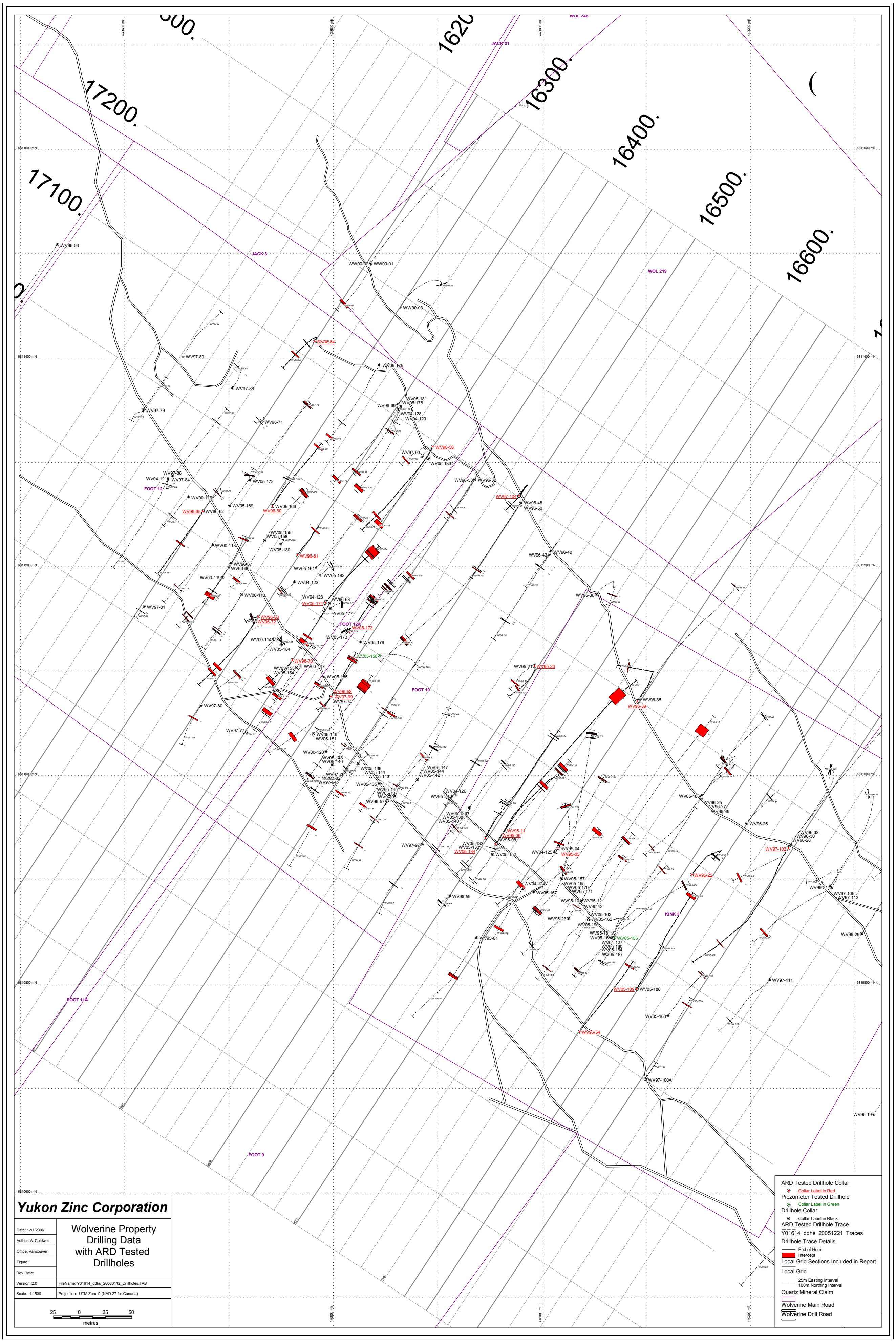
Yukon Zinc Corporation

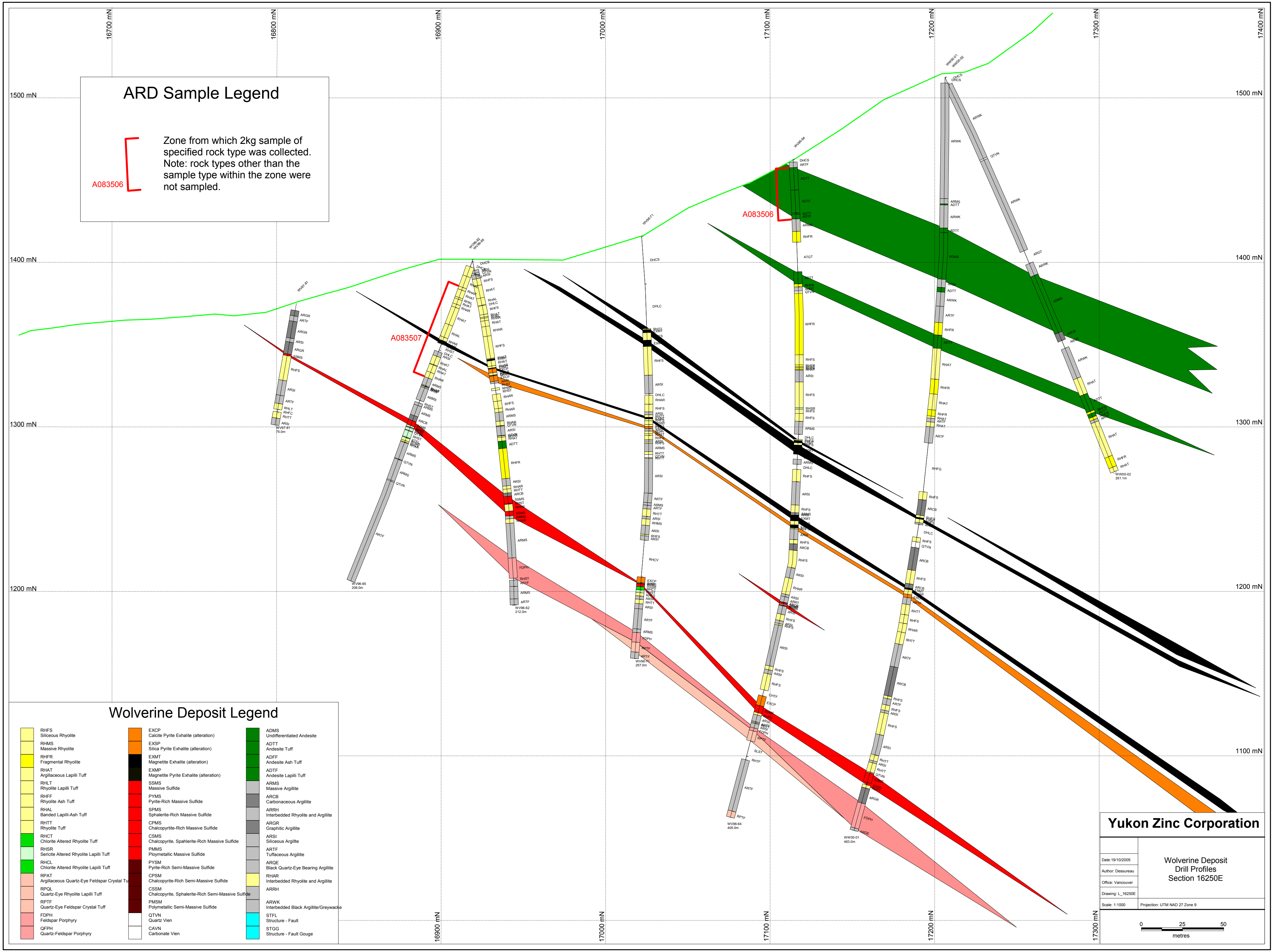
January 2006 | FIGURE 4-3

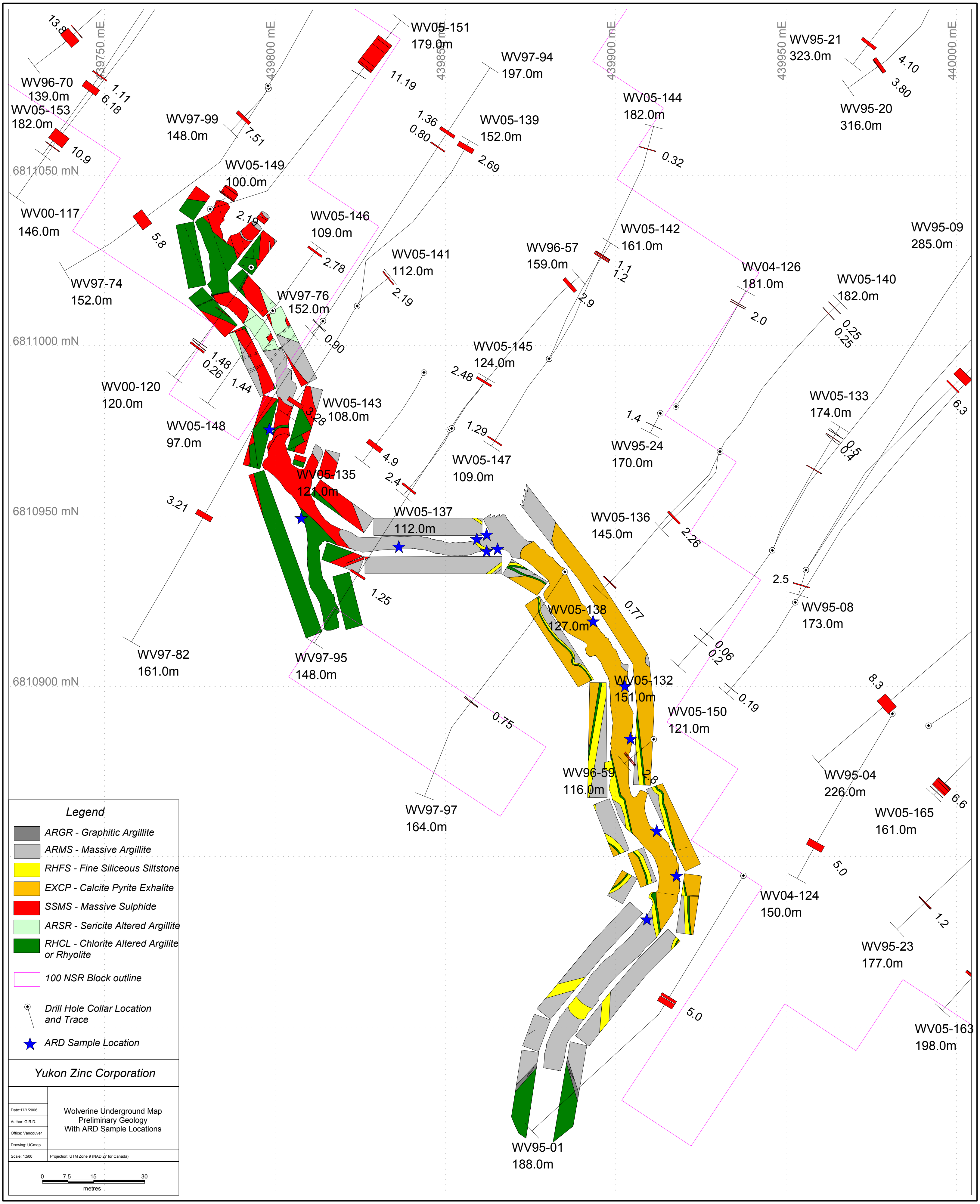
TC 53920

amec

Appendix A
Sample Locations


Yukon Zinc Corporation
Wolverine Property
Drilling Data
with ARD Tested
Drillholes
Date: 12/1/2006
Author: A. Caldwell
Office: Vancouver
Figure:
Rev.Date:
Version: 2.0
FileName: Y01614_ddhs_20060112_Drillholes.TAB
Scale: 1:1500
Projection: UTM Zone 9 (NAD 27 for Canada)
25 0 25 50
metres
ARD Tested Drillhole Collar
Collar Label in Red
Piezometer Tested Drillhole
Collar Label in Green
Drillhole Collar
Collar Label in Black
ARD Tested Drillhole Trace
Y01614_ddhs_20051221_Traces
Drillhole Trace Details
End of Hole
Intercept
Local Grid Sections Included in Report
Local Grid
25m Easting Interval
100m Northing Interval
Quartz Mineral Claim
Wolverine Main Road
Wolverine Drill Road
17200.
17100.
16300.
16400.
16500.
16600.
JACK 3
JACK 31
WOL 219
WOL 246
FOOT 12
FOOT 12A
FOOT 10
FOOT 11A
FOOT 9
KINK 3


ARD Sample Legend
Zone from which 2kg sample of specified rock type was collected. Note: rock types other than the sample type within the zone were not sampled.
A083506
A083507
16700 mN
16800 mN
16900 mN
17000 mN
17100 mN
17200 mN
17300 mN
17400 mN
1500 mN
1400 mN
1300 mN
1200 mN
1100 mN
Wolverine Deposit Legend
RHFS Siliceous Rhyolite
RHMS Massive Rhyolite
RHFR Fragmental Rhyolite
RHAT Argillaceous Lapilli Tuff
RHLT Rhyolite Lapilli Tuff
RHFF Rhyolite Ash Tuff
RHAL Banded Lapilli-Ash Tuff
RHTT Rhyolite Tuff
RHCT Chlorite Altered Rhyolite Tuff
RHSR Sericite Altered Rhyolite Lapilli Tuff
RHCL Chlorite Altered Rhyolite Lapilli Tuff
RPAT Argillaceous Quartz-Eye Feldspar Crystal Tu
RPQL Quartz-Eye Rhyolite Lapilli Tuff
RPTF Quartz-Eye Feldspar Crystal Tuff
FDPH Feldspar Porphyry
QFPH Quartz-Feldspar Porphyry
EXCP Calcite Pyrite Exhalite (alteration)
EXSP Silica Pyrite Exhalite (alteration)
EXMT Magnetite Exhalite (alteration)
EXMP Magnetite Pyrite Exhalite (alteration)
SSMS Massive Sulfide
PYMS Pyrite-Rich Massive Sulfide
SPMS Sphalerite-Rich Massive Sulfide
CPMS Chalcopyrtite-Rich Massive Sulfide
CSMS Chalcopyrite, Spahlerite-Rich Massive Sulfide
PMMS Ploymetallic Massive Sulfide
PYSM Pyrite-Rich Semi-Massive Sulfide
CPSM Chalcopyrite-Rich Semi-Massive Sulfide
CSSM Chalcopyrite, Sphalerite-Rich Semi-Massive Sulfide
PMSM Polymetallic Semi-Massive Sulfide
QTVN Quartz Vien
CAVN Carbonate Vien
ADMS Undifferentiated Andesite
ADTT Andesite Tuff
ADFF Andesite Ash Tuff
ADTF Andesite Lapilli Tuff
ARMS Massive Argillite
ARCB Carbonaceous Argillite
ARRH Interbedded Rhyolite and Argillite
ARGR Graphitic Argillite
ARSI Siliceous Argillte
ARTF Tuffaceous Argillite
ARQE Black Quartz-Eye Bearing Argillite
RHAR Interbedded Rhyolite and Argillite
ARRH
ARWK Interbedded Black Argillite/Greywacke
STFL Structure - Fault
STGG Structure - Fault Gouge
Yukon Zinc Corporation
Date:19/10/2005
Author: Dessureau
Office: Vancouver
Drawing: L_16250E
Scale: 1:1000
Wolverine Deposit
Drill Profiles
Section 16250E
Projection: UTM NAD 27 Zone 9
0 25 50
metres



WV05-151
179.0m
WV97-94
197.0m
WV95-21
323.0m
WV95-20
316.0m
WV96-70
139.0m
WV05-153
182.0m
WV97-99
148.0m
WV05-139
152.0m
WV05-144
182.0m
WV05-149
100.0m
WV00-117
146.0m
WV05-146
109.0m
WV05-142
161.0m
WV95-09
285.0m
WV97-74
152.0m
WV05-141
112.0m
WV96-57
159.0m
WV04-126
181.0m
WV05-140
182.0m
WV97-76
152.0m
WV05-145
124.0m
WV00-120
120.0m
WV05-143
108.0m
WV05-133
174.0m
WV05-148
97.0m
WV05-147
109.0m
WV95-24
170.0m
WV05-135
121.0m
WV05-137
112.0m
WV05-136
145.0m
WV05-138
127.0m
WV95-08
173.0m
WV97-82
161.0m
WV97-95
148.0m
WV05-132
151.0m
WV05-150
121.0m
WV96-59
116.0m
WV95-04
226.0m
WV97-97
164.0m
WV05-165
161.0m
WV04-124
150.0m
WV95-23
177.0m
WV05-163
198.0m
WV95-01
188.0m
439750 mE
439800 mE
439850 mE
439900 mE
439950 mE
440000 mE
6811050 mN
6811000 mN
6810950 mN
6810900 mN
Legend
ARGR - Graphitic Argillite
ARMS - Massive Argillite
RHFS - Fine Siliceous Siltstone
EXCP - Calcite Pyrite Exhalite
SSMS - Massive Sulphide
ARSR - Sericite Altered Argillite
RHCL - Chlorite Altered Argilite or Rhyolite
100 NSR Block outline
Drill Hole Collar Location and Trace
ARD Sample Location
Yukon Zinc Corporation
Date:17/1/2006
Author: G.R.D.
Office: Vancouver
Drawing: UGmap
Scale: 1:500
Wolverine Underground Map
Preliminary Geology
With ARD Sample Locations
Projection: UTM Zone 9 (NAD 27 for Canada)
0 7.5 15 30
metres

Appendix B
Static Testing Results

QUANTITATIVE PHASE ANALYSIS OF EIGHT POWDER SAMPLES USING THE RIETVELD METHOD AND X-RAY POWDER DIFFRACTION DATA.

(Proj. Wolverine Yukon Zinc # 0575 – P.O. 41004)

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January 18, 2006

EXPERIMENTAL METHOD

The eight samples (see Table 1) were reduced into fine powder to the optimum grain-size range for X-ray analysis (<10μm) grinding under ethanol in a vibratory McCrone Micronising Mill for 7 minutes. Step-scan X-ray powder-diffraction data were collected over a range 3-80°2θ with CoKα radiation on a standard Siemens (Bruker) D5000 Bragg-Brentano diffractometer equipped with a diffracted-beam with a Fe monochromator foil, 0.6 mm (0.3°) divergence slit, incident- and diffracted-beam Sollers slits and a Vantec-1 strip detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA, using a take-off angle of 6°.

RESULTS AND DISCUSSION

The X-ray diffractograms were analyzed using the International Centre for Diffraction Database PDF-4 using Search-Match software by Siemens (Bruker). X-ray powder-diffraction data were refined with Rietveld Topas 3 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinement are given in Table 1. These amounts represent the relative amounts of crystalline phases normalized to 100%. The Rietveld refinement plots for the samples are shown in Figures 1-8.

Table 1. Results of quantitative phase analysis (wt. %)

Mineral	Ideal formula	A083503	A083504	A083505	A083510	A083511	A083512	A083515	A083529
Quartz	SiO_2	82.6	66.8	76.3	64.4	70.4	64.7	73.7	80.3
Biotite	$K(Mg,Fe^{2+})_3AlSi_3O_{10}(OH)_2$		0.5				2.5		
Muscovite	$KAl_2AlSi_3O_{10}(OH)_2$	13.9	7.6	16.3	2.7	19.8	18.4	17.3	14.3
K-feldspar	$KAlSi_3O_8$	0.7	4.4	1.4		1.6	1.7	1.2	0.9
Clinochlore	$(Mg,Fe^{2+})_5Al(Si_3Al)O_{10}(OH)_8$	1.1				0.4	5.9	2.7	
Talc	$Mg_3Si_4O_{10}(OH)_2$		0.4						
Kaolinite	$Al_2Si_2O_5(OH)_4$		0.8	3.3					1.2
Ankerite	$Ca(Fe^{2+},Mg,Mn)(CO_3)_2$	0.4	7.7	0.9	3.4	4.1	4.5	3.0	1.3
Calcite	$CaCO_3$	0.3	1.4	0.1		0.4	0.9		0.5
Pyrite	FeS_2	1.0	2.2	1.6	2.0	1.5	1.5	2.0	1.6
Barite	$BaSO_4$		3.8		8.9				
Magnetite	Fe_3O_4		1.4		13.6				
Celsian	$BaAl_2Si_2O_8$		2.9		5.0				
Harmotome	$Ba_{0.5},Ca_{0.5},K,Na)_5[Al_5Si_{11}O_{32}]\cdot 12H_2O$					1.7			
Total		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

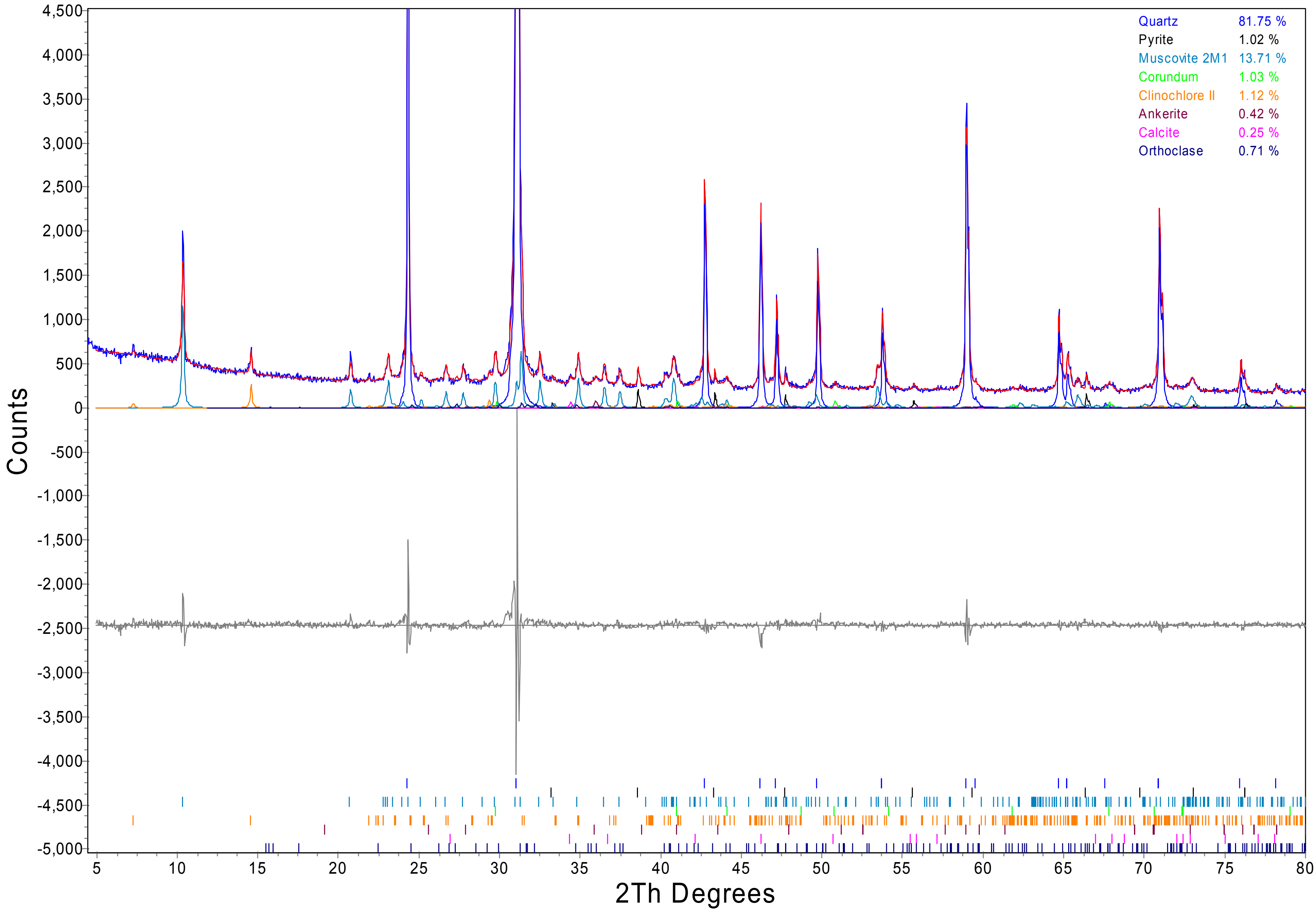

Figure 1. . Rietveld refinement plot of sample **CEMI A083503** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

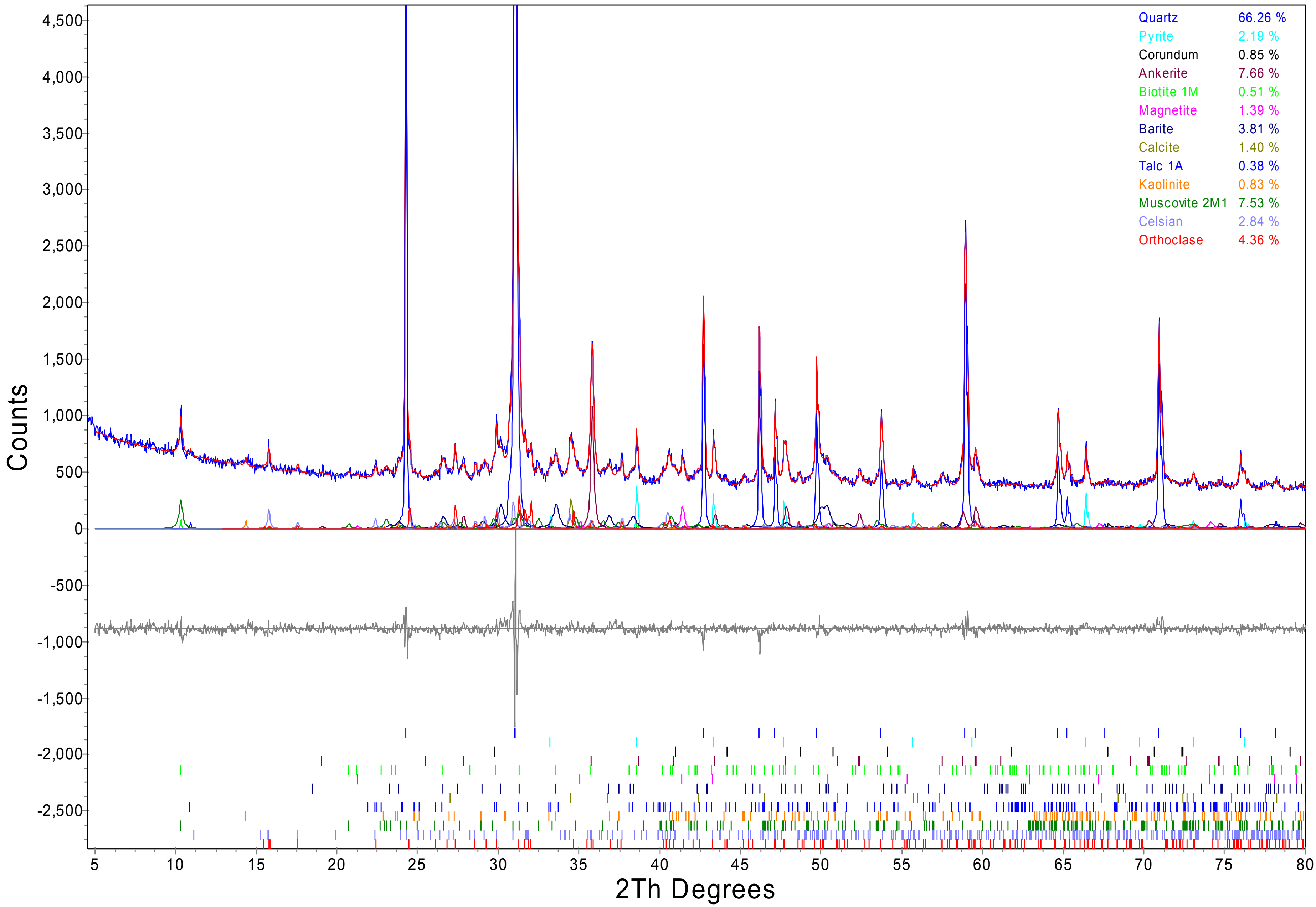

Figure 2. . Rietveld refinement plot of sample **CEMI A083504** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

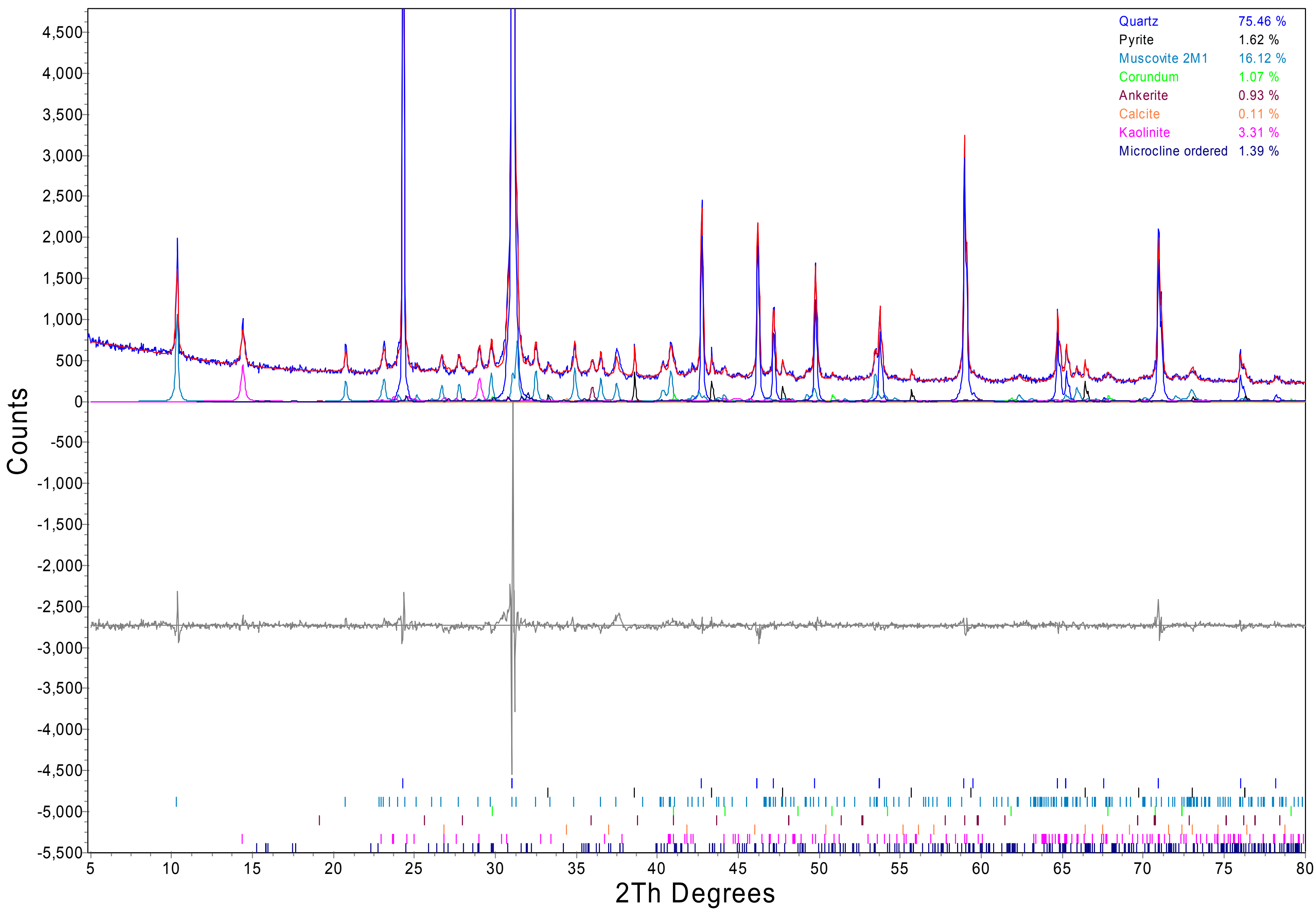

Figure 3. . Rietveld refinement plot of sample **CEMI A083505** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

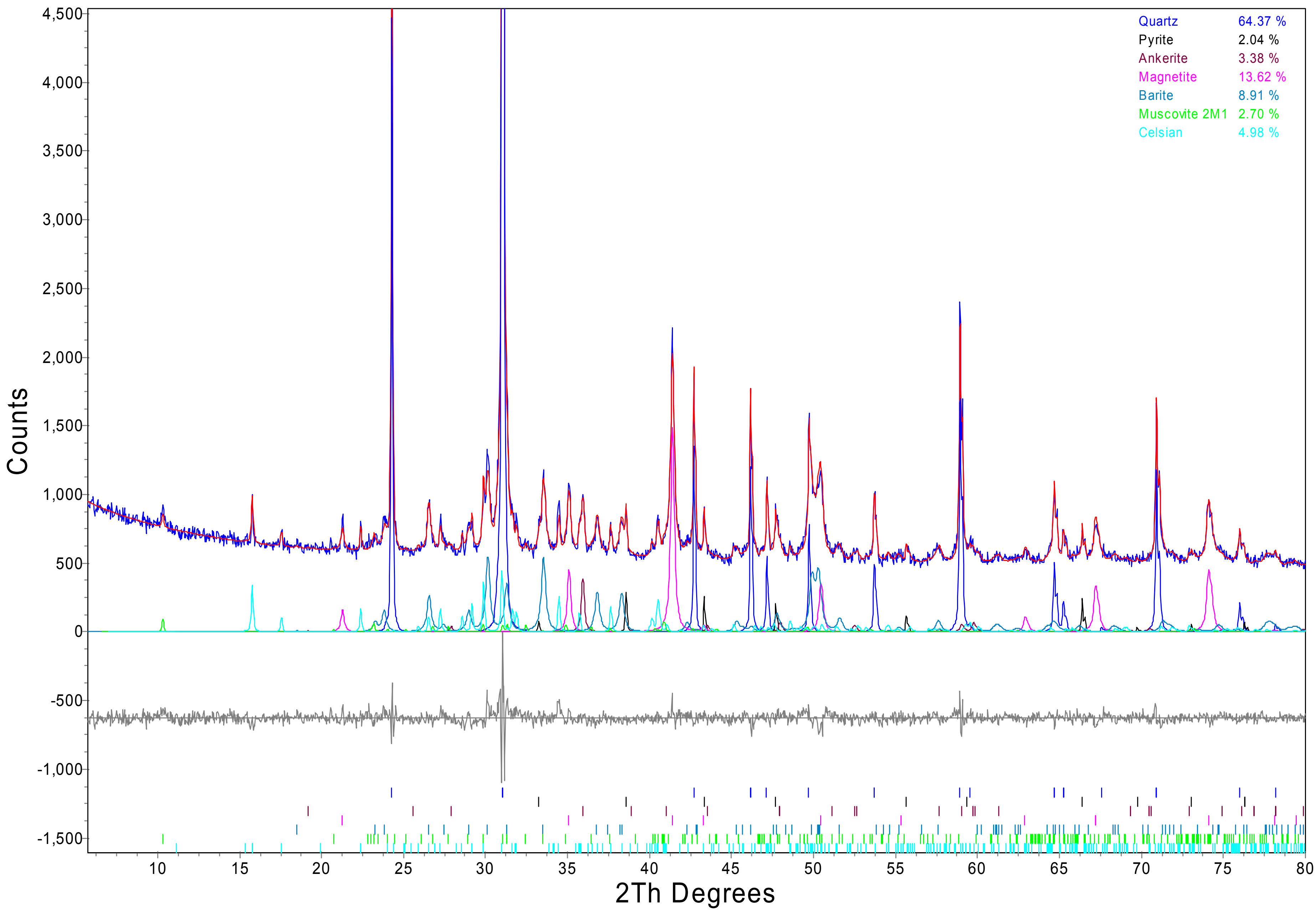

Figure 4. . Rietveld refinement plot of sample **CEMI A083510** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

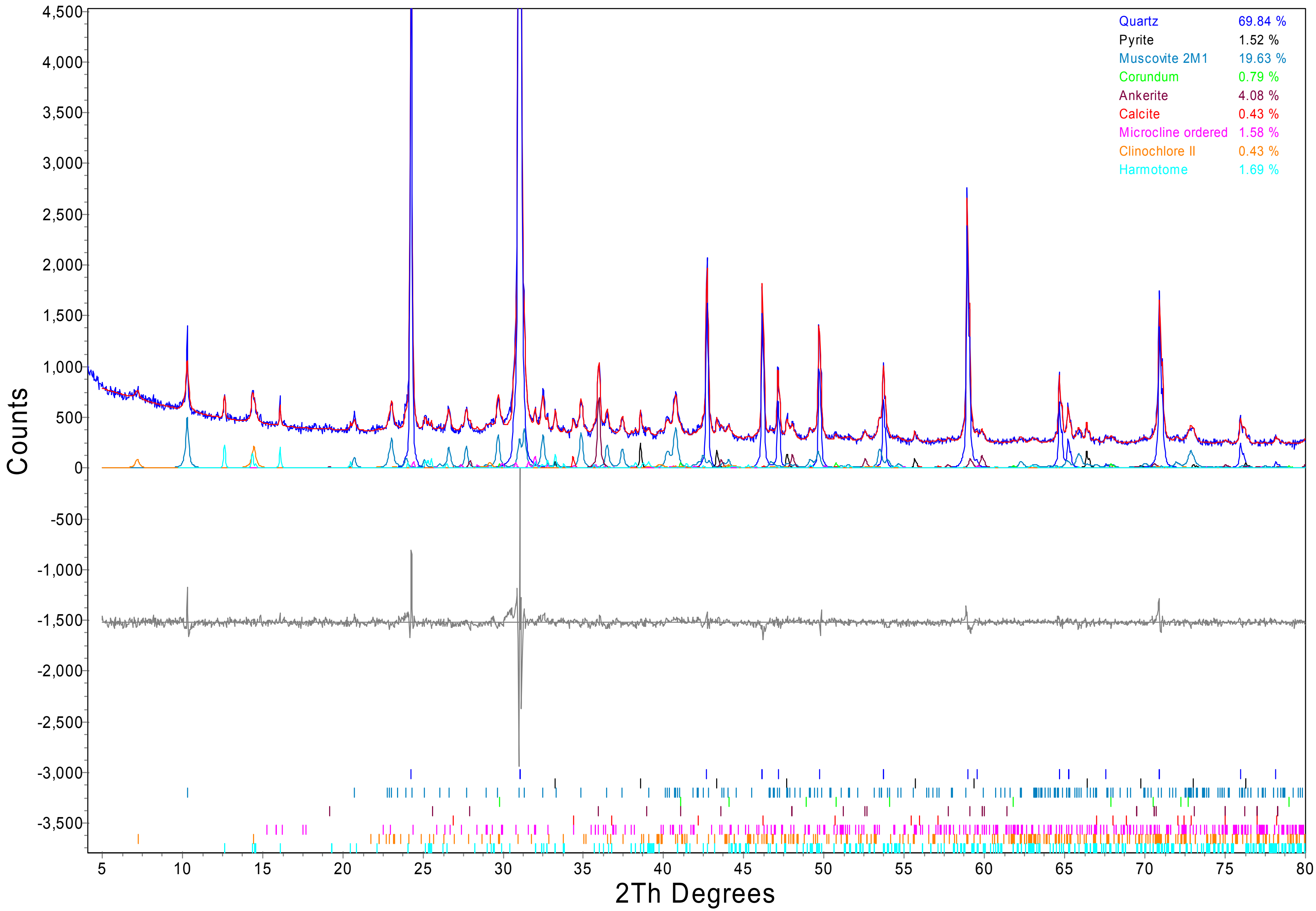

Figure 5. . Rietveld refinement plot of sample **CEMI A083511** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

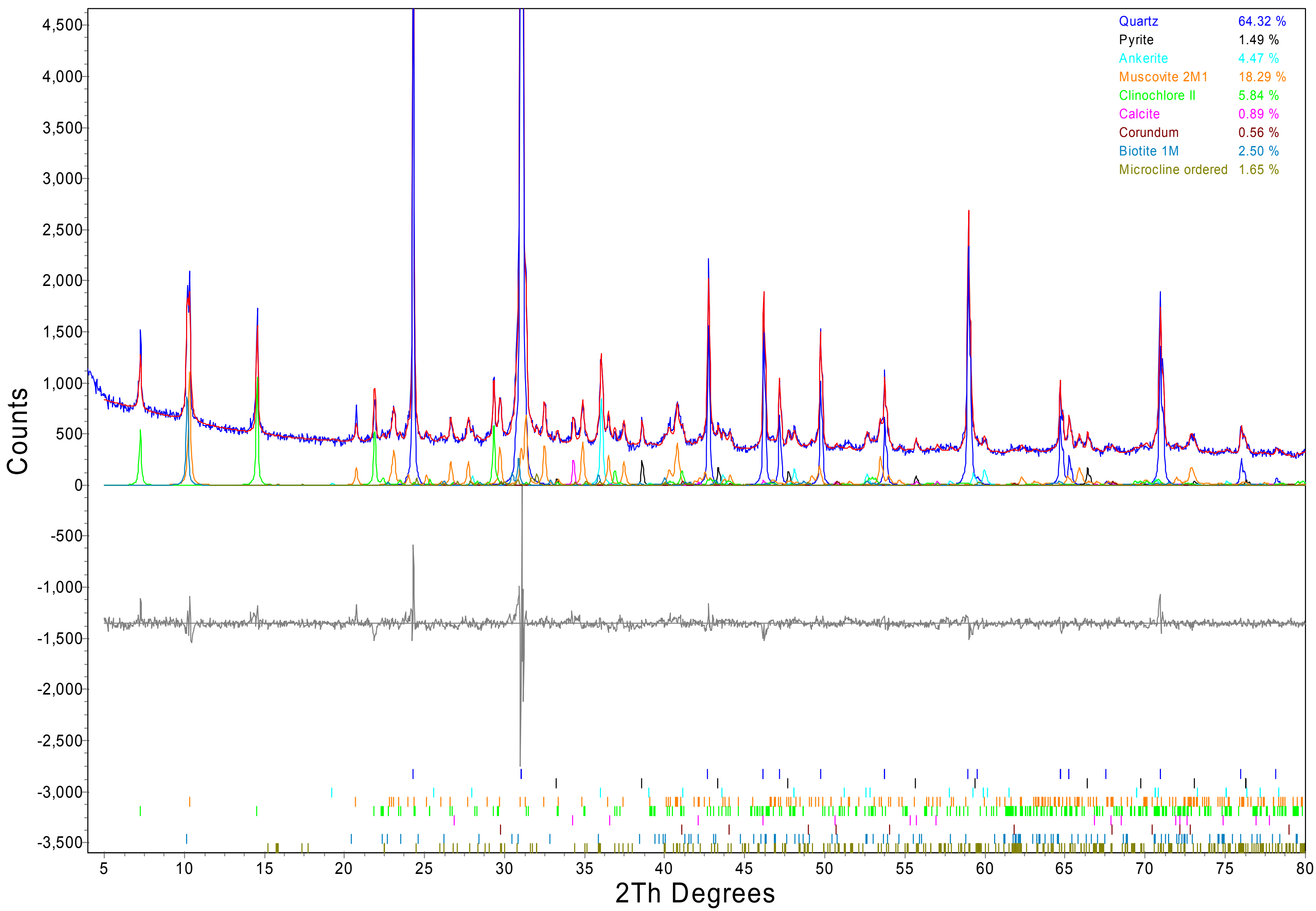

Figure 6. . Rietveld refinement plot of sample **CEMI A083512** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

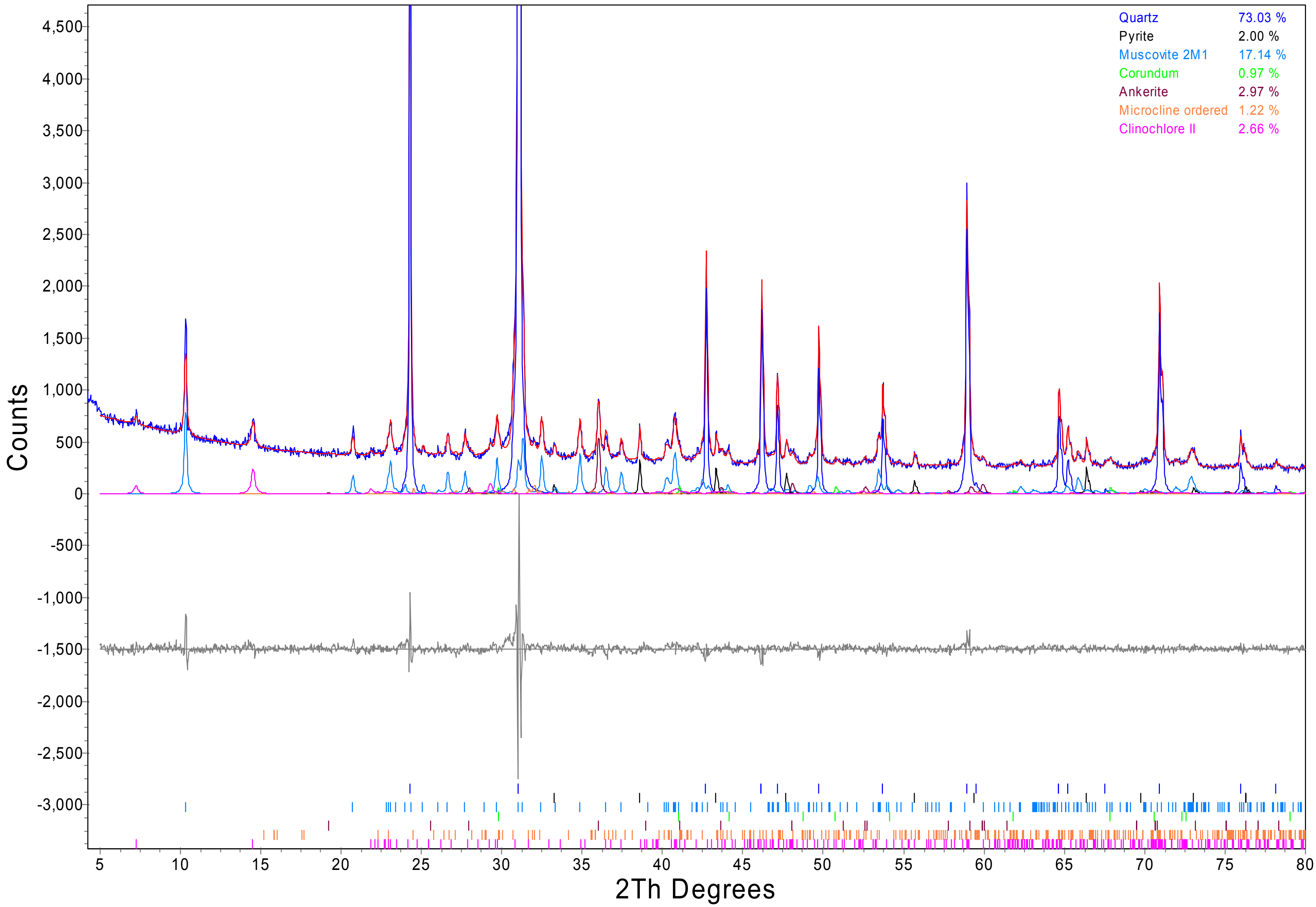

Figure 7. . Rietveld refinement plot of sample **CEMI A083515** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

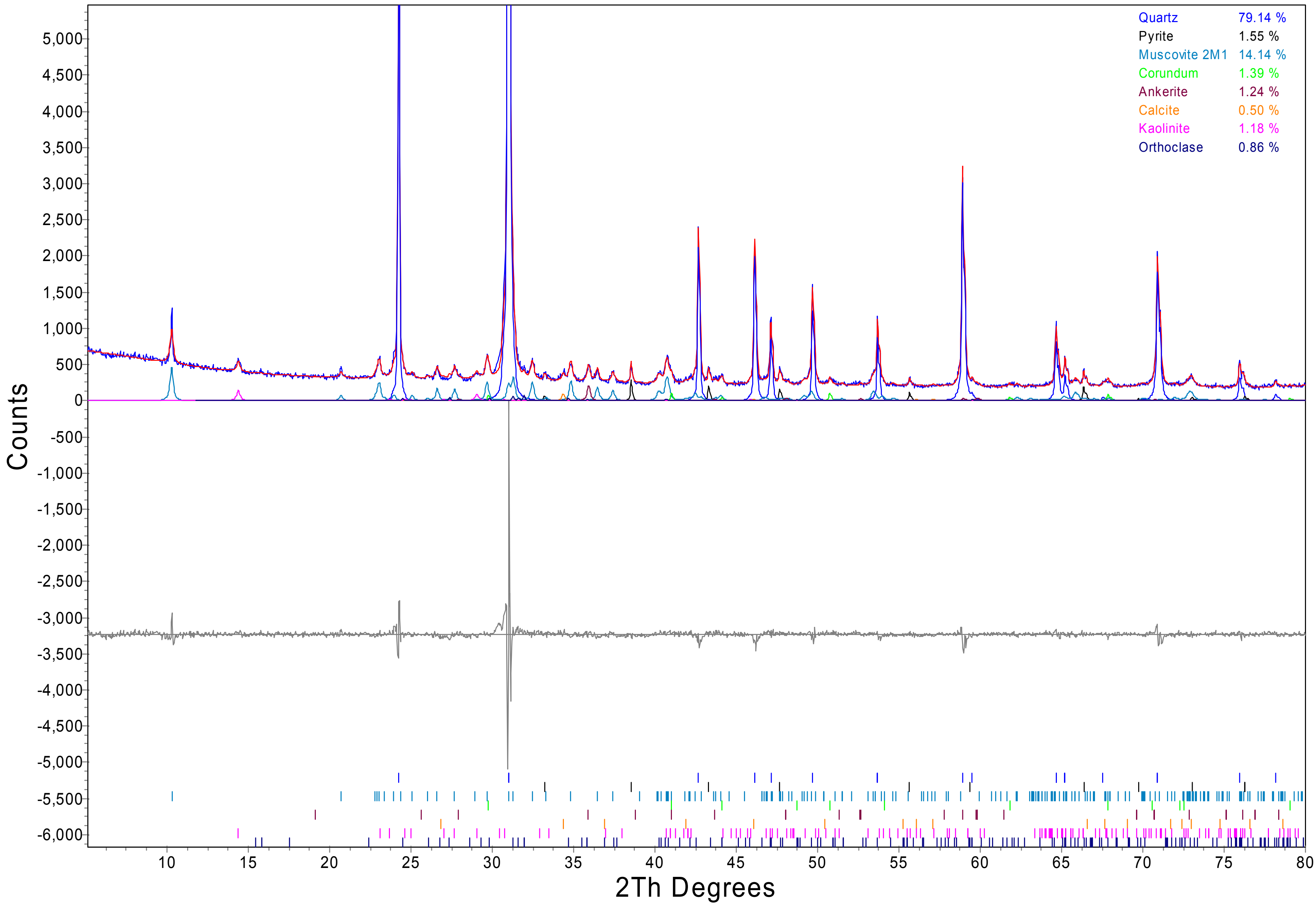

Figure 8. . Rietveld refinement plot of sample **CEMI A083529** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

ACID BASE ACCOUNTING TEST REPORT

Client : Westmin Resources Limited (Wolverine Lake Project)
Sample id : Hanging Wall Composite

Date : December 31, 1997
Project : 96-121

Sample	DDH	From	To	Rock Code	% Total Sulfur	% Sulfate Sulfur	Paste pH	Acid Potential	Neutralization Potential (NP)		
									Actual	Ratio	Net
105235	WV96-39	416.1	419.1	RHCT	0.28	<0.01	8.8	8.8	49.5	5.66	41.
105809	WV96-58	73.0	73.9	RHAT	0.79	0.02	7.4	24.1	14.10	0.59	-10.
105812	WV96-58	78.2	81.3	EXSP	2.14	<0.01	7.7	66.9	24.30	0.36	-43.
105816	WV96-58	104.2	105.6	RHDS	7.14	<0.01	8.1	223.	375.	1.68	152.
105763	WV96-60	262.74	263.65	RHST	3.30	<0.01	8.2	103.	109.	1.06	6.0
105766	WV96-60	268.0	268.87	QTVN	0.13	<0.01	8.8	4.1	31.9	7.85	28.
105773	WV96-60	278.4	280.9	STFL	2.87	0.02	7.7	89.1	82.7	0.93	- 6.4
105777	WV96-60	287.5	288.34	RHST	2.15	<0.01	8.2	67.2	21.5	0.32	-46.
172410	WV96-63	80.5	83.5	RHFS	0.56	<0.01	8.3	17.5	227.	12.97	209.
172411	WV96-63	83.5	89.0	ARRH	1.11	<0.01	8.1	34.7	234.	6.75	200.
172412	WV96-63	89.0	93.5	ARSI	1.16	<0.01	8.2	36.3	155.	4.26	118.
172414	WV96-63	96.3	99.0	ARTF	2.12	<0.01	8.3	66.3	65.2	0.98	- 1.1
105921	WV96-63	103.3	105.2	STFL	2.69	<0.01	7.9	84.1	151.	1.79	67.
172451	WV96-72	96.1	97.1	ARSI	4.04	<0.01	7.4	126.	83.7	0.66	-43.
172454	WV96-72	100.6	102.7	ARSI	2.64	<0.01	7.1	82.5	5.10	0.06	-77.
172455	WV96-72	102.7	104.3	STFL	1.78	<0.01	7.1	55.6	28.0	0.50	-28.

ACID BASE ACCOUNTING TEST REPORT

Client : Westmin Resources Limited (Wolverine Lake Project)
Sample id : Foot Wall Composite

Date : December 31, 1997
Project : 96-121

Sample	DDH	From	To	Rock Code	% Total Sulfur	% Sulfate Sulfur	Paste pH	Acid Potential	Neutralization Potential (NP)		
									Actual	Ratio	Net
172420	WV96-39	366.7	370.8	RHFS	2.08	<0.01	7.9	65.0	28.2	0.43	- 36.8
172421	WV96-39	371.3	374.1	RHAR	0.82	<0.01	7.9	25.6	174.	6.79	148.
172424	WV96-39	379.5	383.7	ARMS	1.60	<0.01	8.1	50.0	249.	4.98	199.
105223	WV96-39	387.1	389.1	ARCB	2.99	<0.01	7.4	93.4	38.1	0.41	- 55.3
105226	WV96-39	393.3	395.2	ARCB	9.77	0.06	6.4	303.	29.4	0.10	-274.
105831	WV96-58	151.9	154.1	ARMS	3.31	0.01	7.7	103.	17.8	0.17	-85.
105835	WV96-58	160.6	163.6	RHQL	0.11	<0.01	8.2	3.4	39.1	11.37	36.
105938	WV96-63	130.0	130.3	SSSG	6.83	<0.01	7.6	213.	200.	0.94	-14.
105944	WV96-63	135.9	137.7	RHCT	0.82	<0.01	8.5	25.6	145.	5.65	119.
105950	WV96-63	149.0	151.4	ARSC	0.33	<0.01	8.4	10.3	221.	21.40	210.
175604	WV96-63	157.7	159.2	RHST	1.59	<0.01	8.1	49.7	99.3	2.00	50.
175605	WV96-63	159.2	161.6	ARMS	2.06	<0.01	7.7	64.4	23.6	0.37	-41.
175609	WV96-63	167.0	169.6	STFL	5.08	<0.01	7.3	159.	25.4	0.16	-133.
175613	WV96-63	176.6	178.6	ARTF	2.19	<0.01	5.8	68.4	22.2	0.32	-46.
172337	WV96-72	36.7	39.5	EXMT	0.73	0.16	7.4	22.8	41.6	1.82	19.
172340	WV96-72	83.4	84.7	STGG	11.9	<0.01	7.8	372.	62.9	0.17	-309.
172344	WV96-72	88.7	90.3	ARSI	1.72	<0.01	8.1	53.8	16.9	0.31	-37.
172345	WV96-72	90.3	91.7	ARSI	7.60	<0.01	8.4	238.	103.	0.43	-135.
172460	WV96-72	107.3	109.4	ARMS	1.70	<0.01	8.4	53.1	345.	6.49	291.
172464	WV96-72	117.5	120.4	RHSR	0.58	<0.01	8.6	18.1	28.7	1.58	11.

ACID BASE ACCOUNTING TEST REPORT

Client : Westmin Resources Limited (Wolverine Lake Project)
Sample id : Massive Sulphide Composite

Date : December 31, 1997
Project : 96-121

Sample	DDH	From	To	Rock Code	% Total Sulfur	% Sulfate Sulfur	Paste pH	Acid Potential	Neutralization Potential (NP)		
									Actual	Ratio	Net
105221	WV96-39	401.0	401.58	SSMS	10.20	<0.01	7.6	319.	32.1	0.10	-287.
105820	WV96-58	144.6	144.8	PYSM	22.2	<0.01	8.2	694.	242.	0.35	-452.
105824	WV96-58	147.2	147.5	SSMS	28.4	0.14	7.8	883.	85.70	0.10	-797.
105829	WV96-58	150.0	150.45	SSMS	12.8	0.03	7.7	399.	59.20	0.15	-340.
105756	WV96-63	252.68	254.67	SSMS	44.0	0.11	7.0	1372.	85.5	0.06	-1286.
105926	WV96-63	114.6	114.8	ARCB	37.2	0.07	7.9	1160.	70.5	0.06	-1090.
105934	WV96-63	124.66	125.0	ARCB	30.5	0.03	7.0	952.	18.0	0.02	-934.
172346	WV96-72	91.7	92.7	SSMS	40.2	0.06	6.9	1254.	25.9	0.02	-1228.
172348	WV96-72	93.7	94.6	SSMS	45.6	0.02	6.3	1424.	10.4	0.01	-1414.
172350	WV96-72	95.4	96.1	SSMS	41.6	<0.01	7.5	1300.	54.8	0.04	-1245.
172456	WV96-72	104.3	105.7	SSMS	32.8	<0.01	7.6	1025.	80.2	0.08	-945.
172458	WV96-72	105.9	106.7	SSMS	33.2	<0.01	7.5	1038.	69.6	0.07	-968.
172459	WV96-72	106.7	107.3	SSMS	32.9	<0.01	7.5	1028.	130.	0.13	-898.

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Client: Process Research Associates Ltd   iPL: 96L1300   Out: Dec 20, 1996   Page 2 of 2   Section 1 of 2
Project: 96-121   49 Pulp   In: Dec 18, 1996   [130018:31:49:69122096]   Certified BC Assayer: David Chiu

Sample Name		Al ppm	Sb ppm	As ppm	Ba ppm	Bi ppm	Cd ppm	Ca ppm	Cr ppm	Co ppm	Cu ppm	Fe ppm	La ppm	Pb ppm	Mg ppm	Mn ppm	Hg ppm	Mo ppm	Ni ppm	P ppm
96-121 172455	P	3118	134	52	45	<	47.0	17038	160	3	397	18511	8	286	820	56	<	26	100	7636
96-121 172456	P	426	472	315	5	6	3310.5	25329	52	17	4242	15%	4	14010	337	755	126	9	84	419
96-121 172458	P	740	346	621	<	29	1788.0	20257	30	10	4558	17%	<	13665	605	441	79	13	103	501
96-121 172459	P	398	275	435	4	<	3049.4	31518	24	23	2575	17%	<	13237	747	633	120	14	97	186
96-121 172460	P	5418	65	67	109	<	53.6	6.6%	32	3	786	25903	18	401	41323	616	3	30	32	323
96-121 172464	P	26325	10	16	52	<	9.2	5893	25	8	29	40824	47	64	26795	580	<	7	6	368
96-121 172604	P	2581	6	9	88	<	6.5	35636	40	4	15	15433	5	57	1104	345	<	4	3	327
96-121 175608	P	1818	16	43	55	<	20.1	8995	40	2	35	17887	7	103	596	94	<	14	32	660
96-121 175609	P	1837	20	32	30	<	14.8	10735	69	2	43	42945	4	65	531	105	<	22	61	1423
96-121 175613	P	3227	28	28	73	<	13.9	16433	97	5	78	18536	11	117	348	45	<	17	107	7514
Min Limit		100	5	5	2	2	0.1	100	1	1	1	100	2	2	100	1	3	1	1	100
Max Reported*		50000	1000	10000	10000	10000	10000.0	50000	10000	10000	20000	50000	10000	20000	50000	10000	10000	1000	10000	50000
Method		ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP

--=No Test ins=Insufficient Sample S=Soil R=Rock C=Core L=Silt P=Pulp U=Undefined m=Estimate/1000 %=Estimate % Max=No Estimate

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Client: Process Research Associates Ltd   iPL: 96L1300   Out: Dec 20, 1996   Page 2 of 2   Section 2 of 2
Project: 96-121   49 Pulp   In: Dec 18, 1996   [130018:28:24:69122096]   Certified BC Assayer: David Chiu

Sample Name		K ppm	Sc ppm	Ag ppm	Na ppm	Sr ppm	Tl ppm	Ti ppm	W ppm	V ppm	Zn ppm	Zr ppm
96-121 172455	P	1085	<	7.4	121	65	<	<	<	98	3553	8
96-121 172456	P	537	<	0.2m	<	49	<	<	<	21	27%	3
96-121 172458	P	154	<	0.1m	<	69	<	<	<	49	14%	11
96-121 172459	P	1004	<	0.1m	<	108	<	<	<	29	24%	4
96-121 172460	P	2169	<	12.2	125	202	<	<	<	26	4207	38
96-121 172464	P	797	<	0.1	101	14	<	<	<	16	743	20
96-121 172604	P	1082	<	0.2	106	77	<	<	<	<	448	7
96-121 175608	P	727	<	1.3	106	24	<	<	<	12	973	10
96-121 175609	P	765	<	1.5	<	50	<	<	<	34	773	9
96-121 175613	P	1263	<	3.1	117	151	<	<	<	89	876	10
Min Limit		100	1	0.1	100	1	10	100	5	2	1	1
Max Reported*		50000	10000	100.0	50000	10000	1000	50000	1000	10000	20000	10000
Method		ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP

---=No Test ins=Insufficient Sample S=Soil R=Rock C=Core L=Silt P=Pulp U=Undefined m=Estimate/1000 %=Estimate % Max=No Estimate

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Client: Process Research Associates Ltd   iPL: 96L1300   Out: Dec 20, 1996   Page 1 of 2   Section 1 of 2
Project: 96-121   49 Pulp   In: Dec 18, 1996   [130018:28:23:69122096]   Certified BC Assayer: David Chiu

Sample Name		Al ppm	Sb ppm	As ppm	Ba ppm	Bi ppm	Cd ppm	Ca ppm	Cr ppm	Co ppm	Cu ppm	Fe ppm	La ppm	Pb ppm	Mg ppm	Mn ppm	Hg ppm	Mo ppm	Ni ppm	P ppm
96-121 105223	P	2247	23	66	34	<	19.9	14852	48	4	75	23906	5	334	778	214	<	16	34	649
96-121 105226+105213	P	3196	439	369	6	2	376.3	12107	82	17	2678	7.2%	<	5585	435	157	7	63	146	1770
96-121 105227	P	25071	235	161	17	20	303.2	6737	73	40	3.1%	10%	26	1644	23227	613	7	8	6	1159
96-121 105235	P	16500	<	51	121	<	2.4	10713	50	5	152	22154	37	26	22883	531	<	5	3	297
96-121 105756	P	698	604	1900	11	<	750.5	22743	42	16	5162	18%	4	5892	951	585	25	16	22	131
96-121 105763+105764	P	2128	65	98	28	<	106.9	38281	58	3	585	26186	2	160	1038	423	7	6	7	<
96-121 105766	P	1447	29	50	361	<	3.4	9914	172	7	71	5442	4	19	1876	234	<	1	17	<
96-121 105773	P	3751	47	109	38	<	19.9	36998	60	3	115	24218	4	94	1405	311	<	26	74	2446
96-121 105777	P	2317	7	13	55	<	1.5	8135	75	3	26	20732	3	35	545	110	<	5	7	574
96-121 105809	P	12044	<	<	102	<	0.6	2842	114	3	91	30041	4	11	2287	98	<	3	13	827
96-121 105812	P	2055	<	<	30	<	2.0	7174	107	5	52	23429	<	209	1025	310	<	11	28	277
96-121 105816+105817	P	3957	277	94	22	<	233.5	6.8%	59	5	661	49042	<	111	33300	2879	19	13	29	105
96-121 105820	P	5683	414	246	22	<	856.5	5.3%	81	28	3819	16%	<	405	15395	1527	52	26	71	189
96-121 105824+105825	P	1654	180	233	3	40	855.4	35638	62	84	18236	19%	<	8970	1087	634	15	34	127	970
96-121 105829+105830	P	2509	283	437	11	6	137.1	25059	72	19	3593	9.1%	4	868	520	313	<	49	134	2517
96-121 105831	P	2017	32	52	18	<	4.7	6665	68	4	123	30036	7	59	359	96	<	6	58	1383
96-121 105835	P	5.0%	6	30	95	<	1.0	6584	70	14	74	7.0%	19	33	45498	1120	<	8	2	255
96-121 105921	P	2071	13	116	50	<	32.7	5.4%	103	3	169	23799	3	361	1396	643	<	12	31	389
96-121 105926+105927	P	681	120	1867	5	3	673.8	23695	63	30	11660	19%	<	8170	582	533	14	12	31	1153
96-121 105934+105935	P	759	816	650	9	24	2849.0	1892	62	58	7410	18%	<	11117	650	173	33	29	166	347
96-121 105938+105939	P	4511	254	100	16	10	85.7	40168	79	13	13797	6.1%	11	1305	18007	696	<	22	75	1506
96-121 105944	P	33042	<	15	112	7	12.2	24783	42	18	528	5.3%	55	118	36628	523	<	7	4	351
96-121 105950	P	3171	<	<	122	<	2.5	7.1%	35	4	42	10078	41	20	5300	524	<	4	4	395
96-121 172337	P	10465	<	<	177	<	<	3214	122	7	91	41921	3	15	2883	270	<	9	37	286
96-121 172340	P	2403	36	301	<	<	112.9	15062	77	13	1560	9.1%	<	4260	4960	632	<	10	49	1046
96-121 172344	P	1810	9	41	51	<	3.6	5931	71	2	42	15363	5	80	505	131	<	6	13	352
96-121 172346	P	594	359	325	<	229	936.7	7069	33	44	6352	15%	<	11869	339	256	48	9	51	442
96-121 172348	P	376	547	1535	<	54	504.3	2848	37	37	9902	18%	<	11302	274	157	11	7	25	410
96-121 172350	P	320	260	406	4	17	1027.3	16332	30	34	19329	19%	3	11290	298	448	17	4	20	596
96-121 172410	P	5962	31	21	341	<	7.8	7.8%	91	3	169	9322	4	117	2381	646	<	1	32	750
96-121 172411	P	1267	8	5	80	<	4.3	8.3%	69	3	120	13394	2	77	1120	1106	<	2	21	<
96-121 172412	P	2073	8	<	84	<	2.8	5.7%	115	4	89	15694	3	58	1237	1033	<	1	30	996
96-121 172414	P	2457	9	53	53	<	3.7	26100	96	5	62	21774	3	78	753	446	<	9	38	935
96-121 172420	P	2453	17	<	44	<	1.6	6674	57	10	149	25253	3	58	1725	490	<	2	70	145
96-121 172421	P	2726	9	11	139	<	0.6	5.3%	74	17	140	14965	4	168	1910	2831	<	3	48	684
96-121 172424	P	6297	25	<	77	<	1.3	5.9%	58	10	94	43425	3	117	11944	3495	<	3	41	217
96-121 172435	P	1411	40	82	16	<	215.5	34728	54	8	1134	5.1%	<	1510	822	602	<	9	24	512
96-121 172451	P	2593	48	219	22	<	15.5	36000	61	5	297	33980	8	59	2605	480	<	28	123	4328
96-121 172454	P	1866	28	39	24	<	4.3	4371	87	4	58	24043	7	24	403	56	<	5	47	1545
Min Limit		100	5	5	2	2	0.1	100	1	1	1	100	2	2	100	1	3	1	1	100
Max Reported*		50000	1000	10000	10000	10000	10000.0	50000	10000	10000	20000	50000	10000	20000	50000	10000	10000	1000	10000	50000
Method		ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP

—=No Test ins=Insufficient Sample S=Soil R=Rock C=Core L=Silt P=Pulp U=Undefined m=Estimate/1000 %=Estimate % Max=No Estimate

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CERTIFICATE OF ANALYSIS
iPL 96L1300

Client: Process Research Associates Ltd   iPL: 96L1300   Out: Dec 20, 1996   Page 1 of 2   Section 2 of 2
Project: 96-121   49 Pulp   In: Dec 18, 1996   [130018:28:23:69122096]   Certified BC Assayer: David Chiu

Sample Name		K ppm	Sc ppm	Ag ppm	Na ppm	Sr ppm	Tl ppm	Ti ppm	W ppm	V ppm	Zn ppm	Zr ppm
96-121 105223	P	1028	<	4.6	124	62	<	<	<	12	2155	14
96-121 105226+105213	P	758	<	0.1m	119	17	<	<	<	75	3.7%	12
96-121 105227	P	961	2	0.2m	<	21	<	106	<	13	2.8%	9
96-121 105235	P	2355	<	0.1	150	27	<	106	<	4	324	19
96-121 105756	P	<	2	0.1m	<	35	<	<	<	22	7.6%	3
96-121 105763+105764	P	1077	<	1.8	105	155	<	<	<	3	10595	16
96-121 105766	P	671	<	0.1	107	52	<	<	<	6	423	2
96-121 105773	P	1436	<	2.7	101	135	<	<	<	47	1639	10
96-121 105777	P	1217	<	0.4	<	35	<	<	<	3	159	6
96-121 105809	P	1013	3	0.2	194	60	<	<	<	35	98	4
96-121 105812	P	818	<	1.0	<	27	<	<	<	12	903	3
96-121 105816+105817	P	1935	2	6.4	115	163	<	<	<	123	2.2%	5
96-121 105820	P	3481	<	6.2	113	101	<	<	<	180	7.7%	33
96-121 105824+105825	P	197	<	78.2	<	43	<	<	<	91	11%	9
96-121 105829+105830	P	910	<	33.0	<	60	<	<	<	77	14893	14
96-121 105831	P	818	<	1.4	102	18	<	<	<	12	691	11
96-121 105835	P	853	2	0.4	<	16	<	188	<	17	470	17
96-121 105921	P	903	<	4.1	101	354	<	<	<	11	4152	17
96-121 105926+105927	P	<	<	0.2m	<	84	<	<	<	20	8.1%	6
96-121 105934+105935	P	<	<	0.2m	<	8	<	<	<	41	25%	4
96-121 105938+105939	P	1164	<	0.2m	115	93	<	<	<	38	8528	21
96-121 105944	P	1277	1	1.2	101	57	<	147	<	9	1478	13
96-121 105950	P	1649	<	0.1	119	143	<	<	<	<	257	15
96-121 172337	P	1419	3	0.2	171	118	<	278	<	46	174	6
96-121 172340	P	525	2	25.0	<	58	<	<	<	37	15431	14
96-121 172344	P	1016	<	1.1	106	21	<	<	<	4	437	13
96-121 172346	P	<	<	0.2m	<	21	<	<	<	18	11%	5
96-121 172348	P	<	<	0.2m	<	14	<	<	<	10	6.0%	3
96-121 172350	P	<	<	0.2m	<	61	<	<	<	14	10%	3
96-121 172410	P	393	6	0.4	154	575	<	<	<	8	946	2
96-121 172411	P	209	5	0.2	109	373	<	<	<	2	556	2
96-121 172412	P	726	1	<	117	213	<	<	<	7	383	5
96-121 172414	P	1549	<	1.0	122	132	<	<	<	10	407	17
96-121 172420	P	911	<	0.2	108	26	<	<	<	6	436	9
96-121 172421	P	958	2	0.2	130	189	<	<	<	8	88	3
96-121 172424	P	2195	3	1.1	122	138	<	197	<	17	222	6
96-121 172435	P	730	<	14.4	<	201	<	<	<	12	17663	15
96-121 172451	P	957	<	2.7	117	120	<	<	<	44	1250	12
96-121 172454	P	757	<	1.2	<	14	<	<	<	9	281	11
Min Limit		100	1	0.1	100	1	10	100	5	2	1	1
Max Reported*		50000	10000	100.0	50000	10000	1000	50000	1000	10000	20000	10000
Method		ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP

---=No Test ins=Insufficient Sample S=Soil R=Rock C=Core L=Silt P=Pulp U=Undefined m=Estimate/1000 %=Estimate % Max=No Estimate

Sample ID	Year	Rock Type	Paste pH	Total S (%)	SO_4-S (%)	Sulphide-S[1] (%)	CO2 (%)	CO3	AP[2] (kg $CaCO_3$/tonne)	MAP (kg $CaCO_3$/tonne)	NP[3] (kg $CaCO_3$/tonne)	Carb-NP (kg $CaCO_3$/tonne)	Non-Carb-NP (kg $CaCO_3$/tonne)	NNP (kg $CaCO_3$/tonne)	NP/AP ratio
105831	1996	1	7.7	3.31	<0.01	3.31			103	103	17.8			-85.6	0.2
172344	1996	1	8.1	1.72	<0.01	1.72			53.8	53.8	16.9			-36.9	0.3
172412	1996	1	8.2	1.16	<0.01	1.16			36.3	36.3	155			119	4.3
172414	1996	1	8.3	2.12	<0.01	2.12			66.3	66.3	65.2			-1.1	1.0
172424	1996	1	8.1	1.6	<0.01	1.6			50	50.0	249			199	5.0
172451	1996	1	7.4	4.04	<0.01	4.04			126	126	83.7			-42.6	0.7
172454	1996	1	7.1	2.64	<0.01	2.64			82.5	82.5	5.1			-77.4	0.1
172460	1996	1	8.4	1.7	<0.01	1.7			53.1	53.1	345			291.9	6.5
175605	1996	1	7.7	2.06	<0.01	2.06			64.4	64.4	23.6			-40.8	0.4
175613	1996	1	5.8	2.19	<0.01	2.19			68.4	68.4	22.2			-46.2	0.3
A083503	2005	1	8.1	0.53	0.01	0.52	0.90	749.94	16.3	16.6	15	20	5.5	-2	0.9
A083513	2005	1	8.6	0.25	0.01	0.24	1.00	833.26	7.5	7.8	26	23	-3.3	18	3.5
A083518	2005	1	8	1.44	<0.01	1.44	2.90	2416.47	45	45.0	82	66	-16.0	37	1.8
A083526	2005	1	7.9	1.24	0.05	1.19	1.20	999.92	37.2	38.8	29	27	-1.7	-10	0.8
A083529	2005	1	7.9	0.95	<0.01	0.95	1.10	916.59	29.7	29.7	22	25	3.0	-8	0.7
A083537	2005	1	8.1	3.84	0.04	3.8	4.2	3499.71	119	120	102	96	-6.5	-18	0.9
ARGILLITE-1	2005	1	8.5	1.72	0.01	1.71	1.2	999.92	53.4	53.8	29	28	1.5	-24.4	0.5
ARGILLITE-2	2005	1	8.0	1.20	0.01	1.19	0.5	416.63	37.2	37.5	18	11	7.2	-19.2	0.5
ARGILLITE-3	2005	1	8.2	0.42	<0.01	0.42	0.7	583.28	13.1	13.1	14	16	-1.8	0.9	1.1
ARGILLITE-4	2005	1	8.1	1.69	0.02	1.67	1.4	1166.57	52.2	52.8	32	33	-0.5	-20.2	0.6
ARGILLITE-5	2005	1	8.3	0.59	0.01	0.58	1.1	916.59	18.1	18.4	21	25	-4.0	2.9	1.2
105223	1996	2	7.4	2.99	<0.01	2.99			93.4	93.4	38.1			-55.3	0.4
105226	1996	2	6.4	9.77	0.06	9.71			303	305	29.4			-274	0.1
105926	1996	2	7.9	37.2	0.07	37.13			1160	1,163	70.5			-1090	0.1
105934	1996	2	7	30.5	0.03	30.47			952	953	18			-934	0.0
105950	1996	2	8.4	0.33	<0.01	0.33			10.3	10.3	221			211	21.4
A083508	2005	2	7.8	0.56	<0.01	0.56	1.10	916.59	17.5	17.5	25	25	0.0	8	1.4
A083515	2005	2	8.1	1.32	<0.01	1.32	1.90	1583.20	41.3	41.3	35	43	8.2	-6	0.9
A083528	2005	2	8.7	0.54	0.03	0.51	2.10	1749.85	15.9	16.9	68	48	-20.2	51	4.3
A083531	2005	2	8.1	1.68	0.01	1.67	1.70	1416.55	52.2	52.5	31	39	7.7	-22	0.6
A083538	2005	2	7.4	3.12	0.02	3.1	0.9	749.94	96.9	97.5	21	20	-0.5	-77	0.2
A083510	2005	3	8.1	2.13	0.26	1.87	2.10	1749.85	58.4	66.6	61	48	-13.2	-6	1.0
A083519	2005	3	8.2	2.04	0.47	1.57	6.90	5749.52	49.1	63.8	174	157	-17.1	110	3.6
A083524	2005	3	7.8	8.03	<0.01	8.03	21.6	17998.50	251	251	516	491	-24.8	265	2.1
A083530	2005	3	7.8	5.96	0.02	5.94	14.5	12082.33	186	186	345	330	-15.2	159	1.9
A083539	2005	3	7.9	0.4	0.08	0.32	1.3	1083.24	10	12.5	22	30	7.6	10	2.2
EXCP-1	2005	3	7.8	6.12	0.02	6.10	16.3	13582.20	191	191	353	370	-17.0	162	1.9
EXCP-2	2005	3	8.0	4.43	0.01	4.42	10	8332.64	138	138	227	227	0.3	88.9	1.6
EXCP-3	2005	3	7.7	4.44	0.02	4.42	16.4	13665.53	138	139	350	373	-23.3	212	2.5
EXCP-4	2005	3	7.8	3.01	0.01	3.00	24.5	20414.97	93.8	94.1	554	556	-1.8	460	5.9
105812	1996	4	7.7	2.14	<0.01	2.14			66.9	66.9	24.3			-42.6	0.4
172337	1996	4	7.4	0.73	0.16	0.57			17.8	22.8	41.6			23.8	2.3
A083504	2005	4	7.8	1.79	0.34	1.45	4.70	3916.34	45.3	55.9	89	107	17.9	33	2.0
A083509	2005	4	7.8	0.74	<0.01	0.74	4.60	3833.01	23.1	23.1	80	105	24.6	57	3.5
A083517	2005	4	8.3	1.85	0.35	1.5	4.60	3833.01	46.9	57.8	116	105	-11.4	58	2.5
A083523	2005	4	8.1	1.94	0.38	1.56	2.20	1833.18	48.8	60.6	34	50	16.0	-27	0.7
A083525	2005	4	8.2	3.04	0.2	2.84	1.30	1083.24	88.8	95.0	31	30	-1.4	-64	0.4
A083540	2005	4	8.1	0.89	0.01	0.88	2.00	1666.53	27.5	27.8	37	45	8.5	9	1.4
EXMT	2005	4	8.1	3.20	1.82	1.38	3.4	2833.10	43.1	100	99	78	20.7	55.9	2.3
105809	1996	5	7.4	0.79	0.02	0.77			24.1	24.7	14.1			-10	0.6
172411	1996	5	8.1	1.11	<0.01	1.11			34.7	34.7	234			199	6.8
172421	1996	5	7.9	0.82	<0.01	0.82			25.6	25.6	174			148	6.8
A083505	2005	5	8.2	0.91	0.04	0.87	1.70	1416.55	27.2	28.4	21	39	17.7	-7	0.8
A083507	2005	5	8	0.57	0.01	0.56	1.70	1416.55	17.5	17.8	33	39	5.7	15	1.9
A083511	2005	5	7.9	0.95	0.04	0.91	2.30	1916.51	28.4	29.7	67	52	-14.7	37	2.4
A083520	2005	5	8.2	0.91	<0.01	0.91	7.10	5916.17	28.4	28.4	173	161	-11.5	145	6.1

Sample ID	Year	Rock Type	Paste pH	Total S (%)	SO_4-S (%)	Sulphide-S[1] (%)	CO2 (%)	CO3	AP[2] (kg $CaCO_3$/tonne)	MAP (kg $CaCO_3$/tonne)	NP[3] (kg $CaCO_3$/tonne)	Carb-NP (kg $CaCO_3$/tonne)	Non-Carb-NP (kg $CaCO_3$/tonne)	NNP (kg $CaCO_3$/tonne)	NP/AP ratio
A083541	2005	5	8.1	2.16	0.31	1.85	3.1	2583.12	57.8	67.5	48	71	22.5	-20	0.8
105235	1996	6	8.8	0.28	<0.01	0.28			8.8	8.8	49.5			40.8	5.7
105763	1996	6	8.2	3.3	<0.01	3.3			103	103	109			5.9	1.1
105777	1996	6	8.2	2.15	<0.01	2.15			67.2	67.2	21.5			-45.7	0.3
105816	1996	6	8.1	7.14	<0.01	7.14			223	223	375			152	1.7
105835	1996	6	8.2	0.11	<0.01	0.11			3.4	3.4	39.1			35.7	11.4
105944	1996	6	8.5	0.82	<0.01	0.82			25.6	25.6	145			119	5.7
172410	1996	6	8.3	0.56	<0.01	0.56			17.5	17.5	227			209	13.0
172420	1996	6	7.9	2.08	<0.01	2.08			65	65.0	28.2			-36.8	0.4
172464	1996	6	8.6	0.58	<0.01	0.58			18.1	18.1	28.7			10.6	1.6
175604	1996	6	8.1	1.59	<0.01	1.59			49.7	49.7	99.3			49.6	2.0
A083501	2005	6	8.5	0.18	0.01	0.17	0.60	499.96	5.3	5.6	17	14	-3.4	11	3.2
A083502	2005	6	8.6	0.53	0.02	0.51	3.90	3249.73	15.9	16.6	89	89	-0.3	72	5.6
A083512	2005	6	8.2	1.35	0.02	1.33	3.00	2499.79	41.6	42.2	80	68	-11.8	38	1.9
A083514	2005	6	8.8	0.32	<0.01	0.32	0.90	749.94	10	10.0	24	20	-3.5	14	2.4
A083516	2005	6	8.7	1.32	0.04	1.28	1.70	1416.55	40	41.3	35	39	3.7	-6	0.9
A083522	2005	6	8.4	0.74	0.03	0.71	1.30	1083.24	22.2	23.1	29	30	0.6	6	1.3
A083542	2005	6	8	0.94	0.05	0.89	2.8	2333.14	27.8	29.4	56	64	7.7	27	2.0
SILICEOUS SILY STONE-1	2005	6	8.4	0.59	0.01	0.58	1.5	1249.90	18.1	18.4	33	35	-2.0	14.9	1.8
SILICEOUS SILY STONE-2	2005	6	8.3	0.60	0.01	0.59	0.9	749.94	18.4	18.8	22	21	1.2	3.6	1.2
SILICEOUS SILY STONE-3	2005	6	8.4	0.69	0.02	0.67	1.5	1249.90	20.9	21.6	34	35	-1.0	13.1	1.6
SILICEOUS SILY STONE-4	2005	6	8.2	0.64	0.01	0.63	1.4	1166.57	19.7	20.0	33	32	1.3	13.3	1.7
SILICEOUS SILY STONE-5	2005	6	8.0	0.23	<0.01	0.23	1.7	1416.55	7.2	7.2	38	40	-2.0	30.8	5.3
FOOTWALL RHYOLITE-1	2005	6	7.1	4.11	0.02	4.09	0.2	166.65	128	128	5	<4		-123	0.0
FOOTWALL RHYOLITE-2	2005	6	7.8	7.60	0.05	7.55	0.2	166.65	236	238	7	4	2.8	-229	0.0
FOOTWALL RHYOLITE-3	2005	6	7.6	3.61	0.02	3.59	0.7	583.28	112	113	19	16	3.2	-93.2	0.2
FOOTWALL RHYOLITE-4	2005	6	8.2	0.22	<0.01	0.22	1.5	1249.90	6.9	6.9	38	33	4.7	31.1	5.5

Sample	Year	Rock Type	Major and Minor Elements (%)									
			Al	Fe	Ca	Mg	Na	K	P	Ti	S	Mn
105831	1996	1	0.2	3	0.67	0.036						0.01
172344	1996	1	0.18	1.64	0.59	0.051						0.013
172412	1996	1	0.21	1.57	5.7	0.12						0.103
172414	1996	1	0.25	2.18	2.61	0.075						0.045
172424	1996	1	0.63	4.34	5.9	1.19						0.35
172451	1996	1	0.26	3.4	3.6	0.26						0.048
172454	1996	1	0.19	2.4	0.44	0.04						0.006
172460	1996	1	0.54	2.59	6.6	4.13						0.062
175605	1996	1	0.18	1.79	0.9	0.06						0.009
175613	1996	1	0.32	1.85	1.64	0.035						0.005
A083503	2005	1	0.55	1.42	0.44	0.21	0.01	0.23	0.036	0.012	0.53	0.017
A083513	2005	1	1.01	1.94	0.64	0.6	0.02	0.39	0.034	0.055	0.27	0.185
A083518	2005	1	0.94	3.06	2.12	0.67	0.02	0.19	0.103	0.012	1.52	0.073
A083526	2005	1	1.13	2.6	0.86	0.57	0.02	0.18	0.067	0.008	1.16	0.023
A083529	2005	1	0.47	1.76	0.72	0.19	0.01	0.13	0.045	<0.005	0.92	0.022
105223	1996	2	0.22	2.39	1.49	0.078						0.021
105226	1996	2	0.32	7.2	1.21	0.044						0.016
105926	1996	2	0.07	19	2.37	0.058						0.053
105934	1996	2	0.08	18	0.19	0.065						0.017
105950	1996	2	0.32	1.01	7.1	0.53						0.052
A083508	2005	2	0.39	1.18	0.83	0.2	0.01	0.13	0.195	0.005	0.55	0.039
A083515	2005	2	0.74	2.68	0.96	0.55	0.01	0.19	0.072	0.016	1.32	0.034
A083528	2005	2	0.99	2.02	1.93	0.66	0.01	0.41	0.061	0.047	0.58	0.078
A083531	2005	2	0.61	2.96	0.92	0.4	0.01	0.18	0.069	0.005	1.74	0.036
A083510	2005	3	1.16	10.6	1.36	0.35	0.02	0.14	0.064	0.019	0.7	0.087
A083519	2005	3	0.78	3.31	6.11	0.19	0.02	0.12	0.057	0.008	1.33	0.09
A083524	2005	3	0.29	8.38	19.85	0.22	0.01	0.07	0.235	<0.005	9.02	0.24
A083530	2005	3	0.25	5.76	13.7	0.14	0.01	0.1	0.141	0.005	6.14	0.152
105812	1996	4	0.21	2.34	0.72	0.1						0.031
172337	1996	4	1.05	4.19	0.32	0.29						0.027
A083504	2005	4	0.89	4.92	2.62	0.44	0.02	0.21	0.08	0.016	1.3	0.402
A083509	2005	4	0.89	4.61	2.41	0.42	0.01	0.06	0.085	<0.005	0.63	0.164
A083517	2005	4	0.96	11.85	3.62	0.24	0.02	0.15	0.017	0.023	0.39	0.091
A083523	2005	4	1.36	13.05	0.98	0.28	0.01	0.14	0.046	0.03	0.47	0.38
A083525	2005	4	1.33	17.75	1	0.21	0.03	0.18	0.026	0.029	0.26	0.1
105809	1996	5	1.2	3	0.28	0.23						0.01
172411	1996	5	0.13	1.34	8.3	0.11						0.111
172421	1996	5	0.27	1.5	5.3	0.19						0.283
A083505	2005	5	0.46	2.37	0.46	0.31	0.01	0.14	0.02	<0.005	0.92	0.028
A083507	2005	5	0.51	1.71	1.06	0.28	0.01	0.19	0.028	0.01	0.59	0.067
A083511	2005	5	1.18	2.6	1.48	0.69	0.02	0.24	0.072	0.027	0.83	0.044
A083520	2005	5	0.77	2.77	6.1	0.26	0.02	0.23	0.048	0.017	0.82	0.149
105235	1996	6	1.65	2.22	1.07	2.29						0.053
105763	1996	6	0.21	2.62	3.83	0.104						0.042
105777	1996	6	0.23	2.07	0.81	0.055						0.011
105816	1996	6	0.4	4.9	6.8	3.33						0.288
105835	1996	6	5	7	0.66	4.55						0.112
105944	1996	6	3.3	5.3	2.48	3.66						0.052
172410	1996	6	0.6	0.93	7.8	0.24						0.065
172420	1996	6	0.25	2.53	0.67	0.17						0.049
172464	1996	6	2.63	4.08	0.59	2.68						0.058
175604	1996	6	0.26	1.54	3.56	0.11						0.035
A083501	2005	6	1.08	1.64	0.42	0.7	0.01	0.21	0.015	0.015	0.18	0.064
A083502	2005	6	0.73	1.32	2.99	0.35	0.02	0.21	0.019	0.006	0.44	0.085
A083512	2005	6	1.5	3.63	1.44	1.62	0.02	0.42	0.027	0.024	1.47	0.05
A083514	2005	6	0.77	1.36	0.69	0.4	0.01	0.22	0.029	0.023	0.31	0.097
A083516	2005	6	0.71	1.53	1.05	0.29	0.02	0.19	0.012	0.005	1.1	0.023
A083522	2005	6	0.41	1.1	0.94	0.18	0.01	0.16	0.009	0.005	0.66	0.018
Background[1]			8.16	5.3	3.86	2.19	2.62	2.39	0.105	0.57	0.026	0.014

		Rock	Other Elements (mg/kg = ppm)																						
Sample	Year	Type	Be	Bi	Ce	Cs	Ga	Ge	Hf	In	La	Li	Nb	Rb	Re	Sc	Sr	Ta	Te	Th	Tl	U	W	Y	Zr
105831	1996	1																							
172344	1996	1																							
172412	1996	1																							
172414	1996	1																							
172424	1996	1																							
172451	1996	1																							
172454	1996	1																							
172460	1996	1																							
175605	1996	1																							
175613	1996	1																							
A083503	2005	1	0.38	0.17	18.95	1.21	1.71	<0.05	0.15	0.012	10.3	5.9	0.09	13.2	0.001	1.8	28.1	<0.01	0.12	3	0.5	0.55	0.2	3.11	6.3
A083513	2005	1	0.23	0.24	39.7	2.87	4.18	0.06	0.38	0.015	19.1	12.2	0.41	27.3	<0.001	2.8	68.4	0.01	0.07	7.1	0.26	0.9	0.26	4.61	13.9
A083518	2005	1	0.12	0.16	19.05	2.01	1.86	0.07	0.51	0.019	11	3.9	0.05	14.8	0.009	2.2	316	<0.01	0.09	3.2	0.05	2.6	0.48	6.65	21.4
A083526	2005	1	0.33	0.18	47.8	4.23	3.03	0.08	0.44	0.017	24.5	6	0.05	13	0.007	1.7	103.5	<0.01	0.05	6.4	0.21	1.4	0.4	6.25	16.4
A083529	2005	1	0.34	0.15	15.25	0.63	1.41	<0.05	0.24	0.019	8.1	2.7	0.05	8.3	0.002	1.8	76.1	<0.01	0.04	3	0.41	0.56	0.43	3.48	9.5
105223	1996	2																							
105226	1996	2																							
105926	1996	2																							
105934	1996	2																							
105950	1996	2																							
A083508	2005	2	0.27	0.19	16.9	0.56	1.29	<0.05	0.23	0.016	8.1	2.6	<0.05	8.5	0.003	1.7	307	<0.01	0.06	2.1	0.26	0.68	0.18	7.87	9.4
A083515	2005	2	0.18	0.2	21.2	1.46	1.92	0.07	0.46	0.015	11.5	3.8	0.08	14.6	0.009	2.1	240	<0.01	0.07	3.4	0.09	2.19	0.16	4.65	20.8
A083528	2005	2	0.23	0.18	44.4	1.17	3.09	0.06	0.31	0.011	22.8	9.9	0.34	23.5	0.003	2	114	<0.01	0.07	9.3	0.12	1.81	0.44	10.65	11.5
A083531	2005	2	0.28	0.15	16.15	1.2	1.56	0.06	0.46	0.017	8.8	4.4	<0.05	13.1	0.009	1.8	158	<0.01	0.07	2.9	0.43	1.62	0.16	4.25	18.4
A083510	2005	3	1.47	0.08	9.56	0.92	3.85	0.17	0.16	0.015	5	7.2	0.16	8.7	0.006	4.3	164.5	<0.01	0.04	1.5	0.16	0.7	0.27	6.67	6.3
A083519	2005	3	1.01	0.11	8.88	0.95	2.27	0.05	0.08	0.015	4.2	3.7	0.08	8	<0.001	3.6	192.5	<0.01	0.04	1.2	0.4	0.26	0.22	7.52	3.2
A083524	2005	3	0.98	0.04	12.25	0.42	0.93	0.1	0.05	0.009	8.5	3.2	0.12	3.7	0.002	2.6	236	<0.01	0.04	1	0.87	0.32	0.17	15.75	2.3
A083530	2005	3	1.32	0.09	11.65	0.52	0.79	0.08	0.05	0.015	7.8	3.9	0.1	5.1	0.001	3.3	141.5	<0.01	0.07	1.1	1.23	0.38	0.28	13.85	2.4
105812	1996	4																							
172337	1996	4																							
A083504	2005	4	0.4	0.14	12.65	1.13	2.79	0.08	0.22	0.022	6	4.9	0.17	13.4	<0.001	4.6	163.5	<0.01	0.05	1.8	0.4	0.58	0.58	7.38	9.5
A083509	2005	4	0.47	0.08	16.05	0.97	3.03	0.06	0.1	0.019	8	3.2	<0.05	5	<0.001	4.1	152	<0.01	0.02	1.6	0.19	0.45	0.29	10.15	3.9
A083517	2005	4	1.36	0.07	10.65	1.65	3.81	0.26	0.07	0.011	5.1	3.5	0.23	9.7	<0.001	3.5	215	<0.01	0.03	1.2	0.14	0.28	0.19	5.07	2.8
A083523	2005	4	1.08	0.15	13.6	3.41	4.88	0.22	0.07	0.018	6.4	4.9	0.17	11.4	0.001	5.2	126	<0.01	0.06	2	0.34	0.78	0.44	5.4	3.2
A083525	2005	4	1.36	0.06	10.35	1.53	5.61	0.65	0.05	0.021	4.4	5.5	0.19	11.9	<0.001	4.7	138	<0.01	0.03	1.5	0.26	0.25	0.35	4.83	1.8
105809	1996	5																							
172411	1996	5																							
172421	1996	5																							
A083505	2005	5	0.23	0.13	21.3	0.94	1.64	0.05	0.2	0.016	11.2	2.7	<0.05	8.6	0.002	2.3	39.6	<0.01	0.05	4.3	0.3	1.03	0.45	3.68	8.8
A083507	2005	5	0.27	0.2	15.4	1.19	1.73	<0.05	0.18	0.015	8.5	4.1	0.09	13	0.002	2.5	99.9	<0.01	0.07	2.7	0.31	0.5	0.49	3.33	8.1
A083511	2005	5	0.23	0.16	22.8	4.11	2.25	0.06	0.59	0.016	11.8	5.1	0.11	18.9	0.009	2.7	261	<0.01	0.04	3.4	0.16	1.84	0.92	5.15	22.5
A083520	2005	5	0.63	0.14	10.85	4.42	2.46	<0.05	0.1	0.014	5.3	4.6	0.17	16.6	0.001	3.3	140	<0.01	0.07	2.2	0.7	0.65	6.25	7.87	4
105235	1996	6																							
105763	1996	6																							
105777	1996	6																							
105816	1996	6																							
105835	1996	6																							
105944	1996	6																							
172410	1996	6																							
172420	1996	6																							
172464	1996	6																							
175604	1996	6																							
A083501	2005	6	0.2	0.13	33.4	0.4	3.97	0.05	0.14	0.014	16.9	13.2	<0.05	10.4	<0.001	2.5	25.8	<0.01	0.04	4.3	0.02	0.36	0.13	4.22	5.5
A083502	2005	6	0.36	0.18	61.3	1.83	2.44	0.07	0.18	0.017	29.9	4.6	0.27	9.9	<0.001	2.3	140.5	<0.01	0.03	9.1	0.21	0.9	0.35	12	7.5
A083512	2005	6	0.24	4.11	29.4	8.8	5.44	0.39	0.62	0.485	15.3	19.1	0.14	33.1	0.005	2.6	131	<0.01	0.05	8.3	4.67	1.95	0.41	6.22	24.3
A083514	2005	6	0.15	0.19	22.7	1.19	2.88	<0.05	0.17	0.012	10	7.6	0.13	14.6	<0.001	2.1	62.2	<0.01	0.09	3.2	0.09	0.41	0.92	2.91	7.2
A083516	2005	6	0.15	0.18	12.85	0.67	1.88	<0.05	0.16	0.013	5.8	3.2	<0.05	11.2	0.001	2	91.5	<0.01	0.08	2.1	0.09	0.4	0.35	3.58	6.9
A083522	2005	6	0.16	0.18	14.35	0.6	1.21	<0.05	0.16	0.013	6.7	3.1	<0.05	10	0.001	1.8	87	<0.01	0.06	2.4	0.07	0.35	0.47	2.99	6.2
Background[1]			2.8	0.17	60	3	15	1.5	3	0.1	30	20	20	90		22	375	2		9.6	0.45	2.7	1.5	33	165

		Rock	Elements of Interest (mg/kg = ppm)																
Sample	Year	Type	Ag	Sb	As	Ba	Cd	Cu	Pb	Zn	B	Mo	Cr	Co	V	Ni	Sn	Se	Hg
105831	1996	1		32	52	18	4.7	123	59	691						58			<3
172344	1996	1		9	41	51	3.6	42	80	437						13			<3
172412	1996	1		8		84	2.8	89	58	383						30			<3
172414	1996	1		9	53	53	3.7	62	78	407						38			<3
172424	1996	1		25		77	1.3	94	117	222						41			<3
172451	1996	1		48	219	22	15.5	297	59	1250						123			<3
172454	1996	1		28	39	24	4.3	58	24	281						47			<3
172460	1996	1		65	67	109	53.6	786	401	4207						32			3
175605	1996	1		16	43	55	20.1	35	103	973						32			<3
175613	1996	1		28	28	73	13.9	78	117	876						107			<3
A083503	2005	1	0.19	1.56	4.8	330	0.15	69.2	16.1	132	<10	1.1	58	7.3	22	32.8	0.3	1.2	0.07
A083513	2005	1	0.11	0.16	6.3	1180	0.04	81.4	13.6	69	<10	1.56	66	11.4	19	45.5	0.4	0.9	0.02
A083518	2005	1	0.62	0.92	4.6	60	0.31	75.9	13.2	224	<10	3.72	49	12	17	108	0.3	5.5	0.05
A083526	2005	1	0.56	1.51	2.5	80	0.23	61.2	15.9	123	<10	3.03	52	8.4	14	54.6	0.5	4.1	0.03
A083529	2005	1	0.47	3.15	8.4	120	0.34	62.5	29.2	192	<10	2.26	118	4.9	16	36.8	0.3	2.4	0.06
105223	1996	2		23	66	34	19.9	75	334	2155						34			<3
105226	1996	2		439	369	6	376.3	2678	5585	37000						146			7
105926	1996	2		120	1867	5	673.8	11660	8170	81000						31			14
105934	1996	2		816	650	9	2849	7410	11117	250000						166			33
105950	1996	2		<5	<5	122	2.5	42	20	257						4			<3
A083508	2005	2	0.35	1.14	3.3	310	0.12	76.9	8.9	107	<10	1.26	81	6.3	13	42.7	0.3	2.1	0.04
A083515	2005	2	0.59	1.16	4.8	80	0.23	70.1	11.2	206	<10	2.54	77	10.2	17	87.5	0.3	4.9	0.07
A083528	2005	2	0.25	0.31	2.3	580	0.67	40.9	13.2	85	<10	3.05	46	8.4	19	36.9	0.4	1.8	0.01
A083531	2005	2	0.64	1.93	7.1	80	0.25	69.4	14.4	201	<10	3.84	94	10.5	17	83.8	0.3	5.1	0.07
A083510	2005	3	0.43	0.46	3.7	90	0.11	42.2	39.9	252	<10	35.9	77	6.2	70	46.4	0.4	4	0.13
A083519	2005	3	0.26	0.65	4.5	50	0.06	48.7	75.8	39	<10	7.15	54	3.2	32	15.2	0.3	2.1	0.03
A083524	2005	3	0.29	3.5	31	20	0.25	28.5	549	68	<10	12.1	12	2	26	7.2	0.2	4	0.03
A083530	2005	3	0.41	3.8	19	20	50.4	26	449	9240	<10	12.6	21	2.7	31	12.8	0.3	4.3	1.85
105812	1996	4		<5	<5	30	2	52	209	903						28			<3
172337	1996	4		<5	<5	177	<0.1	91	15	174						37			<3
A083504	2005	4	0.39	1.52	2.6	60	0.04	70.4	18.8	106	<10	3.36	71	6.1	45	35.2	0.4	4.3	0.08
A083509	2005	4	0.22	1.82	4.4	170	0.01	60.8	5	30	<10	5.71	49	2.7	43	14.6	0.3	1.1	0.02
A083517	2005	4	0.12	0.6	1.1	220	<0.01	26.8	5.8	23	<10	8.4	49	2.2	81	13.6	0.4	1.2	0.01
A083523	2005	4	0.23	1.53	5.4	130	<0.01	68.4	5.5	86	<10	9.33	58	12.3	78	40.8	0.4	1.5	0.04
A083525	2005	4	0.07	0.37	0.8	250	0.21	23.5	7.3	182	<10	8.43	65	3.8	104	15.8	0.5	1.5	0.01
105809	1996	5		<5	<5	102	0.6	91	11	98						13			<3
172411	1996	5		8	5	80	4.3	120	77	556						21			<3
172421	1996	5		9	11	139	0.6	140	168	88						48			<3
A083505	2005	5	0.36	3.5	3.9	220	0.08	67.9	10.4	159	<10	1.14	103	9.6	17	57.8	0.3	2.3	0.07
A083507	2005	5	0.3	1.08	2.7	330	0.06	79.4	53.2	53	<10	1.89	60	7.2	17	39.7	0.3	1.9	0.02
A083511	2005	5	0.63	2.38	8.3	100	0.24	68.1	11.9	153	<10	2.48	81	9.4	24	74.9	0.3	4.4	0.03
A083520	2005	5	0.38	3.28	5.1	100	0.02	52.6	9.6	45	<10	8.37	54	10.4	24	32.5	0.4	1.4	0.05
105235	1996	6		<5	51	121	2.4	152	26	324						3			<3
105763	1996	6		65	98	28	106.9	585	160	10595						7			7
105777	1996	6		7	13	55	1.5	26	35	159						7			<3
105816	1996	6		277	94	22	233.5	661	111	22000						29			19
105835	1996	6		6	30	95	1	74	33	470						2			<3
105944	1996	6		<5	15	112	12.2	528	118	1478						4			<3
172410	1996	6		31	21	341	7.8	169	117	946						32			<3
172420	1996	6		17		44	1.6	149	58	436						70			<3
172464	1996	6		10	16	52	9.2	29	64	743						6			<3
175604	1996	6		6	9	88	6.5	15	57	448						3			<3
A083501	2005	6	0.14	0.15	4.7	520	0.06	79.4	6.1	61	<10	0.44	55	8.6	27	32	0.3	0.5	0.01
A083502	2005	6	0.12	1.86	4.6	210	0.05	25.2	9.6	35	<10	2.27	41	4.4	7	21.9	0.5	1.3	0.04
A083512	2005	6	8.33	4.84	219	80	2.29	2220	69.3	306	<10	2.61	39	12	20	59.3	2.2	108	0.22
A083514	2005	6	0.1	0.16	3.9	910	0.53	62.5	8.6	125	<10	0.99	56	9.3	17	30.1	0.3	0.8	0.04
A083516	2005	6	0.22	1.2	7.9	70	0.02	46.8	6.6	33	<10	1.34	48	7	14	40.4	0.3	2.4	0.04
A083522	2005	6	0.16	0.92	3.1	140	0.02	45.7	4.7	34	<10	1.26	54	6.4	11	34.1	0.2	1.2	0.04
Background[1]			0.07	0.2	1.8	425	0.2	55	12.5	70	10	1.5	100	25	950	75	2	0.05	0.08

Sample ID	Rock	pH	SO4	Al	Fe	Ca	Mg	Na	K	P	Ti	Si	Mn	Be	Bi	Sn	Sr	Tl	U
Units	Type		mg/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
DETECTION				0.0010	0.030	0.050	0.10	2.0	2.0	0.30	0.010	0.050	0.000050	0.00050	0.00050	0.00010	0.00010	0.00010	0.000010
Argilite 1	1	7.88	135	0.187	0.046	28.9	3.27	<2.0	17.2	<0.30	<0.010	1.92	0.0139	<0.00050	<0.00050	<0.00010	0.107	0.00105	0.00397
Argilite 2	1	7.77	192	0.0848	<0.030	37.1	2.96	<2.0	10.9	<0.30	<0.010	1.97	0.150	<0.00050	<0.00050	0.00014	0.0654	0.00040	0.00171
Argilite 3	1	7.75	122	0.122	0.083	23.6	4.79	2.8	14.5	<0.30	<0.010	2.39	0.0407	<0.00050	<0.00050	<0.00010	0.0899	0.00028	0.000896
Argilite 4	1	7.78	251	0.100	0.049	43.5	8.38	<2.0	8.4	<0.30	<0.010	2.12	0.0975	<0.00050	<0.00050	0.00019	0.125	0.00044	0.00183
Argilite 5	1	7.61	657	0.135	<0.030	48.7	10.4	56.9	20.5	<0.30	<0.010	1.73	0.118	<0.00050	<0.00050	0.00012	0.203	0.00046	0.00274
A083503	1	7.95	104	0.209	0.157	34.7	8.34	5.5	15.3	<0.30	<0.010	3.30	0.0850	<0.00050	<0.00050	<0.00010	0.135	0.00021	0.000767
A083518	1	7.15	245	0.0287	<0.030	70.9	30.9	11.9	8.0	<0.30	<0.010	2.76	0.330	<0.00050	<0.00050	<0.00010	0.380	<0.00010	0.00246
A083529	1	7.16	209	0.0408	<0.030	68.6	11.9	2.1	10.6	<0.30	<0.010	2.30	0.0762	<0.00050	<0.00050	<0.00010	0.211	0.00017	0.000450
A083515	2	6.96	148	0.0675	0.044	40.8	15.6	8.1	12.8	<0.30	<0.010	2.58	0.106	<0.00050	<0.00050	0.00012	0.367	<0.00010	0.00235
A083531	2	7.38	163	0.0369	<0.030	64.0	15.0	<2.0	11.0	<0.30	<0.010	2.31	0.204	<0.00050	<0.00050	<0.00010	0.256	<0.00010	0.00206
EXCP 1	3	7.77	299	0.0458	<0.030	83.4	10.2	6.5	7.8	<0.30	<0.010	1.53	0.103	<0.00050	<0.00050	<0.00010	0.327	0.00015	0.00605
EXCP 2	3	7.85	268	0.0879	<0.030	63.3	10.3	<2.0	11.3	<0.30	<0.010	1.79	0.0744	<0.00050	<0.00050	0.00013	0.280	0.00022	0.00282
EXCP 3	3	8.03	288	0.0367	<0.030	86.3	11.5	5.2	10.1	<0.30	<0.010	1.43	0.132	<0.00050	<0.00050	0.00013	0.423	0.00013	0.00618
EXCP 4	3	8.11	101	0.0362	<0.030	65.3	10.6	<2.0	11.3	<0.30	<0.010	2.66	0.0779	<0.00050	<0.00050	<0.00010	0.240	0.00017	0.00429
A083510	3	7.86	43.0	0.0620	0.063	25.8	5.87	11.2	3.2	<0.30	<0.010	3.17	0.0733	<0.00050	<0.00050	<0.00010	0.217	<0.00010	0.00101
A083530	3	7.34	233	0.0139	<0.030	111	7.01	<2.0	4.1	<0.30	<0.010	2.12	0.0565	<0.00050	<0.00050	<0.00010	0.203	0.00029	0.00179
EXMT	4	7.52	54	0.194	<0.030	25.4	5.10	<2.0	<2.0	<0.30	<0.010	1.59	0.0207	<0.00050	<0.00050	0.00013	0.327	0.00019	0.000311
A083504	4	7.82	322	0.0211	<0.030	120	17.0	6.1	8.7	<0.30	<0.010	2.68	1.49	<0.0010	<0.0010	<0.00020	0.141	<0.00020	0.000731
A083525	4	7.35	30.3	0.0808	0.042	25.8	3.40	5.2	2.1	<0.30	<0.010	1.84	0.0316	<0.00050	<0.00050	<0.00010	0.174	<0.00010	0.000400
A083505	5	7.89	150	0.0547	<0.030	32.8	25.1	<2.0	8.8	<0.30	<0.010	1.29	0.0442	<0.00050	<0.00050	<0.00010	0.109	0.00012	0.000640
A083511	5	6.54	184	0.0502	<0.030	61.1	19.9	7.8	8.9	<0.30	<0.010	2.55	0.176	<0.00050	<0.00050	<0.00010	0.329	<0.00010	0.00336
Sliceous Sily Stone 1	7	6.94	67	0.292	0.043	17.0	2.71	4.8	9.8	<0.30	<0.010	1.94	0.0121	<0.00050	<0.00050	<0.00010	0.0829	<0.00010	0.000363
Sliceous Sily Stone 2	7	7.08	63	0.143	0.073	25.4	2.80	<2.0	6.8	<0.30	<0.010	2.42	0.0309	<0.00050	<0.00050	<0.00010	0.119	<0.00010	0.000400
Sliceous Sily Stone 3	7	7.29	114	0.269	0.036	17.8	2.81	13.6	9.9	<0.30	<0.010	1.90	0.00773	<0.00050	<0.00050	0.00011	0.0892	<0.00010	0.00102
Sliceous Sily Stone 4	7	7.35	240	0.151	<0.030	27.1	3.87	9.1	11.4	<0.30	<0.010	1.87	0.0124	<0.00050	<0.00050	<0.00010	0.151	0.00010	0.00188
Sliceous Sily Stone 5	7	7.39	157	0.112	<0.030	30.8	4.71	<2.0	6.4	<0.30	<0.010	2.13	0.0210	<0.00050	<0.00050	0.00012	0.151	<0.00010	0.000700
Footwall Rhyolite 1	7	7.19	192	0.0142	<0.030	53.2	13.5	<2.0	12.5	<0.30	<0.010	2.95	0.394	<0.00050	<0.00050	0.00015	0.201	0.00047	0.000394
Footwall Rhyolite 2	7	7.35	102	0.0870	<0.030	26.1	4.79	7.1	6.2	<0.30	<0.010	2.63	0.00832	<0.00050	<0.00050	<0.00010	0.124	0.00048	0.000508
Footwall Rhyolite 3	7	7.50	127	0.0767	<0.030	25.6	5.90	2.1	9.1	<0.30	<0.010	2.35	0.0107	<0.00050	<0.00050	0.00010	0.138	0.00040	0.00317
Footwall Rhyolite 4	7	7.63	51	0.233	<0.030	16.2	4.90	<2.0	3.7	<0.30	<0.010	1.31	0.00217	<0.00050	<0.00050	<0.00010	0.101	0.00037	0.000384
A083502	7	8.27	31.5	0.686	0.463	12.6	4.45	12.8	7.3	<0.30	<0.010	4.50	0.0142	<0.00050	<0.00050	<0.00010	0.0892	<0.00010	0.00273
A083512	7	6.81	172	0.0581	<0.030	49.5	18.5	12.5	13.5	<0.30	<0.010	2.22	0.103	<0.00050	<0.00050	<0.00010	0.322	0.00023	0.00375
A083516	7	7.15	49.7	0.356	0.126	18.5	5.42	7.7	10.8	<0.30	<0.010	4.97	0.00801	<0.0010	<0.0010	<0.00020	0.106	<0.00020	0.00110
20- BLANK		6.51	<10	0.0020	0.082	<0.050	<0.10	<2.0	<2.0	<0.30	<0.010	<0.050	0.000299	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.000010
Leach Blank		5.49	<1.0	0.0024	<0.030	<0.050	<0.10	<2.0	<2.0	<0.30	<0.010	<0.050	0.000056	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.000010

Shake Flask Tests.19 Samples.W8820.xls
Shake Flask Tests.15 Samples.W9043.xls

Sample ID	Rock	Ag	Sb	As	Ba	Cd	Cu	Pb	Zn	B	Mo	Cr	Co	V	Ni	Li	Se	Hg
Units	Type	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
DETECTION		0.000010	0.00010	0.00010	0.000050	0.000050	0.00010	0.000050	0.0010	0.010	0.000050	0.00050	0.00010	0.0010	0.00050	0.0050	0.00050	0.0010
Argilite 1	1	0.000083	0.262	0.00096	0.0231	<0.000050	0.00355	0.000207	0.0022	<0.010	0.00759	<0.00050	<0.00010	<0.0010	0.00151	0.0061	0.0149	<0.0010
Argilite 2	1	0.000055	0.0360	0.00087	0.0213	0.000071	0.00393	0.000107	0.0043	<0.010	0.00137	0.00058	0.00061	0.0014	0.0175	<0.0050	0.0191	<0.0010
Argilite 3	1	0.000070	0.00597	0.00034	0.0446	<0.000050	0.00482	0.000132	0.0034	0.012	0.00170	<0.00050	0.00096	<0.0010	0.0113	0.0065	0.00719	<0.0010
Argilite 4	1	0.000337	0.0423	0.00057	0.0523	<0.000050	0.00235	0.000287	0.0032	<0.010	0.00336	0.00072	0.00027	<0.0010	0.00679	0.0068	0.0188	<0.0010
Argilite 5	1	0.000235	0.0774	0.00051	0.118	<0.000050	0.00295	0.000195	0.0021	0.014	0.0126	<0.00050	0.00195	<0.0010	0.0113	0.0069	0.0156	<0.0010
A083503	1	0.000016	0.0183	0.00032	0.133	<0.000050	0.00153	0.000468	0.0059	<0.010	0.00474	<0.00050	0.00055	0.0011	0.00942	0.0059	0.00798	<0.0010
A083518	1	0.000279	0.00176	0.00024	0.0517	0.000070	0.00044	<0.000050	0.0049	<0.010	0.00871	<0.00050	0.00135	<0.0010	0.0289	<0.0050	0.0363	<0.0010
A083529	1	0.000055	0.00543	0.00032	0.0656	<0.000050	0.00091	0.000057	0.0033	<0.010	0.00208	<0.00050	0.00015	<0.0010	0.00309	<0.0050	0.0215	<0.0010
A083515	2	0.000060	0.0145	0.00043	0.114	<0.000050	0.00085	0.000090	0.0047	<0.010	0.00670	0.00058	0.00047	<0.0010	0.0130	<0.0050	0.0207	<0.0010
A083531	2	0.000214	0.00442	0.00022	0.0979	0.000060	0.00029	<0.000050	0.0073	<0.010	0.00470	<0.00050	0.00190	<0.0010	0.0239	<0.0050	0.0275	<0.0010
EXCP 1	3	0.000074	0.0218	0.00021	0.306	<0.000050	0.00327	0.000508	0.0049	0.022	0.00694	<0.00050	0.00031	<0.0010	0.00497	0.0121	0.0197	<0.0010
EXCP 2	3	0.000029	0.0212	0.00023	0.257	<0.000050	0.00334	0.000393	0.0023	0.036	0.00510	<0.00050	0.00020	<0.0010	0.00171	0.0168	0.0183	<0.0010
EXCP 3	3	0.000059	0.00760	0.00022	0.254	<0.000050	0.00557	0.000342	0.0023	0.034	0.00579	<0.00050	0.00013	<0.0010	0.00293	0.0193	0.00840	<0.0010
EXCP 4	3	<0.000010	0.00751	0.00027	0.279	<0.000050	0.00424	0.000131	0.0017	<0.010	0.00391	<0.00050	<0.00010	<0.0010	<0.00050	0.0111	0.00420	<0.0010
A083510	3	0.000016	0.00107	0.00010	0.168	<0.000050	0.00237	0.000373	0.0030	<0.010	0.0582	<0.00050	<0.00010	<0.0010	0.00162	<0.0050	0.0174	<0.0010
A083530	3	0.000016	0.00915	0.00024	0.0872	<0.000050	0.00039	0.00165	0.0255	<0.010	0.0153	<0.00050	0.00015	<0.0010	0.00492	0.0059	0.00737	<0.0010
EXMT	4	0.000011	0.0544	0.00018	0.223	<0.000050	0.00129	0.000527	0.0027	<0.010	0.00462	<0.00050	<0.00010	<0.0010	<0.00050	<0.0050	0.0574	<0.0010
A083504	4	0.000036	0.00071	<0.00020	0.0297	<0.00010	0.00097	<0.00010	0.0058	<0.020	0.00060	<0.0010	<0.00020	<0.0020	0.0047	<0.010	0.0134	<0.0010
A083525	4	<0.000010	<0.00010	<0.00010	0.127	<0.000050	0.00054	<0.000050	0.0027	<0.010	0.0430	<0.00050	<0.00010	<0.0010	<0.00050	<0.0050	0.00345	<0.0010
A083505	5	0.000036	0.0305	<0.00010	0.0652	<0.000050	0.00115	0.000062	0.0075	<0.010	0.000874	<0.00050	0.00015	<0.0010	0.00303	<0.0050	0.0108	<0.0010
A083511	5	0.000164	0.00324	0.00070	0.0556	<0.000050	0.00144	0.000104	0.0054	<0.010	0.00604	<0.00050	0.00047	<0.0010	0.0112	<0.0050	0.0334	<0.0010
Sliceous Sily Stone 1	6	0.000040	0.0618	0.00113	0.131	<0.000050	0.00195	0.000106	<0.0010	<0.010	0.00220	<0.00050	<0.00010	0.0035	0.00106	0.0052	0.00562	<0.0010
Sliceous Sily Stone 2	6	0.000118	0.0676	0.00274	0.275	<0.000050	0.00565	0.000173	0.0051	<0.010	0.0231	<0.00050	<0.00010	0.0016	0.00528	0.0077	0.0144	<0.0010
Sliceous Sily Stone 3	6	0.000061	0.0248	0.00074	0.126	<0.000050	0.00418	0.000065	0.0027	0.011	0.000834	<0.00050	<0.00010	0.0033	0.00137	<0.0050	0.00638	<0.0010
Sliceous Sily Stone 4	6	0.000030	0.0256	0.00070	0.0866	<0.000050	0.00404	0.000096	0.0029	0.010	0.00150	<0.00050	<0.00010	0.0017	0.00253	<0.0050	0.00524	<0.0010
Sliceous Sily Stone 5	6	0.000025	0.786	0.00081	0.0737	<0.000050	0.00220	<0.000050	0.0023	<0.010	0.00763	<0.00050	0.00020	0.0021	0.00735	<0.0050	0.00908	<0.0010
Footwall Rhyolite 1	6	<0.000010	0.00907	<0.00010	0.0515	0.000464	0.00375	0.000462	0.0065	<0.010	0.000165	<0.00050	0.00257	<0.0010	0.00271	0.0177	0.0873	<0.0010
Footwall Rhyolite 2	6	0.000304	0.0307	0.00031	0.0888	0.000065	0.00291	0.000258	0.0025	0.038	0.00266	<0.00050	<0.00010	<0.0010	<0.00050	0.0058	0.182	<0.0010
Footwall Rhyolite 3	6	0.000106	0.0151	0.00017	0.0767	<0.000050	0.00266	0.000086	0.0015	0.014	0.00217	<0.00050	<0.00010	<0.0010	<0.00050	0.0067	0.201	<0.0010
Footwall Rhyolite 4	6	<0.000010	0.0334	0.00040	0.0936	<0.000050	0.00198	<0.000050	0.0015	<0.010	0.00503	<0.00050	<0.00010	<0.0010	<0.00050	<0.0050	0.0260	<0.0010
A083502	6	0.000017	0.0271	0.00178	0.191	<0.000050	0.00171	0.000803	0.0098	<0.010	0.00736	<0.00050	0.00015	0.0027	0.00145	<0.0050	0.00492	<0.0010
A083512	6	0.000052	0.0232	0.00081	0.0996	<0.000050	0.00279	0.000102	0.0044	<0.010	0.00374	<0.00050	0.00029	<0.0010	0.00870	0.0053	0.102	<0.0010
A083516	6	0.000028	0.0174	0.00144	0.330	<0.00010	0.00271	0.00076	0.0033	<0.020	0.00213	<0.0010	<0.00020	0.0093	0.0050	<0.010	0.00993	<0.0010
20- BLANK		<0.000010	<0.00010	<0.00010	0.000791	<0.000050	0.00112	<0.000050	<0.0010	<0.010	<0.000050	<0.00050	<0.00010	<0.0010	<0.00050	<0.0050	<0.00050	<0.0010
Leach Blank		<0.000010	<0.00010	<0.00010	0.00108	<0.000050	<0.00010	<0.000050	<0.0010	<0.010	<0.000050	<0.00050	<0.00010	<0.0010	<0.00050	<0.0050	<0.00050	<0.0010

Appendix C
Kinetic Testing Results

HUMIDITY CELL TEST REPORT

Client: Westmin Resources Limited (Wolverine Lake Project)
Test: HC1

Reporting Date: December 31, 1997
Project: 96-121

Sample id: DDH-WV96-63 Hanging Wall Composite (Comp 1)
Sample weight: 1 kg
Flush volume: 500 mL

Starting Date: July 15, 1997
Page: 1 of 3

		Cycle										
Element	Unit	0	1	2	3	4	5	6	7	8	9	10
Al	mg/L	0.18			0.11			0.08			0.10	
Sb	mg/L	<0.05			<0.05			<0.05			<0.05	
As	mg/L	<0.03			<0.03			<0.03			<0.03	
Ba	mg/L	0.063			0.028			0.021			0.018	
Be	mg/L	<0.001			<0.001			<0.001			<0.001	
Bi	mg/L	<0.1			<0.1			<0.1			<0.1	
B	mg/L	0.24			0.30			0.26			0.36	
Cd	mg/L	<0.005			<0.005			<0.005			<0.005	
Ca	mg/L	37.79			26.72			21.54			19.17	
Cr	mg/L	<0.01			<0.01			<0.01			<0.01	
Co	mg/L	<0.01			<0.01			<0.01			<0.01	
Cu	mg/L	<0.01			<0.01			0.02			0.02	
Fe	mg/L	<0.01			<0.01			<0.01			<0.01	
Pb	mg/L	<0.05			<0.05			<0.05			<0.05	
Li	mg/L	<0.02			<0.02			<0.02			<0.02	
Mg	mg/L	2.8			1.8			1.7			1.6	
Mn	mg/L	0.404			0.574			0.673			0.681	
Hg	mg/L	<0.02			<0.02			<0.02			<0.02	
Mo	mg/L	<0.01			<0.01			<0.01			<0.01	
Ni	mg/L	0.16			0.05			0.05			0.06	
P	mg/L	<0.1			<0.1			<0.1			<0.1	
K	mg/L	3			<2			<2			<2	
Se	mg/L	<0.05			<0.05			<0.05			<0.05	
Si	mg/L	0.46			0.18			0.12			0.28	
Ag	mg/L	<0.02			<0.02			<0.02			<0.02	
Na	mg/L	6			1.5			1.0			1.0	
Sr	mg/L	0.221			0.162			0.127			0.112	
Tl	mg/L	<0.2			<0.2			<0.2			<0.2	
Sn	mg/L	<0.1			<0.1			<0.1			<0.1	
Ti	mg/L	<0.01			<0.01			<0.01			<0.01	
W	mg/L	<0.1			<0.1			<0.1			<0.1	
V	mg/L	<0.01			<0.01			<0.01			<0.01	
Zn	mg/L	0.084			0.100			0.103			0.107	
Leachate Vol	mL	462	410	487	480	477	487	458	470	465	472	474
pH		7.4	7.1	6.8	7.3	6.7	7.1	6.9	6.8	6.7	6.9	6.9
Conductivity	μS	263	167	155	160	140	151	124	109	124	111	112
ORP	mV	120	117	119	90	120	93	103	106	118	114	270
Acidity	mg $CaCO_3$/L	4.6	3.8	3.6	4.0	4.7	2.3	2.7	2.8	3.7	3.3	3.0
Alkalinity	mg $CaCO_3$/L	2.5	11.4	10.5	12.9	11.5	8.8	8.6	6.4	9.5	8.4	7.9
Sulphate	mg/L	95	69	61	66	52	55	49	40	44	45	43
Cum. Sulphate	mg/kg	44	72	102	134	158	185	208	226	247	268	288

Process Research Associates Ltd.

HUMIDITY CELL TEST REPORT

Client: Westmin Resources Limited (Wolverine Lake Project)
Test: HC1

Reporting Date: December 31, 1997
Project: 96-121

Sample id: DDH-WV96-63 Hanging Wall Composite (Comp 1)
Sample weight: 1 kg
Flush volume: 500 mL

Starting Date: July 15, 1997
Page: 2 of 3

		Cycle										
Element	Unit	11	12	13	14	15	16	17	18	19	20	21
Al	mg/L		0.06			0.12			0.07	0.05	<0.05	0.11
Sb	mg/L		<0.05			<0.05			<0.05	<0.05	<0.05	<0.05
As	mg/L		<0.03			<0.03			<0.03	<0.03	<0.03	<0.03
Ba	mg/L		0.017			0.016			0.013	0.013	0.012	0.011
Be	mg/L		<0.001			<0.001			<0.001	<0.001	<0.001	0.001
Bi	mg/L		<0.1			<0.1			<0.1	<0.1	<0.1	<0.1
B	mg/L		0.35			0.39			0.28	0.28	0.38	0.31
Cd	mg/L		<0.005			<0.005			<0.005	<0.005	<0.005	<0.005
Ca	mg/L		17.63			17.08			14.25	14.47	13.52	13.13
Cr	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
Co	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
Cu	mg/L		0.02			0.02			0.01	<0.01	<0.01	0.02
Fe	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	0.11
Pb	mg/L		<0.05			<0.05			<0.05	<0.05	<0.05	<0.05
Li	mg/L		<0.02			<0.02			<0.02	<0.02	<0.02	<0.02
Mg	mg/L		1.5			1.5			1.7	1.6	1.2	0.9
Mn	mg/L		0.695			0.643			0.549	0.497	0.396	0.380
Hg	mg/L		<0.02			<0.02			<0.02	<0.02	<0.02	<0.02
Mo	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
Ni	mg/L		0.05			0.04			0.02	0.02	<0.01	0.03
P	mg/L		<0.1			<0.1			<0.1	<0.1	<0.1	<0.1
K	mg/L		<2			<2			<2	<2	<2	<2
Se	mg/L		<0.05			<0.05			<0.05	<0.05	<0.05	<0.05
Si	mg/L		0.09			0.22			0.12	0.11	0.10	0.11
Ag	mg/L		<0.02			<0.02			<0.02	<0.02	<0.02	<0.02
Na	mg/L		1.0			0.9			1.0	0.7	0.9	1.4
Sr	mg/L		0.105			0.101			0.094	0.088	0.079	0.073
Tl	mg/L		<0.2			<0.2			<0.2	<0.2	<0.2	<0.2
Sn	mg/L		<0.1			<0.1			<0.1	<0.1	<0.1	<0.1
Ti	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
W	mg/L		<0.1			<0.1			<0.1	<0.1	<0.1	<0.1
V	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
Zn	mg/L		0.097			0.114			0.067	0.063	0.057	0.075
Leachate Vol	mL	470	466	465	467	474	472	492	471	461	488	470
pH		6.9	7.0	6.7	6.7	7.0	6.9	6.7	6.9	6.6	6.9	6.5
Conductivity	μS	112	97	107	101	100	85	91	93	88	81	69
ORP	mV	290	235	244	212	193	206	257	223	205	221	150
Acidity	mg $CaCO_3$/L	3.5	2.3	4.2	3.3	2.5	3.7	1.8	2.7	3.9	3.2	4.6
Alkalinity	mg $CaCO_3$/L	11.0	9.3	10.2	8.0	6.4	8.0	5.8	9.1	9.5	9.1	6.4
Sulphate	mg/L	40	34	40	36	30	30	39	33	30	29	29
Cum. Sulphate	mg/kg	307	323	342	359	373	387	406	422	435	450	463

Process Research Associates Ltd.

HUMIDITY CELL TEST REPORT

Client: Westmin Resources Limited (Wolverine Lake Project)
Test: HC1

Reporting Date: January 29, 1998
Project: 96-121

Sample id: DDH-WV96-63 Hanging Wall Composite (Comp 1)
Sample weight: 1 kg
Flush volume: 500 mL

Starting Date: July 15, 1997

		Cycle										
Element	Unit	22	23	24	25	26	27	28	29	30	31	32
Al	mg/L	0.15	0.12	0.07	0.12	0.12						
Sb	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05						
As	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03						
Ba	mg/L	0.012	0.011	0.008	0.011	0.010						
Be	mg/L	0.002	<0.001	<0.001	<0.001	<0.001						
Bi	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1						
B	mg/L	0.41	0.30	0.34	0.22	0.36						
Cd	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005						
Ca	mg/L	13.50	14.21	9.64	12.79	11.78						
Cr	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
Co	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
Cu	mg/L	0.06	0.02	0.06	0.05	<0.01						
Fe	mg/L	0.17	<0.01	0.05	0.02	<0.01						
Pb	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05						
Li	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02						
Mg	mg/L	1.3	1.4	1.0	0.9	0.9						
Mn	mg/L	0.439	0.444	0.282	0.328	0.277						
Hg	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02						
Mo	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
Ni	mg/L	0.03	0.02	0.01	0.02	0.01						
P	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1						
K	mg/L	<2	<2	<2	<2	<2						
Se	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05						
Si	mg/L	0.29	0.22	0.17	0.20	0.25						
Ag	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02						
Na	mg/L	0.6	<0.2	1.2	0.4	0.6						
Sr	mg/L	0.081	0.081	0.046	0.073	0.067						
Tl	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2						
Sn	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1						
Ti	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
W	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1						
V	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
Zn	mg/L	0.064	0.057	0.065	0.053	0.022						
Leachate Vol	mL	470	474	495	470	485						
pH		6.6	6.4	6.7	6.7	6.4						
Conductivity	μS	69	69	53	66	59						
ORP	mV	178	179	244	336	277						
Acidity	mg $CaCO_3$/L	4.6	3.7	3.8	4.0	4.4						
Alkalinity	mg $CaCO_3$/L	7.1	8.2	4.6	8.6	7.1						
Sulphate	mg/L	31	30	22	26	28						
Cum. Sulphate	mg/kg	478	492	503	515	529						

HUMIDITY CELL TEST REPORT

Client: Westmin Resources Limited (Wolverine Lake Project)
Test: HC2

Reporting Date: December 31, 1997
Project: 96-121

Sample id: DDH-WV96-60 Foot Wall Composite (Comp 2)
Sample weight: 1 kg
Flush volume: 500 mL

Starting Date: July 15, 1997
Page: 1 of 3

		Cycle										
Element	Unit	0	1	2	3	4	5	6	7	8	9	10
Al	mg/L	0.17			0.11			0.10			0.07	
Sb	mg/L	0.13			0.10			0.05			<0.05	
As	mg/L	<0.03			<0.03			<0.03			<0.03	
Ba	mg/L	0.052			0.021			0.019			0.015	
Be	mg/L	<0.001			<0.001			<0.001			<0.001	
Bi	mg/L	<0.1			<0.1			<0.1			<0.1	
B	mg/L	0.26			0.34			0.38			0.31	
Cd	mg/L	0.011			0.006			0.014			0.018	
Ca	mg/L	21.97			20.38			17.40			18.63	
Cr	mg/L	<0.01			<0.01			<0.01			<0.01	
Co	mg/L	<0.01			<0.01			<0.01			<0.01	
Cu	mg/L	0.03			0.02			0.06			0.02	
Fe	mg/L	0.02			<0.01			0.03			0.11	
Pb	mg/L	<0.05			<0.05			<0.05			<0.05	
Li	mg/L	<0.02			<0.02			<0.02			<0.02	
Mg	mg/L	2.9			2.2			1.8			1.7	
Mn	mg/L	0.083			0.066			0.080			0.100	
Hg	mg/L	<0.02			<0.02			<0.02			<0.02	
Mo	mg/L	<0.01			<0.01			<0.01			<0.01	
Ni	mg/L	0.11			0.02			0.12			0.07	
P	mg/L	<0.1			<0.1			<0.1			<0.1	
K	mg/L	18			8			3			<2	
Se	mg/L	0.13			<0.05			<0.05			<0.05	
Si	mg/L	0.55			0.25			0.27			0.15	
Ag	mg/L	<0.02			<0.02			<0.02			<0.02	
Na	mg/L	32.2			7.9			2.3			1.3	
Sr	mg/L	0.086			0.081			0.067			0.068	
Tl	mg/L	<0.2			<0.2			<0.2			<0.2	
Sn	mg/L	<0.1			<0.1			<0.1			<0.1	
Ti	mg/L	<0.01			<0.01			<0.01			<0.01	
W	mg/L	<0.1			<0.1			<0.1			<0.1	
V	mg/L	<0.01			<0.01			<0.01			<0.01	
Zn	mg/L	0.37			0.300			0.875			1.101	
Leachate Vol	mL	422	430	458	482	458	456	456	456	470	456	454
pH		7.3	7.0	6.6	6.9	6.7	6.7	6.7	6.7	6.6	6.5	6.6
Conductivity	µS	29	166	14	174	14	147	122	126	134	114	119
ORP	mV	111	157	128	90	136	96	121	117	125	123	276
Acidity	mg $CaCO_3$/L	6.3	4.0	3.4	4.0	2.8	4.2	3.6	3.9	3.9	3.7	3.9
Alkalinity	mg $CaCO_3$/L	18.0	5.5	5.9	7.3	6.4	4.4	3.8	3.8	3.8	3.9	4.9
Sulphate	mg/L	125	58	56	67	57	57	47	47	54	51	51
Cum. Sulphate	mg/kg	53	78	103	136	162	188	209	231	256	279	302

Process Research Associates Ltd.

HUMIDITY CELL TEST REPORT

Client: Westmin Resources Limited (Wolverine Lake Project)
Test: HC2

Reporting Date: December 31, 1997
Project: 96-121

Sample id: DDH-WV96-60 Foot Wall Composite (Comp 2)
Sample weight: 1 kg
Flush volume: 500 mL

Starting Date: July 15, 1997

		Cycle										
Element	Unit	11	12	13	14	15	16	17	18	19	20	21
Al	mg/L		0.07			0.06			<0.05	<0.05	<0.05	0.1
Sb	mg/L		<0.05			<0.05			<0.05	<0.05	0.05	<0.05
As	mg/L		<0.03			<0.03			<0.03	<0.03	<0.03	<0.03
Ba	mg/L		0.011			0.010			0.011	0.011	0.011	0.009
Be	mg/L		<0.001			<0.001			<0.001	<0.001	<0.001	<0.001
Bi	mg/L		<0.1			<0.1			<0.1	<0.1	<0.1	<0.1
B	mg/L		0.34			0.3			0.26	0.36	0.35	0.25
Cd	mg/L		0.019			0.013			0.007	0.008	0.012	0.013
Ca	mg/L		17.94			14.70			13.44	15.23	13.83	18.84
Cr	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
Co	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
Cu	mg/L		0.01			0.04			<0.01	<0.01	0.02	<0.01
Fe	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	0.02
Pb	mg/L		<0.05			<0.05			<0.05	<0.05	<0.05	<0.05
Li	mg/L		<0.02			<0.02			<0.02	<0.02	<0.02	<0.02
Mg	mg/L		1.5			1.3			1.2	1.2	1.1	1.4
Mn	mg/L		0.108			0.093			0.078	0.085	0.074	0.093
Hg	mg/L		<0.02			<0.02			<0.02	<0.02	<0.02	<0.02
Mo	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
Ni	mg/L		0.06			0.04			0.02	0.02	0.01	0.03
P	mg/L		<0.1			<0.1			<0.1	<0.1	<0.1	<0.1
K	mg/L		<2			<2			<2	<2	<2	<2
Se	mg/L		<0.05			<0.05			<0.05	<0.05	<0.05	<0.05
Si	mg/L		0.13			0.12			0.15	0.18	0.16	0.15
Ag	mg/L		<0.02			<0.02			<0.02	<0.02	<0.02	<0.02
Na	mg/L		1.2			0.9			0.9	0.9	0.9	1.4
Sr	mg/L		0.064			0.053			0.056	0.058	0.053	0.069
Tl	mg/L		<0.2			<0.2			<0.2	<0.2	<0.2	<0.2
Sn	mg/L		<0.1			<0.1			<0.1	<0.1	<0.1	<0.1
Ti	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
W	mg/L		<0.1			<0.1			<0.1	<0.1	<0.1	<0.1
V	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
Zn	mg/L		1.112			0.764			0.356	0.463	0.454	0.597
Leachate Vol	mL	440	447	445	460	458	467	499	493	478	496	484
pH		6.7	6.8	6.5	6.6	6.7	6.7	6.7	6.8	6.8	6.7	6.6
Conductivity	µS	116	103	104		94	72	83	88	91	84	96
ORP	mV	202	240	245	226	201	213	265	237	213	238	177
Acidity	mg $CaCO_3$/L	3.9	3.5	5.4	4.4	3.5	2.8	2.3	3.2	2.5	3.2	4.6
Alkalinity	mg $CaCO_3$/L	6.9	6.4	7.1	6.2	4.9	4.4	5.8	6.4	8.0	9.3	5.5
Sulphate	mg/L	45	45	42	37	34	29	35	33	33	31	46
Cum. Sulphate	mg/kg	322	342	361	378	394	407	425	441	457	472	494

HUMIDITY CELL TEST REPORT

Client: Westmin Resources Limited (Wolverine Lake Project)
Test: HC2

Reporting Date: January 29, 1998
Project: 96-121

Sample id: DDH-WV96-60 Foot Wall Composite (Comp 2)
Sample weight: 1 kg
Flush volume: 500 mL

Starting Date: July 15, 1997
Page: 3 of 3

		Cycle										
Element	Unit	22	23	24	25	26	27	28	29	30	31	32
Al	mg/L	0.11	0.11	0.09	0.10	0.10						
Sb	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05						
As	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03						
Ba	mg/L	0.008	0.009	0.011	0.010	0.010						
Be	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001						
Bi	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1						
B	mg/L	0.33	0.27	0.30	0.20	0.31						
Cd	mg/L	0.009	0.011	0.009	0.011	0.010						
Ca	mg/L	14.11	13.71	11.79	10.51	11.32						
Cr	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
Co	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
Cu	mg/L	0.03	<0.01	0.08	0.03	0.01						
Fe	mg/L	0.02	<0.01	<0.01	<0.01	<0.01						
Pb	mg/L	<0.05	<0.05	0.06	<0.05	<0.05						
Li	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02						
Mg	mg/L	1.0	1.0	0.8	0.7	0.8						
Mn	mg/L	0.076	0.069	0.087	0.058	0.054						
Hg	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02						
Mo	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
Ni	mg/L	0.02	0.03	0.03	0.02	0.02						
P	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1						
K	mg/L	<2	<2	<2	<2	<2						
Se	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05						
Si	mg/L	0.18	0.20	0.23	0.20	0.28						
Ag	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02						
Na	mg/L	0.5	<0.2	1.2	<0.2	0.5						
Sr	mg/L	0.051	0.049	0.035	0.039	0.040						
Tl	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2						
Sn	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1						
Ti	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
W	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1						
V	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
Zn	mg/L	0.413	0.455	0.525	0.395	0.392						
Leachate Vol	mL	490	490	496	491	485						
pH		6.4	6.6	6.5	6.5	6.4						
Conductivity	µS	74	67	60	55	57						
ORP	mV	197	184	249	340	276						
Acidity	mg $CaCO_3$/L	4.5	3.6	3.7	4.2	4.4						
Alkalinity	mg $CaCO_3$/L	6.6	7.3	6.4	7.1	6.6						
Sulphate	mg/L	33	29	20	21	29						
Cum. Sulphate	mg/kg	510	525	535	545	559						

HUMIDITY CELL TEST REPORT

Client: Westmin Resources Limited (Wolverine Lake Project)
Test: HC3

Reporting Date: December 31, 1997
Project: 96-121

Sample id: DDH-WV96-58 Foot Wall Composite (Comp 3)
Sample weight: 1 kg
Flush volume: 500 mL

Starting Date: July 15, 1997

Element	Unit	Cycle 0	1	2	3	4	5	6	7	8	9	10
Al	mg/L	0.8			0.23			0.37			0.37	
Sb	mg/L	<0.05			<0.05			<0.05			<0.05	
As	mg/L	<0.03			<0.03			<0.03			<0.03	
Ba	mg/L	0.133			0.041			0.021			0.014	
Be	mg/L	<0.001			<0.001			<0.001			<0.001	
Bi	mg/L	<0.1			<0.1			<0.1			<0.1	
B	mg/L	0.24			0.26			0.39			0.35	
Cd	mg/L	<0.005			<0.005			<0.005			<0.005	
Ca	mg/L	31.92			38.14			22.64			20.65	
Cr	mg/L	<0.01			<0.01			<0.01			<0.01	
Co	mg/L	0.04			0.03			0.02			0.03	
Cu	mg/L	0.12			0.07			0.12			0.14	
Fe	mg/L	6.5			1.60			5.09			6.48	
Pb	mg/L	<0.05			<0.05			<0.05			<0.05	
Li	mg/L	<0.02			<0.02			<0.02			<0.02	
Mg	mg/L	5.7			5.3			5.1			6.3	
Mn	mg/L	0.698			0.891			0.999			1.174	
Hg	mg/L	<0.02			<0.02			<0.02			<0.02	
Mo	mg/L	<0.01			<0.01			<0.01			<0.01	
Ni	mg/L	0.8			0.31			0.30			0.31	
P	mg/L	<0.1			<0.1			<0.1			<0.1	
K	mg/L	3			<2			<2			<2	
Se	mg/L	<0.05			<0.05			<0.05			<0.05	
Si	mg/L	0.55			0.38			0.36			0.21	
Ag	mg/L	<0.02			<0.02			<0.02			<0.02	
Na	mg/L	8.9			1.9			1.1			1.1	
Sr	mg/L	0.1			0.093			0.061			0.055	
Tl	mg/L	<0.2			<0.2			<0.2			<0.2	
Sn	mg/L	<0.1			<0.1			<0.1			<0.1	
Ti	mg/L	<0.01			<0.01			<0.01			<0.01	
W	mg/L	<0.1			<0.1			<0.1			<0.1	
V	mg/L	<0.01			<0.01			<0.01			<0.01	
Zn	mg/L	0.788			0.563			0.610			0.697	
Leachate Vol	mL	467	420	490	420	407	449	430	458	452	446	451
pH		4.8	4.5	4.5	4.8	4.8	4.5	4.4	4.3	4.2	4.1	4.3
Conductivity	μS	308	444	358	246	224	140	186	164	220	190	260
ORP	mV	183	204	190	**134**	146	165	227	166	195	186	293
Acidity	mg $CaCO_3$/L	23.5	101.8	59.4	10.7	10.3	10.5	18.3	17.0	25.0	24.9	27.0
Alkalinity	mg $CaCO_3$/L	--	--	--	--	--	--	--	--	--	--	--
Sulphate	mg/L	140	225	180	110	95	60	90	75	95	95	100
Cum. Sulphate	mg/kg	65	160	248	294	333	360	399	433	476	518	563

HUMIDITY CELL TEST REPORT

Client: Westmin Resources Limited (Wolverine Lake Project)
Test: HC3

Reporting Date: December 31, 1997
Project: 96-121

Sample id: DDH-WV96-58 Foot Wall Composite (Comp 3)
Sample weight: 1 kg
Flush volume: 500 mL

Starting Date: July 15, 1997
Page: 2 of 3

		Cycle										
Element	Unit	11	12	13	14	15	16	17	18	19	20	21
Al	mg/L		0.22			0.09			0.16	0.09	0.08	0.15
Sb	mg/L		<0.05			<0.05			<0.05	<0.05	<0.05	<0.05
As	mg/L		<0.03			<0.03			<0.03	<0.03	<0.03	<0.03
Ba	mg/L		0.011			0.010			0.011	0.011	0.01	0.006
Be	mg/L		<0.001			<0.001			<0.001	<0.001	<0.001	<0.001
Bi	mg/L		<0.1			<0.1			<0.1	<0.1	<0.1	<0.1
B	mg/L		0.42			0.42			0.27	0.35	0.39	0.31
Cd	mg/L		<0.005			<0.005			<0.005	<0.005	<0.005	<0.005
Ca	mg/L		15.25			14.23			11.04	12.36	11.75	16.63
Cr	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
Co	mg/L		0.02			<0.01			<0.01	<0.01	<0.01	<0.01
Cu	mg/L		0.13			0.06			0.08	0.05	0.07	0.07
Fe	mg/L		3.10			0.21			0.50	0.43	0.42	0.55
Pb	mg/L		<0.05			<0.05			<0.05	<0.05	<0.05	<0.05
Li	mg/L		<0.02			<0.02			<0.02	<0.02	<0.02	<0.02
Mg	mg/L		6.2			4.1			2.4	2.8	2.5	3.3
Mn	mg/L		1.159			0.654			0.343	0.393	0.366	0.480
Hg	mg/L		<0.02			<0.02			<0.02	<0.02	<0.02	<0.02
Mo	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
Ni	mg/L		0.24			0.11			0.05	0.06	0.05	0.07
P	mg/L		<0.1			<0.1			<0.1	<0.1	<0.1	<0.1
K	mg/L		<2			<2			<2	<2	<2	<2
Se	mg/L		<0.05			<0.05			<0.05	<0.05	<0.05	<0.05
Si	mg/L		0.34			0.22			0.19	0.20	0.30	0.32
Ag	mg/L		<0.02			<0.02			<0.02	<0.02	<0.02	<0.02
Na	mg/L		1.0			1.0			0.9	0.8	0.8	1.4
Sr	mg/L		0.045			0.040			0.035	0.035	0.033	0.046
Tl	mg/L		<0.2			<0.2			<0.2	<0.2	<0.2	<0.2
Sn	mg/L		<0.1			<0.1			<0.1	<0.1	<0.1	<0.1
Ti	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
W	mg/L		<0.1			<0.1			<0.1	<0.1	<0.1	<0.1
V	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
Zn	mg/L		0.559			0.235			0.148	0.135	0.130	0.143
Leachate Vol	mL	437	449	480	460	464	476	463	466	476	470	470
pH		4.3	4.6	4.6	4.8	4.9	4.9	5.2	5.1	5.3	5.3	5.2
Conductivity	µS	164	140	195	154	118	113	85	85	89	89	105
ORP	mV	291	263	288	239	235	196	157	147	171	176	240
Acidity	mg $CaCO_3$/L	16.0	14.0	14.0	8.4	5.1	6.0	5.8	4.6	5.7	6.2	7.6
Alkalinity	mg $CaCO_3$/L	--	--	--	--	--	--	0.4	--	0.4	0.2	--
Sulphate	mg/L	85	75	95	73	50	56	41	40	40	40	58
Cum. Sulphate	mg/kg	600	634	680	713	737	763	782	801	820	839	866

HUMIDITY CELL TEST REPORT

Client: Westmin Resources Limited (Wolverine Lake Project)
Test: HC3

Reporting Date: January 29, 1998
Project: 96-121

Sample id: DDH-WV96-58 Foot Wall Composite (Comp 3)
Sample weight: 1 kg
Flush volume: 500 mL

Starting Date: July 15, 1997
Page: 3 of 3

		Cycle										
Element	Unit	22	23	24	25	26	27	28	29	30	31	32
Al	mg/L	0.15	0.15	0.11	0.12	0.12						
Sb	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05						
As	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03						
Ba	mg/L	0.007	0.008	0.008	0.008	0.007						
Be	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001						
Bi	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1						
B	mg/L	0.40	0.29	0.30	0.19	0.31						
Cd	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005						
Ca	mg/L	11.54	11.97	11.19	11.34	10.69						
Cr	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
Co	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
Cu	mg/L	0.08	0.07	0.12	0.09	0.04						
Fe	mg/L	0.56	0.52	0.42	0.52	0.43						
Pb	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05						
Li	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02						
Mg	mg/L	2.5	2.6	2.3	2.1	1.9						
Mn	mg/L	0.400	0.403	0.363	0.336	0.290						
Hg	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02						
Mo	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
Ni	mg/L	0.07	0.07	0.06	0.05	0.03						
P	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1						
K	mg/L	<2	<2	<2	<2	<2						
Se	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05						
Si	mg/L	0.35	0.30	0.18	0.28	0.40						
Ag	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02						
Na	mg/L	0.6	<0.2	1.2	<0.2	0.5						
Sr	mg/L	0.034	0.033	0.027	0.031	0.029						
Tl	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2						
Sn	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1						
Ti	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
W	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1						
V	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
Zn	mg/L	0.129	0.127	0.124	0.107	0.075						
Leachate Vol	mL	465	474	484	468	470						
pH		4.8	5.0	5.3	5.5	5.4						
Conductivity	μS	78	75	75	70	67						
ORP	mV	210	193	200	253	216						
Acidity	mg $CaCO_3$/L	8.0	5.3	5.2	6.3	5.98						
Alkalinity	mg $CaCO_3$/L	--	--	1	0.2	0.2						
Sulphate	mg/L	40	42	34	35	40						
Cum. Sulphate	mg/kg	885	904	921	937	956						

HUMIDITY CELL TEST REPORT

Client: Westmin Resources Limited (Wolverine Lake Project)
Test: HC4

Reporting Date: December 31, 1997
Project: 96-121

Sample id: DDH-WV96-72 Hanging Wall Composite (Comp 4)
Sample weight: 1 kg
Flush volume: 500 mL

Starting Date: July 15, 1997
Page: 1 of 3

Element	Unit	Cycle 0	1	2	3	4	5	6	7	8	9	10
Al	mg/L	0.17			0.12			0.11			0.12	
Sb	mg/L	<0.05			<0.05			<0.05			<0.05	
As	mg/L	<0.03			<0.03			<0.03			<0.03	
Ba	mg/L	0.067			0.036			0.033			0.025	
Be	mg/L	<0.001			<0.001			<0.001			<0.001	
Bi	mg/L	<0.1			<0.1			<0.1			<0.1	
B	mg/L	0.24			0.34			0.29			0.34	
Cd	mg/L	0.017			0.008			0.017			0.012	
Ca	mg/L	55.69			25.81			32.99			25.58	
Cr	mg/L	<0.01			<0.01			<0.01			<0.01	
Co	mg/L	0.01			<0.01			<0.01			<0.01	
Cu	mg/L	0.01			<0.01			0.04			0.03	
Fe	mg/L	<0.01			<0.01			<0.01			0.03	
Pb	mg/L	<0.05			<0.05			<0.05			<0.05	
Li	mg/L	<0.02			<0.02			<0.02			<0.02	
Mg	mg/L	9.8			4.0			6.9			4.8	
Mn	mg/L	1.033			0.323			0.514			0.366	
Hg	mg/L	<0.02			<0.02			<0.02			<0.02	
Mo	mg/L	<0.01			<0.01			<0.01			<0.01	
Ni	mg/L	0.14			0.01			0.02			<0.01	
P	mg/L	<0.1			<0.1			<0.1			<0.1	
K	mg/L	5			<2			<2			<2	
Se	mg/L	0.1			<0.05			0.07			<0.05	
Si	mg/L	0.62			0.27			0.25			0.28	
Ag	mg/L	<0.02			<0.02			<0.02			<0.02	
Na	mg/L	14.5			2.0			1.3			1.1	
Sr	mg/L	0.311			0.175			0.191			0.140	
Tl	mg/L	<0.2			<0.2			<0.2			<0.2	
Sn	mg/L	<0.1			<0.1			<0.1			<0.1	
Ti	mg/L	<0.01			<0.01			<0.01			<0.01	
W	mg/L	<0.1			<0.1			<0.1			<0.1	
V	mg/L	<0.01			<0.01			<0.01			<0.01	
Zn	mg/L	1.426			0.622			1.292			0.836	
Leachate Vol	mL	417	415	483	458	440	425	452	451	467	452	467
pH		7.1	6.6	7.0	6.8	6.7	6.6	6.5	6.7	6.3	6.5	6.7
Conductivity	µS	456	241	398	175	225	211	220	210	210	163	150
ORP	mV	112	168	115	164	142	111	140	124	142	157	275
Acidity	mg $CaCO_3$/L	8.4	5.3	4.2	3.7	3.9	4.2	3.8	3.7	3.9	3.9	3.5
Alkalinity	mg $CaCO_3$/L	17.7	6.4	8.6	7.5	5.9	3.9	5.1	3.5	4.2	3.5	4.4
Sulphate	mg/L	175	105	180	90	95	95	95	90	95	90	78
Cum. Sulphate	mg/kg	73	117	203	245	287	327	370	410	455	495	532

HUMIDITY CELL TEST REPORT

Client: Westmin Resources Limited (Wolverine Lake Project)
Test: HC4

Reporting Date: December 31, 1997
Project: 96-121

Sample id: DDH-WV96-72 Hanging Wall Composite (Comp 4)
Sample weight: 1 kg
Flush volume: 500 mL

Starting Date: July 15, 1997

		Cycle										
Element	Unit	11	12	13	14	15	16	17	18	19	20	21
Al	mg/L		0.06			0.08			<0.05	0.07	0.05	0.11
Sb	mg/L		<0.05			<0.05			<0.05	<0.05	<0.05	<0.05
As	mg/L		<0.03			<0.03			<0.03	<0.03	<0.03	<0.03
Ba	mg/L		0.023			0.021			0.016	0.014	0.018	0.013
Be	mg/L		<0.001			<0.001			<0.001	<0.001	<0.001	<0.001
Bi	mg/L		<0.1			<0.1			<0.1	<0.1	<0.1	<0.1
B	mg/L		0.22			0.35			0.25	0.31	0.37	0.24
Cd	mg/L		0.009			0.009			0.006	0.006	0.011	0.010
Ca	mg/L		17.73			17.17			14.02	15.34	14.18	20.68
Cr	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
Co	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
Cu	mg/L		0.02			0.01			0.02	0.02	<0.01	<0.01
Fe	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	0.02
Pb	mg/L		<0.05			<0.05			<0.05	<0.05	<0.05	<0.05
Li	mg/L		<0.02			<0.02			<0.02	<0.02	<0.02	<0.02
Mg	mg/L		3.9			3.7			3.0	3.4	3.1	4.1
Mn	mg/L		0.319			0.362			0.280	0.295	0.300	0.396
Hg	mg/L		<0.02			<0.02			<0.02	<0.02	<0.02	<0.02
Mo	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
Ni	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
P	mg/L		<0.1			<0.1			<0.1	<0.1	<0.1	<0.1
K	mg/L		<2			<2			<2	<2	<2	<2
Se	mg/L		<0.05			<0.05			<0.05	<0.05	0.05	<0.05
Si	mg/L		0.12			0.18			0.12	0.14	0.15	0.19
Ag	mg/L		<0.02			<0.02			<0.02	<0.02	<0.02	<0.02
Na	mg/L		0.9			0.8			0.8	0.8	0.9	1.4
Sr	mg/L		0.096			0.093			0.085	0.082	0.080	0.109
Tl	mg/L		<0.2			<0.2			<0.2	<0.2	<0.2	<0.2
Sn	mg/L		<0.1			<0.1			<0.1	<0.1	<0.1	<0.1
Ti	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
W	mg/L		<0.1			<0.1			<0.1	<0.1	<0.1	<0.1
V	mg/L		<0.01			<0.01			<0.01	<0.01	<0.01	<0.01
Zn	mg/L		0.739			0.708			0.459	0.466	0.601	0.783
Leachate Vol	mL	455	456	460	459	459	482	474	479	483	482	480
pH		6.7	6.6	6.6	6.6	6.7	6.6	6.6	6.6	6.6	6.8	6.6
Conductivity	µS	159	117	133	129	130	104	110	106	108	102	122
ORP	mV	102	243	167	228	213	182	146	139	146	188	198
Acidity	mg $CaCO_3$/L	4.0	4.2	5.1	4.9	3.5	3.2	2.8	3.0	3.0	4.1	5.1
Alkalinity	mg $CaCO_3$/L	5.7	4.6	6.6	5.3	3.5	5.1	4.9	4.6	4.6	6.2	4.6
Sulphate	mg/L	75	57	60	64	50	45	45	41	45	40	66
Cum. Sulphate	mg/kg	566	592	620	649	672	694	715	735	756	776	807

HUMIDITY CELL TEST REPORT

Client: Westmin Resources Limited (Wolverine Lake Project)
Test: HC4

Reporting Date: January 29, 1998
Project: 96-121

Sample id: DDH-WV96-72 Hanging Wall Composite (Comp 4)
Sample weight: 1 kg
Flush volume: 500 mL

Starting Date: July 15, 1997
Page: 3 of 3

Element	Unit	Cycle 22	23	24	25	26	27	28	29	30	31	32
Al	mg/L	0.14	0.07	0.08	0.10	0.12						
Sb	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05						
As	mg/L	<0.03	<0.03	<0.03	<0.03	<0.03						
Ba	mg/L	0.015	0.013	0.013	0.014	0.015						
Be	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001						
Bi	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1						
B	mg/L	0.42	0.23	0.34	0.19	0.33						
Cd	mg/L	0.009	0.007	0.008	0.008	0.008						
Ca	mg/L	14.90	13.82	11.61	12.08	11.33						
Cr	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
Co	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
Cu	mg/L	<0.01	<0.01	0.05	0.03	<0.01						
Fe	mg/L	0.03	<0.01	<0.01	<0.01	<0.01						
Pb	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05						
Li	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02						
Mg	mg/L	3.4	3.0	2.6	2.6	2.5						
Mn	mg/L	0.342	0.300	0.273	0.283	0.251						
Hg	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02						
Mo	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
Ni	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
P	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1						
K	mg/L	<2	<2	<2	<2	<2						
Se	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05						
Si	mg/L	0.32	0.15	0.16	0.16	0.35						
Ag	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02						
Na	mg/L	0.7	<0.2	1.3	<0.2	0.5						
Sr	mg/L	0.080	0.073	0.054	0.067	0.062						
Tl	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2						
Sn	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1						
Ti	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
W	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1						
V	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01						
Zn	mg/L	0.584	0.537	0.545	0.575	0.513						
Leachate Vol	mL	480	486	492	478	478						
pH		6.4	6.4	6.6	6.2	6.4						
Conductivity	μS	94	82	75	75	70						
ORP	mV	172	160	172	259	195						
Acidity	mg $CaCO_3$/L	5.3	4.2	4.1	5.1	4.6						
Alkalinity	mg $CaCO_3$/L	6.6	6.6	6.0	6.9	6.6						
Sulphate	mg/L	43	37	31	33	38						
Cum. Sulphate	mg/kg	828	846	861	877	895						

Leachate Chemistry for HC 1
ample = Siliceous Siltstone-2
DRAFT

Date / Reporting Units	Cycle	Volume mL Input	Volume mL Output	pH	Cond. umhos/cm	Acidity mgCaCO3/L (pH 4.5)	Acidity mgCaCO3/L (pH 8.3)	Alkalinity mgCaCO3/L	Sulphate (mg/L)	Hardness CaCO3 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mg mg/L	Mn mg/L	Hg ug/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L	Major Anions	Major Cations	Diff	Diff (%)
22-Dec-05	1	750	595	8.30	115	#N/A	#N/A	26.5	33	51.5	0.056	0.016	0.0017	0.166	< 0.0002	< 0.0002	< 0.01	< 0.00004	17.1	< 0.0002	< 0.0002	0.0011	< 0.01	< 0.0002	0.0059	2.14	0.017	< 0.02	0.0004	0.0024	< 0.03	5.76	0.0077	2.06	< 0.00005	0.58	0.083	< 0.0002	0.00003	< 0.0001	< 0.0002	< 0.0002	0.0002	0.001	< 0.001	< 0.002	1.22	1.20	-0.02	-0.6%
29-Dec-05	2	500	505	7.78	246	#N/A	2.5	51.5	73	117	0.067	0.034	0.0026	0.085	< 0.0002	< 0.0002	0.03	< 0.00004	37.9	< 0.0002	0.0004	0.0015	< 0.01	< 0.0002	0.007	5.49	0.135	< 0.02	0.0024	0.018	< 0.03	7.1	0.017	1.97	< 0.00005	1.11	0.116	< 0.0002	0.00007	< 0.0001	< 0.0002	< 0.0002	0.002	0.0005	0.003	< 0.002	2.55	2.57	0.02	0.4%
05-Jan-06	3	500	510	7.48	212	#N/A	4.5	37.0	60	89.8	0.093	0.022	0.0021	0.066	< 0.0002	< 0.0002	0.01	< 0.00004	29.8	< 0.0002	< 0.0002	0.0006	< 0.01	< 0.0002	0.0033	3.69	0.082	< 0.02	0.0023	0.0079	< 0.03	4.77	0.0073	1.56	< 0.00005	0.65	0.083	< 0.0002	0.00005	< 0.0001	< 0.0002	0.0004	0.0014	0.0006	0.001	< 0.002	1.99	1.94	-0.05	-1.2%
12-Jan-06	4	500	495	7.77	157	#N/A	2.5	36.0	39	73.9	0.091	0.017	0.0013	0.071	< 0.0002	< 0.0002	< 0.01	< 0.00004	24.5	< 0.0002	< 0.0002	0.0006	< 0.01	< 0.0002	0.0025	3.05	0.079	< 0.02	0.0017	0.0055	< 0.03	3.32	0.0035	1.5	< 0.00005	0.33	0.076	< 0.0002	0.00003	< 0.0001	< 0.0002	0.0003	0.0008	0.0005	0.001	< 0.002	1.53	1.57	0.04	1.3%
19-Jan-06	5	500	470	7.72	128	#N/A	2.5	28.8	35	55.4	0.11	0.013	0.0012	0.079	< 0.0002	< 0.0002	< 0.01	< 0.00004	18.5	< 0.0002	< 0.0002	0.0005	0.01	< 0.0002	0.0016	2.23	0.059	< 0.02	0.0015	0.0031	< 0.03	2.08	0.0033	1.06	< 0.00005	0.23	0.062	< 0.0002	0.00002	< 0.0001	< 0.0002	0.0003	0.0006	0.0006	< 0.001	< 0.002	1.30	1.17	-0.13	-5.4%
26-Jan-06	6	500	460	7.76	124	#N/A	1.5	27.5	30																																									
02-Feb-06	7	500	445	7.61	115	#N/A	1.5	28.5	28																																									
09-Feb-06	8	500	480	7.73	110	#N/A	4.5	26.3	IP																																									
16-Feb-06	9	500	450	7.75	91	#N/A	1.3	25.8	IP																																									

Leachate Chemistry for HC 2
Sample = EXMT
DRAFT

Date / Reporting Units	Cycle	Volume mL Input	Volume mL Output	pH	Cond. umhos/cm	Acidity mgCaCO3/L (pH 4.5)	Acidity mgCaCO3/L (pH 8.3)	Alkalinity mgCaCO3/L	Sulphate (mg/L)	Hardness CaCO3 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mg mg/L	Mn mg/L	Hg ug/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L	Major Anions	Major Cations	Diff	Diff (%)
22-Dec-05	1	750	620	7.94	203	#N/A	3.0	77.3	112	219	0.059	0.047	0.001	0.113	< 0.0002	< 0.0002	0.03	< 0.00004	59.2	< 0.0002	0.0009	0.0027	< 0.01	< 0.0002	0.0089	17.1	0.079	< 0.02	0.01	0.0003	< 0.03	4.54	0.03	3.64	< 0.00005	3.68	0.161	< 0.0002	0.00013	< 0.0001	< 0.0002	< 0.0002	0.0015	0.0006	0.017	< 0.002	3.88	4.64	0.76	8.9%
29-Dec-05	2	500	460	7.68	265	#N/A	3.5	72.0	83	141	0.082	0.039	0.0019	0.168	< 0.0002	< 0.0002	0.02	< 0.00004	39	< 0.0002	0.0003	0.0015	< 0.01	0.0003	0.0042	10.5	0.058	< 0.02	0.0061	0.0003	< 0.03	1.72	0.064	2.32	0.00063	0.91	0.199	< 0.0002	0.00011	< 0.0001	0.0003	< 0.0002	0.002	0.0007	0.004	< 0.002	3.17	2.89	-0.28	-4.5%
05-Jan-06	3	500	405	7.55	344	#N/A	6.0	61.5	97	159	0.092	0.033	0.0054	0.077	< 0.0002	< 0.0002	0.01	0.00004	45.9	< 0.0002	0.0002	0.0012	< 0.01	0.0003	0.0034	10.8	0.047	< 0.02	0.0045	0.0004	0.04	1.63	0.108	2.29	< 0.00005	0.46	0.168	< 0.0002	0.00012	< 0.0001	0.0004	0.0003	0.0027	0.0007	0.003	< 0.002	3.25	3.24	-0.01	-0.2%
12-Jan-06	4	500	445	7.84	230	#N/A	3.0	63.0	56	118	0.092	0.026	0.0022	0.107	< 0.0002	< 0.0002	< 0.01	0.00004	33.7	< 0.0002	< 0.0002	0.0023	< 0.01	< 0.0002	0.003	8.23	0.045	< 0.02	0.0036	< 0.0002	< 0.03	1.26	0.07	2.46	< 0.00005	0.21	0.176	< 0.0002	0.0001	< 0.0001	0.0003	< 0.0002	0.0018	0.0007	0.003	< 0.002	2.43	2.40	-0.03	-0.5%
19-Jan-06	5	500	430	7.86	174	#N/A	2.8	49.5	43	84.9	0.12	0.019	0.0008	0.129	< 0.0002	< 0.0002	< 0.01	0.00005	24.8	< 0.0002	< 0.0002	0.0007	< 0.01	< 0.0002	0.002	5.59	0.04	< 0.02	0.0027	< 0.0002	< 0.03	0.88	0.052	1.72	< 0.00005	0.15	0.171	< 0.0002	0.00008	< 0.0001	< 0.0002	< 0.0002	0.0013	0.0007	0.002	< 0.002	1.89	1.73	-0.16	-4.4%
26-Jan-06	6	500	390	7.78	68	#N/A	1.8	24.3	10																																									
02-Feb-06	7	500	450	7.94	90	#N/A	1.5	29.5	15																																									
09-Feb-06	8	500	455	7.81	115	#N/A	4.3	33.0	IP																																									
16-Feb-06	9	500	465	7.52	75	#N/A	2.5	27.5	IP																																									

Leachate Chemistry for HC 3
ample = Footwall Rhyolite-2
DRAFT

Date / Reporting Units	Cycle	Volume mL Input	Volume mL Output	pH	Cond. umhos/cm	Acidity mgCaCO3/L (pH 4.5)	Acidity mgCaCO3/L (pH 8.3)	Alkalinity mgCaCO3/L	Sulphate (mg/L)	Hardness CaCO3 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mg mg/L	Mn mg/L	Hg ug/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L	Major Anions	Major Cations	Diff	Diff (%)
22-Dec-05	1	750	575	7.48	245	#N/A	3.0	24.0	70	88.9	0.045	0.011	0.0031	0.077	< 0.0002	< 0.0002	0.03	< 0.00004	28	< 0.0002	< 0.0002	0.0004	< 0.01	< 0.0002	0.0048	4.59	0.0064	< 0.02	0.0021	< 0.0002	< 0.03	4.8	0.107	1.34	< 0.00005	9.46	0.141	< 0.0002	0.00025	< 0.0001	< 0.0002	< 0.0002	0.0014	< 0.0002	< 0.001	< 0.002	1.94	2.31	0.37	8.7%
29-Dec-05	2	500	395	6.93	414	#N/A	3.0	10.0	112	170	0.017	0.0088	0.0072	0.04	< 0.0002	< 0.0002	0.03	< 0.00004	55.6	< 0.0002	< 0.0002	0.0009	< 0.01	< 0.0002	0.0039	7.43	0.0095	< 0.02	0.0023	< 0.0002	< 0.03	4.61	0.25	0.98	0.00075	10.5	0.22	< 0.0002	0.00027	< 0.0001	0.0006	< 0.0002	0.0016	< 0.0002	0.002	< 0.002	2.53	3.96	1.43	22.0%
05-Jan-06	3	500	370	6.79	611	#N/A	6.0	14.0	216	244	0.014	0.011	0.014	0.027	< 0.0002	< 0.0002	0.03	0.00005	75.8	< 0.0002	< 0.0002	0.0017	< 0.01	< 0.0002	0.0051	13.3	0.023	0.06	0.0016	0.0006	< 0.03	6.19	0.289	1.27	0.00013	12.3	0.285	< 0.0002	0.00038	< 0.0001	0.0002	0.0002	0.0072	< 0.0002	0.003	< 0.002	4.78	5.57	0.79	7.6%
12-Jan-06	4	500	370	6.89	363	#N/A	3.8	8.8	160	152	0.016	0.007	0.0051	0.024	< 0.0002	< 0.0002	0.03	< 0.00004	46.3	< 0.0002	< 0.0002	0.0019	< 0.01	< 0.0002	0.004	8.79	0.018	< 0.02	0.0011	< 0.0002	< 0.03	4.67	0.181	1.47	< 0.00005	6.24	0.202	< 0.0002	0.00027	< 0.0001	< 0.0002	< 0.0002	0.0011	< 0.0002	0.005	< 0.002	3.51	3.42	-0.08	-1.2%
19-Jan-06	5	500	455	6.96	237	#N/A	3.3	10.5	122	112	0.011	0.0056	0.0023	0.02	< 0.0002	< 0.0002	0.02	< 0.00004	33.4	< 0.0002	< 0.0002	0.0011	< 0.01	< 0.0002	0.0033	6.96	0.023	< 0.02	0.0008	< 0.0002	< 0.03	3.66	0.151	1.38	< 0.00005	3.62	0.148	< 0.0002	0.00023	< 0.0001	0.0002	< 0.0002	0.0014	< 0.0002	0.003	< 0.002	2.75	2.49	-0.26	-5.0%
26-Jan-06	6	500	465	7.02	254	#N/A	3.0	13.0	102																																									
02-Feb-06	7	500	430	7.05	201	#N/A	4.3	10.5	78																																									
09-Feb-06	8	500	445	7.04	229	#N/A	8.5	12.5	IP																																									
16-Feb-06	9	500	465	7.04	219	#N/A	2.0	11.8	IP																																									

Leachate Chemistry for HC 4
ample = Footwall Rhyolite-3
DRAFT

Date / Reporting Units	Cycle	Volume mL Input	Volume mL Output	pH	Cond. umhos/cm	Acidity mgCaCO3/L (pH 4.5)	Acidity mgCaCO3/L (pH 8.3)	Alkalinity mgCaCO3/L	Sulphate (mg/L)	Hardness CaCO3 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mg mg/L	Mn mg/L	Hg ug/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L	Major Anions	Major Cations	Diff	Diff (%)
22-Dec-05	1	750	570	7.39	330	#N/A	4.5	15.0	84	134	0.014	0.0054	0.0064	0.14	< 0.0002	< 0.0002	0.02	0.00006	40.2	< 0.0002	0.0003	0.0017	< 0.01	< 0.0002	0.0068	8.22	0.033	< 0.02	0.0012	< 0.0002	< 0.03	8.12	0.251	1.59	< 0.00005	4.01	0.218	< 0.0002	0.00035	< 0.0001	0.0003	< 0.0002	0.0092	< 0.0002	0.003	< 0.002	2.05	3.06	1.01	19.8%
29-Dec-05	2	500	355	6.53	391	#N/A	3.5	8.0	144	162	0.008	0.008	0.0092	0.057	< 0.0002	< 0.0002	0.02	0.00013	47.6	< 0.0002	0.0005	0.004	< 0.01	< 0.0002	0.0036	10.5	0.053	0.04	0.0014	0.0003	0.03	7.27	0.324	1.37	0.00077	4.41	0.227	< 0.0002	0.0003	< 0.0001	0.0005	< 0.0002	0.0042	< 0.0002	0.01	< 0.002	3.16	3.62	0.46	6.7%
05-Jan-06	3	500	370	6.63	527	#N/A	6.5	14.0	191	214	0.016	0.0085	0.014	0.058	< 0.0002	< 0.0002	0.02	0.00013	62.2	< 0.0002	0.0004	0.0052	0.01	< 0.0002	0.0045	14.2	0.054	0.03	0.0016	0.0005	< 0.03	9.34	0.281	2.21	0.00031	4.53	0.25	< 0.0002	0.00034	< 0.0001	0.001	< 0.0002	0.0073	< 0.0002	0.011	< 0.002	4.26	4.71	0.45	5.0%
12-Jan-06	4	500	420	7.06	241	#N/A	4.0	16.3	90	107	0.013	0.0052	0.0037	0.045	< 0.0002	< 0.0002	0.02	0.00005	30.3	< 0.0002	0.0002	0.001	< 0.01	< 0.0002	0.0028	7.63	0.03	< 0.02	0.0007	< 0.0002	< 0.03	4.87	0.115	1.49	< 0.00005	1.73	0.14	< 0.0002	0.00017	< 0.0001	0.0006	< 0.0002	0.0068	< 0.0002	0.003	< 0.002	2.20	2.34	0.14	3.1%
19-Jan-06	5	500	450	7.09	151	#N/A	3.0	13.3	57	65.1	0.34	0.0036	0.0011	0.047	< 0.0002	< 0.0002	0.13	0.00005	18.8	0.0003	< 0.0002	0.0023	0.02	0.0024	0.0018	4.42	0.027	< 0.02	0.0004	< 0.0002	< 0.03	2.62	0.061	1.06	< 0.00005	0.73	0.092	< 0.0002	0.00013	< 0.0001	0.0003	0.0011	0.0032	< 0.0002	0.012	< 0.002	1.45	1.40	-0.05	-1.8%
26-Jan-06	6	500	465	7.25	200	#N/A	2.8	27.5	66																																									
02-Feb-06	7	500	435	7.47	266	#N/A	2.3	29.5	87																																									
09-Feb-06	8	500	445	7.26	144	#N/A	3.0	19.3	IP																																									
16-Feb-06	9	500	440	7.09	100	#N/A	2.5	12.8	IP																																									

Leachate Chemistry for HC 5
Sample = Excp-2
DRAFT

Date / Reporting Units	Cycle	Volume mL Input	Volume mL Output	pH	Cond. umhos/cm	Acidity mgCaCO3/L (pH 4.5)	Acidity mgCaCO3/L (pH 8.3)	Alkalinity mgCaCO3/L	Sulphate (mg/L)	Hardness CaCO3 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mg mg/L	Mn mg/L	Hg ug/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L	Major Anions	Major Cations	Diff	Diff (%)
22-Dec-05	1	750	590	7.74	632	#N/A	5.0	52.8	197	214	0.092	0.011	0.0005	0.156	< 0.0002	< 0.0002	0.04	< 0.00004	66.9	< 0.0002	0.0003	0.0016	< 0.01	< 0.0002	0.016	11.4	0.076	< 0.02	0.0031	0.0022	< 0.03	13.9	0.0096	1.47	< 0.00005	3.61	0.24	< 0.0002	0.00009	< 0.0001	< 0.0002	< 0.0002	0.0021	0.0003	0.006	< 0.002	5.16	4.79	-0.37	-3.7%
29-Dec-05	2	500	385	7.65	333	#N/A	2.8	26.5	126	153	0.099	0.023	0.0006	0.096	< 0.0002	< 0.0002	0.05	< 0.00004	47.3	< 0.0002	< 0.0002	0.0015	< 0.01	< 0.0002	0.0058	8.38	0.068	< 0.02	0.0036	0.0006	0.03	5.77	0.015	0.78	0.0007	2.56	0.194	< 0.0002	0.00006	< 0.0001	0.0004	< 0.0002	0.0016	0.0003	< 0.001	< 0.002	3.16	3.31	0.15	2.4%
05-Jan-06	3	500	385	7.33	363	#N/A	3.5	27.0	133	158	0.1	0.0093	0.0009	0.083	< 0.0002	< 0.0002	0.03	< 0.00004	48.2	< 0.0002	< 0.0002	0.0029	< 0.01	< 0.0002	0.0044	9.21	0.076	< 0.02	0.0025	0.0009	< 0.03	4.17	0.015	0.75	< 0.00005	1.54	0.154	< 0.0002	0.00005	< 0.0001	0.0003	< 0.0002	0.0026	0.0002	< 0.001	< 0.002	3.31	3.34	0.03	0.4%
12-Jan-06	4	500	400	7.68	370	#N/A	2.8	34.3	139	181	0.088	0.0079	0.0006	0.069	< 0.0002	< 0.0002	0.04	< 0.00004	55.6	< 0.0002	< 0.0002	0.0021	< 0.01	< 0.0002	0.0049	10.1	0.066	< 0.02	0.0029	< 0.0002	0.03	4.97	0.016	1.09	< 0.00005	1.29	0.18	< 0.0002	0.00005	< 0.0001	0.0004	< 0.0002	0.0025	0.0003	0.002	< 0.002	3.58	3.79	0.21	2.8%
19-Jan-06	5	500	480	7.89	301	#N/A	2.5	66.0	90	144	0.12	0.0094	0.0004	0.055	< 0.0002	< 0.0002	0.04	< 0.00004	39.6	< 0.0002	< 0.0002	0.001	< 0.01	< 0.0002	0.0066	11	0.075	< 0.02	0.0032	0.0004	< 0.03	5.66	0.015	1.97	< 0.00005	0.74	0.16	< 0.0002	0.00007	< 0.0001	0.0002	< 0.0002	0.0031	0.0004	< 0.001	< 0.002	3.20	3.06	-0.14	-2.2%
26-Jan-06	6	500	495	7.87	238	#N/A	3.3	70.0	48																																									
02-Feb-06	7	500	475	7.91	275	#N/A	3.0	86.0	44																																									
09-Feb-06	8	500	485	7.88	237	#N/A	7.0	77.3	IP																																									
16-Feb-06	9	500	445	7.78	168	#N/A	2.3	48.0	IP																																									

Leachate Chemistry for HC 6
Sample = Excp-3
DRAFT

Date / Reporting Units	Cycle	Volume mL Input	Volume mL Output	pH	Cond. umhos/cm	Acidity mgCaCO3/L (pH 4.5)	Acidity mgCaCO3/L (pH 8.3)	Alkalinity mgCaCO3/L	Sulphate (mg/L)	Hardness CaCO3 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mg mg/L	Mn mg/L	Hg ug/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L	Major Anions	Major Cations	Diff	Diff (%)
22-Dec-05	1	750	605	8.13	336	#N/A	1.5	37.8	86	137	0.067	0.0028	0.0002	0.203	< 0.0002	< 0.0002	0.02	< 0.00004	44.5	< 0.0002	< 0.0002	0.001	< 0.01	< 0.0002	0.012	6.33	0.077	< 0.02	0.0017	< 0.0002	< 0.03	7.96	0.003	0.33	< 0.00005	7.13	0.165	< 0.0002	0.00004	< 0.0001	< 0.0002	< 0.0002	0.0023	< 0.0002	< 0.001	< 0.002	2.55	3.26	0.71	12.2%
29-Dec-05	2	500	520	7.70	659	#N/A	3.5	51.0	216	300	0.032	0.0032	0.0003	0.067	< 0.0002	< 0.0002	0.05	< 0.00004	91.7	< 0.0002	< 0.0002	0.0017	< 0.01	< 0.0002	0.016	17.1	0.332	< 0.02	0.0018	0.003	< 0.03	9.82	0.0057	0.78	0.00055	9	0.266	< 0.0002	0.00005	< 0.0001	< 0.0002	< 0.0002	0.0092	< 0.0002	0.002	< 0.002	5.52	6.63	1.11	9.1%
05-Jan-06	3	500	505	7.53	678	#N/A	4.5	45.5	270	311	0.026	0.002	0.0002	0.047	< 0.0002	< 0.0002	0.03	< 0.00004	97.1	< 0.0002	< 0.0002	0.0008	< 0.01	< 0.0002	0.012	16.4	0.316	< 0.02	0.0013	0.0033	< 0.03	7.14	0.0025	0.7	< 0.00005	4.76	0.254	< 0.0002	0.00004	< 0.0001	< 0.0002	< 0.0002	0.011	< 0.0002	0.001	< 0.002	6.54	6.58	0.05	0.4%
12-Jan-06	4	500	495	7.72	511	#N/A	4.0	40.8	199	269	0.021	0.0011	< 0.0002	0.051	< 0.0002	< 0.0002	0.02	< 0.00004	84	< 0.0002	< 0.0002	0.0004	< 0.01	< 0.0002	0.0089	14.3	0.242	< 0.02	0.001	0.0012	< 0.03	4.78	0.0017	0.58	< 0.00005	2.46	0.22	< 0.0002	0.00003	< 0.0001	< 0.0002	< 0.0002	0.0066	< 0.0002	< 0.001	< 0.002	4.96	5.60	0.64	6.0%
19-Jan-06	5	500	455	7.48	569	#N/A	6.8	26.0	282	293	0.03	0.001	< 0.0002	0.038	< 0.0002	< 0.0002	0.01	< 0.00004	91.7	< 0.0002	< 0.0002	0.0006	< 0.01	< 0.0002	0.0067	15.5	0.154	< 0.02	0.001	0.0007	< 0.03	3.81	0.0057	0.3	< 0.00005	1.65	0.239	< 0.0002	0.00002	< 0.0001	< 0.0002	< 0.0002	0.0048	< 0.0002	< 0.001	< 0.002	6.40	6.02	-0.37	-3.0%
26-Jan-06	6	500	465	7.68	523	#N/A	2.8	35.3	200																																									
02-Feb-06	7	500	445	7.70	489	#N/A	2.5	33.0	187																																									
09-Feb-06	8	500	460	7.76	479	#N/A	9.3	40.5	IP																																									
16-Feb-06	9	500	450	7.78	413	#N/A	2.3	37.0	IP																																									

Leachate Chemistry for HC 7
Sample = Argillite-2
DRAFT

Date / Reporting Units	Cycle	Volume mL Input	Volume mL Output	pH	Cond. umhos/cm	Acidity mgCaCO3/L (pH 4.5)	Acidity mgCaCO3/L (pH 8.3)	Alkalinity mgCaCO3/L	Sulphate (mg/L)	Hardness CaCO3 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mg mg/L	Mn mg/L	Hg ug/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L	Major Anions	Major Cations	Diff	Diff (%)
22-Dec-05	1	750	585	7.08	291	#N/A	5.3	24.5	140	137	0.006	0.0099	0.001	0.037	< 0.0002	< 0.0002	< 0.01	0.00073	46.7	< 0.0002	0.016	0.0017	< 0.01	< 0.0002	0.0053	4.83	0.663	< 0.02	0.0003	0.451	< 0.03	13.3	0.016	0.68	< 0.00005	2.52	0.143	< 0.0002	0.002	< 0.0001	0.0004	< 0.0002	0.0008	0.0003	0.17	< 0.002	3.41	3.18	-0.23	-3.5%
29-Dec-05	2	500	455	4.63	467	#N/A	9.3	1.0	164	199	0.2	0.011	0.0018	0.041	< 0.0002	< 0.0002	0.01	0.0013	68.8	0.0002	0.0062	0.024	0.68	0.0056	0.0045	6.46	0.632	< 0.02	0.0003	0.103	< 0.03	12.1	0.034	1.07	< 0.00005	2.68	0.158	< 0.0002	0.0016	< 0.0001	0.0002	0.0002	0.0009	0.0006	0.3	< 0.002	3.44	4.39	0.95	12.2%
05-Jan-06	3	500	430	6.27	536	#N/A	4.5	5.3	227	238	0.005	0.0095	0.0019	0.021	< 0.0002	< 0.0002	0.01	0.00066	85.9	< 0.0002	0.0037	0.003	0.03	0.0002	0.0035	5.73	0.661	< 0.02	0.0005	0.044	< 0.03	9.11	0.029	0.81	< 0.00005	1.62	0.164	< 0.0002	0.00086	< 0.0001	0.0003	< 0.0002	0.0001	< 0.0002	0.12	< 0.002	4.83	5.06	0.23	2.3%
12-Jan-06	4	500	450	6.87	350	#N/A	6.0	8.8	143	165	0.006	0.0063	0.0006	0.014	< 0.0002	< 0.0002	< 0.01	0.0004	60.6	< 0.0002	0.002	0.0012	< 0.01	< 0.0002	0.0018	3.37	0.448	< 0.02	0.0004	0.016	< 0.03	4.36	0.015	0.73	< 0.00005	0.63	0.112	< 0.0002	0.0004	< 0.0001	< 0.0002	< 0.0002	0.0002	< 0.0002	0.06	< 0.002	3.15	3.44	0.29	4.3%
19-Jan-06	5	500	485	6.85	234	#N/A	7.8	8.5	105	101	0.004	0.0047	0.0004	0.0097	< 0.0002	< 0.0002	< 0.01	0.00049	35.8	< 0.0002	0.0022	0.0015	< 0.01	< 0.0002	0.0014	2.69	0.459	< 0.02	0.0004	0.016	< 0.03	3.17	0.014	0.68	< 0.00005	0.41	0.063	< 0.0002	0.00035	< 0.0001	< 0.0002	< 0.0002	0.0002	0.0003	0.08	< 0.002	2.36	2.11	-0.25	-5.6%
26-Jan-06	6	500	495	6.86	206	#N/A	1.8	8.5	69																																									
02-Feb-06	7	500	470	7.02	188	#N/A	2.5	9.5	68																																									
09-Feb-06	8	500	480	7.03	173	#N/A	7.0	12.3	IP																																									
16-Feb-06	9	500	480	7.02	256	#N/A	2.5	11.0	IP																																									

Leachate Chemistry for HC 8
Sample = Argillite-4
DRAFT

Date Reporting Units	Cycle	Volume mL Input	Volume mL Output	pH	Cond. umhos/cm	Acidity mgCaCO3/L (pH 4.5)	Acidity mgCaCO3/L (pH 8.3)	Alkalinity mgCaCO3/L	Sulphate (mg/L)	Hardness CaCO3 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L
22-Dec-05	1	750	565	7.73	581	#N/A	5.0	76.0	249	359	0.025	0.046	0.0015	0.065	< 0.0002	< 0.0002	0.02	0.00006	109	< 0.0002	0.0037	0.0012	< 0.01	< 0.0002
29-Dec-05	2	500	465	7.08	484	#N/A	6.8	40.8	159	243	0.015	0.022	0.0014	0.037	< 0.0002	< 0.0002	0.04	0.0001	71.1	< 0.0002	0.0021	0.0011	< 0.01	< 0.0002
05-Jan-06	3	500	450	7.40	430	#N/A	4.5	38.3	163	206	0.06	0.017	0.0017	0.025	< 0.0002	< 0.0002	0.03	0.00005	60.3	< 0.0002	0.0009	0.0014	< 0.01	< 0.0002
12-Jan-06	4	500	450	7.64	272	#N/A	4.5	38.0	91	134	0.061	0.012	0.0007	0.022	< 0.0002	< 0.0002	0.02	< 0.00004	38.6	< 0.0002	0.0005	0.0008	< 0.01	< 0.0002
19-Jan-06	5	500	460	7.48	148	#N/A	3.5	24.0	49	68	0.097	0.0076	0.0004	0.015	< 0.0002	< 0.0002	< 0.01	< 0.00004	19.8	< 0.0002	< 0.0002	0.0005	< 0.01	< 0.0002
26-Jan-06	6	500	470	7.44	178	#N/A	3.0	33.3	45															
02-Feb-06	7	500	465	7.83	166	#N/A	2.3	39.3	66															
09-Feb-06	8	500	475	7.88	141	#N/A	4.0	38.3	IP															
16-Feb-06	9	500	460	7.76	118	#N/A	1.8	32.5	IP															

Date	Li mg/L	Mg mg/L	Mn mg/L	Hg ug/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L	Major Anions	Major Cations	Diff	Diff (%)
22-Dec-05	0.017	20.8	0.333	< 0.02	0.0029	0.153	< 0.03	25.2	0.029	3.75	< 0.00005	1.52	0.363	< 0.0002	0.0013	< 0.0001	< 0.0002	< 0.0002	0.0035	0.0004	0.027	< 0.002	6.71	7.86	1.15	7.9%
29-Dec-05	0.0068	15.8	0.365	< 0.02	0.004	0.033	< 0.03	6.32	0.034	1.73	< 0.00005	0.83	0.191	< 0.0002	0.0006	< 0.0001	< 0.0002	< 0.0002	0.0031	< 0.0002	0.016	< 0.002	4.13	5.05	0.92	10.0%
05-Jan-06	0.004	13.4	0.233	< 0.02	0.0042	0.01	< 0.03	3.76	0.029	1.48	< 0.00005	0.33	0.147	< 0.0002	0.0003	< 0.0001	< 0.0002	< 0.0002	0.003	0.0002	0.004	< 0.002	4.16	4.22	0.06	0.7%
12-Jan-06	0.0026	9.04	0.146	< 0.02	0.0032	0.0041	< 0.03	2.35	0.016	1.34	< 0.00005	0.2	0.108	< 0.0002	0.00019	< 0.0001	< 0.0002	< 0.0002	0.0016	0.0002	0.002	< 0.002	2.66	2.74	0.08	1.5%
19-Jan-06	0.0011	4.5	0.106	< 0.02	0.002	0.0013	< 0.03	1.06	0.0093	0.74	< 0.00005	0.12	0.051	< 0.0002	0.00013	< 0.0001	< 0.0002	0.0002	0.0008	0.0003	< 0.001	< 0.002	1.50	1.39	-0.11	-3.8%
26-Jan-06																										
02-Feb-06																										
09-Feb-06																										
16-Feb-06																										

Leachate Chemistry for HC 9
Sample = A083503
DRAFT

Date Reporting Units	Cycle	Volume mL Input	Volume mL Output	pH	Cond. umhos/cm	Acidity mgCaCO3/L (pH 4.5)	Acidity mgCaCO3/L (pH 8.3)	Alkalinity mgCaCO3/L	Sulphate (mg/L)	Hardness CaCO3 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L
12-Jan-06	1	750	540	7.66	1519	#N/A	6.0	71.0	258	485	0.006	0.02	0.0013	0.128	< 0.0002	< 0.0002	0.02	0.00006	135	< 0.0002	0.0041	0.0039	0.01	< 0.0002
19-Jan-06	2	500	485	7.70	194	#N/A	2.8	42.3	57	78.4	0.057	0.014	0.0005	0.068	< 0.0002	< 0.0002	0.01	< 0.00004	24	< 0.0002	0.0004	0.0012	0.03	< 0.0002
26-Jan-06	3	500	485	7.39	111	#N/A	2.8	23.8	26															
02-Feb-06	4	500	480	7.79	266	#N/A	2.3	49.0	66															
09-Feb-06	5	500	430	7.55	151	#N/A	3.5	26.5	IP															
16-Feb-06	6	500	480	7.46	101	#N/A	3.3	26.8	IP															

Date	Li mg/L	Mg mg/L	Mn mg/L	Hg ug/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L	Major Anions	Major Cations	Diff	Diff (%)
12-Jan-06	0.016	36.1	0.563	< 0.02	0.011	0.056	< 0.03	58.2	0.026	6.22	< 0.00005	26.8	0.344	< 0.0002	0.00049	< 0.0001	0.0003	0.0003	0.0027	0.0004	0.044	< 0.002	6.80	12.36	5.57	29.1%
19-Jan-06	0.0041	4.48	0.085	< 0.02	0.0034	0.0041	< 0.03	9.09	0.0046	1.98	< 0.00005	1.98	0.107	< 0.0002	0.00012	< 0.0001	< 0.0002	0.0007	0.0012	0.0004	0.002	< 0.002	2.03	1.88	-0.15	-3.8%
26-Jan-06																										
02-Feb-06																										
09-Feb-06																										
16-Feb-06																										

Leachate Chemistry for HC 10
Sample = A083529
DRAFT

Date Reporting Units	Cycle	Volume mL Input	Volume mL Output	pH	Cond. umhos/cm	Acidity mgCaCO3/L (pH 4.5)	Acidity mgCaCO3/L (pH 8.3)	Alkalinity mgCaCO3/L	Sulphate (mg/L)	Hardness CaCO3 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L
12-Jan-06	1	750	540	7.56	2070	#N/A	6.5	52.3	1172	1180	0.005	0.013	0.0032	0.097	< 0.0002	< 0.0002	0.02	0.00015	363	< 0.0002	0.0013	0.0042	< 0.01	< 0.0002
19-Jan-06	2	500	490	7.91	481	#N/A	4.3	101.0	136	227	0.016	0.015	0.0011	0.076	< 0.0002	< 0.0002	0.02	0.00004	80.1	< 0.0002	0.0004	0.0017	< 0.01	< 0.0002
26-Jan-06	3	500	480	8.05	402	#N/A	2.3	106.5	99															
02-Feb-06	4	500	475	7.94	356	#N/A	3.3	92.3	80															
09-Feb-06	5	500	375	7.83	338	#N/A	3.3	70.8	IP															
16-Feb-06	6	500	470	7.97	307	#N/A	2.0	87.8	IP															

Date	Li mg/L	Mg mg/L	Mn mg/L	Hg ug/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L	Major Anions	Major Cations	Diff	Diff (%)
12-Jan-06	0.0041	66.6	0.468	< 0.02	0.0028	0.017	< 0.03	58.8	0.085	4.92	< 0.00005	13.2	0.7	< 0.0002	0.00052	< 0.0001	0.0005	0.0002	0.0022	< 0.0002	0.071	< 0.002	25.46	25.67	0.21	0.4%
19-Jan-06	0.0027	6.51	0.144	< 0.02	0.0019	0.0048	< 0.03	12.4	0.022	5.24	< 0.00005	1.57	0.336	< 0.0002	0.00024	< 0.0001	0.0003	0.0002	0.0007	0.0002	0.014	< 0.002	4.85	4.92	0.06	0.7%
26-Jan-06																										
02-Feb-06																										
09-Feb-06																										
16-Feb-06																										

Leachate Chemistry for HC 11
Sample = A083504
DRAFT

Date Reporting Units	Cycle	Volume mL Input	Volume mL Output	pH	Cond. umhos/cm	Acidity mgCaCO3/L (pH 4.5)	Acidity mgCaCO3/L (pH 8.3)	Alkalinity mgCaCO3/L	Sulphate (mg/L)	Hardness CaCO3 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L
12-Jan-06	1	750	545	7.54	2320	#N/A	7.3	64.8	1266	1020	0.004	0.0029	0.001	0.031	< 0.0002	< 0.0002	0.02	< 0.00004	342	< 0.0002	0.0009	0.0047	< 0.01	< 0.0002
19-Jan-06	2	500	460	7.20	326	#N/A	2.8	17.5	139	148	0.035	0.0017	< 0.0002	0.036	< 0.0002	< 0.0002	< 0.01	< 0.00004	51.3	< 0.0002	< 0.0002	0.0008	< 0.01	< 0.0002
26-Jan-06	3	500	440	7.41	771	#N/A	4.3	31.3	379															
02-Feb-06	4	500	420	7.42	274	#N/A	3.0	22.8	98															
09-Feb-06	5	500	440	7.70	407	#N/A	1.5	30.5	IP															
16-Feb-06	6	500	435	7.48	286	#N/A	2.3	26.3	IP															

Date	Li mg/L	Mg mg/L	Mn mg/L	Hg ug/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L	Major Anions	Major Cations	Diff	Diff (%)
12-Jan-06	0.0064	41	4.89	< 0.02	0.0005	0.012	< 0.03	21	0.024	3.09	< 0.00005	16.8	0.283	< 0.0002	0.00024	< 0.0001	< 0.0002	< 0.0002	0.0014	< 0.0002	0.029	< 0.002	27.67	21.71	-5.96	-12.1%
19-Jan-06	0.0008	4.71	0.405	< 0.02	< 0.0001	0.0006	< 0.03	2.3	0.0072	0.51	< 0.00005	1.14	0.07	< 0.0002	0.00005	< 0.0001	< 0.0002	< 0.0002	0.0002	< 0.0002	< 0.001	< 0.002	3.25	3.06	-0.19	-3.0%
26-Jan-06																										
02-Feb-06																										
09-Feb-06																										
16-Feb-06																										

Leachate Chemistry for HC 12
Sample = A083505
DRAFT

Date Reporting Units	Cycle	Volume mL Input	Volume mL Output	pH	Cond. umhos/cm	Acidity mgCaCO3/L (pH 4.5)	Acidity mgCaCO3/L (pH 8.3)	Alkalinity mgCaCO3/L	Sulphate (mg/L)	Hardness CaCO3 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L
12-Jan-06	1	750	580	7.28	648	#N/A	4.0	17.8	246	271	0.014	0.0025	0.0004	0.069	< 0.0002	< 0.0002	< 0.01	< 0.00004	46	< 0.0002	0.0004	0.0027	< 0.01	< 0.0002
19-Jan-06	2	500	450	7.13	612	#N/A	3.5	18.3	298	298	0.011	0.0098	0.0003	0.048	< 0.0002	< 0.0002	< 0.01	< 0.00004	45.5	< 0.0002	0.0004	0.0011	< 0.01	< 0.0002
26-Jan-06	3	500	455	7.31	447	#N/A	3.0	21.8	184															
02-Feb-06	4	500	435	7.49	346	#N/A	2.0	23.0	141															
09-Feb-06	5	500	455	7.75	279	#N/A	1.3	28.5	IP															
16-Feb-06	6	500	455	7.48	214	#N/A	2.3	29.5	IP															

Date	Li mg/L	Mg mg/L	Mn mg/L	Hg ug/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L	Major Anions	Major Cations	Diff	Diff (%)
12-Jan-06	0.0027	37.8	0.126	< 0.02	0.0002	0.0039	< 0.03	7.21	0.013	0.44	< 0.00005	2.53	0.121	< 0.0002	0.00023	< 0.0001	< 0.0002	< 0.0002	0.0001	< 0.0002	0.004	< 0.002	5.48	5.70	0.22	2.0%
19-Jan-06	0.0026	44.8	0.072	< 0.02	0.0003	0.0036	< 0.03	6.62	0.021	0.5	< 0.00005	2.99	0.126	< 0.0002	0.00019	< 0.0001	0.0003	< 0.0002	0.0003	< 0.0002	0.004	< 0.002	6.57	6.26	-0.32	-2.5%
26-Jan-06																										
02-Feb-06																										
09-Feb-06																										
16-Feb-06																										

Leachate Chemistry for HC 13
Sample = A083511
DRAFT

Date Reporting Units	Cycle	Volume mL Input	Volume mL Output	pH	Cond. umhos/cm	Acidity mgCaCO3/L (pH 4.5)	Acidity mgCaCO3/L (pH 8.3)	Alkalinity mgCaCO3/L	Sulphate (mg/L)	Hardness CaCO3 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L
12-Jan-06	1	750	540	7.74	2130	#N/A	9.0	115.8	1067	554	0.008	0.0095	0.0022	0.108	< 0.0002	< 0.0002	0.02	0.00005	150	< 0.0002	0.0022	0.0059	< 0.01	< 0.0002
19-Jan-06	2	500	400	7.79	410	#N/A	3.0	67.5	136	171	0.038	0.013	0.0023	0.099	< 0.0002	< 0.0002	0.02	< 0.00004	48.2	< 0.0002	0.0005	0.0022	< 0.01	< 0.0002
26-Jan-06	3	500	480	7.86	562	#N/A	5.5	100.8	150															
02-Feb-06	4	500	500	7.84	278	#N/A	2.5	52.3	75															
09-Feb-06	5	500	475	7.97	342	#N/A	1.5	72.0	IP															
16-Feb-06	6	500	465	7.85	352	#N/A	2.0	65.0	IP															

Date	Li mg/L	Mg mg/L	Mn mg/L	Hg ug/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L	Major Anions	Major Cations	Diff	Diff (%)
12-Jan-06	0.0046	43.3	0.597	< 0.02	0.012	0.043	< 0.03	15.1	0.044	4.96	< 0.00005	19.8	0.378	< 0.0002	0.00003	< 0.0001	< 0.0002	0.0002	0.0077	0.0002	0.03	< 0.002	24.54	12.30	-12.25	-33.2%
19-Jan-06	0.0022	12.3	0.162	< 0.02	0.0076	0.0078	< 0.03	6.44	0.027	2.87	< 0.00005	8.19	0.276	< 0.0002	< 0.00002	< 0.0001	< 0.0002	0.0003	0.0037	0.0003	0.003	< 0.002	4.18	3.94	-0.24	-3.0%
26-Jan-06																										
02-Feb-06																										
09-Feb-06																										
16-Feb-06																										

Leachate Chemistry for HC 14
Sample = Feed Ore
DRAFT

Date Reporting Units	Cycle	Volume mL Input	Volume mL Output	pH	Cond. umhos/cm	Acidity mgCaCO3/L (pH 4.5)	Acidity mgCaCO3/L (pH 8.3)	Alkalinity mgCaCO3/L	Sulphate (mg/L)	Hardness CaCO3 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L
16-Feb-06	1	750	545	7.35	796	#N/A	11.0	37.3	IP															

Date	Li mg/L	Mg mg/L	Mn mg/L	Hg ug/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L	Major Anions	Major Cations	Diff	Diff (%)
16-Feb-06																										

Leachate Chemistry for HC 15
Sample = Hump Feed Ore
DRAFT

Date Reporting Units	Cycle	Volume mL Input	Volume mL Output	pH	Cond. umhos/cm	Acidity mgCaCO3/L (pH 4.5)	Acidity mgCaCO3/L (pH 8.3)	Alkalinity mgCaCO3/L	Sulphate (mg/L)	Hardness CaCO3 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L
16-Feb-06	1	750	545	7.62	1350	#N/A	5.3	69.5	IP															

Date	Li mg/L	Mg mg/L	Mn mg/L	Hg ug/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L	Major Anions	Major Cations	Diff	Diff (%)
16-Feb-06																										

Leachate Chemistry for HC 16
Sample = Lynx Feed Ore
DRAFT

Date Reporting Units	Cycle	Volume mL Input	Volume mL Output	pH	Cond. umhos/cm	Acidity mgCaCO3/L (pH 4.5)	Acidity mgCaCO3/L (pH 8.3)	Alkalinity mgCaCO3/L	Sulphate (mg/L)	Hardness CaCO3 mg/L	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Ca mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L
16-Feb-06	1	750	590	7.13	1203	#N/A	34.0	47.0	IP															

Date	Li mg/L	Mg mg/L	Mn mg/L	Hg ug/L	Mo mg/L	Ni mg/L	P mg/L	K mg/L	Se mg/L	Si mg/L	Ag mg/L	Na mg/L	Sr mg/L	Te mg/L	Tl mg/L	Th mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L	Zr mg/L	Major Anions	Major Cations	Diff	Diff (%)
16-Feb-06																										

Appendix D
Water Quality Prediction

2005 Underground Seepage Chemistry Results

Wolverine Project - July-Nov 2005

Less than Detection Limit values set to Detection Limit

Under Ground WQ Analyses	Units	UG	UG	UG	UG	UG	UG	UG	UG	UG	UG
		Jul-7-05	July 11-05	**Aug 6-05**	Aug 11-05	Aug 17-05	Aug 27-05	Aug 29-05	Oct 27-05	Nov 11-05	Jul 29-05
											From Floor
Conventional Parameters											
pH		8.18	8.77	8.13	7.92	8.06	7.77	7.85	8.35		7.85
Conductivity	uS/cm	354		344	352	350	328	255	317		255
Total Hardness (CaCO3)	mg/L	189	190	184	200	184			182	175	180
Acidity (pH 4.5)	mgCaCO3/L										
Acidity (pH 8.3)	mgCaCO3/L										
Bromide Br	mg/L			0.05	0.05	0.05			0.05		
Thiosalts	mg/L										
Fluoride (F)	mg/L	0.202		0.168	0.183	0.181	0.180		0.222		
Dissolved Chloride (Cl)	mg/L	0.5		0.5	0.5	0.5	0.5		0.5		
Sulphate	mg/L	74.6		69.6	68.2	66.7	68.8		55.7		
Total Dissolved Solids	mg/L	237		222	231	227	256		187		
Total Suspended Solids	mg/L	**80.3**		3	12.4	7.4	**425**		**44.4**		
Turbidity	(NTU)	24.8									
Ammonia (N)	mg/L	0.059	0.039	0.032	-	0.103	0.475		0.060		**14.3**
Total Kjeldahl Nitrogen (Calc)	mg/L										
Nitrite (N)	mg/L	0.0011	0.001	0.0036	0.001	0.0066			0.0019		5.15
Nitrate (N)	mg/L	0.0072	0.005	0.005	0.005	0.0266	0.005		0.0062		24.3
Nitrate and Nitrite N	mg/L						0.0011				
Total Nitrogen (N)	mg/L										
Total Phosphate	mg/L	0.0765		0.0120	0.0165	0.0078	2.51		0.0279		
Alkalinity Total Dissolved CaCo3	mg/L	121					110		144		
Organic Parameters											
Dissolved Organic Carbon C	mg/L	0.5	-	-	0.5	0.5	-	0.81	-	-	0.5
Dissolved Metals											
Aluminum D-Al	mg/L	0.0367	0.0112	0.005	0.005	0.0579	0.2	0.2	0.0137	0.001	0.0112
Antimony D-Sb	mg/L	0.00115	0.00268	0.00059	0.0005	0.0005	0.2	0.2	0.214	0.0001	0.00268
Arsenic D-As	mg/L	0.0005	0.00115	0.0005	0.0005	0.0005	0.2	0.2	0.00146	0.0001	0.00115
Barium D-Ba	mg/L	0.025	0.02	0.02	0.021	0.032	0.048	0.028	0.023	0.0166	0.02
Beryllium D-Be	mg/L	0.001	0.001	0.001	0.001	0.001	0.005	0.005	0.001	0.0005	0.001
Bismuth D-Bi	mg/L	-	-		-	-	0.2	0.2	-	0.0005	-
Boron D-B	mg/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.01	0.1
Cadmium D-Cd	mg/L	0.00005	0.000076	0.000017	0.000017	0.000079	0.01	0.01	0.000140	0.000017	0.000076
Calcium D-Ca	mg/L	56.5	58.2	51.6	56.6	51.9	49.4	45.9	51.7	49.3	58.2
Chromium D-Cr	mg/L	0.001	0.001	0.001	0.001	0.001	0.01	0.01	0.001	0.0005	0.001
Cobalt D-Co	mg/L	0.0003	0.0003	0.0003	0.0003	0.0003	0.01	0.01	0.0003	0.0001	0.0003
Copper D-Cu	mg/L	0.001	0.001	0.001	0.001	0.0011	0.01	0.01	0.001	0.0001	0.001
Iron D-Fe	mg/L	0.03	0.032	0.433	0.03	0.937	0.142	0.076	0.03	0.03	0.032
Lead D-Pb	mg/L	0.0005	0.0005	0.0005	0.0005	0.00112	0.05	0.05	0.00071	0.00005	0.0005
Lithium D-Li	mg/L	0.005	0.005	0.005	0.005	0.005	0.01	0.01	0.005	0.005	0.005
Magnesium D-Mg	mg/L	11.6	10.9	13.5	14.3	13.2	13.4	13.9	12.7	12.5	10.9
Manganese D-Mn	mg/L	0.0736	0.0528	0.0499	0.0282	0.0642	0.0618	0.0421	0.0306	0.0401	0.0528
Mercury D-Hg	mg/L	0.00002	0.00002	0.00002	0.0001	0.0001			0.00002	0.00005	0.00002
Molybdenum D-Mo	mg/L	0.001	0.0019	0.001	0.001	0.001	0.03	0.03	0.001	0.00100	0.0019
Nickel D-Ni	mg/L	0.0017	0.0019	0.001	0.001	0.001	0.05	0.05	0.001	0.0005	0.0019
Phosphorus D-P	mg/L	-	-		-	-	0.3	0.3	-	0.3	-
Potassium D-K	mg/L	2	2	2	2	2	2	2	2	2	2
Selenium D-Se	mg/L	0.001	0.001	0.001	0.001	0.001	0.2	0.2	0.0321	0.001	0.001
Silicon D-Si	mg/L	-	-		-	-	4.55	4.91	-	5.22	-
Silver D-Ag	mg/L	0.00002	0.00002	0.00002	0.00002	0.00002	0.01	0.01	0.000028	0.00001	0.00002
Sodium D-Na	mg/L	2	4.4	2	2	2	2	2	2	2.3	4.4
Strontium D-Sr	mg/L	-	-		-	-	0.465	0.473	-	0.451	-
Thallium D-Tl	mg/L	0.0002	0.0002	0.0002	0.0002	0.0002	0.2	0.2	0.00033	0.0001	0.0002
Tin D-Sn	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.03	0.03	0.0005	0.0001	0.0005
Titanium D-Ti	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Uranium D-U	mg/L	0.00120	0.00139	0.00197	0.00124	0.00193			0.0155	0.00193	0.00139
Vanadium D-V	mg/L	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.001	0.03
Zinc D-Zn	mg/L	0.005	0.005	0.005	0.005	0.0193	0.0214	0.005	0.005	0.001	0.005

Note: <DL values set to DL

	Mean	Median
pH	8.10	8.06
Conductivity	319.38	336.00
Total Hardness (CaCO3)	185.50	184.00
Acidity (pH 4.5)		
Acidity (pH 8.3)		
Bromide Br	0.05	0.05
Thiosalts		
Fluoride (F)	0.189	0.182
Dissolved Chloride (Cl)	0.500	0.500
Sulphate	67.267	68.500
Total Dissolved Solids	226.667	229.000
Total Suspended Solids	95.417	28.400
Turbidity	24.800	24.800
Ammonia (N)	2.153	0.060
Total Kjeldahl Nitrogen (Calc)		
Nitrite (N)	0.738	0.002
Nitrate (N)	3.045	0.006
Nitrate and Nitrite N	0.001	0.001
Total Nitrogen (N)		
Total Phosphate	0.442	0.022
Alkalinity Total Dissolved	125	121
Dissolved Organic Carbon C	0.562	0.500
Aluminum	0.0542	0.0125
Antimony	0.0622	0.0019
Arsenic	0.0406	0.0008
Barium	0.0254	0.0220
Beryllium	0.0018	0.0010
Bismuth	0.1335	0.2000
Boron	0.0910	0.1000
Cadmium	0.0020	0.0001
Calcium	52.9300	51.8000
Chromium	0.0028	0.0010
Cobalt	0.0022	0.0003
Copper	0.0027	0.0010
Iron	0.1772	0.0320
Lead	0.0104	0.0005
Lithium	0.0060	0.0050
Magnesium	12.6900	12.9500
Manganese	0.0496	0.0514
Mercury	0.000044	0.000020
Molybdenum	0.0070	0.0010
Nickel	0.0110	0.0014
Phosphorus	0.3000	0.3000
Potassium	2.0000	2.0000
Selenium	0.0439	0.0010
Silicon	4.8933	4.9100
Silver	0.0020	0.0000
Sodium	2.5100	2.0000
Strontium	0.4630	0.4650
Thallium	0.0402	0.0002
Tin	0.0064	0.0005
Titanium	0.0100	0.0100
Uranium	0.0033	0.0017
Vanadium	0.0271	0.0300
Zinc	0.0077	0.0050

Groundwater Inflow Concentrations and Loads
Based on 2005 underground seepage monitoring data
Data available on worksheet "2005 UG WQ Data"

Void Space at Closure 130,000 m^3
130000000 L

	Estimated Groundwater Concentration (mg/L)	Resulting Load in Mine (mg)
Sulphate	68.5	8905000000
Alkalinity	125	16250000000
Aluminum	0.05417	7042100
Antimony	0.06222	8088600
Arsenic	0.040586	5276180
Barium	0.02536	3296800
Beryllium	0.00175	227500
Bismuth	0.1335	17355000
Boron	0.091	11830000
Cadmium	0.0020472	266136
Calcium	52.93	6880900000
Chromium	0.00275	357500
Cobalt	0.00222	288600
Copper	0.00272	353600
Iron	0.1772	23036000
Lead	0.010438	1356940
Lithium	0.006	780000
Magnesium	12.69	1649700000
Manganese	0.04961	6449300
Mercury	0.00004375	5688
Molybdenum	0.00698	907400
Nickel	0.011	1430000
Phosphorus	0.3	39000000
Potassium	2	260000000
Selenium	0.04391	5708300
Silicon	4.893	636133333.3
Silver	0.0020158	262054
Sodium	2.51	326300000
Strontium	0.463	60190000
Thallium	0.040163	5221190
Tin	0.00636	826800
Titanium	0.01	1300000
Uranium	0.00331875	431437.5
Vanadium	0.0271	3523000
Zinc	0.00767	997100

Estimated Backfill Release Rates
Based on Data from Crandon Mine (Chapman, et al. 2003)

	mole metal/mole SO4	Sulphate Release Rate	Sulphate Release Rate	Metal Release Rate				Element
		mol/m2/s	mol/kg/s	mol/kg/s	mmol/kg/wk	mg/kg/wk	mol/m2/s	g/mol
Sb	7.18E-05	8.50E-08	2.20E-08	1.58E-12	0.0010	0.000116	6.10E-12	121.75
As	1.59E-02	8.50E-08	2.20E-08	3.50E-10	0.212	0.01585	1.35E-09	74.92
Cd	2.19E-04	8.50E-08	2.20E-08	4.82E-12	0.003	0.000328	1.86E-11	112.41
Cu	4.09E-03	8.50E-08	2.20E-08	9.00E-11	0.054	0.003458	3.48E-10	63.55
Fe	2.55E-01	8.50E-08	2.20E-08	5.61E-09	3.393	0.189495	2.17E-08	55.85
Pb	8.62E-04	8.50E-08	2.20E-08	1.90E-11	0.011	0.002376	7.33E-11	207.2
Mn	2.82E-03	8.50E-08	2.20E-08	6.20E-11	0.038	0.002061	2.40E-10	54.93
Se	5.96E-04	8.50E-08	2.20E-08	1.31E-11	0.0079	0.000626	5.07E-11	78.96
Zn	1.29E-01	8.50E-08	2.20E-08	2.84E-09	1.716	0.11222	1.10E-08	65.38

Oxidation Rate

1.70E-07 moles O2 /m2/s
4.40E-08 moles O2/kg/s

Equivalent Sulphate Release Rate

8.50E-08 moles SO4/m2/s
2.20E-08 moles SO4/kg/s
13.3056 mmol/kg/wk

Wolverine Project - 1997 Humidity Cells

Summary of Metal Release Rates

Element	Unit	Average	Min	Max	Median
Al	mg/kg	0.058	0.042	0.098	0.046
Sb	mg/kg	0.024	0.023	0.028	0.024
As	mg/kg	0.014	0.014	0.014	0.014
Ba	mg/kg	0.009	0.007	0.010	0.009
Be	mg/kg	0.0005	0.0005	0.0005	0.0005
Bi	mg/kg	0.047	0.046	0.047	0.047
B	mg/kg	0.146	0.140	0.151	0.147
Cd	mg/kg	0.0036	0.0023	0.0054	0.0034
Ca	mg/kg	8.086	7.353	9.276	7.857
Cr	mg/kg	0.005	0.005	0.005	0.005
Co	mg/kg	0.005	0.005	0.007	0.005
Cu	mg/kg	0.018	0.009	0.040	0.012
Fe	mg/kg	0.213	0.006	0.822	0.012
Pb	mg/kg	0.024	0.023	0.024	0.024
Li	mg/kg	0.009	0.009	0.009	0.009
Mg	mg/kg	1.218	0.643	1.869	1.181
Mn	mg/kg	0.178	0.038	0.271	0.201
Hg	mg/kg	0.009	0.009	0.009	0.009
Mo	mg/kg	0.005	0.005	0.005	0.005
Ni	mg/kg	0.031	0.009	0.078	0.019
P	mg/kg	0.047	0.046	0.047	0.047
K	mg/kg	1.144	0.954	1.623	0.999
Se	mg/kg	0.025	0.023	0.026	0.025
Si	mg/kg	0.110	0.092	0.140	0.103
Ag	mg/kg	0.009	0.009	0.009	0.009
Na	mg/kg	0.900	0.577	1.551	0.735
Sr	mg/kg	0.043	0.021	0.072	0.040
Tl	mg/kg	0.094	0.092	0.095	0.094
Sn	mg/kg	0.047	0.046	0.047	0.047
Ti	mg/kg	0.005	0.005	0.005	0.005
W	mg/kg	0.047	0.046	0.047	0.047
V	mg/kg	0.005	0.005	0.005	0.005
Zn	mg/kg	0.1929	0.0355	0.3296	0.2032
Acidity	mg/kg	3.238	1.652	7.559	1.871
Alkalinity	mg/kg	3.215	2.715	3.953	2.978
Sulphate	mg/kg	27.212	19.583	35.410	26.927

Data from four cells operated in 1997 by Process Research Associates, Ltd.
Based on results of four cells operated for 26 weeks

2005-06 Tailings Release Rates

Parameter	Atomic wt. %	Min	Median	Max	Average	Average	Min Average	Median Average	Max Average	Average' Average	Average
		mg/kg/wk	mg/kg/wk	mg/kg/wk	mg/kg/wk	mol/kg/wk	$mg/m^2/wk$	$mg/m^2/wk$	$mg/m^2/wk$	$mg/m^2/wk$	$mol/m^2/wk$
Alkalinity		2.23	4.22	5.51	4.05		0.009224	0.017444	0.022779	0.016723	
SO_4	96	101	215	286	204	3.52E-09	0.416980	0.888909	1.180793	0.843898	1.45E-11
Cl	35.45	0.06	0.18	1.33	0.33	1.52E-11	0.000259	0.000728	0.005488	0.001348	6.29E-14
F	19.00	0.01	0.05	0.34	0.05	4.32E-12	0.000058	0.000189	0.001405	0.000205	1.79E-14
NO_3	62.01	0.01	0.02	0.29	0.04	1.04E-12	0.000048	0.000092	0.001218	0.000161	4.29E-15
$NH_3 + NH_4$	35.076	0.028	0.109	0.332	0.108	5.10E-12	0.000116	0.000449	0.001372	0.000447	2.11E-14
Thiosalts	112.1	2.8	120.8	561.6	147.3	2.17E-09	0.011364	0.499289	2.320661	0.608843	8.98E-12
CN(T)	26.020	0.0005	0.004	0.012	0.003	2.17E-13	0.000002	0.000017	0.000051	0.000014	8.99E-16
CNO	42.0	0.0	0.0	0.6	0.2	6.67E-12	0.000114	0.000194	0.002285	0.000701	2.76E-14
CNS	58.1	0.1	1.6	15.1	3.5	9.86E-11	0.000227	0.006510	0.062331	0.014305	4.07E-13
Hg	200.6	0.023	0.044	0.060	0.044	3.62E-13	0.000097	0.000182	0.000247	0.000182	1.50E-15
Ag	107.8700	0.000	0.002	0.010	0.003	4.27E-14	0.000000	0.000009	0.000043	0.000012	1.76E-16
Al	26.980	0.002	0.004	0.033	0.005	3.21E-13	0.000010	0.000018	0.000135	0.000022	1.33E-15
As	74.920	0.001	0.004	0.011	0.004	9.41E-14	0.000005	0.000015	0.000045	0.000018	3.89E-16
Ba	137.330	0.002	0.014	0.054	0.015	1.81E-13	0.000009	0.000057	0.000222	0.000062	7.47E-16
Be	9.010	0.001	0.002	0.003	0.002	4.04E-13	0.000005	0.000009	0.000012	0.000009	1.67E-15
Bi	208.9800	0.0001	0.0001	0.0002	0.0001	1.04E-15	0.000000	0.000001	0.000001	0.000001	4.31E-18
B	10.81	0.00	0.00	0.01	0.00	7.30E-13	0.000010	0.000018	0.000056	0.000020	3.02E-15
Ca	40.1	11.8	88.2	223.6	86.3	3.56E-09	0.048927	0.364272	0.923901	0.356503	1.47E-11
Cd	112.410	0.00004	0.034	0.092	0.032	4.76E-13	0.000000	0.000141	0.000381	0.000134	1.97E-15
Co	58.9300	0.0001	0.004	0.018	0.006	1.58E-13	0.000000	0.000017	0.000073	0.000023	6.53E-16
Cr	51.996	0.0003	0.0004	0.019	0.001	2.41E-14	0.000001	0.000002	0.000080	0.000003	9.98E-17
Cu	63.5500	0.0003	0.001	0.013	0.001	3.73E-14	0.000001	0.000004	0.000052	0.000006	1.54E-16
Fe	55.85	0.005	0.01	0.08	0.01	2.86E-13	0.000019	0.000037	0.000343	0.000040	1.18E-15
Li	6.941	0.001	0.002	0.003	0.002	5.24E-13	0.000005	0.000009	0.000012	0.000009	2.16E-15
K	39.10	0.09	0.57	2.54	0.83	3.50E-11	0.000375	0.002347	0.010478	0.003425	1.45E-13
Mg	24.31	1.00	10.12	24.37	10.30	7.01E-10	0.004129	0.041826	0.100707	0.042558	2.90E-12
Mn	54.94	0.03	0.72	4.04	0.89	2.68E-11	0.000142	0.002970	0.016684	0.003685	1.11E-13
Mo	95.9400	0.0001	0.0001	0.0018	0.0002	3.36E-15	0.000000	0.000001	0.000007	0.000001	1.39E-17
Na	22.99	0.05	1.15	12.28	2.29	1.65E-10	0.000224	0.004765	0.050760	0.009469	6.81E-13
Ni	58.700	0.0005	0.011	0.054	0.014	3.86E-13	0.000002	0.000047	0.000225	0.000057	1.60E-15
P	31.0	0.0	0.0	0.1	0.0	2.35E-12	0.000097	0.000182	0.000247	0.000182	9.70E-15
Pb	207.2000	0.0001	0.008	0.130	0.013	1.06E-13	0.000000	0.000032	0.000538	0.000055	4.37E-16
Sb	121.7500	0.012	0.022	0.043	0.023	3.10E-13	0.000048	0.000091	0.000179	0.000094	1.28E-15
Se	78.96	0.002	0.27	0.95	0.26	5.37E-12	0.000009	0.001108	0.003936	0.001060	2.22E-14
Si	28.09	0.03	0.10	0.29	0.10	6.17E-12	0.000116	0.000422	0.001205	0.000433	2.55E-14
Sn	118.710	0.0003	0.002	0.053	0.004	5.66E-14	0.000001	0.000007	0.000220	0.000017	2.34E-16
Sr	87.620	0.014	0.257	0.598	0.275	5.19E-12	0.000058	0.001063	0.002473	0.001136	2.14E-14
Ti	47.870	0.001	0.002	0.010	0.002	8.63E-14	0.000005	0.000009	0.000040	0.000010	3.57E-16
Tl	204.3800	0.0001	0.004	0.012	0.005	3.80E-14	0.000000	0.000018	0.000048	0.000019	1.57E-16
U	238.0300	0.00005	0.00009	0.00021	0.00009	6.43E-16	0.000000	0.000000	0.000001	0.000000	2.66E-18
V	50.940	0.0005	0.001	0.003	0.001	3.94E-14	0.000002	0.000005	0.000013	0.000005	1.63E-16
Zn	65.4	0.01	1.9	8.9	2.0	5.03E-11	0.000058	0.007996	0.036688	0.008218	2.08E-13

Mine Volumes and Areas
From Yukon Zinc Mine Model, January 2006

Rock Type	Total Tonnes	Volumes(m3)	Mined Tonnes 2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Non-Carbonaceous Argillite	28,873	10,312	2,887	2,887	2,887	2,887	2,887	2,887	2,887	2,887	2,887	1,444	1,444	
Argillite	115,493	41,247	11,549	11,549	11,549	11,549	11,549	11,549	11,549	11,549	11,549	5,775	5,775	
Calcite-Pyrite Exhalite	21,000	7,500	7,000	3,500	3,500	3,500	3,500							
Iron Formation	20,000	7,143	20,000			6,667			6,667					
Interbedded Rhyolite/Argillite	10,000	3,571	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	500	500	
Rhyolite and Rhyolite Fragments	10,000	3,571	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	500	500	
Ore	5,000,000	1,190,476	100,000	456,250	456,250	456,250	456,250	456,250	456,250	456,250	456,250	456,250	456,250	337,500
Total	5,205,366	1,263,821												

				Exposed Surfaces By Year 2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Footwall	m2			2,976	13,579	13,579	13,579	13,579	13,579	13,579	13,579	13,579	13,579	13,579	10,045
covered with paste		95%		2,827	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	9,542
open to air		5%		149	679	679	679	679	679	679	679	679	679	679	502
Hangingwall	m2			2,976	13,579	13,579	13,579	13,579	13,579	13,579	13,579	13,579	13,579	13,579	10,045
covered with paste		95%		2,827	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	12,900	9,542
open to air		10%		298	1,358	1,358	1,358	1,358	1,358	1,358	1,358	1,358	1,358	1,358	1,004
Stopes															
Rhyolite	m2			37	170	170	170	170	170	170	170	170	170	170	126
Argillite	m2			74	339	339	339	339	339	339	339	339	339	339	251
Massive Sulphides	m2			112	509	509	509	509	509	509	509	509	509	509	377
Development			fill %												
Non-Carbonaceous Argillite	m2		40%	490	490	490	490	490	490	490	490	490	245	245	-
Argillite	m2		40%	2,177	2,177	2,177	2,177	2,177	2,177	2,177	2,177	2,177	1,088	1,088	-
Calcite-Pyrite Exhalite	m2		5%	2,089	1,044	1,044	1,044	1,044	-	-	-	-	-	-	-
Iron Formation	m2		0%	8,077	-	-	2,692	-	-	2,692	-	-	-	-	-
Interbedded Rhyolite/Argillite	m2		40%	188	188	188	188	188	188	188	188	188	94	94	-
Rhyolite and Rhyolite Fragments	m2		40%	188	188	188	188	188	188	188	188	188	94	94	-

Mine Volumes and Areas
From Yukon Zinc Mine Model, January 2006

Mined Volumes												Filled Volumes							
2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2007	2008	2009	2010	2011	2012	2013	2014
1,031	1,031	1,031	1,031	1,031	1,031	1,031	1,031	1,031	516	516	-	1,372	1,372	1,372	1,372	1,372	1,372	1,372	1,372
4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125	4,125	2,062	2,062	-	5,488	5,488	5,488	5,488	5,488	5,488	5,488	5,488
2,500	1,250	1,250	1,250	1,250	-	-	-	-	-	-	-								
7,143	-	-	2,381	-	-	2,381	-	-	-	-	-								
357	357	357	357	357	357	357	357	357	179	179	-	475	475	475	475	475	475	475	475
357	357	357	357	357	357	357	357	357	179	179	-	475	475	475	475	475	475	475	475
23,810	108,631	108,631	108,631	108,631	108,631	108,631	108,631	108,631	108,631	108,631	80,357								

78,107
0.00
78106.800 1

4,898
21,766
6,266
13,461
1,885
1,885
50,161

				Open Volumes												
2015	2016	2017	2018	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
1,372	686	686	-	- 341	- 341	- 341	- 341	- 341	- 341	- 341	- 341	- 341	- 170	- 170	-	- 3,409
5,488	2,744	2,744	-	- 1,363	- 1,363	- 1,363	- 1,363	- 1,363	- 1,363	- 1,363	- 1,363	- 1,363	- 682	- 682	-	- 13,635
				2,500	1,250	1,250	1,250	1,250	-	-	-	-	-	-	-	7,500
				7,143	-	-	2,381	-	-	2,381	-	-	-	-	-	11,905
475	238	238	-	- 118	- 118	- 118	- 118	- 118	- 118	- 118	- 118	- 118	- 59	- 59	-	- 1,181
475	238	238	-	- 118	- 118	- 118	- 118	- 118	- 118	- 118	- 118	- 118	- 59	- 59	-	- 1,181
				-	-	-	-	-	-	-	-	-	-	-	-	
																- 0

		78,107	total	
		19,405	total EXCP and EXMT	
		-	left open total	
100%	58,702	58,702	filled	58702.04
	-	19,405	left open other	
		78,107	filled other	
		133%		
100%	1	1	filled	1268583
		#REF!		
		#DIV/0!		

Mine Rock Release Rates

Release Rates (mmoles/m2/s)		Release Rates (mg/m2/s)																																		
Lithology	Rock Type	Sulphate	Alkalinity	Al	Sb	As	Ba	Be	Bi	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	Tl	W	V	Zn
Non-Carbonaceous Argillites	1	6.09E-10		6.01E-12	3.80E-13	3.09E-13	1.08E-13	9.18E-14	3.72E-13	2.25E-11	7.94E-14	3.83E-10	1.59E-13	1.96E-13	1.04E-12	2.43E-11	1.92E-13	2.14E-12	1.27E-10	8.16E-12	7.42E-14	8.62E-14	2.20E-12	2.51E-12	6.86E-11	5.44E-13	8.24E-12	1.38E-13	1.12E-10	1.36E-12	7.69E-13	6.55E-13	4.05E-14	4.23E-13	1.62E-13	8.33E-12
Argillites	2	6.09E-10		3.55E-12	3.40E-13	3.31E-13	1.08E-13	9.18E-14	3.72E-13	2.23E-11	3.68E-14	3.34E-10	1.59E-13	1.40E-13	4.68E-13	6.31E-12	1.99E-13	2.14E-12	8.29E-11	5.36E-12	7.42E-14	8.62E-14	8.73E-13	2.51E-12	4.82E-11	5.24E-13	6.47E-12	1.38E-13	6.47E-11	8.11E-13	7.60E-13	6.55E-13	4.05E-14	4.23E-13	1.62E-13	8.33E-12
Calcite-Pyrite Exhalite	3	6.09E-10		3.55E-12	3.40E-13	3.31E-13	1.08E-13	9.18E-14	3.72E-13	2.23E-11	3.68E-14	3.34E-10	1.59E-13	1.40E-13	4.68E-13	6.31E-12	1.99E-13	2.14E-12	8.29E-11	5.36E-12	7.42E-14	8.62E-14	8.73E-13	2.51E-12	4.82E-11	5.24E-13	6.47E-12	1.38E-13	6.47E-11	8.11E-13	7.60E-13	6.55E-13	4.05E-14	4.23E-13	1.62E-13	8.33E-12
Iron Formation	4	6.09E-10		3.55E-12	3.40E-13	3.31E-13	1.08E-13	9.18E-14	3.72E-13	2.23E-11	3.68E-14	3.34E-10	1.59E-13	1.40E-13	4.68E-13	6.31E-12	1.99E-13	2.14E-12	8.29E-11	5.36E-12	7.42E-14	8.62E-14	8.73E-13	2.51E-12	4.82E-11	5.24E-13	6.47E-12	1.38E-13	6.47E-11	8.11E-13	7.60E-13	6.55E-13	4.05E-14	4.23E-13	1.62E-13	8.33E-12
Rhyolite/Argillite	5	6.09E-10		3.55E-12	3.40E-13	3.31E-13	1.08E-13	9.18E-14	3.72E-13	2.23E-11	3.68E-14	3.34E-10	1.59E-13	1.40E-13	4.68E-13	6.31E-12	1.99E-13	2.14E-12	8.29E-11	5.36E-12	7.42E-14	8.62E-14	8.73E-13	2.51E-12	4.82E-11	5.24E-13	6.47E-12	1.38E-13	6.47E-11	8.11E-13	7.60E-13	6.55E-13	4.05E-14	4.23E-13	1.62E-13	8.33E-12
Rhyolite/Rhyolite Fragmental	6	6.09E-10		3.55E-12	3.40E-13	3.31E-13	1.08E-13	9.18E-14	3.72E-13	2.23E-11	3.68E-14	3.34E-10	1.59E-13	1.40E-13	4.68E-13	6.31E-12	1.99E-13	2.14E-12	8.29E-11	5.36E-12	7.42E-14	8.62E-14	8.73E-13	2.51E-12	4.82E-11	5.24E-13	6.47E-12	1.38E-13	6.47E-11	8.11E-13	7.60E-13	6.55E-13	4.05E-14	4.23E-13	1.62E-13	8.33E-12
Massive Sulphide																																				
Backfill*		0.000000085			6.1E-12	1.35E-09					1.86E-11				3.48E-10	2.17E-08	7.33E-11			2.4E-10						5.07E-11										1.1E-08

Release Rates (mg/m2/s)		Release Rates (mg/m2/s)																																		
Lithology	Rock Type	Sulphate	Alkalinity	Al	Sb	As	Ba	Be	Bi	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	Tl	W	V	Zn
g/mole		**96.06**		**26.98**	**121.75**	**74.92**	**137.33**	**9.01**	**208.98**	**10.81**	**112.41**	**40.08**	**51.996**	**58.93**	**63.55**	**55.85**	**207.2**	**6.941**	**24.305**	**54.94**	**200.59**	**95.94**	**58.7**	**30.97**	**39.1**	**78.96**	**28.09**	**107.87**	**22.99**	**87.62**	**204.38**	**118.71**	**204.38**	**183.5**	**50.94**	**65.38**
Non-Carbonaceous Argillites	1	5.85E-05	4.49E-06	1.62E-07	4.63E-08	2.31E-08	1.49E-08	8.27E-10	7.77E-08	2.43E-07	8.93E-09	1.53E-05	8.27E-09	1.16E-08	6.61E-08	1.36E-06	3.97E-08	1.49E-08	3.09E-06	4.48E-07	1.49E-08	8.27E-09	1.29E-07	7.77E-08	2.68E-06	4.30E-08	2.31E-07	1.49E-08	2.56E-06	1.19E-07	1.57E-07	7.77E-08	8.27E-09	7.77E-08	8.27E-09	5.45E-07
Argillites	2	5.85E-05	4.49E-06	9.59E-08	4.13E-08	2.48E-08	1.49E-08	8.27E-10	7.77E-08	2.41E-07	4.13E-09	1.34E-05	8.27E-09	8.27E-09	2.98E-08	3.52E-07	4.13E-08	1.49E-08	2.01E-06	2.94E-07	1.49E-08	8.27E-09	5.13E-08	7.77E-08	1.88E-06	4.13E-08	1.82E-07	1.49E-08	1.49E-06	7.11E-08	1.55E-07	7.77E-08	8.27E-09	7.77E-08	8.27E-09	5.45E-07
Calcite-Pyrite Exhalite	3	5.85E-05	4.49E-06	9.59E-08	4.13E-08	2.48E-08	1.49E-08	8.27E-10	7.77E-08	2.41E-07	4.13E-09	1.34E-05	8.27E-09	8.27E-09	2.98E-08	3.52E-07	4.13E-08	1.49E-08	2.01E-06	2.94E-07	1.49E-08	8.27E-09	5.13E-08	7.77E-08	1.88E-06	4.13E-08	1.82E-07	1.49E-08	1.49E-06	7.11E-08	1.55E-07	7.77E-08	8.27E-09	7.77E-08	8.27E-09	5.45E-07
Iron Formation	4	5.85E-05	4.49E-06	9.59E-08	4.13E-08	2.48E-08	1.49E-08	8.27E-10	7.77E-08	2.41E-07	4.13E-09	1.34E-05	8.27E-09	8.27E-09	2.98E-08	3.52E-07	4.13E-08	1.49E-08	2.01E-06	2.94E-07	1.49E-08	8.27E-09	5.13E-08	7.77E-08	1.88E-06	4.13E-08	1.82E-07	1.49E-08	1.49E-06	7.11E-08	1.55E-07	7.77E-08	8.27E-09	7.77E-08	8.27E-09	5.45E-07
Rhyolite/Argillite	5	5.85E-05	4.49E-06	9.59E-08	4.13E-08	2.48E-08	1.49E-08	8.27E-10	7.77E-08	2.41E-07	4.13E-09	1.34E-05	8.27E-09	8.27E-09	2.98E-08	3.52E-07	4.13E-08	1.49E-08	2.01E-06	2.94E-07	1.49E-08	8.27E-09	5.13E-08	7.77E-08	1.88E-06	4.13E-08	1.82E-07	1.49E-08	1.49E-06	7.11E-08	1.55E-07	7.77E-08	8.27E-09	7.77E-08	8.27E-09	5.45E-07
Rhyolite/Rhyolite Fragmental	6	5.85E-05	4.49E-06	9.59E-08	4.13E-08	2.48E-08	1.49E-08	8.27E-10	7.77E-08	2.41E-07	4.13E-09	1.34E-05	8.27E-09	8.27E-09	2.98E-08	3.52E-07	4.13E-08	1.49E-08	2.01E-06	2.94E-07	1.49E-08	8.27E-09	5.13E-08	7.77E-08	1.88E-06	4.13E-08	1.82E-07	1.49E-08	1.49E-06	7.11E-08	1.55E-07	7.77E-08	8.27E-09	7.77E-08	8.27E-09	5.45E-07
Massive Sulphide																																				
Backfill **(Crandon Data)**		8.1651E-06			7.43E-10	1.01E-07					2.09E-09				2.21E-08	1.21E-06	1.52E-08			1.32E-08						4E-09										7.17E-07

Release Rates (mg/m2/wk)		Release Rates (mg/m2/wk)																																		
Lithology	Rock Type	Sulphate	Alkalinity	Al	Sb	As	Ba	Be	Bi	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	Tl	W	V	Zn
Non-Carbonaceous Argillites	1	35.4	2.715	0.098	0.028	0.014	0.009	0.0005	0.047	0.147	0.0054	9.276	0.005	0.007	0.04	0.822	0.024	0.009	1.869	0.271	0.009	0.005	0.078	0.047	1.623	0.026	0.14	0.009	1.551	0.072	0.095	0.047	0.005	0.047	0.005	0.329553
Argillites	2	35.4	2.715	0.058	0.025	0.015	0.009	0.0005	0.047	0.146	0.0025	8.086	0.005	0.005	0.018	0.213	0.025	0.009	1.218	0.178	0.009	0.005	0.031	0.047	1.14	0.025	0.11	0.009	0.9	0.043	0.094	0.047	0.005	0.047	0.005	0.329553
Calcite-Pyrite Exhalite	3	35.4	2.715	0.058	0.025	0.015	0.009	0.0005	0.047	0.146	0.0025	8.086	0.005	0.005	0.018	0.213	0.025	0.009	1.218	0.178	0.009	0.005	0.031	0.047	1.14	0.025	0.11	0.009	0.9	0.043	0.094	0.047	0.005	0.047	0.005	0.329553
Iron Formation	4	35.4	2.715	0.058	0.025	0.015	0.009	0.0005	0.047	0.146	0.0025	8.086	0.005	0.005	0.018	0.213	0.025	0.009	1.218	0.178	0.009	0.005	0.031	0.047	1.14	0.025	0.11	0.009	0.9	0.043	0.094	0.047	0.005	0.047	0.005	0.329553
Rhyolite/Argillite	5	35.4	2.715	0.058	0.025	0.015	0.009	0.0005	0.047	0.146	0.0025	8.086	0.005	0.005	0.018	0.213	0.025	0.009	1.218	0.178	0.009	0.005	0.031	0.047	1.14	0.025	0.11	0.009	0.9	0.043	0.094	0.047	0.005	0.047	0.005	0.329553
Rhyolite/Rhyolite Fragmental	6	35.4	2.715	0.058	0.025	0.015	0.009	0.0005	0.047	0.146	0.0025	8.086	0.005	0.005	0.018	0.213	0.025	0.009	1.218	0.178	0.009	0.005	0.031	0.047	1.14	0.025	0.11	0.009	0.9	0.043	0.094	0.047	0.005	0.047	0.005	0.329553
Massive Sulphide **(2005 Tailings Data)**		1.18	0.022779	0.000135	0.000179	0.000045	0.000222	0.000012	0.000001	0.000056	0.000381	0.923901	0.00008	0.000073	0.000052	0.000343	0.000538	0.000012	0.100707	0.016684	0.000247	0.000007	0.000225	0.000247	0.010478	0.003936	0.001205	0.000043	0.05076	0.002473	0.000048	0.00022	0.00004		0.000013	0.036688
Backfill **(Crandon Data)**		4.938	0.022779	0.000135	0.00045	0.061					0.001	0.923901			0.013	0.732	0.009			0.008						0.002										0.434

Release Rates (mg/m2/yr)		Release Rates (mg/m2/yr)																																		
Lithology	Rock Type	Sulphate	Alkalinity	Al	Sb	As	Ba	Be	Bi	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	Tl	W	V	Zn
Non-Carbonaceous Argillites	1	1840.8	141.18	5.096	1.456	0.728	0.468	0.026	2.444	7.644	0.2808	482.352	0.26	0.364	2.08	42.744	1.248	0.468	97.188	14.092	0.468	0.26	4.056	2.444	84.396	1.352	7.28	0.468	80.652	3.744	4.94	2.444	0.26	2.444	0.26	17.13676
Argillites	2	1840.8	141.18	3.016	1.3	0.78	0.468	0.026	2.444	7.592	0.13	420.472	0.26	0.26	0.936	11.076	1.3	0.468	63.336	9.256	0.468	0.26	1.612	2.444	59.28	1.3	5.72	0.468	46.8	2.236	4.888	2.444	0.26	2.444	0.26	17.13676
Calcite-Pyrite Exhalite	3	1840.8	141.18	3.016	1.3	0.78	0.468	0.026	2.444	7.592	0.13	420.472	0.26	0.26	0.936	11.076	1.3	0.468	63.336	9.256	0.468	0.26	1.612	2.444	59.28	1.3	5.72	0.468	46.8	2.236	4.888	2.444	0.26	2.444	0.26	17.13676
Iron Formation	4	1840.8	141.18	3.016	1.3	0.78	0.468	0.026	2.444	7.592	0.13	420.472	0.26	0.26	0.936	11.076	1.3	0.468	63.336	9.256	0.468	0.26	1.612	2.444	59.28	1.3	5.72	0.468	46.8	2.236	4.888	2.444	0.26	2.444	0.26	17.13676
Rhyolite/Argillite	5	1840.8	141.18	3.016	1.3	0.78	0.468	0.026	2.444	7.592	0.13	420.472	0.26	0.26	0.936	11.076	1.3	0.468	63.336	9.256	0.468	0.26	1.612	2.444	59.28	1.3	5.72	0.468	46.8	2.236	4.888	2.444	0.26	2.444	0.26	17.13676
Rhyolite/Rhyolite Fragmental	6	1840.8	141.18	3.016	1.3	0.78	0.468	0.026	2.444	7.592	0.13	420.472	0.26	0.26	0.936	11.076	1.3	0.468	63.336	9.256	0.468	0.26	1.612	2.444	59.28	1.3	5.72	0.468	46.8	2.236	4.888	2.444	0.26	2.444	0.26	17.13676
Massive Sulphide		61.36	1.184508	0.00702	0.009308	0.00234	0.011544	0.000624	0.000052	0.002912	0.019812	48.04285	0.00416	0.003796	0.002704	0.017836	0.027976	0.000624	5.236764	0.867568	0.012844	0.000364	0.0117	0.012844	0.544856	0.204672	0.06266	0.002236	2.63952	0.128596	0.002496	0.01144	0.00208		0.000676	1.907776
Backfill		257.495	1.184508	0.00702	0.023	3.193					0.066	48.04285			0.697	38.176	0.479			0.415						0.126										22.608

* Backfill release rates calculation from 'Backfill Release Rates' worksheet.

Mine Surface Areas

Lithology	Rock Type		Exposed Surface Area (m2)											
			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Non-Carbonaceous Argillites	1		490	490	490	490	490	490	490	490	490	245	245	0
Argillites	2		2325	2855	2855	2855	2855	2855	2855	2855	2855	1767	1767	502
Calcite-Pyrite Exhalite	3		2089	1044	1044	1044	1044	0	0	0	0	0	0	0
Iron Formation	4		8077	0	0	2692	0	0	2692	0	0	0	0	0
Interbedded Rhyolite/Argillite	5		188	188	188	188	188	188	188	188	188	94	94	0
Rhyolite/Rhyolite Fragmental	6		337	867	867	867	867	867	867	867	867	773	773	502
Massive Sulphide			298	1358	1358	1358	1358	1358	1358	1358	1358	1358	1358	1004
Backfill			1190	5432	5432	5432	5432	5432	5432	5432	5432	5432	5432	4018

Lithology	Rock Type	Fracture Factor	Exposed Surface Area with Estimated Fracture Area (m2)											
			2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Non-Carbonaceous Argillites	1	50	24486	24486	24486	24486	24486	24486	24486	24486	24486	12243	12243	0
Argillites	2	50	116267	142774	142774	142774	142774	142774	142774	142774	142774	88361	88361	25112
Calcite-Pyrite Exhalite	3	30	62662	31331	31331	31331	31331	0	0	0	0	0	0	0
Iron Formation	4	30	242302	0	0	80767	0	0	80767	0	0	0	0	0
Interbedded Rhyolite/Argillite	5	30	5654	5654	5654	5654	5654	5654	5654	5654	5654	2827	2827	0
Rhyolite/Rhyolite Fragmental	6	30	10118	26022	26022	26022	26022	26022	26022	26022	26022	23195	23195	15067
Massive Sulphide		50	14881	67894	67894	67894	67894	67894	67894	67894	67894	67894	67894	50223
Backfill		1	1190	5432	5432	5432	5432	5432	5432	5432	5432	5432	5432	4018

ESTIMATE OF AVAILABLE SOLUBLE PRODUCTS AT CLOSURE

Years Exposed before Closure			12	11	10	9	8	7	6	5	4	3	2	1
Years to Flood			13	12	11	10	9	8	7	6	5	4	3	2
Total Years Exposed to Oxidation			25	23	21	19	17	15	13	11	9	7	5	3
Leaching Factor*	1		1	1	1	1	1	1	1	1	1	1	1	1
Years of Soluble Products Available			25	23	21	19	17	15	13	11	9	7	5	3

* Proportion of accumulated leachable weathering product available on mine surfaces at Closure. A value <1 assumes some leaching of soluble products from walls during mine operation

DATA FROM 'REVISED MINE VOLUMES AND AREAS' SHEET

Stopes:			Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rhyolite Surfaces	m2			2976	13579	13579	13579	13579	13579	13579	13579	13579	13579	13579	10045
covered with paste**		0.8		2827	12900	12900	12900	12900	12900	12900	12900	12900	12900	12900	9542
open to air***		0.2		595	2716	2716	2716	2716	2716	2716	2716	2716	2716	2716	2009
Argillite Surfaces	m2			2976	13579	13579	13579	13579	13579	13579	13579	13579	13579	13579	10045
covered with paste**		0.8		2827	12900	12900	12900	12900	12900	12900	12900	12900	12900	12900	9542
open to air***		0.2		595	2716	2716	2716	2716	2716	2716	2716	2716	2716	2716	2009
Stope Surface Areas															
Rhyolite	m2			149	679	679	679	679	679	679	679	679	679	679	502
Argillite	m2			149	679	679	679	679	679	679	679	679	679	679	502
Massive Sulphides	m2			298	1,358	1,358	1,358	1,358	1,358	1,358	1,358	1,358	1,358	1,358	1,004
Development Surface Areas															
Non-Carbonaceous Argillite				490	490	490	490	490	490	490	490	490	245	245	0
Argillite				2177	2177	2177	2177	2177	2177	2177	2177	2177	1088	1088	0
Calcite-Pyrite Exhalite				2089	1044	1044	1044	1044	0	0	0	0	0	0	0
Iron Formation				8077	0	0	2692	0	0	2692	0	0	0	0	0
Interbedded Rhyolite/Argillite				188	188	188	188	188	188	188	188	188	94	94	0
Rhyolite and Rhyolite Fragments				188	188	188	188	188	188	188	188	188	94	94	0

** Assumed that this proportion of backfill and stope mine rock is covered and not available for oxidation and leaching.

*** Assumed that this proportion of backfill and stope mine rock is exposed and available for ongoing oxidation and leaching

WASTE ROCK SUMP LOADS

Estimated from measured flows and concentrations in the Wolverine Waste Rock Sump

As of the end of Oct 2006:

26850 tonnes waste rock
4180 tonnes ore

31030 tonnes total

220 m3 Sump Volume
(no loss from sump, except minor discharges)

220000 L

	Sump Water Quality (Oct 26, 2006)	Set <DL to DL	Load in Sump	Load per tonne of Rock	Assume Load accumulated in 1 month*	Convert to units for WQ Prediction
	mg/L	mg/L	Total Load (mg)	mg/tonne	**mg/t/yr**	mg/kg/yr
Sulphate	557	557	122540000	3949.08153	47388.97841	47.388978
Alkalinity	84.7	84.7	18634000	600.51563	7206.18756	7.2061876
Aluminum	<0.20	0.2	44000	1.4179826	17.01579117	0.0170158
Antimony	<0.20	0.2	44000	1.4179826	17.01579117	0.0170158
Arsenic	0.00094	0.00094	206.8	0.00666452	0.079974218	7.997E-05
Barium	0.173	0.17	37400	1.20528521	14.46342249	0.0144634
Beryllium	<0.0050	0.005	1100	0.03544956	0.425394779	0.0004254
Bismuth	<0.20	0.2	44000	1.4179826	17.01579117	0.0170158
Boron	0.18	0.18	39600	1.27618434	15.31421205	0.0153142
Cadmium	<0.010	0.01	2200	0.07089913	0.850789558	0.0008508
Calcium	278	278	61160000	1970.99581	23651.94973	23.65195
Chromium	<0.010	0.01	2200	0.07089913	0.850789558	0.0008508
Cobalt	<0.010	0.01	2200	0.07089913	0.850789558	0.0008508
Copper	<0.010	0.01	2200	0.07089913	0.850789558	0.0008508
Iron	<0.030	0.03	6600	0.21269739	2.552368675	0.0025524
Lead	<0.050	0.05	11000	0.35449565	4.253947792	0.0042539
Lithium	<0.010	0.01	2200	0.07089913	0.850789558	0.0008508
Magnesium	17.3	17.3	3806000	122.655495	1471.865936	1.4718659
Manganese	0.0428	0.0428	9416	0.30344828	3.64137931	0.0036414
Mercury	-		0	0	0	0
Molybdenum	0.033	0.033	7260	0.23396713	2.807605543	0.0028076
Nickel	<0.050	0.05	11000	0.35449565	4.253947792	0.0042539
Phosphorus	<0.30	0.3	66000	2.1269739	25.52368675	0.0255237
Potassium	11.3	11.3	2486000	80.1160168	961.3922011	0.9613922
Selenium	0.0635	0.0635	13970	0.45020947	5.402513696	0.0054025
Silicon	3.11	3.11	684200	22.0496294	264.5955527	0.2645956
Silver	<0.010	0.01	2200	0.07089913	0.850789558	0.0008508
Sodium	68.7	68.7	15114000	487.077022	5844.924267	5.8449243
Strontium	0.543	0.543	119460	3.84982275	46.19787303	0.0461979
Thallium	<0.20	0.2	44000	1.4179826	17.01579117	0.0170158
Tin	<0.030	0.03	6600	0.21269739	2.552368675	0.0025524
Titanium	<0.010	0.01	2200	0.07089913	0.850789558	0.0008508
Vanadium	<0.030	0.03	6600	0.21269739	2.552368675	0.0025524
Zinc	<0.0050	0.005	1100	0.03544956	0.425394779	0.0004254

* Waste rock and ore have accumulated in the temporary containment for up to 3 months.
Therefore, it is assumed that the loads from the waste accumulated during October 2006
Evaporative loss from the sump is not accounted for - concs are likely higher than expected.

Loose Waste Backfill

Loose waste rock to be backfilled	0.16	Mt
(over life of mine)	160000	tonnes
	160000000	kg
	0.1	Estimated mass of loose waste **not** encapsulated in paste backfill
	1333333.3 kg/year	(assume equal masses per year of mining)

			Accumulated Loads (mg) per Year												
		Loading rate (mg/kg/yr)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total Load Accumulated (mg)
Years Weathering			25	23	21	19	17	15	13	11	9	7	5	3	
Sulphate	Sulphate	47.388978	1579632614	1453262005	1.327E+09	1.2E+09	1.07E+09	947779568.2	8.21E+08	6.95E+08	5.69E+08	4.42E+08	3.16E+08	1.9E+08	10615131163
Alkalinity	Alkalinity	7.2061876	240206252	220989751.9	201773252	1.83E+08	1.63E+08	144123751.2	1.25E+08	1.06E+08	86474251	67257751	48041250	28824750	1614186014
Al	Aluminum	0.0170158	567193.039	521817.5959	476442.15	431066.7	385691.3	340315.8234	294940.4	249564.9	204189.5	158814.1	113438.6	68063.16	3811537
Sb	Antimony	0.0170158	567193.039	521817.5959	476442.15	431066.7	385691.3	340315.8234	294940.4	249564.9	204189.5	158814.1	113438.6	68063.16	3811537
As	Arsenic	7.997E-05	2665.807283	2452.542701	2239.2781	2026.014	1812.749	1599.48437	1386.22	1172.955	959.6906	746.426	533.1615	319.8969	17914
Ba	Barium	0.0144634	482114.0831	443544.9565	404975.83	366406.7	327837.6	289268.4499	250699.3	212130.2	173561.1	134991.9	96422.82	57853.69	3239807
Be	Beryllium	0.0004254	14179.82597	13045.4399	11911.054	10776.67	9642.282	8507.895585	7373.51	6239.123	5104.737	3970.351	2835.965	1701.579	95288
Bi	Bismuth	0.0170158	567193.039	521817.5959	476442.15	431066.7	385691.3	340315.8234	294940.4	249564.9	204189.5	158814.1	113438.6	68063.16	3811537
B	Boron	0.0153142	510473.7351	469635.8363	428797.94	387960	347122.1	306284.2411	265446.3	224608.4	183770.5	142932.6	102094.7	61256.85	3430383
Cd	Cadmium	0.0008508	28359.65195	26090.87979	23822.108	21553.34	19284.56	17015.79117	14747.02	12478.25	10209.47	7940.703	5671.93	3403.158	190577
Ca	Calcium	23.65195	788398324.2	725326458.3	662254592	5.99E+08	5.36E+08	473038994.5	4.1E+08	3.47E+08	2.84E+08	2.21E+08	1.58E+08	94607799	5298036739
Cr	Chromium	0.0008508	28359.65195	26090.87979	23822.108	21553.34	19284.56	17015.79117	14747.02	12478.25	10209.47	7940.703	5671.93	3403.158	190577
Co	Cobalt	0.0008508	28359.65195	26090.87979	23822.108	21553.34	19284.56	17015.79117	14747.02	12478.25	10209.47	7940.703	5671.93	3403.158	190577
Cu	Copper	0.0008508	28359.65195	26090.87979	23822.108	21553.34	19284.56	17015.79117	14747.02	12478.25	10209.47	7940.703	5671.93	3403.158	190577
Fe	Iron	0.0025524	85078.95585	78272.63938	71466.323	64660.01	57853.69	51047.37351	44241.06	37434.74	30628.42	23822.11	17015.79	10209.47	571731
Pb	Lead	0.0042539	141798.2597	130454.399	119110.54	107766.7	96422.82	85078.95585	73735.1	62391.23	51047.37	39703.51	28359.65	17015.79	952884
Li	Lithium	0.0008508	28359.65195	26090.87979	23822.108	21553.34	19284.56	17015.79117	14747.02	12478.25	10209.47	7940.703	5671.93	3403.158	190577
Mg	Magnesium	1.4718659	49062197.87	45137222.04	41212246	37287270	33362295	29437318.72	25512343	21587367	17662391	13737415	9812440	5887464	329697970
Mn	Manganese	0.0036414	121379.3103	111668.9655	101958.62	92248.28	82537.93	72827.58621	63117.24	53406.9	43696.55	33986.21	24275.86	14565.52	815669
Hg	Mercury	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mo	Molybdenum	0.0028076	93586.85143	86099.90332	78612.955	71126.01	63639.06	56152.11086	48665.16	41178.21	33691.27	26204.32	18717.37	11230.42	628904
Ni	Nickel	0.0042539	141798.2597	130454.399	119110.54	107766.7	96422.82	85078.95585	73735.1	62391.23	51047.37	39703.51	28359.65	17015.79	952884
P	Phosphorus	0.0255237	850789.5585	782726.3938	714663.23	646600.1	578536.9	510473.7351	442410.6	374347.4	306284.2	238221.1	170157.9	102094.7	5717306
K	Potassium	0.9613922	32046406.7	29482694.17	26918982	24355269	21791557	19227844.02	16664131	14100419	11536706	8972994	6409281	3845569	215351853
Se	Selenium	0.0054025	180083.7899	165677.0867	151270.38	136863.7	122457	108050.2739	93643.57	79236.87	64830.16	50423.46	36016.76	21610.05	1210163
Si	Silicon	0.2645956	8819851.756	8114263.616	7408675.5	6703087	5997499	5291911.054	4586323	3880735	3175147	2469558	1763970	1058382	59269404
Ag	Silver	0.0008508	28359.65195	26090.87979	23822.108	21553.34	19284.56	17015.79117	14747.02	12478.25	10209.47	7940.703	5671.93	3403.158	190577
Na	Sodium	5.8449243	194830808.9	179244344.2	163657879	1.48E+08	1.32E+08	116898485.3	1.01E+08	85725556	70139091	54552626	38966162	23379697	1309263036
Sr	Strontium	0.0461979	1539929.101	1416734.773	1293540.4	1170346	1047152	923957.4605	800763.1	677568.8	554374.5	431180.1	307985.8	184791.5	10348324
Tl	Thallium	0.0170158	567193.039	521817.5959	476442.15	431066.7	385691.3	340315.8234	294940.4	249564.9	204189.5	158814.1	113438.6	68063.16	3811537
Sn	Tin	0.0025524	85078.95585	78272.63938	71466.323	64660.01	57853.69	51047.37351	44241.06	37434.74	30628.42	23822.11	17015.79	10209.47	571731
TI	Titanium	0.0008508	28359.65195	26090.87979	23822.108	21553.34	19284.56	17015.79117	14747.02	12478.25	10209.47	7940.703	5671.93	3403.158	190577
V	Vanadium	0.0025524	85078.95585	78272.63938	71466.323	64660.01	57853.69	51047.37351	44241.06	37434.74	30628.42	23822.11	17015.79	10209.47	571731
Zn	Zinc	0.0004254	14179.82597	13045.4399	11911.054	10776.67	9642.282	8507.895585	7373.51	6239.123	5104.737	3970.351	2835.965	1701.579	95288

Accumulated Loadings

SULPHATE		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	1126848308	1036700444	946552578.9	856404714.3	766256849.6	676108985	585961120.3	495813255.6	405665391	157758763.2	112684830.8	0	7166755241	
Argillites	2	5350625418	6044826500	5519189413	4993552326	4467915239	3942278152	3416641065	2891003978	2365366891	1138579746	813271247.1	138676339.3	41081926317	
Calcite-Pyrite Exhalite	3	2883703180	1326503463	1211155336	1095807208	980459081.3	0	0	0	0	0	0	0	7497628269	
Iron Formation	4	11150731954	0	0	2824852095	0	0	1932793539	0	0	0	0	0	15908377587	
Interbedded Rhyolite/Argillite	5	260183745.6	239369045.9	218554346.3	197739646.6	176924947	156110247.3	135295547.7	114480848.1	93666148.41	36425724.38	26018374.56	0	1654768622	
Rhyolite/Rhyolite Fragmental	6	465630174.2	1101730430	1005927784	910125137.7	814322491.6	718519845.6	622717199.5	526914553.4	431111907.3	298883536.9	213488240.6	83205803.57	7192577104	80502033140
Massive Sulphide		22827380.95	95817931.55	87485937.5	79153943.45	70821949.4	62489955.36	54157961.31	45825967.26	37493973.21	29161979.17	20829985.12	9245089.286	615312054	615312054
Backfill		7663529.571	32167665.38	29370477.08	26573288.79	23776100.5	20978912.2	18181723.91	15384535.61	12587347.32	9790159.028	6992970.734	3103729.476	206570440	206570440

ALKALINITY		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	86423535.51	79509652.67	72595769.83	65681886.99	58768004.14	51854121.3	44940238.46	38026355.62	31112472.78	12099294.97	8642353.551	0	549653686	
Argillites	2	410365763	463607456.2	423293764.3	382980072.5	342666380.6	302352688.8	262038997	221725305.1	181411613.3	87323277.13	62373769.38	10635770.09	3150774857	
Calcite-Pyrite Exhalite	3	221165371	101736070.7	92889455.83	84042840.99	75196226.15	0	0	0	0	0	0	0	575029965	
Iron Formation	4	855204442.2	0	0	216651792	0	0	148235436.6	0	0	0	0	0	1220091671	
Interbedded Rhyolite/Argillite	5	19954770.32	18358388.69	16762007.07	15165625.44	13569243.82	11972862.19	10376480.57	8780098.94	7183717.314	2793667.845	1995477.032	0	126912339	
Rhyolite/Rhyolite Fragmental	6	35711466.75	84497121.95	77149546.13	69801970.31	62454394.49	55106818.66	47759242.84	40411667.02	33064091.2	22922847.53	16373462.52	6381462.054	551634091	6174096609
Massive Sulphide		440665.1786	1849692.087	1688849.297	1528006.507	1367163.717	1206320.926	1045478.136	884635.346	723792.5558	562949.7656	402106.9754	178469.3973	11878130	11878130
Backfill		35253.21429	147975.367	135107.9438	122240.5205	109373.0973	96505.67411	83638.25089	70770.82768	57903.40446	45035.98125	32168.55804	14277.55179	950250	950250

ALUMINUM		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	3119523.565	2869961.68	2620399.795	2370837.91	2121276.024	1871714.139	1622152.254	1372590.369	1123028.483	436733.2991	311952.3565	0	19840170	
Argillites	2	8766561.419	9903953.023	9042739.717	8181526.41	7320313.104	6459099.798	5597886.491	4736673.185	3875459.879	1865469.64	1332478.315	227209.8214	67309371	
Calcite-Pyrite Exhalite	3	4724711.425	2173367.256	1984378.799	1795390.342	1606401.885	0	0	0	0	0	0	0	12284250	
Iron Formation	4	18269560.83	0	0	4628288.743	0	0	3166723.877	0	0	0	0	0	26064573	
Interbedded Rhyolite/Argillite	5	426289.7527	392186.5724	358083.3922	323980.212	289877.0318	255773.8516	221670.6714	187567.4912	153464.311	59680.56537	42628.97527	0	2711203	
Rhyolite/Rhyolite Fragmental	6	762896.8955	1805095.055	1648130.267	1491165.48	1334200.693	1177235.905	1020271.118	863306.3305	706341.5431	489696.1904	349782.9931	136325.8929	11784448	139994015
Massive Sulphide		2611.607143	10962.22098	10008.98438	9055.747768	8102.511161	7149.274554	6196.037946	5242.801339	4289.564732	3336.328125	2383.091518	1057.700893	70395.87054	70396
Backfill		208.9285714	876.9776786	800.71875	724.4598214	648.2008929	571.9419643	495.6830357	419.4241071	343.1651786	266.90625	190.6473214	84.61607143	5631.669643	5632

ANTIMONY		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	891292	819989	748686	677382	606079	534775	463472	392169	320865	124781	89129	0	5668620	
Argillites	2	3778690	4268945	3897733	3526520	3155307	2784095	2412882	2041669	1670457	804082	574344	97935	29012660	
Calcite-Pyrite Exhalite	3	2036514	936796	855336	773875	692415	0	0	0	0	0	0	0	5294935	
Iron Formation	4	7874811	0	0	1994952	0	0	1364967	0	0	0	0	0	11234730	
Interbedded Rhyolite/Argillite	5	183746	169046	154346	139647	124947	110247	95548	80848	66148	25724	18375	0	1168622	
Rhyolite/Rhyolite Fragmental	6	328835	778058	710401	642744	575087	507429	439772	372115	304458	211076	150769	58761	5079504	57459070
Massive Sulphide		3463	14535	13271	12007	10743	9479	8215	6952	5688	4424	3160	1402	93340	93340
Backfill		697	2927	2673	2418	2164	1909	1655	1400	1145	891	636	282	18798	18798

ARSENIC		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	445646	409995	374343	338691	303039	267388	231736	196084	160433	62390	44565	0	2834310	
Argillites	2	2267214	2561367	2338640	2115912	1893184	1670457	1447729	1225002	1002274	482449	344606	58761	17407596	
Calcite-Pyrite Exhalite	3	1221908	562078	513201	464325	415449	0	0	0	0	0	0	0	3176961	
Iron Formation	4	110247	101428	92608	83788	74968	66148	57329	48509	39689	15435	11025	0	701173	
Interbedded Rhyolite/Argillite	5	110247	101428	92608	83788	74968	66148	57329	48509	39689	15435	11025	0	701173	
Rhyolite/Rhyolite Fragmental	6	197301	466835	426241	385646	345052	304458	263863	223269	182675	126646	90461	35257	3047702	27868915
Massive Sulphide		871	3654	3336	3019	2701	2383	2065	1748	1430	1112	794	353	23465	23465
Backfill		95034	398907	364220	329532	294844	260157	225469	190782	156094	121407	86719	38489	2561654	2561654

BARIUM		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	286487	263568	240649	217730	194811	171892	148973	126054	103135	40108	28649	0	1822056	
Argillites	2	1360328	1536820	1403184	1269547	1135911	1002274	868638	735001	601364	289469	206764	35257	10444558	
Calcite-Pyrite Exhalite	3	733145	337247	307921	278595	249269	0	0	0	0	0	0	0	1906177	
Iron Formation	4	2834932	0	0	718183	0	0	491388	0	0	0	0	0	4044503	
Interbedded Rhyolite/Argillite	5	66148	60857	55565	50273	44981	39689	34397	29105	23813	9261	6615	0	420704	
Rhyolite/Rhyolite Fragmental	6	118381	280101	255744	231388	207031	182675	158318	133961	109605	75987	54277	21154	1828621	20466619
Massive Sulphide		4295	18027	16459	14892	13324	11757	10189	8621	7054	5486	3919	1739	115762	115762
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

BERYLLIUM		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	15916	14643	13369	12096	10823	9550	8276	7003	5730	2228	1592	0	101225	
Argillites	2	75574	85379	77955	70530	63106	55682	48258	40833	33409	16082	11487	1959	580253	
Calcite-Pyrite Exhalite	3	40730	18736	17107	15478	13848	0	0	0	0	0	0	0	105899	
Iron Formation	4	157496	0	0	39899	0	0	27299	0	0	0	0	0	224695	
Interbedded Rhyolite/Argillite	5	3675	3381	3087	2793	2499	2205	1911	1617	1323	514	367	0	23372	
Rhyolite/Rhyolite Fragmental	6	6577	15561	14208	12855	11502	10149	8795	7442	6089	4222	3015	1175	101590	1137034
Massive Sulphide		232	974	890	805	720	635	551	466	381	297	212	94	6257	6257
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

BISMUTH		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	1496098	1376410	1256722	1137035	1017347	897659	777971	658283	538595	209454	149610	0	9515184	
Argillites	2	7103938	8025617	7327737	6629858	5931978	5234098	4536218	3838339	3140459	1511674	1079767	184118	54543800	
Calcite-Pyrite Exhalite	3	3828645	1761177	1608031	1454885	1301739	0	0	0	0	0	0	0	9954478	
Iron Formation	4	14804644	0	0	3750510	0	0	2566138	0	0	0	0	0	21121292	
Interbedded Rhyolite/Argillite	5	345442	317806	290171	262536	234900	207265	179630	151994	124359	48362	34544	0	2197009	
Rhyolite/Rhyolite Fragmental	6	618210	1462749	1335554	1208358	1081163	953967	826771	699576	572380	396823	283445	110471	9549467	106881230
Massive Sulphide		19	81	74	67	60	53	46	39	32	25	18	8	521	521
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

BORON		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	4679285	4304943	3930600	3556257	3181914	2807571	2433228	2058886	1684543	655100	467929	0	29760255	
Argillites	2	22067551	24930640	22762759	20594877	18426995	16259113	14091232	11923350	9755468	4695837	3354170	571942	169433933	
Calcite-Pyrite Exhalite	3	11893239	5470890	4995160	4519431	4043701	0	0	0	0	0	0	0	30922422	
Iron Formation	4	45988894	0	0	11650520	0	0	7971408	0	0	0	0	0	65610823	
Interbedded Rhyolite/Argillite	5	1073074	987228	901382	815536	729690	643845	557999	472153	386307	150230	107307	0	6824752	
Rhyolite/Rhyolite Fragmental	6	1920396	4543860	4148742	3753623	3358505	2963387	2568269	2173150	1778032	1232684	880488	343165	29664301	332216486
Massive Sulphide		1083	4547	4152	3756	3361	2966	2570	2175	1779	1384	989	439	29201	29201
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

CADMIUM		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	171892	158141	144389	130638	116887	103135	89384	75633	61881	24065	17189	0	1093234	
Argillites	2	377869	426895	389773	352652	315531	278409	241288	204167	167046	80408	57434	9794	2901266	
Calcite-Pyrite Exhalite	3	203651	93680	85534	77388	69241	0	0	0	0	0	0	0	529494	
Iron Formation	4	787481	0	0	199495	0	0	136497	0	0	0	0	0	1123473	
Interbedded Rhyolite/Argillite	5	18375	16905	15435	13965	12495	11025	9555	8085	6615	2572	1837	0	116862	
Rhyolite/Rhyolite Fragmental	6	32883	77806	71040	64274	57509	50743	43977	37211	30446	21108	15077	5876	507950	6272279
Massive Sulphide		7371	30938	28248	25557	22867	20177	17487	14796	12106	9416	6726	2985	198673	198673
Backfill		1964	8244	7527	6810	6093	5376	4660	3943	3226	2509	1792	795	52939	52939

Accumulated Loadings

CALCIUM		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	295272455	295272455	295272455	295272455	295272455	295272455	295272455	295272455	295272455	147636228	147636228	0	2952724550	
Argillites	2	1222179580	1500812671	1500812671	1500812671	1500812671	1500812671	1500812671	1500812671	1500812671	928829280	928829280	263968192	15350307704	
Calcite-Pyrite Exhalite	3	658689941	329344971	329344971	329344971	329344971	0	0	0	0	0	0	0	1976069823	
Iron Formation	4	2547028773	0	0	849009591	0	0	849009591	0	0	0	0	0	4245047956	
Interbedded Rhyolite/Argillite	5	59430671	59430671	59430671	59430671	59430671	59430671	59430671	59430671	59430671	29715336	29715336	0	594306714	
Rhyolite/Rhyolite Fragmental	6	106358350	273538205	273538205	273538205	273538205	273538205	273538205	273538205	273538205	243822869	243822869	158380915	2940690642	28059147389
Massive Sulphide		17873085	81545949	81545949	81545949	81545949	81545949	81545949	81545949	81545949	81545949	81545949	60321661	893654241	893654241
Backfill		1429847	6523676	6523676	6523676	6523676	6523676	6523676	6523676	6523676	6523676	6523676	4825733	71492339	71492339

CHROMIUM		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	159159	146427	133694	120961	108228	95496	82763	70030	57297	22282	15916	0	1012254	
Argillites	2	755738	853789	779547	705304	631061	556819	482576	408334	334091	160816	114869	19587	5802532	
Calcite-Pyrite Exhalite	3	407303	187359	171067	154775	138483	0	0	0	0	0	0	0	1058987	
Iron Formation	4	1574962	0	0	398990	0	0	272993	0	0	0	0	0	2246946	
Interbedded Rhyolite/Argillite	5	36749	33809	30869	27929	24989	22049	19110	16170	13230	5145	3675	0	233724	
Rhyolite/Rhyolite Fragmental	6	65767	155612	142080	128549	115017	101486	87954	74423	60892	42215	30154	11752	1015901	11370344
Massive Sulphide		1548	6496	5931	5366	4801	4237	3672	3107	2542	1977	1412	627	41716	41716
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

COBALT		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	222823	204997	187171	169346	151520	133694	115868	98042	80216	31195	22282	0	1417155	
Argillites	2	755738	853789	779547	705304	631061	556819	482576	408334	334091	160816	114869	19587	5802532	
Calcite-Pyrite Exhalite	3	407303	187359	171067	154775	138483	0	0	0	0	0	0	0	1058987	
Iron Formation	4	1574962	0	0	398990	0	0	272993	0	0	0	0	0	2246946	
Interbedded Rhyolite/Argillite	5	36749	33809	30869	27929	24989	22049	19110	16170	13230	5145	3675	0	233724	
Rhyolite/Rhyolite Fragmental	6	65767	155612	142080	128549	115017	101486	87954	74423	60892	42215	30154	11752	1015901	11775245
Massive Sulphide		1412	5928	5412	4897	4381	3866	3350	2835	2320	1804	1289	572	38066	38066
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

COPPER		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	1273275	1171413	1069551	967689	865827	763965	662103	560241	458379	178258	127327	0	8098029	
Argillites	2	2720657	3073641	2806367	2539094	2271821	2004548	1737275	1470002	1202729	578939	413528	70513	20889115	
Calcite-Pyrite Exhalite	3	1466290	674493	615842	557190	498539	0	0	0	0	0	0	0	3812353	
Iron Formation	4	5669864	0	0	1436365	0	0	982776	0	0	0	0	0	8089006	
Interbedded Rhyolite/Argillite	5	132297	121713	111129	100546	89962	79378	68794	58211	47627	18522	13230	0	841408	
Rhyolite/Rhyolite Fragmental	6	236761	560202	511489	462775	414062	365349	316636	267923	219209	151975	108553	42308	3657243	45387153
Massive Sulphide		1006	4222	3855	3488	3121	2754	2387	2019	1652	1285	918	407	27115	27115
Backfill		20736	87039	79471	71902	64333	56765	49196	41628	34059	26490	18922	8398	558939	558939

IRON		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	26165800	24072536	21979272	19886008	17792744	15699480	13606216	11512952	9419688	3663212	2616580	0	166414486	
Argillites	2	32194441	36371414	33208682	30045950	26883219	23720487	20557756	17395024	14232292	6850776	4893412	834408	247187862	
Calcite-Pyrite Exhalite	3	17351095	7981504	7287460	6593416	5899372	0	0	0	0	0	0	0	45112848	
Iron Formation	4	67093387	0	0	16996991	0	0	11629520	0	0	0	0	0	95719899	
Interbedded Rhyolite/Argillite	5	1565512	1440271	1315030	1189789	1064548	939307	814066	688825	563584	219172	156551	0	9956659	
Rhyolite/Rhyolite Fragmental	6	2801673	6629056	6052616	5476177	4899737	4323297	3746858	3170418	2593978	1798367	1284548	500645	43277371	607669124
Massive Sulphide		6635	27852	25430	23008	20586	18164	15743	13321	10899	8477	6055	2687	178858	178858
Backfill		1136186	4769143	4354435	3939727	3525019	3110310	2695602	2280894	1866186	1451478	1036770	460156	30625906	30625906

LEAD		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	763965	702848	641731	580613	519496	458379	397262	336145	275027	106955	76396	0	4858817	
Argillites	2	3778690	4268945	3897733	3526520	3155307	2784095	2412882	2041669	1670457	804082	574344	97935	29012660	
Calcite-Pyrite Exhalite	3	2036514	936796	855336	773875	692415	0	0	0	0	0	0	0	5294935	
Iron Formation	4	7874811	0	0	1994952	0	0	1364967	0	0	0	0	0	11234730	
Interbedded Rhyolite/Argillite	5	183746	169046	154346	139647	124947	110247	95548	80848	66148	25724	18375	0	1168622	
Rhyolite/Rhyolite Fragmental	6	328835	778058	710401	642744	575087	507429	439772	372115	304458	211076	150769	58761	5079504	56649268
Massive Sulphide		10408	43686	39888	36089	32290	28491	24692	20894	17095	13296	9497	4215	280541	280541
Backfill		14249	59810	54609	49408	44207	39007	33806	28605	23404	18203	13002	5771	384081	384081

LITHIUM		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	286487	263568	240649	217730	194811	171892	148973	126054	103135	40108	28649	0	1822056	
Argillites	2	1360328	1536820	1403184	1269547	1135911	1002274	868638	735001	601364	289469	206764	35257	10444558	
Calcite-Pyrite Exhalite	3	733145	337247	307921	278595	249269	0	0	0	0	0	0	0	1906177	
Iron Formation	4	2834932	0	0	718183	0	0	491388	0	0	0	0	0	4044503	
Interbedded Rhyolite/Argillite	5	66148	60857	55565	50273	44981	39689	34397	29105	23813	9261	6615	0	420704	
Rhyolite/Rhyolite Fragmental	6	118381	280101	255744	231388	207031	182675	158318	133961	109605	75987	54277	21154	1828621	20466619
Massive Sulphide		232	974	890	805	720	635	551	466	381	297	212	94	6257	6257
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

MAGNESIUM		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	59493771	54734269	49974768	45215266	40455764	35696263	30936761	26177259	21417758	8329128	5949377	0	378380382.6	
Argillites	2	184097790	207983013	189897534	171812055	153726575	135641096	117555616	99470137	81384657	39174862	27982045	4771406	1413496787	
Calcite-Pyrite Exhalite	3	99218940	45640712	41671955	37703197	33734440	0	0	0	0	0	0	0	257969244	
Iron Formation	4	383660777	0	0	97194064	0	0	66501201	0	0	0	0	0	547356042.4	
Interbedded Rhyolite/Argillite	5	8952085	8235918	7519751	6803584	6087418	5371251	4655084	3938917	3222751	1253292	895208	0	56935259.36	
Rhyolite/Rhyolite Fragmental	6	16020835	37906996	34610736	31314475	28018215	24721954	21425693	18129433	14833172	10283620	7345443	2862844	247473415.6	2901611131
Massive Sulphide		1948201	8177573	7466480	6755387	6044293	5333200	4622107	3911013	3199920	2488827	1777733	789021	52513755.07	52513755
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

MANGANESE		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	8626438	7936323	7246208	6556093	5865978	5175863	4485748	3795633	3105518	1207701	862644	0	54864143	
Argillites	2	26904275	30394890	27751856	25108822	22465788	19822755	17179721	14536687	11893653	5725062	4089330	697299	206570138	
Calcite-Pyrite Exhalite	3	14499976	6669989	6089990	5509991	4929992	0	0	0	0	0	0	0	37699939	
Iron Formation	4	56068652	0	0	14204059	0	0	9718566	0	0	0	0	0	79991277	
Interbedded Rhyolite/Argillite	5	1308269	1203607	1098946	994284	889623	784961	680300	575638	470977	183158	130827	0	8320588	
Rhyolite/Rhyolite Fragmental	6	2341304	5539774	5058055	4576335	4094616	3612896	3131177	2649457	2167738	1502861	1073472	418379	36166066	423612151
Massive Sulphide		322756	1354768	1236962	1119156	1001350	883544	765738	647933	530127	412321	294515	130716	8699887	8699887
Backfill		12360	51882	47370	42859	38347	33836	29324	24813	20302	15790	11279	5006	333168	333168

MERCURY		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	286487	263568	240649	217730	194811	171892	148973	126054	103135	40108	28649	0	1,822,056	
Argillites	2	1360328	1536820	1403184	1269547	1135911	1002274	868638	735001	601364	289469	206764	35257	10,444,558	
Calcite-Pyrite Exhalite	3	733145	337247	307921	278595	249269	0	0	0	0	0	0	0	1,906,177	
Iron Formation	4	2834932	0	0	718183	0	0	491388	0	0	0	0	0	4,044,503	
Interbedded Rhyolite/Argillite	5	66148	60857	55565	50273	44981	39689	34397	29105	23813	9261	6615	0	420,704	
Rhyolite/Rhyolite Fragmental	6	118381	280101	255744	231388	207031	182675	158318	133961	109605	75987	54277	21154	1,828,621	20466619
Massive Sulphide		4778	20057	18313	16569	14825	13081	11336	9592	7848	6104	4360	1935	128,798	128798
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	-	0

MOLYBDENUM		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	159159	146427	133694	120961	108228	95496	82763	70030	57297	22282	15916	0	1012254	
Argillites	2	755738	853789	779547	705304	631061	556819	482576	408334	334091	160816	114869	19587	5802532	
Calcite-Pyrite Exhalite	3	407303	187359	171067	154775	138483	0	0	0	0	0	0	0	1058987	
Iron Formation	4	1574962	0	0	398990	0	0	272993	0	0	0	0	0	2246946	
Interbedded Rhyolite/Argillite	5	36749	33809	30869	27929	24989	22049	19110	16170	13230	5145	3675	0	233724	
Rhyolite/Rhyolite Fragmental	6	65767	155612	142080	128549	115017	101486	87954	74423	60892	42215	30154	11752	1015901	11370344
Massive Sulphide		135	568	519	470	420	371	321	272	222	173	124	55	3650	3650
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

Accumulated Loadings

NICKEL		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	2482886	2284255	2085624	1886993	1688363	1489732	1291101	1092470	893839	347604	248289	0	15791156	
Argillites	2	4685576	5293492	4833188	4372885	3912581	3452277	2991974	2531670	2071366	997061	712187	121440	35975698	
Calcite-Pyrite Exhalite	3	2525277	1161627	1060616	959605	858594	0	0	0	0	0	0	0	6565720	
Iron Formation	4	9764765	0	0	2473741	0	0	1692559	0	0	0	0	0	13931065	
Interbedded Rhyolite/Argillite	5	227845	209617	191389	173162	154934	136707	118479	100252	82024	31898	22784	0	1449091	
Rhyolite/Rhyolite Fragmental	6	407755	964792	880897	797002	713107	629212	545317	461422	377527	261734	186953	72864	6298584	80011314
Massive Sulphide		4353	18270	16682	15093	13504	11915	10327	8738	7149	5561	3972	1763	117326	117326
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

PHOSPOROUS		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	1496098	1376410	1256722	1137035	1017347	897659	777971	658283	538595	209454	149610	0	9515184	
Argillites	2	7103938	8025617	7327737	6629858	5931978	5234098	4536218	3838339	3140459	1511674	1079767	184118	54543800	
Calcite-Pyrite Exhalite	3	3828645	1761177	1608031	1454885	1301739	0	0	0	0	0	0	0	9954478	
Iron Formation	4	14804644	0	0	3750510	0	0	2566138	0	0	0	0	0	21121292	
Interbedded Rhyolite/Argillite	5	345442	317806	290171	262536	234900	207265	179630	151994	124359	48362	34544	0	2197009	
Rhyolite/Rhyolite Fragmental	6	618210	1462749	1335554	1208358	1081163	953967	826771	699576	572380	396823	283445	110471	9549467	106881230
Massive Sulphide		4778	20057	18313	16569	14825	13081	11336	9592	7848	6104	4360	1935	128798	128798
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

POTASSIUM		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	51663130	47530080	43397029	39263979	35130928	30997878	26864828	22731777	18598727	7232838	5166313	0	328577507	
Argillites	2	172308276	194663904	177736608	160809312	143882016	126954720	110027424	93100128	76172832	36666127	26190091	4465848	1322977288	
Calcite-Pyrite Exhalite	3	92865018	42717908	39003307	35288707	31574106	0	0	0	0	0	0	0	241449046	
Iron Formation	4	359091368	0	0	90969813	0	0	62242504	0	0	0	0	0	512303685	
Interbedded Rhyolite/Argillite	5	8378799	7708495	7038191	6367887	5697583	5027279	4356975	3686671	3016367	1173032	837880	0	53289159	
Rhyolite/Rhyolite Fragmental	6	14994870	35479455	32394285	29309115	26223945	23138775	20053605	16968435	13883265	9625063	6875045	2679509	231625364	2690222050
Massive Sulphide		202699	850831	776845	702860	628875	554890	480904	406919	332934	258948	184963	82093	5463762	5463762
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

SELENIUM		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	827629	761418	695208	628998	562788	496577	430367	364157	297946	115868	82763	0	5263719	
Argillites	2	3778690	4268945	3897733	3526520	3155307	2784095	2412882	2041669	1670457	804082	574344	97935	29012660	
Calcite-Pyrite Exhalite	3	2036514	936796	855336	773875	692415	0	0	0	0	0	0	0	5294935	
Iron Formation	4	7874811	0	0	1994952	0	0	1364967	0	0	0	0	0	11234730	
Interbedded Rhyolite/Argillite	5	183746	169046	154346	139647	124947	110247	95548	80848	66148	25724	18375	0	1168622	
Rhyolite/Rhyolite Fragmental	6	328835	778058	710401	642744	575087	507429	439772	372115	304458	211076	150769	58761	5079504	57054169
Massive Sulphide		76143	319610	291818	264025	236233	208441	180649	152857	125065	97273	69480	30838	2052431	2052431
Backfill		3754	15759	14389	13018	11648	10278	8907	7537	6167	4796	3426	1521	101200	101200

SILICON		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	4456462	4099945	3743428	3386911	3030394	2673877	2317360	1960843	1604326	623905	445646	0	28343100	
Argillites	2	16626237	18783359	17150024	15516688	13883352	12250017	10616681	8983346	7350010	3537960	2527114	430915	127655703	
Calcite-Pyrite Exhalite	3	8960660	4121903	3763477	3405051	3046624	0	0	0	0	0	0	0	23297715	
Iron Formation	4	34649167	0	0	8777789	0	0	6005856	0	0	0	0	0	49432812	
Interbedded Rhyolite/Argillite	5	808481	743802	679124	614445	549767	485088	420410	355731	291053	113187	80848	0	5141936	
Rhyolite/Rhyolite Fragmental	6	1446873	3423456	3125764	2828072	2530381	2232689	1934997	1637305	1339613	928734	663382	258549	22349816	256221082
Massive Sulphide		23311	97848	89339	80831	72322	63814	55305	46797	38288	29780	21271	9441	628348	628348
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

SILVER		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	286487	263568	240649	217730	194811	171892	148973	126054	103135	40108	28649	0	1822056	
Argillites	2	1360328	1536820	1403184	1269547	1135911	1002274	868638	735001	601364	289469	206764	35257	10444558	
Calcite-Pyrite Exhalite	3	733145	337247	307921	278595	249269	0	0	0	0	0	0	0	1906177	
Iron Formation	4	2834932	0	0	718183	0	0	491388	0	0	0	0	0	4044503	
Interbedded Rhyolite/Argillite	5	66148	60857	55565	50273	44981	39689	34397	29105	23813	9261	6615	0	420704	
Rhyolite/Rhyolite Fragmental	6	118381	280101	255744	231388	207031	182675	158318	133961	109605	75987	54277	21154	1828621	20466619
Massive Sulphide		832	3492	3188	2884	2581	2277	1974	1670	1366	1063	759	337	22422	22422
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

SODIUM		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	49371235	45421536	41471838	37522139	33572440	29622741	25673042	21723343	17773645	6911973	4937124	0	314001056	
Argillites	2	136032850	153682030	140318375	126954720	113591065	100227411	86863756	73500101	60136446	28946943	20676388	3525670	1044455754	
Calcite-Pyrite Exhalite	3	73314488	33724664	30792085	27859505	24926926	0	0	0	0	0	0	0	190617668	
Iron Formation	4	283493185	0	0	71818274	0	0	49138819	0	0	0	0	0	404450278	
Interbedded Rhyolite/Argillite	5	6614841	6085654	5556466	5027279	4498092	3968905	3439717	2910530	2381343	926078	661484	0	42070389	
Rhyolite/Rhyolite Fragmental	6	11838055	28010096	25574435	23138775	20703114	18267454	15831793	13396133	10960472	7598734	5427667	2115402	182862130	2178457274
Massive Sulphide		981964	4121795	3763378	3404961	3046544	2688127	2329710	1971293	1612876	1254459	896042	397696	26468847	26468847
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

STRONTIUM		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	2291895	2108543	1925192	1741840	1558489	1375137	1191785	1008434	825082	320865	229189	0	14576451	
Argillites	2	6499347	7342586	6704100	6065614	5427129	4788643	4150157	3511671	2873186	1383021	987872	168449	49901775	
Calcite-Pyrite Exhalite	3	3502803	1611290	1471177	1331065	1190953	0	0	0	0	0	0	0	9107289	
Iron Formation	4	13544674	0	0	3431318	0	0	2347744	0	0	0	0	0	19323735	
Interbedded Rhyolite/Argillite	5	316042	290759	265476	240192	214909	189625	164342	139059	113775	44246	31604	0	2010030	
Rhyolite/Rhyolite Fragmental	6	565596	1338260	1221890	1105519	989149	872778	756408	640037	523667	363051	259322	101069	8736746	103656026
Massive Sulphide		47841	200812	183350	165888	148426	130964	113502	96040	78578	61117	43655	19376	1289548	1289548
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

THALLIUM		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	3024028	2782106	2540183	2298261	2056339	1814417	1572495	1330572	1088650	423364	302403	0	19232818	
Argillites	2	14207875	16051234	14655475	13259715	11863956	10468196	9072437	7676677	6280918	3023347	2159534	368237	109087601	
Calcite-Pyrite Exhalite	3	7657291	3522354	3216062	2909771	2603479	0	0	0	0	0	0	0	19908956	
Iron Formation	4	29609288	0	0	7501020	0	0	5132277	0	0	0	0	0	42242585	
Interbedded Rhyolite/Argillite	5	690883	635613	580342	525071	469801	414530	359259	303989	248718	96724	69088	0	4394018	
Rhyolite/Rhyolite Fragmental	6	1236419	2925499	2671108	2416716	2162325	1907934	1653543	1399152	1144760	793646	566890	220942	19098934	213964912
Massive Sulphide		929	3898	3559	3220	2881	2542	2203	1864	1525	1186	847	376	25030	25030
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

VANADIUM		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	1496098	1376410	1256722	1137035	1017347	897659	777971	658283	538595	209454	149610	0	9515184	
Argillites	2	7103938	8025617	7327737	6629858	5931978	5234098	4536218	3838339	3140459	1511674	1079767	184118	54543800	
Calcite-Pyrite Exhalite	3	3828645	1761177	1608031	1454885	1301739	0	0	0	0	0	0	0	9954478	
Iron Formation	4	14804644	0	0	3750510	0	0	2566138	0	0	0	0	0	21121292	
Interbedded Rhyolite/Argillite	5	345442	317806	290171	262536	234900	207265	179630	151994	124359	48362	34544	0	2197009	
Rhyolite/Rhyolite Fragmental	6	618210	1462749	1335554	1208358	1081163	953967	826771	699576	572380	396823	283445	110471	9549467	106881230
Massive Sulphide		4256	17864	16311	14758	13204	11651	10097	8544	6990	5437	3884	1724	114719	114719
Backfill		0	0	0	0	0	0	0	0	0	0	0	0	0	0

ZINC		Accumulated Loads (mg)													
Lithology	Rock Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Totals	Total Load Accumulated (mg)
Non-Carbonaceous Argillites	1	10490294	9651070	8811847	7972623	7133400	6294176	5454953	4615729	3776506	1468641	1049029	0	66718267	
Argillites	2	49811169	56273772	51380400	46487029	41593657	36700286	31806914	26913543	22020171	10599506	7571076	1290995	382448518	
Calcite-Pyrite Exhalite	3	26845577	12348965	11275142	10201319	9127496	0	0	0	0	0	0	0	69798500	
Iron Formation	4	103806742	0	0	26297708	0	0	17993169	0	0	0	0	0	148097618	
Interbedded Rhyolite/Argillite	5	2422157	2228385	2034612	1840840	1647067	1453294	1259522	1065749	871977	339102	242216	0	15404920	
Rhyolite/Rhyolite Fragmental	6	4334742	10256461	9364595	8472729	7580862	6688996	5797130	4905264	4013398	2782430	1987450	774597	66958653	749426476
Massive Sulphide		709738	2979126	2720071	2461017	2201962	1942908	1683854	1424799	1165745	906690	647636	287444	19130990	19130990
Backfill		672854	2824305	2578713	2333121	2087530	1841938	1596346	1350755	1105163	859571	613979	272506	18136781	18136781

Estimated Unequilibriated Concentrations at Closure
1996 Humidity Cell Data and Crandon Backfill Data
2005-06 Wolverine Tailings Data for Massive Sulphide

Void Space at Closure 130,000 m3
130000000 L

	Load Sources						
Parameter	Groundwater	Paste Backfill	Mine Rock Surfaces	Loose Waste	Massive Sulphide	Total Load	Concentration (mg/L)
Sulphate	8905000000	206570440	80502033140	10615131163	615312054	100844046796	776
Alkalinity	16250000000	950250	6174096609	1614186014	11878130	24051111003	185
Aluminum	7042100	5632	139994015	3811537	70396	150923680	1.16
Antimony	8088600	18798	57459070	3811537	93340	69471346	0.53
Arsenic	5276180	2561654	27868915	17914	23465	35748129	0.275
Barium	3296800	0	20466619	3239807	115762	27118987	0.21
Beryllium	227500	0	1137034	95288	6257	1466080	0.011
Bismuth	17355000	0	106881230	3811537	521	128048289	1.0
Boron	11830000	0	332216486	3430383	29201	347506070	2.7
Cadmium	266136	52939	6272279	190577	198673	6980603	0.05370
Calcium	6880900000	71492339	28059147389	5298036739	893654241	41203230708	317
Chromium	357500	0	11370344	190577	41716	11960137	0.09
Cobalt	288600	0	11775245	190577	38066	12292488	0.09
Copper	353600	558939	45387153	190577	27115	46517384	0.358
Iron	23036000	30625906	607669124	571731	178858	662081619	5.1
Lead	1356940	384081	56649268	952884	280541	59623713	0.459
Lithium	780000	0	20466619	190577	6257	21443453	0.16
Magnesium	1649700000	0	2901611131	329697970	52513755	4933522855	38
Manganese	6449300	333168	423612151	815669	8699887	439910174	3.4
Mercury	5688	0	20466619	0	128798	20601104	0.16
Molybdenum	907400	0	11370344	628904	3650	12910297	0.099
Nickel	1430000	0	80011314	952884	117326	82511525	0.635
Phosphorus	39000000	0	106881230	5717306	128798	151727335	1.2
Potassium	260000000	0	2690222050	215351853	5463762	3171037665	24
Selenium	5708300	101200	57054169	1210163	2052431	66126262	0.509
Silicon	636133333.3	0	256221082	59269404	628348	952252167	7.3
Silver	262054	0	20466619	190577	22422	20941672	0.1611
Sodium	326300000	0	2178457274	1309263036	26468847	3840489157	30
Strontium	60190000	0	103656026	10348324	1289548	175483898	1.3
Thallium	5221190	0	213964912	3811537	25030	223022668	1.7
Vanadium	3523000	0	106881230	571731	114719	111090680	0.9
Zinc	997100	18136781	749426476	190577	19130990	787881925	6.06

	Load Sources - Percentages				
Parameter	Groundwater	Paste Backfill	Mine Rock Surfaces	Loose Waste	Massive Sulphide
Sulphate	8.83%	0.2048%	79.83%	10.53%	0.610%
Alkalinity	67.56%	0.0040%	25.67%	6.71%	0.049%
Aluminum	4.67%	0.0037%	92.76%	2.53%	0.047%
Antimony	11.64%	0.0271%	82.71%	5.49%	0.134%
Arsenic	14.76%	7.1658%	77.96%	0.05%	0.066%
Barium	12.16%	0.0000%	75.47%	11.95%	0.427%
Beryllium	15.52%	0.0000%	77.56%	6.50%	0.427%
Bismuth	13.55%	0.0000%	83.47%	2.98%	0.000%
Boron	3.40%	0.0000%	95.60%	0.99%	0.008%
Cadmium	3.81%	0.7584%	89.85%	2.73%	2.846%
Calcium	16.70%	0.1735%	68.10%	12.86%	2.169%
Chromium	2.99%	0.0000%	95.07%	1.59%	0.349%
Cobalt	2.35%	0.0000%	95.79%	1.55%	0.310%
Copper	0.76%	1.2016%	97.57%	0.41%	0.058%
Iron	3.48%	4.6257%	91.78%	0.09%	0.027%
Lead	2.28%	0.6442%	95.01%	1.60%	0.471%
Lithium	3.64%	0.0000%	95.44%	0.89%	0.029%
Magnesium	33.44%	0.0000%	58.81%	6.68%	1.064%
Manganese	1.47%	0.0757%	96.30%	0.19%	1.978%
Mercury	0.03%	0.0000%	99.35%	0.000%	0.625%
Molybdenum	7.03%	0.0000%	88.07%	4.87%	0.028%
Nickel	1.73%	0.0000%	96.97%	1.15%	0.142%
Phosphorus	25.70%	0.0000%	70.44%	3.77%	0.085%
Potassium	8.20%	0.0000%	84.84%	6.79%	0.172%
Selenium	8.63%	0.1530%	86.28%	1.83%	3.104%
Silicon	66.80%	0.0000%	26.91%	6.22%	0.066%
Silver	1.25%	0.0000%	97.73%	0.91%	0.107%
Sodium	8.50%	0.0000%	56.72%	34.09%	0.689%
Strontium	34.30%	0.0000%	59.07%	5.90%	0.735%
Thallium	2.34%	0.0000%	95.94%	1.71%	0.011%
Vanadium	3.17%	0.0000%	96.21%	0.51%	0.103%
Zinc	0.13%	2.30%	95.12%	0.02%	2.428%

MINTEQ Simulation Summary

Parameter	Species	Initial Concentration (mg/L)	MINTEQA2 Simulation No Precip (mg/L)	Base Case (mg/L)	pH = 6.0 (mg/L)	pH = 4.0 (mg/L)	CCME (mg/L)
Temperature			10°C	10°C	10°C	10°C	
Final pH	H^+		9.72	8.00	6.00	4.00	
Final Eh	e^-		203 mV	300 mV	413 mV	525 mV	
Ionic Strength (M)			0.028	0.026	0.03	0.031	
Sulphate	SO_4^{-2}	775.7	929.4	852.4	987.0	1038.5	
Alkalinity	$CaCO_3$	185.0	185.0	57.4	185.0	185.0	
Aluminum	Al^{+3}	1.161	1.160	0.001	0.003	1.160	**0.1**
Antimony	Sb(V)	0.534	0.536	0.536	0.536	0.536	
	Sb(III)		0.000	1.88E-11	1.87E-09	1.77E-07	
Arsenic	As(V)	0.275	0.277	0.277	0.277	0.277	**0.005**
	As(III)		6.66E-18	5.98E-15	7.98E-12	9.01E-10	
Barium	Ba^{+2}	0.209	0.206	0.006	0.006	0.005	
Beryllium		0.011					
Bismuth		0.985					
Boron	H_3BO_3	2.673	2.674	2.674	2.674	2.674	
Cadmium	Cd^{+2}	0.054	0.056	0.056	0.056	0.056	**0.00008**
Calcium	Ca^{+2}	316.9	316.9	266.4	315.9	316.9	
Chromium		0.092					
Cobalt		0.095					
Copper	Cu^{+2}	0.358	0.356	0.020	0.356	0.356	**0.002**
Iron	Fe(II)	5.093	0.0001	2.36E-07	2.34E-03	3.99E+00	**0.3**
	Fe(III)		5.093	7.21E-06	7.19E-04	5.86E-02	
Lead	Pb^{+2}	0.459	0.456	0.045	0.456	0.456	**0.002**
Lithium		0.165					
Magnesium	Mg^{+2}	38.0	37.9	37.9	37.9	37.9	
Manganese	Mn^{+2}	3.38	3.38	0.94	3.38	3.38	
Mercury		0.158					
Molybdenum	MoO_4^{-2}	0.099	0.096	0.096	0.096	0.096	**0.073**
Nickel	Ni^{+2}	0.635	0.632	0.632	0.632	0.632	**0.065**
Phosphorus	PO_4^{-3}	1.17	1.17	2.59E-04	6.18E-01	1.17E+00	
Potassium	K^{+1}	24.4	24.4	24.4	24.4	24.2	
Selenium	Se(IV)	0.509	0.505	0.505	0.505	0.505	**0.001**
	Se(VI)		0.0005	1.94E-04	3.12E-06	3.06E-08	
Silicon	H_4SiO_4	7.33	7.32	6.72	6.72	7.32	
Silver	Ag^{+1}	0.161	0.162	0.162	0.162	0.162	**0.0001**
Sodium	Na^{+1}	29.5	29.5	29.5	29.5	29.5	
Strontium		1.35					
Thallium		1.72					
Vanadium		0.85					
Zinc	Zn^{+2}	6.061	6.062	1.50	6.06	6.06	**0.03**

MINTEQ Simulation
Base Case without precipitation

Temperature 10C
final pH 9.72
final Eh 203 mV pe=3.61
Ionic Strengtl 0.028

Parameter	Initial Concentration (mg/L)	CCME	GFW (mg/mmol)	Symbol	MINTEQA2 Simulation: MINTEQ Component	Total dissolved (mmol/L)	Remaining Dissolved (mg/L)	% dissolved	Sat. Index	Saturated Phase
Sulphate	775.7		96.0636	SO4	SO4-2	9.6748	929.4	100%	-0.38	Gypsum
Alkalinity	185.0		100.0872	CaCO3	CO3-2	1.8485	185.0	100%	2.01	Calcite
Aluminum	1.161	**0.1**	26.981539	Al	Al+3	0.0430	1.160	100%	1.26	Al(OH)3
Antimony	0.534		121.75	Sb	Sb(OH)3	0.0000	0.000	100%		
					Sb(OH)6-1	0.0044	0.536	100%		
Arsenic	0.275	**0.005**	74.92159	As	AsO4-3	0.0037	0.277	100%		
					H3AsO3	0.0000	6.66E-18	100%		
Barium	0.209		137.327	Ba	Ba+2	0.0015	0.206	100%	1.54	Barite
Beryllium	0.011		9.012182	Be						
Bismuth	0.985		208.98037	Bi						
Boron	2.673		10.811	B	H3BO3	0.2473	2.674	100%		
Cadmium	0.054	**0.00008**	112.411	Cd	Cd+2	0.0005	0.056	100%	1.08	Otavite
Calcium	316.9		40.078	Ca	Ca+2	7.9080	316.9	100%	2.01	Calcite
Chromium	0.092		51.9961	Cr						
Cobalt	0.095		58.93320	Co						
Copper	0.358	**0.002**	63.546	Cu	Cu+2	0.0056	0.356	100%	3.50	Malachite
Iron (total dissolved)	5.093	**0.3**	55.847	Fe	Fe+2	2.39E-06	0.0001	100%	6.12	Ferrihydrite
					Fe+3	0.0912	5.093	100%	9.20	Goethite
Lead	0.459	**0.002**	207.2	Pb	Pb+2	0.0022	0.456	100%	4.38	Hydrocerrusite
Lithium	0.165		6.941	Li						
Magnesium	38.0		24.3050	Mg	Mg+2	1.5613	37.9	100%	2.64	Dolomite
Manganese	3.38		54.93805	Mn	Mn+2	0.0616	3.38	100%	1.84	Rhodochrosite
Mercury	0.158		200.59	Hg						
Molybdenum	0.099	**0.073**	95.94	Mo	MoO4-2	0.0010	0.096	100%		
Nickel	0.635	**0.065**	58.546	Ni	Ni+2	0.0108	0.632	100%	2.68	Ni(OH)2 (c)
Phosphorus	1.17		30.973762	P	PO4-3	0.0377	1.17	100%	16.2	Hydroxyapatite
Potassium	24.4		39.0983	K	K+1	0.6239	24.4	100%	3.40	K-Jarosite
Selenium	0.509	**0.001**	78.96	Se	HSeO3-1	0.0064	0.505	100%		
					SeO4-2	0.0000	0.0005	100%		
Silicon	7.33		28.0855	Si	H4SiO4	0.2608	7.32	100%	2.52	Imogolite
Silver	0.161	**0.0001**	107.8682	Ag	Ag+1	0.0015	0.162	100%		
Sodium	29.5		22.989768	Na	Na+1	1.2850	29.5	100%		
Strontium	1.35		87.62	Sr						
Thallium	1.72		204.3833	Tl						
Vanadium	0.85		50.9415	V						
Zinc	6.061	**0.03**	65.39	Zn	Zn+2	0.0927	6.062	100%	6.63	Hydrozincite

MINTEQ Simulation
Base Case withpH adjustment and precipitation

Temperature 10C
final pH 8.00
final Eh 300 mV pe=5.35
Ionic Strength 0.026

Parameter	Initial Concentration (mg/L)	CCME	GFW (mg/mmol)	Symbol	MINTEQA2 Simulation					
					MINTEQ Component	Total dissolved (mmol/L)	Remaining Dissolved (mg/L)	% dissolved	% precipitated	Saturated Phase
Sulphate	775.7		96.0636	SO4	SO4-2	8.8738	852.4	99.98%	0.02%	Barite
Alkalinity	185.0		100.0872	CaCO3	CO3-2	0.5735	57.4	31.0%	69.0%	Calcite
Aluminum	1.161	**0.1**	26.981539	Al	Al+3	3.86E-05	0.001	0.09%	99.9%	Al(OH)3
Antimony	0.534		121.75	Sb	Sb(OH)3	1.54E-13	1.88E-11	100%		
					Sb(OH)6-1	0.0044	0.536	100%		
Arsenic	0.275	**0.005**	74.92159	As	AsO4-3	0.0037	0.277	100%		
					H3AsO3	7.98E-17	5.98E-15	100%		
Barium	0.209		137.327	Ba	Ba+2	4.13E-05	0.006	3%	97.3%	Barite
Beryllium	0.011		9.012182	Be						
Bismuth	0.985		208.98037	Bi						
Boron	2.673		10.811	B	H3BO3	0.2473	2.674	100%		
Cadmium	0.054	**0.00008**	112.411	Cd	Cd+2	0.0005	0.056	100%		
Calcium	316.9		40.078	Ca	Ca+2	6.6469	266.4	84%	16.0%	Calcite
Chromium	0.092		51.9961	Cr						
Cobalt	0.095		58.93320	Co						
Copper	0.358	**0.002**	63.546	Cu	Cu+2	0.0003	0.020	6%	94.3%	Malachite
Iron (total dissolved)	5.093	**0.3**	55.847	Fe	Fe+2	4.22E-09	2.36E-07	100%		
					Fe+3	1.29E-07	7.21E-06		100.0%	Ferrihydrite
Lead	0.459	**0.002**	207.2	Pb	Pb+2	0.0002	0.045	10%	90.2%	Hydrocerrusite
Lithium	0.165		6.941	Li						
Magnesium	38.0		24.3050	Mg	Mg+2	1.5614	37.9	100%		
Manganese	3.38		54.93805	Mn	Mn+2	0.0171	0.94	28%	72.2%	Rhodochrosite
Mercury	0.158		200.59	Hg						
Molybdenum	0.099	**0.073**	95.94	Mo	MoO4-2	0.0010	0.096	100%		
Nickel	0.635	**0.065**	58.546	Ni	Ni+2	0.0108	0.632	100%		
Phosphorus	1.17		30.973762	P	PO4-3	8.35E-06	2.59E-04	0%	100.0%	Hydroxyapatite
Potassium	24.4		39.0983	K	K+1	0.6239	24.4	100%		
Selenium	0.509	**0.001**	78.96	Se	HSeO3-1	0.0064	0.505	100%		
					SeO4-2	2.45E-06	1.94E-04	100%		
Silicon	7.33		28.0855	Si	H4SiO4	0.2393	6.72	92%	8.2%	Imogolite
Silver	0.161	**0.0001**	107.8682	Ag	Ag+1	0.0015	0.162	100%		
Sodium	29.5		22.989768	Na	Na+1	1.2850	29.5	100%		
Strontium	1.35		87.62	Sr						
Thallium	1.72		204.3833	Tl						
Vanadium	0.85		50.9415	V						
Zinc	6.061	**0.03**	65.39	Zn	Zn+2	0.0230	1.50	25%	75.2%	Hydrozincite

MINTEQ Simulation
pH=6.0

Temperature 10C
final pH 6.00
final Eh 413 mV pe=7.35
Ionic Strength 0.03

Parameter	Initial Concentration (mg/L)	CCME	GFW (mg/mmol)	Symbol	MINTEQA2 Simulation					
					MINTEQ Component	Total dissolved (mmol/L)	Remaining Dissolved (mg/L)	% dissolved	% precipitated	Saturated Phase
Sulphate	775.7		96.0636	SO4	SO4-2	10.2740	987.0	99.99%	0.01%	Barite
Alkalinity	185.0		100.0872	CaCO3	CO3-2	1.8485	185.0	100%		
Aluminum	1.161	**0.1**	26.981539	Al	Al+3	1.14E-04	0.003	0.27%	99.7%	Imogolite
Antimony	0.534		121.75	Sb	Sb(OH)3	1.53E-11	1.87E-09	100%		
					Sb(OH)6-1	0.0044	0.536	100%		
Arsenic	0.275	**0.005**	74.92159	As	AsO4-3	0.0037	0.277	100%		
					H3AsO3	1.07E-13	7.98E-12	100%		
Barium	0.209		137.327	Ba	Ba+2	4.36E-05	0.006	2.9%	97.1%	Barite
Beryllium	0.011		9.012182	Be						
Bismuth	0.985		208.98037	Bi						
Boron	2.673		10.811	B	H3BO3	0.2473	2.674	100%		
Cadmium	0.054	**0.00008**	112.411	Cd	Cd+2	0.0005	0.056	100%		
Calcium	316.9		40.078	Ca	Ca+2	7.8818	315.9	99.66%	0.34%	Hydroxyapatite
Chromium	0.092		51.9961	Cr						
Cobalt	0.095		58.93320	Co						
Copper	0.358	**0.002**	63.546	Cu	Cu+2	0.0056	0.356	100%		
Iron (total dissolved)	5.093	**0.3**	55.847	Fe	Fe+2	4.20E-05	2.34E-03	100%		
					Fe+3	1.29E-05	7.19E-04		100.0%	Ferrihydrite
Lead	0.459	**0.002**	207.2	Pb	Pb+2	0.0022	0.456	100%		
Lithium	0.165		6.941	Li						
Magnesium	38.0		24.3050	Mg	Mg+2	1.5614	37.9	100%		
Manganese	3.38		54.93805	Mn	Mn+2	0.0616	3.38	100%		
Mercury	0.158		200.59	Hg						
Molybdenum	0.099	**0.073**	95.94	Mo	MoO4-2	0.0010	0.096	100%		
Nickel	0.635	**0.065**	58.546	Ni	Ni+2	0.0108	0.632	100%		
Phosphorus	1.17		30.973762	P	PO4-3	2.00E-02	6.18E-01	53%	47.0%	Hydroxyapatite
Potassium	24.4		39.0983	K	K+1	0.6239	24.4	100%		
Selenium	0.509	**0.001**	78.96	Se	HSeO3-1	0.0064	0.505	100%		
					SeO4-2	3.96E-08	3.12E-06	100%		
Silicon	7.33		28.0855	Si	H4SiO4	0.2394	6.72	92%	8.2%	Imogolite
Silver	0.161	**0.0001**	107.8682	Ag	Ag+1	0.0015	0.162	100%		
Sodium	29.5		22.989768	Na	Na+1	1.2850	29.5	100%		
Strontium	1.35		87.62	Sr						
Thallium	1.72		204.3833	Tl						
Vanadium	0.85		50.9415	V						
Zinc	6.061	**0.03**	65.39	Zn	Zn+2	0.0927	6.06	100%		

MINTEQ Simulation
pH=4.0

Temperature 10C
final pH 4.00
final Eh 525 mV pe=9.35
Ionic Strength 0.031

Parameter	Initial Concentration (mg/L)	CCME	GFW (mg/mmol)	Symbol	MINTEQA2 Simulation					
					MINTEQ Component	Total dissolved (mmol/L)	Remaining Dissolved (mg/L)	% dissolved	% precipitated	Saturated Phase
Sulphate	775.7		96.0636	SO4	SO4-2	10.8110	1038.5	99.87%	0.13%	Barite & K-Jarosite
Alkalinity	185.0		100.0872	CaCO3	CO3-2	1.8485	185.0	100%		
Aluminum	1.161	**0.1**	26.981539	Al	Al+3	4.30E-02	1.160	100%		
Antimony	0.534		121.75	Sb	Sb(OH)3	1.45E-09	1.77E-07	100%		
					Sb(OH)6-1	0.0044	0.536	100%		
Arsenic	0.275	**0.005**	74.92159	As	AsO4-3	0.0037	0.277	100%		
					H3AsO3	1.20E-11	9.01E-10	100%		
Barium	0.209		137.327	Ba	Ba+2	3.80E-05	0.005	2.5%	97.5%	Barite
Beryllium	0.011		9.012182	Be						
Bismuth	0.985		208.98037	Bi						
Boron	2.673		10.811	B	H3BO3	0.2473	2.674	100%		
Cadmium	0.054	**0.00008**	112.411	Cd	Cd+2	0.0005	0.056	100%		
Calcium	316.9		40.078	Ca	Ca+2	7.9081	316.9	100%		
Chromium	0.092		51.9961	Cr						
Cobalt	0.095		58.93320	Co						
Copper	0.358	**0.002**	63.546	Cu	Cu+2	0.0056	0.356	100%		
Iron (total dissolved)	5.093	**0.3**	55.847	Fe	Fe+2	7.15E-02	3.99E+00	100%		
					Fe+3	1.05E-03	5.86E-02	5.3%	94.7%	K-Jarosite
Lead	0.459	**0.002**	207.2	Pb	Pb+2	0.0022	0.456	100%		
Lithium	0.165		6.941	Li						
Magnesium	38.0		24.3050	Mg	Mg+2	1.5614	37.9	100%		
Manganese	3.38		54.93805	Mn	Mn+2	0.0616	3.38	100%		
Mercury	0.158		200.59	Hg						
Molybdenum	0.099	**0.073**	95.94	Mo	MoO4-2	0.0010	0.096	100%		
Nickel	0.635	**0.065**	58.546	Ni	Ni+2	0.0108	0.632	100%		
Phosphorus	1.17		30.973762	P	PO4-3	3.77E-02	1.17E+00	100%		
Potassium	24.4		39.0983	K	K+1	0.6177	24.2	99.0%	1.0%	K-Jarosite
Selenium	0.509	**0.001**	78.96	Se	HSeO3-1	0.0064	0.505	100%		
					SeO4-2	3.88E-10	3.06E-08	100%		
Silicon	7.33		28.0855	Si	H4SiO4	0.2608	7.32	100%		
Silver	0.161	**0.0001**	107.8682	Ag	Ag+1	0.0015	0.162	100%		
Sodium	29.5		22.989768	Na	Na+1	1.2850	29.5	100%		
Strontium	1.35		87.62	Sr						
Thallium	1.72		204.3833	Tl						
Vanadium	0.85		50.9415	V						
Zinc	6.061	**0.03**	65.39	Zn	Zn+2	0.0927	6.06	100%		

Charge balance - Unspeciated:

Sum of cations=	0.021512201	Sum of anions=	0.0215862
Percent difference=	0.1716978		

Improved activity guesses prior to first iteration:

Log activity:	Al+3	-11.67903294
Log activity:	CO3-2	-5.234980832
Log activity:	Fe+2	-4.045388196
Log activity:	Fe+3	-17.47367724
Log activity:	Mn+2	-4.210725166
Log activity:	H4SiO4	-3.583692415
Log activity:	SO4-2	-2.051827028
Log activity:	H3AsO3	-53.43179829
Log activity:	Cu+2	-5.660757623
Log activity:	PO4-3	-9.005401253
Log activity:	SeO4-2	-19.50188823
Log activity:	HSeO3-1	-5.326596578
Log activity:	Sb(OH)3	-13.35654734
Log activity:	Sb(OH)6-1	-13.66654733
Log activity:	AsO4-3	-54.70743378

RESULTS:

Parameters of the component most out of balance:

Iter.	Name	Total mol	Diff fxn	Log activity	Residual
0	MoO4-2	1.00E-06	4.003E-06	-6	4.002E-06
1	MoO4-2	1.00E-06	1.15E-06	-6.298477	1.15E-06
2	MoO4-2	1.00E-06	1.658E-07	-6.486906	1.657E-07
3	MoO4-2	1.00E-06	7.82E-10	-6.537197	6.82E-10
4	MoO4-2	1.00E-06	-4.89E-10	-6.538073	3.89E-10

ID	Name	Anal mol	Calc mol	Log Activity	Gamma	New logK
61	AsO4-3	3.70E-06	8.18E-10	-9.700976	2.43E-01	0
30	Al+3	4.30E-05	7.39E-12	-11.74518	2.43E-01	0
150	Ca+2	7.91E-03	5.77E-03	-2.511646	5.34E-01	0
140	CO3-2	1.85E-03	8.82E-06	-5.327501	5.34E-01	0
280	Fe+2	9.00E-05	2.08E-06	-5.955723	5.34E-01	0
100	Ba+2	1.50E-06	1.20E-06	-6.193916	5.34E-01	0
410	K+1	6.24E-04	6.13E-04	-3.281004	8.55E-01	0
460	Mg+2	0.0015614	0.0011972	-3.194601	0.5336418	0
470	Mn+2	6.16E-05	4.34E-05	-4.635019	0.5336418	0
500	Na+1	1.29E-03	1.26E-03	-2.967634	0.8546976	0
770	H4SiO4	0.0002608	0.0002584	-3.584781	1.006685	0
950	Zn+2	0.0000927	5.695E-05	-4.517231	0.5336418	0
732	SO4-2	8.88E-03	6.40E-03	-2.466689	0.5336418	0
20	Ag+1	1.50E-06	1.41E-06	-5.917753	0.8546976	0
740	Sb(OH)3	0.0000044	1.532E-16	-15.81183	1.006685	0
231	Cu+2	0.0000056	3.192E-07	-6.768683	0.5336418	0
600	Pb+2	2.20E-06	1.82E-07	-7.011796	0.5336418	0
540	Ni+2	0.0000108	7.221E-06	-5.414167	0.5336418	0
90	H3BO3	0.0002473	0.000233	-3.629703	1.006685	0
160	Cd+2	5.00E-07	3.36E-07	-6.746807	0.5336418	0
580	PO4-3	0.0000377	1.239E-09	-9.520771	0.2433953	0
762	SeO4-2	6.40E-06	2.17E-09	-8.936818	0.5336418	0
480	MoO4-2	1.00E-06	5.43E-07	-6.53797	0.5336418	0
2	H2O	-2.56E-23	-3.26E-04	-0.00017	1	0
60	H3AsO3	1.00E-16	7.49E-20	-19.12276	1.006685	0
330	H+1	1.00E-09	1.17E-08	-8	0.8546976	0
281	Fe+3	0.0000012	3.79E-14	-14.03522	0.2433953	0
1	E-1	1.00E-16	4.48E-06	-5.348797	0.8546976	0
761	HSeO3-1	1.00E-16	4.07E-06	-5.45895	0.8546976	0
741	Sb(OH)6-1	1.00E-16	4.40E-06	-5.424747	0.8546976	0

Part 4 of output file

Percentage distribution of components among type I and type II species

AsO4-3

0.022107925	% bound in species	6.10E+01	AsO4-3
93.86865132	% bound in species	3.30E+06	HAsO4-2
6.109232023	% bound in species	3.30E+06	H2AsO4-

Al+3

0.181265535	% bound in species	303301	Al(OH)2+
1.953252144	% bound in species	303303	Al(OH)3 (aq)
97.83377027	% bound in species	3.03E+05	Al(OH)4-
0.027047173	% bound in species	3.01E+05	Al2(OH)2CO3+2

Ca+2

72.95403874	% bound in species	1.50E+02	Ca+2
25.99101125	% bound in species	1.51E+06	CaSO4 (aq)
0.134733906	% bound in species	1505800	CaHPO4 (aq)
0.030015164	% bound in species	1505801	CaPO4-
0.611034661	% bound in species	1.50E+06	CaHCO3+
0.249440504	% bound in species	1501401	CaCO3 (aq)
0.024604282	% bound in species	1500901	CaH2BO3+

CO3-2

0.47691341	% bound in species	1.40E+02	CO3-2
91.59310603	% bound in species	3.30E+06	HCO3-
2.260554863	% bound in species	3.30E+06	H2CO3* (aq)
0.083368119	% bound in species	6.00E+06	PbCO3 (aq)
0.442145567	% bound in species	9.50E+06	ZnCO3 (aq)
0.06104454	% bound in species	9.50E+06	ZnHCO3+
0.253578857	% bound in species	2.31E+06	CuCO3 (aq)
0.01211396	% bound in species	2.31E+06	Cu(CO3)2-2
0.036193318	% bound in species	5.40E+06	NiCO3 (aq)
0.030179331	% bound in species	5.40E+06	NiHCO3+
0.036832688	% bound in species	4.70E+06	MnHCO3+
0.106695165	% bound in species	4.60E+06	MgCO3 (aq)
0.55403521	% bound in species	4.60E+06	MgHCO3+
2.614029751	% bound in species	1.50E+06	CaHCO3+
1.067116057	% bound in species	1.50E+06	CaCO3 (aq)

	0.053344183	% bound in species	5001401	NaHCO3 (aq)
	0.293613486	% bound in species	4701401	MnCO3 (aq)
Fe+2				
	71.15447611	% bound in species	2.80E+02	Fe+2
	0.540144123	% bound in species	2.80E+06	FeOH+
	26.64548169	% bound in species	2.81E+06	FeSO4 (aq)
	0.025111326	% bound in species	2.81E+06	FeH2PO4+
	1.073465271	% bound in species	2.81E+06	FeHPO4 (aq)
	0.561227412	% bound in species	2.80E+06	FeHCO3+
Ba+2				
	79.94192983	% bound in species	1.00E+02	Ba+2
	19.51830852	% bound in species	1.01E+06	BaSO4 (aq)
	0.049700433	% bound in species	1.01E+06	BaHPO4 (aq)
	0.075805249	% bound in species	1.00E+06	BaCO3 (aq)
	0.399717255	% bound in species	1.00E+06	BaHCO3+
	0.014478914	% bound in species	1.00E+06	BaH2BO3+
K+1				
	98.19260827	% bound in species	4.10E+02	K+1
	1.801825772	% bound in species	4.11E+06	KSO4-
Mg+2				
	76.6769813	% bound in species	4.60E+02	Mg+2
	0.011148661	% bound in species	4.60E+06	MgMoO4(aq)
	22.31022464	% bound in species	4.61E+06	MgSO4 (aq)
	0.19547576	% bound in species	4.61E+06	MgHPO4 (aq)
	0.126319538	% bound in species	4.60E+06	MgCO3 (aq)
	0.655938552	% bound in species	4.60E+06	MgHCO3+
	0.01697265	% bound in species	4.60E+06	MgH2BO3+
Mn+2				
	70.49812231	% bound in species	4.70E+02	Mn+2
	0.031000027	% bound in species	4.70E+06	MnOH+
	18.8409265	% bound in species	4.71E+06	MnSO4 (aq)
	0.710825718	% bound in species	4.71E+06	MnHPO4 (aq)
	1.105325565	% bound in species	4.70E+06	MnHCO3+
	8.811154262	% bound in species	4.70E+06	MnCO3 (aq)
Na+1				
	98.09800384	% bound in species	5.00E+02	Na+1
	1.801734324	% bound in species	5.01E+06	NaSO4-
	0.013274655	% bound in species	5.00E+06	NaCO3-
	0.076736811	% bound in species	5.00E+06	NaHCO3 (aq)
H4SiO4				
	99.08710917	% bound in species	7.70E+02	H4SiO4
	0.176364368	% bound in species	7.71E+06	H4SiO4SO4-2
	0.73649164	% bound in species	3.31E+06	H3SiO4-
Zn+2				
	61.44186931	% bound in species	9.50E+02	Zn+2
	1.171581277	% bound in species	9.50E+06	ZnOH+
	4.154149366	% bound in species	9.50E+06	Zn(OH)2 (aq)
	21.31036923	% bound in species	9.51E+06	ZnSO4 (aq)
	1.364856788	% bound in species	9.51E+06	Zn(SO4)2-2
	0.480894038	% bound in species	9.51E+06	ZnHPO4 (aq)
	8.816984854	% bound in species	9.50E+06	ZnCO3 (aq)
	1.217311269	% bound in species	9.50E+06	ZnHCO3+
	0.027130845	% bound in species	9.50E+06	Zn(CO3)2-2
	0.013007648	% bound in species	9.50E+06	ZnH2BO3+
SO4-2				
	72.09686161	% bound in species	7.32E+02	SO4-2
	0.222587612	% bound in species	9.51E+06	ZnSO4 (aq)
	0.028511961	% bound in species	9.51E+06	Zn(SO4)2-2
	0.025958316	% bound in species	5.41E+06	NiSO4 (aq)
	0.130770651	% bound in species	4.71E+06	MnSO4 (aq)
	3.925030067	% bound in species	4.61E+06	MgSO4 (aq)
	23.15968737	% bound in species	1.51E+06	CaSO4 (aq)
	0.260878875	% bound in species	5.01E+06	NaSO4-
	0.126669718	% bound in species	4.11E+06	KSO4-
Ag+1				
	94.26558467	% bound in species	2.00E+01	Ag+1
	5.625014784	% bound in species	2.07E+05	AgSO4-
	0.084217706	% bound in species	2.08E+05	AgSeO3-1
	0.017122573	% bound in species	2.01E+05	AgH2BO3 (aq)
Sb(OH)3				
	99.98215475	% bound in species	7.40E+02	Sb(OH)3
	0.017816995	% bound in species	7.40E+06	Sb(OH)4-1
Cu+2				
	5.700097858	% bound in species	2.31E+02	Cu+2
	5.269935664	% bound in species	2.31E+06	CuOH+
	0.243141745	% bound in species	2.31E+06	Cu(OH)2 (aq)
	0.129684294	% bound in species	2.31E+06	Cu2(OH)2+2
	1.962487559	% bound in species	2.32E+06	CuSO4 (aq)
	0.288049883	% bound in species	2.32E+06	CuHPO4 (aq)
	83.70236675	% bound in species	2.31E+06	CuCO3 (aq)
	0.225329872	% bound in species	2.31E+06	CuHCO3+
	1.999313197	% bound in species	2.31E+06	Cu(CO3)2-2
	0.458792812	% bound in species	2.31E+06	CuH2BO3+
Pb+2				
	8.289646276	% bound in species	6.00E+02	Pb+2

	7.867348704	% bound in species	6.00E+06 PbOH+
	0.353633113	% bound in species	6.00E+06 Pb(OH)2 (aq)
	7.348581117	% bound in species	6.01E+06 PbSO4 (aq)
	0.285206041	% bound in species	6.01E+06 Pb(SO4)2-2
	0.039547749	% bound in species	6.01E+06 PbHPO4 (aq)
	1.597843689	% bound in species	6.00E+06 Pb(CO3)2-2
	70.04734111	% bound in species	6.00E+06 PbCO3 (aq)
	4.134969312	% bound in species	6.00E+06 PbHCO3+
	0.035016325	% bound in species	6.00E+06 PbH2BO3+
Ni+2			
	66.86295078	% bound in species	5.40E+02 Ni+2
	0.174830043	% bound in species	5.40E+06 NiOH+
	0.035908961	% bound in species	5.40E+06 Ni(OH)2 (aq)
	21.3316494	% bound in species	5.41E+06 NiSO4 (aq)
	0.228439318	% bound in species	5.41E+06 NiHPO4 (aq)
	6.194997796	% bound in species	5.40E+06 NiCO3 (aq)
	5.165618923	% bound in species	5.40E+06 NiHCO3+
H3BO3			
	94.22774657	% bound in species	9.00E+01 H3BO3
	0.010389085	% bound in species	2.31E+06 CuH2BO3+
	4.850769754	% bound in species	3.30E+06 H2BO3-
	0.10715422	% bound in species	4.60E+06 MgH2BO3+
	0.78675729	% bound in species	1.50E+06 CaH2BO3+
Cd+2			
	67.1429929	% bound in species	1.60E+02 Cd+2
	0.103893671	% bound in species	1.60E+06 CdOH+
	23.65512717	% bound in species	1.61E+06 CdSO4 (aq)
	2.475274618	% bound in species	1.61E+06 Cd(SO4)2-2
	1.289989014	% bound in species	1.61E+06 CdHPO4 (aq)
	1.333329134	% bound in species	1.60E+06 CdHCO3+
	3.925147914	% bound in species	1.60E+06 CdCO3 (aq)
	0.025234774	% bound in species	1.60E+06 Cd(CO3)2-2
	0.047069008	% bound in species	1.60E+06 CdH2BO3+
PO4-3			
	48.96319457	% bound in species	3.31E+06 HPO4-2
	5.14220533	% bound in species	3.31E+06 H2PO4-
	0.065440523	% bound in species	5405800 NiHPO4 (aq)
	0.083040835	% bound in species	2.81E+06 FeHPO4 (aq)
	0.020422976	% bound in species	4.61E+06 MgPO4-
	8.09572556	% bound in species	4.61E+06 MgHPO4 (aq)
	28.26247801	% bound in species	1.51E+06 CaHPO4 (aq)
	6.296135457	% bound in species	1.51E+06 CaPO4-
	0.274242242	% bound in species	1.51E+06 CaH2PO4+
	0.280841413	% bound in species	5.01E+06 NaHPO4-
	0.088123562	% bound in species	4.11E+06 KHPO4-
	0.017108324	% bound in species	1.61E+06 CdHPO4 (aq)
	1.182451211	% bound in species	9.51E+06 ZnHPO4 (aq)
	0.042788953	% bound in species	2.32E+06 CuHPO4 (aq)
	1.1614352	% bound in species	4.71E+06 MnHPO4 (aq)
SeO4-2			
	85.55278153	% bound in species	7.62E+02 SeO4-2
	13.96188526	% bound in species	1.51E+06 CaSeO4 (aq)
	0.213481233	% bound in species	9.51E+06 ZnSeO4 (aq)
	0.060602714	% bound in species	5.41E+06 NiSeO4 (aq)
	0.209720084	% bound in species	4.71E+06 MnSeO4 (aq)
MoO4-2			
	54.30016708	% bound in species	4.80E+02 MoO4-2
	17.40715412	% bound in species	4.60E+06 MgMoO4(aq)
	28.28899614	% bound in species	1.50E+06 CaMoO4(aq)
H2O			
	0.099052521	% bound in species	3.30E+06 OH-
	0.047979321	% bound in species	6.00E+06 PbOH+
	0.043212703	% bound in species	3.03E+05 Al(OH)2+
	0.698466795	% bound in species	3.03E+05 Al(OH)3 (aq)
	46.64606169	% bound in species	3.03E+05 Al(OH)4-
	0.301047452	% bound in species	9.50E+06 ZnOH+
	2.134885742	% bound in species	9.50E+06 Zn(OH)2 (aq)
	0.081808413	% bound in species	2.31E+06 CuOH+
	47.48812682	% bound in species	2.81E+06 Fe(OH)2+
	1.522187765	% bound in species	2.81E+06 Fe(OH)3 (aq)
	0.871959543	% bound in species	2.81E+06 Fe(OH)4-
	0.020137162	% bound in species	4.60E+06 MgOH+
H3AsO3			
	95.77339736	% bound in species	6.00E+01 H3AsO3
	4.226599916	% bound in species	3300600 H2AsO3-
H+1			
	1.229962876	% bound in species	3.31E+06 HPO4-2
	0.258345956	% bound in species	3.31E+06 H2PO4-
	0.203365854	% bound in species	4.61E+06 MgHPO4 (aq)
	0.709957735	% bound in species	1.51E+06 CaHPO4 (aq)
	0.013778013	% bound in species	1.51E+06 CaH2PO4+
	0.029703354	% bound in species	9.51E+06 ZnHPO4 (aq)
	0.029175428	% bound in species	4.71E+06 MnHPO4 (aq)
	0.231411882	% bound in species	3.30E+06 HAsO4-2
	0.030121853	% bound in species	3.30E+06 H2AsO4-
	112.8167806	% bound in species	3.30E+06 HCO3-
	5.568727454	% bound in species	3.30E+06 H2CO3* (aq)
	0.075189594	% bound in species	9.50E+06 ZnHCO3+
	0.037172394	% bound in species	5.40E+06 NiHCO3+

0.045367445	% bound in species	4.70E+06	MnHCO3+
0.682414555	% bound in species	4601401	MgHCO3+
3.219744736	% bound in species	1501400	CaHCO3+
0.065704935	% bound in species	5001401	NaHCO3 (aq)

Fe+3

0.010928171	% bound in species	2.81E+06	FeOH+2
97.02361132	% bound in species	2.81E+06	Fe(OH)2+
2.073334452	% bound in species	2.81E+06	Fe(OH)3 (aq)
0.890755958	% bound in species	2.81E+06	Fe(OH)4-

E-1

99.9993197	% bound in species	4700021	MnO4-2

HSeO3-1

63.56975256	% bound in species	7.61E+02	HSeO3-1
36.41028052	% bound in species	3307611	SeO3-2
0.019746831	% bound in species	207610	AgSeO3-1

Sb(OH)6-1

99.99943884	% bound in species	741	Sb(OH)6-1

Part 5 of output file

Provisional mass distribution

idx	Name	Dissolved Mol/kg	Percent	Sorbed Mol/kg	Percent	Precipitated Mol/kg	Percent
61	AsO4-3	3.69968E-06	100	0	0	0	0
30	Al+3	4.2999E-05	100	0	0	0	0
150	Ca+2	0.007907781	100	0	0	0	0
140	CO3-2	0.00184846	100	0	0	0	0
280	Fe+2	2.91625E-06	100	0	0	0	0
100	Ba+2	1.49989E-06	100	0	0	0	0
410	K+1	0.000623886	100	0	0	0	0
460	Mg+2	0.001561292	100	0	0	0	0
470	Mn+2	6.15961E-05	100	0	0	0	0
500	Na+1	0.001284971	100	0	0	0	0
770	H4SiO4	0.000260801	100	0	0	0	0
950	Zn+2	9.26948E-05	100	0	0	0	0
732	SO4-2	0.008874525	100	0	0	0	0
20	Ag+1	1.49997E-06	100	0	0	0	0
740	Sb(OH)3	1.53233E-16	100	0	0	0	0
231	Cu+2	5.59996E-06	100	0	0	0	0
600	Pb+2	2.19998E-06	100	0	0	0	0
540	Ni+2	1.07993E-05	100	0	0	0	0
90	H3BO3	0.0002473	100	0	0	0	0
160	Cd+2	4.99969E-07	100	0	0	0	0
580	PO4-3	3.76983E-05	100	0	0	0	0
762	SeO4-2	2.53337E-09	100	0	0	0	0
480	MoO4-2	9.99952E-07	100	0	0	0	0
2	H2O	0.000360739	100	0	0	0	0
60	H3AsO3	7.81804E-20	100	0	0	0	0
330	H+1	0.001500718	100	0	0	0	0
281	Fe+3	8.82816E-05	100	0	0	0	0
1	E-1	-4.10416E-44	100	0	0	0	0
761	HSeO3-1	6.39716E-06	100	0	0	0	0
741	Sb(OH)6-1	4.3999E-06	100	0	0	0	0

Charge balance: SPECIATED

Sum of cations=	0.016181298	Sum of anions=	0.0146656
Percent difference=	4.913656934		
Provisional ionic strei	0.028937679		
Provisional pH=	8		
Provisional pe=	5.348796552	or Eh=	300.49467

Part 6 of output file

Saturation indices and stoichiometry of all supersaturated minerals

ID	Name	log IAP	Sat. Index	No. of comp	Stoichiometry on line below								
1960000	Zn-Al LDH	24.55559089	4.7255909	5									
2	950	1	30	0.5	140	-6	330	6	2	0	0	0	0
2000	Ag metal	-11.26654951	3.2217636	2									
1	20	1	1	0	0	0	0	0	0	0	0	0	0
2074102	SbO2	-26.77286509	1.0512349	4									
1	741	1	1	2	330	-4	2	0	0	0	0	0	0
2077000	Chalcedony	-3.584441267	0.14839	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2077002	Quartz	-3.584441267	0.6230768	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2060004	Pb(OH)2	8.987864868	0.2946222	3									
-2	330	1	600	2	2	0	0	0	0	0	0	0	0
2003000	Al(OH)3 (am)	12.25431133	0.4241454	3									
1	30	3	2	-3	330	0	0	0	0	0	0	0	0
2003001	Boehmite	12.25448098	2.584172	3									
-3	330	1	30	2	2	0	0	0	0	0	0	0	0
2003002	Diaspore	12.25448098	4.4250796	3									
-3	330	1	30	2	2	0	0	0	0	0	0	0	0
2003003	Gibbsite (C)	12.25431133	3.5398301	3									
1	30	3	2	-3	330	0	0	0	0	0	0	0	0
2003004	Al(OH)3 (Soil)	12.25431133	2.9898301	3									
1	30	3	2	-3	330	0	0	0	0	0	0	0	0
2003005	Imogolite	20.92435103	6.1275932	4									
2	30	1	770	3	2	-6	330	0	0	0	0	0	0
2023101	Tenorite(am)	9.231147783	0.1391319	3									
1	231	1	2	-2	330	0	0	0	0	0	0	0	0
2023103	Tenorite(c)	9.231147783	0.9888255	3									
1	231	-2	330	1	2	0	0	0	0	0	0	0	0
2028100	Ferrihydrite	9.964275648	5.8324859	3									
1	281	3	2	-3	330	0	0	0	0	0	0	0	0

2028101 Fe3(OH)8		29.97248909	9.7504891	4									
-8	330	2	281	1	280	8	2	0	0	0	0	0	0
2028102 Goethite		9.964445299	8.9111761	3									
1	281	2	2	-3	330	0	0	0	0	0	0	0	0
2028103 Ferrihydrite (aged)		9.964275648	7.2742756	3									
1	281	-3	330	3	2	0	0	0	0	0	0	0	0
3003000 Al2O3		24.5091316	2.4568155	3									
2	30	3	2	-6	330	0	0	0	0	0	0	0	0
3028000 Magnetite		29.97316769	24.635086	4									
-8	330	2	281	1	280	4	2	0	0	0	0	0	0
3028001 Hercynite		34.55323905	8.7468195	4									
-8	330	1	280	2	30	4	2	0	0	0	0	0	0
3028100 Hematite		19.92906025	20.149961	3									
2	281	3	2	-6	330	0	0	0	0	0	0	0	0
3028101 Maghemite		19.92906025	13.54306	3									
-6	330	2	281	3	2	0	0	0	0	0	0	0	0
3028102 Lepidocrocite		9.964445299	8.5934453	3									
-3	330	1	281	2	2	0	0	0	0	0	0	0	0
3046001 Magnesioferrite		32.73428963	13.285997	4									
-8	330	1	460	2	281	4	2	0	0	0	0	0	0
3023100 Cupric Ferrite		29.16020803	21.221097	4									
-8	330	1	231	2	281	4	2	0	0	0	0	0	0
5060000 Cerrusite		-12.33929647	1.0907739	2									
1	600	1	140	0	0	0	0	0	0	0	0	0	0
5060003 Hydrocerrusite		-15.69072808	3.0692719	4									
3	600	2	2	-2	330	2	140	0	0	0	0	0	0
5095000 Smithsonite		-9.844731222	1.0200018	2									
1	950	1	140	0	0	0	0	0	0	0	0	0	0
5095001 ZnCO3:1H2O		-9.844900873	0.4150991	3									
1	950	1	140	1	2	0	0	0	0	0	0	0	0
5095003 Hydrozincite		14.75782792	3.8629249	4									
5	950	2	140	-6	330	6	2	0	0	0	0	0	0
5023101 Malachite		-2.865205077	2.1935847	4									
2	231	2	2	-2	330	1	140	0	0	0	0	0	0
5023102 Azurite		-14.96138829	2.0618123	4									
3	231	2	2	-2	330	2	140	0	0	0	0	0	0
5054000 NiCO3		-10.74166804	0.0723539	2									
1	540	1	140	0	0	0	0	0	0	0	0	0	0
5047000 Rhodochrosite		-9.962520079	1.0200321	2									
1	470	1	140	0	0	0	0	0	0	0	0	0	0
5015000 Aragonite		-7.839146803	0.4162379	2									
1	150	1	140	0	0	0	0	0	0	0	0	0	0
5015001 Calcite		-7.839146803	0.5713667	2									
1	150	1	140	0	0	0	0	0	0	0	0	0	0
5015002 Dolomite (ordered)		-16.36124841	0.362161	3									
1	150	1	460	2	140	0	0	0	0	0	0	0	0
5095002 ZnCO3		-9.844731222	0.9552688	2									
1	950	1	140	0	0	0	0	0	0	0	0	0	0
5047002 MnCO3 (am)		-9.962520079	0.5374799	2									
1	470	1	140	0	0	0	0	0	0	0	0	0	0
6003001 Al4(OH)10SO4		30.55089595	7.8508959	4									
-10	330	4	30	1	732	10	2	0	0	0	0	0	0
6023100 Antlerite		9.226585045	0.438585	4									
3	231	4	2	-4	330	1	732	0	0	0	0	0	0
6023101 Brochantite		18.45756318	1.3528654	4									
4	231	6	2	-6	330	1	732	0	0	0	0	0	0
6050000 Na-Jarosite		-2.007675488	2.0525522	5									
1	500	3	281	2	732	-6	330	6	2	0	0	0	0
6041002 K-Jarosite		-2.321045012	7.7341722	5									
1	410	3	281	2	732	-6	330	6	2	0	0	0	0
6010000 Barite		-8.660604204	1.5328536	2									
1	100	1	732	0	0	0	0	0	0	0	0	0	0
6041001 Alunite		4.54906202	4.0000995	5									
1	410	3	30	2	732	-6	330	6	2	0	0	0	0
6128100 Fe2(SeO3)3:2H2O		-20.44761891	0.1785811	4									
3	761	2	281	2	2	-3	330	0	0	0	0	0	0
6128101 Fe2(OH)4SeO3		6.469940993	4.916041	4									
1	761	2	281	4	2	-5	330	0	0	0	0	0	0
6260001 PbMoO4		-13.54976568	2.5707465	2									
1	600	1	480	0	0	0	0	0	0	0	0	0	0
6216001 CdMoO4		-13.28477653	1.0457129	2									
1	480	1	160	0	0	0	0	0	0	0	0	0	0
7060007 Pb3(PO4)2		-40.07692889	3.4530711	2									
3	600	2	580	0	0	0	0	0	0	0	0	0	0
7060002 Hydroxylpyromorphite		-55.62146089	7.1685391	4									
5	600	3	580	1	2	-1	330	0	0	0	0	0	0
7060003 Plumbgummite		-21.2898943	11.500106	5									
-5	330	1	600	3	30	2	580	6	2	0	0	0	0
7060005 Tsumebite		-6.31406283	3.4759372	5									
-3	330	2	600	1	231	1	580	6	2	0	0	0	0
7095000 Zn3(PO4)2:4H2O		-32.59391173	2.8260883	3									
3	950	2	580	4	2	0	0	0	0	0	0	0	0
7028001 Vivianite		-36.91006731	0.8968934	3									
3	280	2	580	8	2	0	0	0	0	0	0	0	0
7028100 Strengite		-23.5563254	2.7568056	3									
1	281	1	580	2	2	0	0	0	0	0	0	0	0
7047001 MnHPO4		-22.15579013	3.2442099	3									
1	470	1	580	1	330	0	0	0	0	0	0	0	0
7015003 Hydroxyapatite		-33.12071254	11.212287	4									
5	150	3	580	1	2	-1	330	0	0	0	0	0	0
7015006 Ca3(PO4)2 (beta)		-26.57647987	2.8446819	2									
3	150	2	580	0	0	0	0	0	0	0	0	0	0
7015007 Ca4H(PO4)3:3H2O		-46.60940568	0.4705943	4									
4	150	1	330	3	580	3	2	0	0	0	0	0	0
7210000 BaHAsO4:H2O		-23.89506092	0.7449391	4									
1	100	1	61	1	330	1	2	0	0	0	0	0	0
8603000 Halloysite		17.33990977	6.0812017	4									
2	30	2	770	1	2	-6	330	0	0	0	0	0	0

8603001	Kaolinite		17.33990977	8.5313552	4									
2		30	2	770	1	2	-6	330	0	0	0	0	0	0
8628000	Greenalite		22.9631005	2.1531005	4									
-6		330	3	280	2	770	1	2	0	0	0	0	0	0

Iterations=			5 Solid:		Ferrihydrite	precipitates	
Iterations=			5 Solid:		Hydroxyapat	precipitates	
	5	SeO4-2		6.4E-06	-1.679E-06	-8.936818	1.678E-06
	6	SeO4-2		6.4E-06	1.964E-06	-8.804725	1.964E-06
	7	SeO4-2		6.4E-06	2.241E-07	-8.920956	2.234E-07
	8	SeO4-2		6.4E-06	8.505E-09	-8.935897	7.865E-09
Iterations=			9 Solid:		Barite	precipitates	
Iterations=			9 Solid:		Al(OH)3 (Soi	precipitates	
	9	H3BO3		0.0002473	-5.153E-07	-3.629692	4.905E-07
	10	H3BO3		0.0002473	7.698E-07	-3.630056	7.451E-07
	11	H3BO3		0.0002473	-1.385E-07	-3.630178	1.138E-07
	12	Ni+2		0.0000108	2.626E-08	-5.412079	2.518E-08
Iterations=			13 Solid:		Rhodochrosi	precipitates	
	13	Ni+2		0.0000108	-3.429E-06	-5.412909	3.428E-06
	14	Ni+2		0.0000108	4.254E-06	-5.286448	4.253E-06
	15	Ni+2		0.0000108	7.221E-07	-5.388832	7.211E-07
	16	Ni+2		0.0000108	2.623E-08	-5.410647	2.515E-08
Iterations=			17 Solid:		Malachite	precipitates	
	17	Pb+2		0.0000022	-1.327E-07	-7.002633	1.324E-07
	18	Pb+2		0.0000022	8.96E-08	-7.03879	8.938E-08
	19	Ni+2		0.0000108	7.228E-07	-5.388858	7.218E-07
	20	Ni+2		0.0000108	2.627E-08	-5.410699	2.519E-08
Iterations=			21 Solid:		Hydrocerrusi	precipitates	
	21	Ni+2		0.0000108	-3.432E-06	-5.41153	3.431E-06
	22	Ni+2		0.0000108	4.262E-06	-5.286273	4.261E-06
	23	Ni+2		0.0000108	7.228E-07	-5.388867	7.217E-07
	24	Ni+2		0.0000108	2.627E-08	-5.410706	2.519E-08
Iterations=			25 Solid:		Hydrozincite	precipitates	
	25	Sb(OH)3		4.4E-06	-6.37E-07	-15.81155	6.365E-07
	26	Sb(OH)3		4.4E-06	6.563E-07	-15.74363	6.558E-07
	27	Sb(OH)3		4.4E-06	7.325E-08	-15.80402	7.281E-08
	28	Sb(OH)3		4.4E-06	2.758E-09	-15.81119	2.318E-09
Iterations=			29 Solid:		Calcite	precipitates	
	29	Ag+1		0.0000015	-2.168E-07	-5.917549	2.167E-07
	30	Ag+1		0.0000015	2.208E-07	-5.859438	2.207E-07
	31	Ag+1		0.0000015	2.85E-08	-5.909711	2.835E-08
	32	Ag+1		0.0000015	1.458E-09	-5.91641	1.308E-09
	33	SO4-2		0.0088736	1.751E-06	-2.44308	8.639E-07
Iterations=			34 Solid:		Imogolite	precipitates	
	34	SO4-2		0.0088736	-0.0029992	-2.443151	0.0029984
	35	SO4-2		0.0088736	0.0038501	-2.297463	0.0038493
	36	SO4-2		0.0088736	0.000618	-2.418116	0.0006171
	37	SO4-2		0.0088736	2.746E-05	-2.44197	2.657E-05
	38	SO4-2		0.0088736	1.468E-06	-2.443084	5.803E-07
Iterations=			39 Solid		Al(OH)3 (Soi	dissolves	
	39	H4SiO4		0.0002393	-5.292E-05	-3.732714	5.289E-05
	40	H4SiO4		0.0002393	-6.065E-07	-3.624323	5.825E-07
	41	H4SiO4		0.0002393	-2.923E-07	-3.622972	2.683E-07
	42	SO4-2		0.0088736	2.746E-05	-2.441976	2.657E-05
	43	SO4-2		0.0088736	1.467E-06	-2.44309	5.8E-07

ID	Name	Anal mol	Calc mol	Log Activity	Gamma	New logK
61	AsO4-3	0.0000037	7.957E-10	-9.692076	0.2553811	0
160	Cd+2	0.0000005	3.451E-07	-6.725538	0.5451655	0
150	Ca+2	0.0079083	0.0047866	-2.583445	0.5451655	0
740	Sb(OH)3	0.0000044	1.541E-16	-15.8095	1.006121	0
480	MoO4-2	0.000001	5.609E-07	-6.514567	0.5451655	0
762	SeO4-2	0.0000064	2.145E-09	-8.931946	0.5451655	0
410	K+1	0.0006239	0.000612	-3.279083	0.8592748	0
460	Mg+2	0.0015614	0.001185	-3.189771	0.5451655	0
90	H3BO3	0.0002473	0.0002334	-3.629231	1.006121	0
500	Na+1	0.001285	0.0012602	-2.965435	0.8592748	0
20	Ag+1	0.0000015	1.41E-06	-5.916784	0.8592748	0
540	Ni+2	0.0000108	7.701E-06	-5.376906	0.5451655	0
732	SO4-2	0.0088751	0.0066118	-2.443149	0.5451655	0
770	H4SiO4	0.0002608	0.0002371	-3.622362	1.006121	0
2	H2O	-1.35525E-20	-0.0004077	-0.00017	1	0
60	H3AsO3	1E-16	7.647E-20	-19.11386	1.006121	0
330	H+1	1E-09	1.164E-08	-8	0.8592748	0
280	Fe+2	0.00009	2.987E-12	-11.78821	0.5451655	0
1	E-1	1E-16	4.479E-06	-5.348797	0.8592748	0
761	HSeO3-1	1E-16	4.091E-06	-5.454078	0.8592748	0
741	Sb(OH)6-1	1E-16	4.4E-06	-5.422415	0.8592748	0
281	Fe+3	0.0000012	5.31E-20	-19.8677	0.2553811	0
580	PO4-3	0.0000377	2.846E-13	-13.13854	0.2553811	0
100	Ba+2	0.0000015	3.26E-08	-7.750308	0.5451655	0
30	Al+3	0.000043	6.348E-15	-14.79019	0.2553811	0
470	Mn+2	0.0000616	1.283E-05	-5.15537	0.5451655	0
231	Cu+2	0.0000056	4.445E-08	-7.615634	0.5451655	0
600	Pb+2	0.0000022	3.645E-08	-7.701765	0.5451655	0
950	Zn+2	0.0000927	1.491E-05	-5.089943	0.5451655	0
140	CO3-2	0.0018485	2.731E-06	-5.827183	0.5451655	0

Type I - Components of species in solution

ID	Name	Calc mol	Activity	Log activity	Gamma	New logk
330	H+1	1.16377E-08	1E-08	-8	0.8592748	0.0658679
30	Al+3	6.34783E-15	1.621E-15	-14.79019	0.2553811	0.5928113
150	Ca+2	0.0047866	0.0026095	-2.583445	0.5451655	0.2634717
140	CO3-2	2.73079E-06	1.489E-06	-5.827183	0.5451655	0.2634717
280	Fe+2	2.98719E-12	1.629E-12	-11.78821	0.5451655	0.2634717
281	Fe+3	5.31019E-20	1.356E-20	-19.8677	0.2553811	0.5928113
410	K+1	0.000612047	0.0005259	-3.279083	0.8592748	0.0658679
460	Mg+2	0.00118495	0.000646	-3.189771	0.5451655	0.2634717
470	Mn+2	1.28263E-05	6.992E-06	-5.15537	0.5451655	0.2634717

500	Na+1	0.001260181	0.0010828	-2.965435	0.8592748	0.0658679
770	H4SiO4	0.000237131	0.0002386	-3.622362	1.006121	-0.00265
950	Zn+2	1.49117E-05	8.129E-06	-5.089943	0.5451655	0.2634717
732	SO4-2	0.006611838	0.0036045	-2.443149	0.5451655	0.2634717
480	MoO4-2	5.60925E-07	3.058E-07	-6.514567	0.5451655	0.2634717
61	AsO4-3	7.95674E-10	2.032E-10	-9.692076	0.2553811	0.5928113
231	Cu+2	4.44465E-08	2.423E-08	-7.615634	0.5451655	0.2634717
600	Pb+2	3.64507E-08	1.987E-08	-7.701765	0.5451655	0.2634717
540	Ni+2	7.70E-06	4.198E-06	-5.376906	0.5451655	0.2634717
90	H3BO3	2.33E-04	0.0002348	-3.629231	1.006121	-0.00265
160	Cd+2	3.45091E-07	1.881E-07	-6.725538	0.5451655	0.2634717
580	PO4-3	2.84626E-13	7.269E-14	-13.13854	0.2553811	0.5928113
762	SeO4-2	2.15E-09	1.17E-09	-8.931946	0.5451655	0.2634717
761	HSeO3-1	4.09E-06	3.515E-06	-5.454078	0.8592748	0.0658679
740	Sb(OH)3	1.54117E-16	1.551E-16	-15.8095	1.006121	-0.00265
741	Sb(OH)6-1	4.4E-06	3.781E-06	-5.422415	0.8592748	0.0658679
60	H3AsO3	7.65E-20	7.694E-20	-19.11386	1.006121	-0.00265
100	Ba+2	3.2596E-08	1.777E-08	-7.750308	0.5451655	0.2634717
20	Ag+1	1.40956E-06	1.211E-06	-5.916784	0.8592748	0.0658679

Type II - Other species in solution or adsorbed

ID	Name	Calc mol	Activity	Log activity	Gamma	New logk
4803300	H2Mo6O21-4	1.45E-49	1.277E-50	-49.89368	0.088331	54.247094
4604800	MgMoO4(aq)	1.86E-07	1.87E-07	-6.728167	1.006121	2.9735215
1504800	CaMoO4(aq)	2.53E-07	2.547E-07	-6.593905	1.006121	2.5014564
3300020	OH-	3.55E-07	3.054E-07	-6.515129	0.8592748	-14.449092
9503304	Zn2OH+3	6.66117E-12	1.701E-12	-11.76926	0.2553811	-8.9963947
6003300	PbOH+	3.52E-08	3.021E-08	-7.51991	0.8592748	-7.7521074
6003301	Pb(OH)2 (aq)	1.59E-09	1.599E-09	-8.796104	1.006121	-17.09665
6003302	Pb(OH)3-	1.87E-12	1.61E-12	-11.79327	0.8592748	-28.025132
6003303	Pb2OH+3	6.20E-14	1.582E-14	-13.8007	0.2553811	-5.8041886
6003304	Pb3(OH)4+2	1.55E-16	8.457E-17	-16.07277	0.5451655	-24.703326
6003306	Pb4(OH)4+4	3.69023E-20	3.26E-21	-20.48683	0.088331	-20.625207
303300	AlOH+2	1.08E-12	5.874E-13	-12.23107	0.5451655	-5.1772424
303301	Al(OH)2+	6.99E-11	6.006E-11	-10.22142	0.8592748	-11.365027
303303	Al(OH)3 (aq)	7.58E-10	7.623E-10	-9.117895	1.006121	-18.32985
303302	Al(OH)4-	3.77E-08	3.242E-08	-7.489246	0.8592748	-24.632514
9503300	ZnOH+	2.89E-07	2.483E-07	-6.605072	0.8592748	-9.4490918
9503301	Zn(OH)2 (aq)	1.03055E-06	1.037E-06	-5.984281	1.006121	-16.896649
9503302	Zn(OH)3-	3.84074E-10	3.3E-10	-9.481453	0.8592748	-28.325133
9503303	Zn(OH)4-2	9.65718E-15	5.265E-15	-14.27862	0.5451655	-40.924528
1603300	CdOH+	5.42601E-10	4.662E-10	-9.331387	0.8592748	-10.539811
1603301	Cd(OH)2 (aq)	9.49449E-12	9.553E-12	-11.01988	1.006121	-20.296651
1603302	Cd(OH)3-	1.09603E-16	9.418E-17	-16.02605	0.8592748	-33.234131
1603303	Cd(OH)4-2	1.77524E-22	9.678E-23	-22.01422	0.5451655	-47.024527
1603304	Cd2OH+3	2.08647E-15	5.328E-16	-15.2734	0.2553811	-9.2293413
2313300	CuOH+	4.17561E-08	3.588E-08	-7.445148	0.8592748	-7.7634768
2313305	Cu2OH+3	2.51648E-14	6.427E-15	-14.19202	0.2553811	-6.3677697
2313303	Cu(OH)4-2	1.82197E-17	9.933E-18	-17.00293	0.5451655	-41.123146
2313302	Cu(OH)3-	6.45247E-11	5.544E-11	-10.25614	0.8592748	-26.574131
2313301	Cu(OH)2 (aq)	1.93793E-09	1.95E-09	-8.710013	1.006121	-17.09669
2313304	Cu2(OH)2+2	7.1922E-11	3.921E-11	-10.40661	0.5451655	-10.911531
203300	AgOH (aq)	1.2117E-10	1.219E-10	-9.913954	1.006121	-11.99965
203301	Ag(OH)2-	1.39555E-14	1.199E-14	-13.92112	0.8592748	-23.938132
5403300	NiOH+	2.04623E-08	1.758E-08	-7.754913	0.8592748	-10.311969
5403301	Ni(OH)2 (aq)	4.22771E-09	4.254E-09	-8.371245	1.006121	-18.996649
5403302	Ni(OH)3-	4.98257E-12	4.281E-12	-11.36841	0.8592748	-29.925131
2803300	FeOH+	2.30425E-14	1.98E-14	-13.70334	0.8592748	-9.8490924
2803302	Fe(OH)2 (aq)	4.0238E-18	4.048E-18	-17.39271	1.006121	-21.606816
2803301	Fe(OH)3-	1.29653E-20	1.114E-20	-19.95309	0.8592748	-32.0985
2813300	FeOH+2	1.38884E-14	7.571E-15	-14.12082	0.5451655	-1.9894757
2813301	Fe(OH)2+	1.25297E-10	1.077E-10	-9.967926	0.8592748	-6.0340173
2813302	Fe(OH)3 (aq)	2.69338E-12	2.71E-12	-11.56705	1.006121	-15.701492
2813303	Fe(OH)4-	1.15033E-12	9.885E-13	-12.00504	0.8592748	-24.070797
2813304	Fe2(OH)2+4	7.95286E-27	7.025E-28	-27.15336	0.088331	-2.3637346
2813305	Fe3(OH)4+5	1.41071E-33	3.182E-35	-34.49726	0.0225581	-5.2467798
4703300	MnOH+	5.7312E-09	4.925E-09	-8.307622	0.8592748	-11.086215
4703302	Mn(OH)4-2	6.5982E-22	3.597E-22	-21.44405	0.5451655	-48.024527
4700020	MnO4-	1.67605E-50	1.44E-50	-49.84158	0.8592748	-135.36365
4700021	MnO4-2	3.03063E-45	1.652E-45	-44.78194	0.5451655	-124.75761
4603300	MgOH+	7.30635E-08	6.278E-08	-7.202167	0.8592748	-11.946358
1503300	CaOH+	1.54976E-08	1.332E-08	-7.875604	0.8592748	-13.226122
1003300	BaOH+	2.47757E-14	2.129E-14	-13.67184	0.8592748	-13.855496
303305	Al3(OH)4+5	1.21878E-26	2.749E-28	-27.56077	0.0225581	-13.542837
303304	Al2(OH)2+4	1.2208E-21	1.078E-22	-21.96724	0.088331	-7.3326445
2313306	Cu3(OH)4+2	4.38432E-13	2.39E-13	-12.62157	0.5451655	-21.510518
4703304	Mn2(OH)3+	7.30498E-11	6.277E-11	-10.20225	0.8592748	-23.825133
4703303	Mn2OH+3	4.84064E-13	1.236E-13	-12.90791	0.2553811	-10.004189
4103300	KOH (aq)	2.77419E-10	2.791E-10	-9.554213	1.006121	-14.27761
5003300	NaOH (aq)	3.79894E-10	3.822E-10	-9.417688	1.006121	-14.454733
7413300	Sb(OH)5 (aq)	2.48373E-11	2.499E-11	-10.60225	1.006121	2.8173499
3307320	HSO4-	2.73278E-09	2.348E-09	-8.629262	0.8592748	1.8797549
6007320	PbSO4 (aq)	3.48687E-08	3.508E-08	-7.454915	1.006121	2.68735
6007321	Pb(SO4)2-2	1.39768E-09	7.62E-10	-9.118064	0.5451655	3.7334717
307320	AlSO4+	3.39436E-14	2.917E-14	-13.53511	0.8592748	3.764093
307321	Al(SO4)2-	4.57705E-15	3.933E-15	-14.40528	0.8592748	5.3370701
9507320	ZnSO4 (aq)	5.58106E-06	5.615E-06	-5.250634	1.006121	2.2798091
9507321	Zn(SO4)2-2	3.69173E-07	2.013E-07	-6.696242	0.5451655	3.5434716
1607320	CdSO4 (aq)	1.31196E-07	1.32E-07	-6.879431	1.006121	2.2866071
1607321	Cd(SO4)2-2	1.41786E-08	7.73E-09	-8.111837	0.5451655	3.7634717
2317320	CuSO4 (aq)	1.65129E-08	1.661E-08	-7.779526	1.006121	2.2766071
2317321	CuHSO4+	2.22374E-16	1.911E-16	-15.71878	0.8592748	2.4058678
207320	AgSO4-	8.8796E-08	7.63E-08	-7.117475	0.8592748	1.3083271
5407320	NiSO4 (aq)	2.65134E-06	2.668E-06	-5.573884	1.006121	2.2435214
5407321	Ni(SO4)2-2	6.61099E-10	3.604E-10	-9.443205	0.5451655	1.0834717
2807320	FeSO4 (aq)	1.20711E-12	1.214E-12	-11.9156	1.006121	2.3131039
2817320	FeSO4+	5.92922E-19	5.095E-19	-18.29287	0.8592748	4.0838486
2817321	Fe(SO4)2-	3.26345E-20	2.804E-20	-19.55219	0.8592748	5.2676772

4707320	MnSO4 (aq)	3.69903E-06	3.722E-06	-5.429262	1.006121	2.1666073
4607320	MgSO4 (aq)	0.000372049	0.0003743	-3.426749	1.006121	2.2035215
1507320	CaSO4 (aq)	0.001840189	0.0018515	-2.732488	1.006121	2.2914564
5007320	NaSO4-	2.44345E-05	2.1E-05	-4.677865	0.8592748	0.7965872
4107320	KSO4-	1.18565E-05	1.019E-05	-4.99191	0.8592748	0.7961906
7707320	H4SiO4SO4-2	4.35912E-07	2.376E-07	-6.624073	0.5451655	-0.2950899
1007320	BaSO4 (aq)	8.58801E-09	8.641E-09	-8.063457	1.006121	2.1273501
3307611	SeO3-2	2.30571E-06	1.257E-06	-5.900667	0.5451655	-8.1831174
3307610	H2SeO3 (aq)	1.30536E-11	1.313E-11	-10.88162	1.006121	2.5698093
1607610	Cd(SeO3)2-2	5.62052E-13	3.064E-13	-12.51369	0.5451655	-10.616528
207610	AgSeO3-1	1.27352E-09	1.094E-09	-8.960863	0.8592748	-5.5241322
207611	Ag(SeO3)2-3	5.34405E-14	1.365E-14	-13.86494	0.2553811	-12.447189
2817610	FeHSeO3+2	1.34795E-22	7.349E-23	-22.1338	0.5451655	3.4514524
3307620	HSeO4-1	4.17315E-16	3.586E-16	-15.4454	0.8592748	1.5524102
1507620	CaSeO4 (aq)	3.0336E-10	3.052E-10	-9.515391	1.006121	1.99735
9507620	ZnSeO4 (aq)	1.46373E-12	1.473E-12	-11.83189	1.006121	2.18735
9507621	Zn(SeO4)2-2	3.23322E-21	1.763E-21	-20.75384	0.5451655	2.4634717
1607620	CdSeO4 (aq)	4.07254E-14	4.097E-14	-13.38748	1.006121	2.26735
5407620	NiSeO4 (aq)	1.69265E-12	1.703E-12	-11.76878	1.006121	2.5374192
4707620	MnSeO4 (aq)	1.6222E-12	1.632E-12	-11.78725	1.006121	2.2974192
3305800	HPO4-2	4.35659E-09	2.375E-09	-8.624325	0.5451655	12.777683
3305801	H2PO4-	4.64929E-10	3.995E-10	-9.398482	0.8592748	19.805922
3305802	H3PO4	4.75624E-16	4.785E-16	-15.32009	1.006121	21.815799
5405801	NiH2PO4+	1.12312E-14	9.651E-15	-14.01544	0.8592748	20.565868
5405800	NiHPO4 (aq)	6.48496E-12	6.525E-12	-11.18544	1.006121	15.32735
1005800	BaHPO4 (aq)	4.99466E-15	5.025E-15	-14.29884	1.006121	14.58735
2805800	FeH2PO4+	2.58301E-19	2.22E-19	-18.65374	0.8592748	22.338869
2805801	FeHPO4 (aq)	1.11072E-17	1.118E-17	-16.95175	1.006121	15.97235
2815801	FeH2PO4+2	1.28008E-25	6.979E-26	-25.15623	0.5451655	24.113472
2815800	FeHPO4+	4.24711E-19	3.649E-19	-18.43777	0.8592748	22.634332
4605800	MgPO4-	1.86717E-12	1.604E-12	-11.79468	0.8592748	4.5994924
4605802	MgHPO4 (aq)	7.44534E-10	7.491E-10	-9.125465	1.006121	15.200192
1505800	CaHPO4 (aq)	2.17877E-09	2.192E-09	-8.659139	1.006121	15.060192
1505801	CaPO4-	4.82516E-10	4.146E-10	-9.382356	0.8592748	6.4054926
1505802	CaH2PO4+	2.10171E-11	1.806E-11	-10.74329	0.8592748	21.044553
5005800	NaHPO4-	2.55209E-11	2.193E-11	-10.65897	0.8592748	13.510868
4105800	KHPO4-	8.00292E-12	6.877E-12	-11.16262	0.8592748	13.320868
305801	AlHPO4+	1.40328E-16	1.206E-16	-15.91872	0.8592748	20.075868
305800	Al2PO4+3	7.14335E-24	1.824E-24	-23.73891	0.2553811	19.572811
6005801	PbH2PO4+	1.9887E-16	1.709E-16	-15.7673	0.8592748	21.138868
6005800	PbHPO4 (aq)	4.28597E-14	4.312E-14	-13.3653	1.006121	15.47235
1605800	CdHPO4 (aq)	1.63409E-12	1.644E-12	-11.78407	1.006121	16.07735
9505800	ZnHPO4 (aq)	2.87654E-11	2.894E-11	-10.53848	1.006121	15.68735
2315800	CuHPO4 (aq)	5.5358E-13	5.57E-13	-12.25417	1.006121	16.49735
4705800	MnHPO4 (aq)	3.18746E-11	3.207E-11	-10.49391	1.006121	15.79735
4105804	K2HPO4 (aq)	6.31898E-15	6.358E-15	-14.1967	1.006121	13.49735
4105803	K2PO4-	4.2576E-18	3.658E-18	-17.4367	0.8592748	2.3258679
4105802	KH2PO4 (aq)	2.83616E-13	2.854E-13	-12.54462	1.006121	19.870349
4105801	KPO4-2	1.36975E-15	7.467E-16	-15.12683	0.5451655	1.55426
5005804	Na2HPO4 (aq)	1.76988E-14	1.781E-14	-13.74941	1.006121	13.31735
5005803	Na2PO4-	3.85889E-17	3.316E-17	-16.47941	0.8592748	2.6558678
5005802	NaH2PO4 (aq)	5.83954E-13	5.875E-13	-12.23097	1.006121	19.870349
5005801	NaPO4-2	3.27533E-15	1.786E-15	-14.74822	0.5451655	1.6192254
3300601	HAsO3-2	2.12936E-27	1.161E-27	-26.93522	0.5451655	-23.557887
3300600	H2AsO3-	3.35482E-21	2.883E-21	-20.5402	0.8592748	-9.3604671
3300612	H3AsO4	3.29795E-13	3.318E-13	-12.47911	1.006121	21.21032
3300610	HAsO4-2	3.46981E-06	1.892E-06	-5.723166	0.5451655	12.232382
3300611	H2AsO4-	2.29472E-07	1.972E-07	-6.705137	0.8592748	19.052807
7400020	Sb(OH)4-1	2.73023E-20	2.346E-20	-19.62967	0.8592748	-11.754132
7403302	Sb(OH)2+	4.3305E-23	3.721E-23	-22.42933	0.8592748	1.4458679
3301400	HCO3-	0.000532931	0.0004579	-3.339197	0.8592748	10.553854
3301401	H2CO3* (aq)	1.32308E-05	1.331E-05	-4.875763	1.006121	16.948769
6001400	Pb(CO3)2-2	7.03624E-10	3.836E-10	-9.416131	0.5451655	10.203471
6001401	PbCO3 (aq)	9.96328E-08	1.002E-07	-6.998948	1.006121	6.5273502
9501401	ZnCO3 (aq)	6.92189E-07	6.964E-07	-6.157126	1.006121	4.7573502
9501400	ZnHCO3+	9.50042E-08	8.163E-08	-7.088125	0.8592748	11.894868
1601400	CdHCO3+	2.20367E-09	1.894E-09	-8.722721	0.8592748	11.895868
6001402	PbHCO3+	5.84682E-09	5.024E-09	-8.298948	0.8592748	13.295867
1601401	CdCO3 (aq)	6.52573E-09	6.566E-09	-8.182721	1.006121	4.3673499
1601403	Cd(CO3)2-2	1.29888E-11	7.081E-12	-11.1499	0.5451655	7.4934717
2311400	CuCO3 (aq)	2.11122E-07	2.124E-07	-6.672817	1.006121	6.76735
2311402	CuHCO3+	5.65003E-10	4.855E-10	-9.313817	0.8592748	12.194868
2311401	Cu(CO3)2-2	1.56125E-09	8.511E-10	-9.069999	0.5451655	10.463471
5401401	NiCO3 (aq)	2.30814E-07	2.322E-07	-6.634089	1.006121	4.5673502
5401400	NiHCO3+	1.91328E-07	1.644E-07	-6.784089	0.8592748	12.485868
2801400	FeHCO3+	7.57664E-15	6.51E-15	-14.18639	0.8592748	11.494868
4701400	MnHCO3+	6.46683E-08	5.557E-08	-7.255176	0.8592748	11.793244
4601400	MgCO3 (aq)	6.3146E-07	6.353E-07	-6.197004	1.006121	2.8173001
4601401	MgHCO3+	3.25968E-06	2.801E-06	-5.552693	0.8592748	11.530129
1501400	CaHCO3+	1.2892E-05	1.108E-05	-4.955547	0.8592748	11.520948
1501401	CaCO3 (aq)	5.29401E-06	5.326E-06	-5.273565	1.006121	3.1344122
1001401	BaCO3 (aq)	9.99836E-12	1.006E-11	-10.99742	1.006121	2.5774192
1001400	BaHCO3+	5.24106E-11	4.504E-11	-10.34645	0.8592748	11.296909
5001400	NaCO3-	5.39652E-08	4.637E-08	-7.333754	0.8592748	1.5247316
5001401	NaHCO3 (aq)	3.13804E-07	3.157E-07	-6.500692	1.006121	10.289276
301400	Al2(OH)2CO3+2	1.46412E-15	7.982E-16	-15.09789	0.5451655	4.5734716
9501402	Zn(CO3)2-2	6.59422E-10	3.595E-10	-9.444308	0.5451655	7.5634719
4701401	MnCO3 (aq)	5.18558E-07	5.217E-07	-6.282552	1.006121	4.6973498
4601402	Mg2CO3+2	4.43349E-09	2.417E-09	-8.616726	0.5451655	3.8534716
3307701	H2SiO4-2	2.48259E-12	1.353E-12	-11.86857	0.5451655	-23.982734
3307700	H3SiO4-	1.75217E-06	1.506E-06	-5.822292	0.8592748	-10.134063
307700	AlH3SiO4+2	7.12565E-14	3.885E-14	-13.41065	0.5451655	-2.734628
2810900	FeH2BO3+2	7.18687E-18	3.918E-18	-17.40693	0.5451655	-1.6465283
6000901	Pb(H2BO3)2 (aq)	5.33486E-13	5.368E-13	-12.27023	1.006121	-13.31265
6000900	PbH2BO3+	1.56629E-10	1.346E-10	-9.870996	0.8592748	-6.474132
1600901	Cd(H2BO3)2 (aq)	1.00774E-13	1.014E-13	-12.994	1.006121	-15.01265
1600900	CdH2BO3+	2.46093E-10	2.115E-10	-9.674769	0.8592748	-7.2541323
9500901	Zn(H2BO3)2 (aq)	1.77397E-11	1.785E-11	-10.7484	1.006121	-14.40265

9500900	ZnH2BO3+	3.2114E-09	2.759E-09	-8.559174	0.8592748	-7.7741322
2310901	Cu(H2BO3)2 (aq)	3.41393E-11	3.435E-11	-10.4641	1.006121	-11.59265
2310900	CuH2BO3+	3.63918E-09	3.127E-09	-8.504865	0.8592748	-5.1941323
903300	H10(BO3)4-2	1.76522E-14	9.623E-15	-14.01667	0.5451655	-15.236279
3300900	H2BO3-	1.1945E-05	1.026E-05	-4.98868	0.8592748	-9.2935815
3300901	H5(BO3)2-	2.65123E-09	2.278E-09	-8.64242	0.8592748	-9.3180903
3300902	H8(BO3)3-	3.97485E-11	3.415E-11	-10.46655	0.8592748	-7.5129871
200901	AgH2BO3 (aq)	2.57831E-10	2.594E-10	-9.586015	1.006121	-8.04265
4600901	MgH2BO3+	2.66818E-07	2.293E-07	-6.639652	0.8592748	-7.754782
1500901	CaH2BO3+	1.64217E-06	1.411E-06	-5.850449	0.8592748	-7.5719053
1000901	BaH2BO3+	6.00559E-12	5.16E-12	-11.28731	0.8592748	-7.8419052
5000901	NaH2BO3 (aq)	2.30507E-08	2.319E-08	-7.634666	1.006121	-9.04265
3304801	HMoO4-	3.86477E-11	3.321E-11	-10.47874	0.8592748	4.1016907
3304802	MoO3(H2O)3(aq)	9.01161E-15	9.067E-15	-14.04255	1.006121	8.4693691
3304803	Mo7O24-6	1.05779E-52	4.499E-55	-54.34685	0.0042536	57.625685
3304804	HMo7O24-5	8.45365E-56	1.907E-57	-56.71965	0.0225581	62.528332
304801	AlMo6O21-3	5.10782E-47	1.304E-47	-46.88458	0.2553811	55.585312
204801	Ag2MoO4 (aq)	1.73088E-19	1.741E-19	-18.75908	1.006121	-0.4135987
4803302	H3Mo8O28-5	6.65357E-67	1.501E-68	-67.82364	0.0225581	73.938909
4803301	Mo8O26-4	9.19157E-71	8.119E-72	-71.0905	0.088331	78.078904

Type III - Species with fixed activity

ID	Name	Calc mol	Log mol	New logK	dH
2	H2O	-0.000407748	-3.3896077	0.0001697	0
600610	H3AsO3/AsO4	-9.99202E-17	-16.000347	41.275636	-138.85
330	H+1	-0.000145829	-3.836156	8	0
2802810	Fe+2/Fe+3	-9E-05	-4.0457575	13.428289	-42.7
3300021	O2 (g)	-2.15012E-05	-4.6675373	-53.39485	571.66
7617620	HSeO3-/SeO4-2	6.39762E-06	-5.1939815	38.175292	-201.2
7407410	Sb(OH)3/Sb(OH)6-	-4.40002E-06	-5.3565449	24.31	0

Type IV - Finite solids (present at equilibrium)

ID	Name	Calc mol	Log mol	New logK	dH
2028100	Ferrihydrite	9.11999E-05	-4.0400058	-4.13179	100.4
7015003	Hydroxyapatite	1.25639E-05	-4.9008762	44.333	0
6010000	Barite	1.45875E-06	-5.8360199	10.193457	-23
2003005	Imogolite	2.14807E-05	-4.6679511	-14.79676	193.6
5047000	Rhodochrosite	4.44855E-05	-4.3517815	10.982552	1.88
5023101	Malachite	2.63911E-06	-5.5785429	5.0587897	44.2
5060003	Hydrocerrusite	6.61399E-07	-6.1795361	18.76	0
5095003	Hydrozincite	1.39454E-05	-4.8555688	-10.8949	236.5
5015001	Calcite	0.001198695	-2.9212912	8.4106272	8

Type V - Undersaturated solids (not present at equilibrium)

ID	Name	Calc mol	Log mol	New logK	dH
2003004	Al(OH)3 (Soil)	0.88069189	-0.055176	-9.264481	105

Type VI - Excluded species (not present in mole balance)

ID	Name	Calc mol	Log mol	New logK	dH
3301404	CH4 (g)	0	-85.185453	43.431594	-257.133
3301403	CO2 (g)	0.00024767	-3.6061269	18.220886	-10
1	E-1	4.47923E-06	-5.3487966	0	0

Part 4 of output file

Percentage distribution of components among type I and type II species

AsO4-3

0.021504238	% bound in species	61	AsO4-3
93.77665973	% bound in species	3300610	HAsO4-2
6.201827114	% bound in species	3300611	H2AsO4-

Cd+2

69.01705772	% bound in species	160	Cd+2
0.108518477	% bound in species	1603300	CdOH+
26.23870733	% bound in species	1607320	CdSO4 (aq)
2.835681795	% bound in species	1607321	Cd(SO4)2-2
0.440727318	% bound in species	1601400	CdHCO3+
1.305124663	% bound in species	1601401	CdCO3 (aq)
0.049217738	% bound in species	1600900	CdH2BO3+

Ca+2

72.01264016	% bound in species	150	Ca+2
27.68496474	% bound in species	1507320	CaSO4 (aq)
0.193955499	% bound in species	1501400	CaHCO3+
0.079646481	% bound in species	1501401	CaCO3 (aq)
0.024705915	% bound in species	1500901	CaH2BO3+

Sb(OH)3

99.98225975	% bound in species	740	Sb(OH)3
0.01771216	% bound in species	7400020	Sb(OH)4-1

MoO4-2

56.09185209	% bound in species	480	MoO4-2
18.58566438	% bound in species	4604800	MgMoO4(aq)
25.3186179	% bound in species	1504800	CaMoO4(aq)

SeO4-2

87.43999987	% bound in species	762	SeO4-2
12.36357087	% bound in species	1507620	CaSeO4 (aq)
0.05965479	% bound in species	9507620	ZnSeO4 (aq)
0.068984484	% bound in species	5407620	NiSeO4 (aq)
0.066113202	% bound in species	4707620	MnSeO4 (aq)

K+1

98.09957485	% bound in species	410	K+1
1.900379357	% bound in species	4107320	KSO4-

Mg+2

75.8889783	% bound in species	460	Mg+2
0.011903151	% bound in species	4604800	MgMoO4(aq)
23.82753114	% bound in species	4607320	MgSO4 (aq)
0.040441239	% bound in species	4601400	MgCO3 (aq)
0.208763088	% bound in species	4601401	MgHCO3+
0.017088118	% bound in species	4600901	MgH2BO3+

H3BO3

94.38328722	% bound in species	90	H3BO3
4.830183021	% bound in species	3300900	H2BO3-
0.107892606	% bound in species	4600901	MgH2BO3+
0.664041654	% bound in species	1500901	CaH2BO3+

Na+1

98.06805033	% bound in species	500	Na+1
1.901504266	% bound in species	5007320	NaSO4-
0.024420384	% bound in species	5001401	NaHCO3 (aq)

Ag+1

93.97013068	% bound in species	20	Ag+1
5.919697497	% bound in species	207320	AgSO4-
0.084900728	% bound in species	207610	AgSeO3-1
0.017188622	% bound in species	200901	AgH2BO3 (aq)

Ni+2

71.30742181	% bound in species	540	Ni+2
0.189462871	% bound in species	5403300	NiOH+
0.039144817	% bound in species	5403301	Ni(OH)2 (aq)
24.54906954	% bound in species	5407320	NiSO4 (aq)
2.137128207	% bound in species	5401401	NiCO3 (aq)
1.771529614	% bound in species	5401400	NiHCO3+

SO4-2

74.50975854	% bound in species	732	SO4-2
0.062893736	% bound in species	9507320	ZnSO4 (aq)
0.029878353	% bound in species	5407320	NiSO4 (aq)
0.041684945	% bound in species	4707320	MnSO4 (aq)
4.192677764	% bound in species	4607320	MgSO4 (aq)
20.73735356	% bound in species	1507320	CaSO4 (aq)
0.275355537	% bound in species	5007320	NaSO4-
0.133612987	% bound in species	4107320	KSO4-

H4SiO4

99.08570507	% bound in species	770	H4SiO4
0.182146844	% bound in species	7707320	H4SiO4SO4-2
0.73214702	% bound in species	3307700	H3SiO4-

H2O

11.5799388	% bound in species	3300020	OH-
1.145316391	% bound in species	6003300	PbOH+
0.103572296	% bound in species	6003301	Pb(OH)2 (aq)
0.074053186	% bound in species	303303	Al(OH)3 (aq)
4.916427022	% bound in species	303302	Al(OH)4-
9.413766593	% bound in species	9503300	ZnOH+
67.1531817	% bound in species	9503301	Zn(OH)2 (aq)
0.037540842	% bound in species	9503302	Zn(OH)3-
0.017678619	% bound in species	1603300	CdOH+
1.360465112	% bound in species	2313300	CuOH+
0.126280121	% bound in species	2313301	Cu(OH)2 (aq)
0.666687794	% bound in species	5403300	NiOH+
0.275487976	% bound in species	5403301	Ni(OH)2 (aq)
0.18672965	% bound in species	4703300	MnOH+
2.380501635	% bound in species	4603300	MgOH+
0.50493038	% bound in species	1503300	CaOH+
0.012377412	% bound in species	5003300	NaOH (aq)

H3AsO3

95.79722553	% bound in species	60	H3AsO3
4.202771805	% bound in species	3300600	H2AsO3-

H+1

0.620546759	% bound in species	3300610	HAsO4-2
0.082078499	% bound in species	3300611	H2AsO4-
95.31031778	% bound in species	3301400	HCO3-
4.732444681	% bound in species	3301401	H2CO3* (aq)
0.016990706	% bound in species	9501400	ZnHCO3+
0.034217467	% bound in species	5401400	NiHCO3+
0.011565395	% bound in species	4701400	MnHCO3+
0.582967005	% bound in species	4601401	MgHCO3+
2.305628216	% bound in species	1501400	CaHCO3+
0.056121184	% bound in species	5001401	NaHCO3 (aq)

Fe+2

70.70387582	% bound in species	280	Fe+2
0.545392933	% bound in species	2803300	FeOH+
28.57103513	% bound in species	2807320	FeSO4 (aq)
0.179331561	% bound in species	2801400	FeHCO3+

E-1

99.99930871	% bound in species	4700021	MnO4-2

HSeO3-1

63.93978462	% bound in species	761	HSeO3-1
36.04008598	% bound in species	3307611	SeO3-2
0.01990612	% bound in species	207610	AgSeO3-1

Sb(OH)6-1

99.99943552	% bound in species	741	Sb(OH)6-1

Fe+3

0.010753306	% bound in species	2813300	FeOH+2
97.01319561	% bound in species	2813301	Fe(OH)2+
2.085384336	% bound in species	2813302	Fe(OH)3 (aq)
0.890660333	% bound in species	2813303	Fe(OH)4-

PO4-3

52.14788235	% bound in species	3305800	HPO4-2
5.565140768	% bound in species	3305801	H2PO4-
0.077624179	% bound in species	5405800	NiHPO4 (aq)
0.022349846	% bound in species	4605800	MgPO4-
8.911984257	% bound in species	4605802	MgHPO4 (aq)
26.07961447	% bound in species	1505800	CaHPO4 (aq)
5.775663241	% bound in species	1505801	CaPO4-
0.251572326	% bound in species	1505802	CaH2PO4+
0.305482395	% bound in species	5005800	NaHPO4-
0.095793943	% bound in species	4105800	KHPO4-
0.019559826	% bound in species	1605800	CdHPO4 (aq)
0.344318849	% bound in species	9505800	ZnHPO4 (aq)
0.381534859	% bound in species	4705800	MnHPO4 (aq)

Ba+2

79.01587728	% bound in species	100	Ba+2
20.81820688	% bound in species	1007320	BaSO4 (aq)
0.024237021	% bound in species	1001401	BaCO3 (aq)
0.127048485	% bound in species	1001400	BaHCO3+
0.014558164	% bound in species	1000901	BaH2BO3+

Al+3

0.181296438	% bound in species	303301	Al(OH)2+
1.965150031	% bound in species	303303	Al(OH)3 (aq)
97.85044961	% bound in species	303302	Al(OH)4-

Mn+2

74.94420905	% bound in species	470	Mn+2
0.033487402	% bound in species	4703300	MnOH+
21.61345466	% bound in species	4707320	MnSO4 (aq)
0.377857113	% bound in species	4701400	MnHCO3+
3.029936732	% bound in species	4701401	MnCO3 (aq)

Cu+2

13.812479	% bound in species	231	Cu+2
12.97637797	% bound in species	2313300	CuOH+
0.020052085	% bound in species	2313302	Cu(OH)3-
0.602242043	% bound in species	2313301	Cu(OH)2 (aq)
0.044701841	% bound in species	2313304	Cu2(OH)2+2
5.131657167	% bound in species	2317320	CuSO4 (aq)
65.60958365	% bound in species	2311400	CuCO3 (aq)
0.175584003	% bound in species	2311402	CuHCO3+
0.485183649	% bound in species	2311401	Cu(CO3)2-2
0.010609333	% bound in species	2310901	Cu(H2BO3)2 (aq)
1.130932765	% bound in species	2310900	CuH2BO3+

Pb+2

16.89085704	% bound in species	600	Pb+2
16.28932843	% bound in species	6003300	PbOH+
0.736531474	% bound in species	6003301	Pb(OH)2 (aq)
16.15773878	% bound in species	6007320	PbSO4 (aq)
0.647668491	% bound in species	6007321	Pb(SO4)2-2
0.326051451	% bound in species	6001400	Pb(CO3)2-2
46.16869971	% bound in species	6001401	PbCO3 (aq)
2.709351724	% bound in species	6001402	PbHCO3+
0.072580064	% bound in species	6000900	PbH2BO3+

Zn+2

64.90997221	% bound in species	950	Zn+2
1.257704566	% bound in species	9503300	ZnOH+
4.485922953	% bound in species	9503301	Zn(OH)2 (aq)
24.29401978	% bound in species	9507320	ZnSO4 (aq)
1.606987315	% bound in species	9507321	Zn(SO4)2-2
3.013057359	% bound in species	9501401	ZnCO3 (aq)
0.413547671	% bound in species	9501400	ZnHCO3+
0.013979029	% bound in species	9500900	ZnH2BO3+

CO3-2

0.476190724	% bound in species	140	CO3-2
92.93151948	% bound in species	3301400	HCO3-
2.307165086	% bound in species	3301401	H2CO3* (aq)
0.017373772	% bound in species	6001401	PbCO3 (aq)
0.120702525	% bound in species	9501401	ZnCO3 (aq)
0.016566644	% bound in species	9501400	ZnHCO3+
0.036815048	% bound in species	2311400	CuCO3 (aq)
0.040248818	% bound in species	5401401	NiCO3 (aq)
0.033363451	% bound in species	5401400	NiHCO3+
0.011276741	% bound in species	4701400	MnHCO3+
0.110112808	% bound in species	4601400	MgCO3 (aq)
0.568417049	% bound in species	4601401	MgHCO3+
2.248083297	% bound in species	1501400	CaHCO3+
0.923159823	% bound in species	1501401	CaCO3 (aq)
0.054720485	% bound in species	5001401	NaHCO3 (aq)
0.090425215	% bound in species	4701401	MnCO3 (aq)

Part 5 of output file
Equilibrated mass distribution

idx	Name	Dissolved		Sorbed		Precipitated	
		Mol/kg	Percent	Mol/kg	Percent	Mol/kg	Percent

61	AsO4-3	3.70008E-06	100	0	0	0	0
160	Cd+2	5.00008E-07	100	0	0	0	0
150	Ca+2	0.006646889	84.04843	0	0	0.0012615	15.95157
740	Sb(OH)3	1.54144E-16	100	0	0	0	0
480	MoO4-2	1.00001E-06	100	0	0	0	0
762	SeO4-2	2.45366E-09	100	0	0	0	0
410	K+1	0.000623903	100	0	0	0	0
460	Mg+2	0.001561426	100	0	0	0	0
90	H3BO3	0.0002473	100	0	0	0	0
500	Na+1	0.001285007	100	0	0	0	0
20	Ag+1	1.50001E-06	100	0	0	0	0
540	Ni+2	1.08002E-05	100	0	0	0	0
732	SO4-2	0.008873788	99.98357	0	0	1.459E-06	0.0164361
770	H4SiO4	0.000239319	91.76352	0	0	2.148E-05	8.236477
2	H2O	3.06925E-06	100	0	0	0	0
60	H3AsO3	7.98239E-20	100	0	0	0	0
330	H+1	0.000559154	100	0	0	0	0
280	Fe+2	4.22493E-12	100	0	0	0	0
1	E-1	-1.21226E-44	100	0	0	0	0
761	HSeO3-1	6.39762E-06	100	0	0	0	0
741	Sb(OH)6-1	4.40002E-06	100	0	0	0	0
281	Fe+3	1.29155E-10	0.0001416	0	0	9.12E-05	99.99986
580	PO4-3	8.3543E-09	0.02216	0	0	3.769E-05	99.97784
100	Ba+2	4.12524E-08	2.750161	0	0	1.459E-06	97.24984
30	Al+3	3.85531E-08	0.0896583	0	0	4.296E-05	99.91034
470	Mn+2	1.71145E-05	27.78327	0	0	4.449E-05	72.21673
231	Cu+2	3.21785E-07	5.746166	0	0	5.278E-06	94.25384
600	Pb+2	2.15802E-07	9.809161	0	0	1.984E-06	90.19084
950	Zn+2	2.2973E-05	24.78205	0	0	6.973E-05	75.21794
140	CO3-2	0.000573467	31.02335	0	0	0.001275	68.97665

Charge balance: SPECIATED			
Sum of cations=	0.013907464	Sum of anions=	0.0138357
Percent difference=	0.258825976		
Equilibrium ionic stre	0.026500182		
Equilibrium pH=	8		
Equilibrium pe=	5.348796552	or Eh=	300.49467

Part 6 of output file

Saturation indices and stoichiometry of all minerals

ID	Name	log IAP	Sat. Index	No. of comp	Stoichiometry on line below								
1960003	Sb2O3(s)	-31.61848989	-23.13849	2									
2	740	-3	2	0	0	0	0	0	0	0	0	0	0
1960000	Zn-Al LDH	20.11531934	0.2853193	5									
2	950	1	30	0.5	140	-6	330	6	2	0	0	0	0
74001	Sb metal	-55.85538012	-43.387916	4									
1	740	3	330	3	1	-3	2	0	0	0	0	0	0
60000	Pb metal	-18.39935832	-22.63702	2									
1	600	2	1	0	0	0	0	0	0	0	0	0	0
95000	Zn metal	-15.7875359	-42.999714	2									
1	950	2	1	0	0	0	0	0	0	0	0	0	0
16000	Cd metal (alpha)	-17.42313141	-31.636952	2									
1	160	2	1	0	0	0	0	0	0	0	0	0	0
16001	Cd metal (gamma)	-17.42313141	-31.745728	2									
1	160	2	1	0	0	0	0	0	0	0	0	0	0
2000	Ag metal	-11.26558096	3.2227321	2									
1	20	1	1	0	0	0	0	0	0	0	0	0	0
1474003	AlSb	-86.69195562	-152.31606	5									
1	740	6	1	1	30	3	330	-3	2	0	0	0	0
1474002	ZnSb	-71.64291603	-83.16602	5									
1	740	5	1	1	950	3	330	-3	2	0	0	0	0
1474004	CdSb	-73.27851154	-72.720893	5									
1	740	5	1	3	330	1	160	-3	2	0	0	0	0
1474006	Ag4Sb	-89.652123	-33.470323	5									
1	740	6	1	3	20	3	330	-3	2	0	0	0	0
1474001	Breithauptite	-71.92987951	-52.516408	5									
1	740	5	1	3	330	1	540	-3	2	0	0	0	0
1474009	Mn2Sb	-87.56130534	-148.64091	5									
2	470	1	740	7	1	3	330	-3	2	0	0	0	0
1474005	Mg2Sb3	-195.3408696	-270.02467	5									
2	460	3	740	9	330	13	1	-9	2	0	0	0	0
1474010	Ca3Sb2	-151.5538732	-301.3281	5									
3	150	2	740	6	330	12	1	-6	2	0	0	0	0
1474008	NaSb	-64.1696115	-88.2027	5									
1	500	1	740	3	330	4	1	-3	2	0	0	0	0
1474007	Na3Sb	-80.79807426	-179.26028	5									
3	500	1	740	3	330	6	1	-3	2	0	0	0	0
2076100	SeO2	-13.45390861	-13.565501	3									
1	761	1	330	-1	2	0	0	0	0	0	0	0	0
2076200	SeO3	-24.93177682	-47.33427	3									
1	762	2	330	-1	2	0	0	0	0	0	0	0	0
2074100	Sb2O5	-26.84364298	-15.803643	3									
2	741	2	330	-7	2	0	0	0	0	0	0	0	0
2074102	SbO2	-26.77053322	1.0535668	4									
1	741	1	1	2	330	-4	2	0	0	0	0	0	0
2074001	Sb2O4	-4.921066434	-8.9546303	4									
2	740	-2	2	-2	330	-2	1	0	0	0	0	0	0
2074002	Sb4O6 (cubic)	-63.23697978	-44.109181	3									
4	740	0	330	-6	2	0	0	0	0	0	0	0	0
2074003	Sb4O6 (rhombic)	-63.23697978	-45.177279	3									
4	740	0	330	-6	2	0	0	0	0	0	0	0	0
2074006	Senarmontite	-31.61848989	-19.894055	2									
2	740	-3	2	0	0	0	0	0	0	0	0	0	0
2074007	Valentinite	-31.61848989	-21.442004	2									
2	740	-3	2	0	0	0	0	0	0	0	0	0	0
2077000	Chalcedony	-3.622022203	0.110809	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2077001	Cristobalite	-3.622022203	-0.086351	2									

1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2077002 Quartz		-3.622022203	0.5854959	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2077003 SiO2 (am,gel)		-3.622022203	-0.7820914	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2077004 SiO2 (am,ppt)		-3.622022203	-0.7414185	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2060000 Massicot		8.298065135	-5.212336	3									
1	600	1	2	-2	330	0	0	0	0	0	0	0	0
2060001 Litharge		8.298065135	-4.9998348	3									
1	600	1	2	-2	330	0	0	0	0	0	0	0	0
2060002 PbO:0.3H2O		8.29800915	-4.6819909	3									
-2	330	1	600	1.33	2	0	0	0	0	0	0	0	0
2060003 Plattnerite		34.99548859	-17.354226	4									
-4	330	-2	1	1	600	2	2	0	0	0	0	0	0
2060004 Pb(OH)2		8.297895483	-0.3953472	3									
-2	330	1	600	2	2	0	0	0	0	0	0	0	0
2060005 Pb2O(OH)2		16.59596062	-9.5940394	3									
2	600	3	2	-4	330	0	0	0	0	0	0	0	0
2003000 Al(OH)3 (am)		9.209305209	-2.6208607	3									
1	30	3	2	-3	330	0	0	0	0	0	0	0	0
2003001 Boehmite		9.20947486	-0.4608342	3									
-3	330	1	30	2	2	0	0	0	0	0	0	0	0
2003002 Diaspore		9.20947486	1.3800735	3									
-3	330	1	30	2	2	0	0	0	0	0	0	0	0
2003003 Gibbsite (C)		9.209305209	0.494824	3									
1	30	3	2	-3	330	0	0	0	0	0	0	0	0
2003004 Al(OH)3 (Soil)		9.209305209	-0.055176	3									
1	30	3	2	-3	330	0	0	0	0	0	0	0	0
2003005 Imogolite		14.79675787	-7.105E-15	4									
2	30	1	770	3	2	-6	330	0	0	0	0	0	0
2095000 Zn(OH)2 (am)		10.9097179	-2.358902	3									
1	950	2	2	-2	330	0	0	0	0	0	0	0	0
2095002 Zn(OH)2 (beta)		10.9097179	-1.6158856	3									
1	950	2	2	-2	330	0	0	0	0	0	0	0	0
2095003 Zn(OH)2 (gamma)		10.9097179	-1.5834494	3									
1	950	2	2	-2	330	0	0	0	0	0	0	0	0
2095007 Zn(OH)2 (delta)		10.9097179	-0.9342821	3									
1	950	-2	330	2	2	0	0	0	0	0	0	0	0
2095004 Zn(OH)2 (epsilon)		10.9097179	-1.3539366	3									
1	950	2	2	-2	330	0	0	0	0	0	0	0	0
2095006 Zincite		10.90988755	-1.1518554	3									
1	950	1	2	-2	330	0	0	0	0	0	0	0	0
2016001 Cd(OH)2		9.274122388	-5.2480245	3									
1	160	2	2	-2	330	0	0	0	0	0	0	0	0
2023100 Cu(OH)2		8.384026843	-1.3989679	3									
1	231	2	2	-2	330	0	0	0	0	0	0	0	0
2023101 Tenorite(am)		8.384196494	-0.7078194	3									
1	231	1	2	-2	330	0	0	0	0	0	0	0	0
2023103 Tenorite(c)		8.384196494	0.1418743	3									
1	231	-2	330	1	2	0	0	0	0	0	0	0	0
2002000 Ag2O		4.16626154	-8.8311274	3									
2	20	1	2	-2	330	0	0	0	0	0	0	0	0
2054000 Ni(OH)2 (am)		10.62275441	-3.1578286	3									
1	540	2	2	-2	330	0	0	0	0	0	0	0	0
2054001 Ni(OH)2 (c)		10.62275441	-0.1672456	3									
1	540	-2	330	2	2	0	0	0	0	0	0	0	0
2028001 Fe(OH)2 (am)		4.2114519	-10.128853	3									
1	280	2	2	-2	330	0	0	0	0	0	0	0	0
2028002 Fe(OH)2 (c)		4.2114519	-8.6785481	3									
1	280	-2	330	2	2	0	0	0	0	0	0	0	0
2028100 Ferrihydrite		4.131789752	4.768E-08	3									
1	281	3	2	-3	330	0	0	0	0	0	0	0	0
2028101 Fe3(OH)8		12.4750314	-7.7469686	4									
-8	330	2	281	1	280	8	2	0	0	0	0	0	0
2028102 Goethite		4.131959404	3.0786902	3									
1	281	2	2	-3	330	0	0	0	0	0	0	0	0
2028103 Ferrihydrite (aged)		4.131789752	1.4417898	3									
1	281	-3	330	3	2	0	0	0	0	0	0	0	0
2047000 Pyrolusite		37.5418843	-6.3624862	4									
1	470	2	2	-4	330	-2	1	0	0	0	0	0	0
2047003 Pyrochroite		10.84429119	-5.2500358	3									
1	470	2	2	-2	330	0	0	0	0	0	0	0	0
2047100 Manganite		24.19308775	-1.1469123	4									
1	470	2	2	-3	330	-1	1	0	0	0	0	0	0
2048001 MoO3		-22.51439691	-14.514397	3									
1	480	2	330	-1	2	0	0	0	0	0	0	0	0
2046000 Brucite		12.80988921	-5.348119	3									
1	460	2	2	-2	330	0	0	0	0	0	0	0	0
2046001 Periclase		12.81005887	-10.177573	3									
-2	330	1	460	1	2	0	0	0	0	0	0	0	0
2046002 Mg(OH)2 (active)		12.80988921	-5.9841108	3									
1	460	2	2	-2	330	0	0	0	0	0	0	0	0
2015000 Lime		13.41638581	-21.082549	3									
-2	330	1	150	1	2	0	0	0	0	0	0	0	0
2015001 Portlandite		13.41621616	-10.481477	3									
1	150	2	2	-2	330	0	0	0	0	0	0	0	0
2010001 Ba(OH)2:8H2O		8.247995622	-16.650136	3									
1	100	10	2	-2	330	0	0	0	0	0	0	0	0
2074005 Cu(SbO3)2		30.16055351	-15.049946	4									
2	740	1	231	-6	330	-4	1	0	0	0	0	0	0
3006000 Arsenolite		-38.2272194	-36.568416	2									
2	60	-3	2	0	0	0	0	0	0	0	0	0	0
3006001 Claudetite		-38.2272194	-36.623246	2									
2	60	-3	2	0	0	0	0	0	0	0	0	0	0
3006100 As2O5		-67.38364349	-32.664316	3									
2	61	6	330	-3	2	0	0	0	0	0	0	0	0
3060000 Pb2O3		43.29355372	-17.746446	4									

-6	330	-2	1	2	600	3	2	0	0	0	0	0	0
3060001	Minium	51.59161886	-25.845598	4									
-8	330	-2	1	3	600	4	2	0	0	0	0	0	0
3003000	Al2O3	18.41911937	-3.6331967	3									
2	30	3	2	-6	330	0	0	0	0	0	0	0	0
3028000	Magnetite	12.47571001	7.1376284	4									
-8	330	2	281	1	280	4	2	0	0	0	0	0	0
3028001	Hercynite	22.63074092	-3.1756786	4									
-8	330	1	280	2	30	4	2	0	0	0	0	0	0
3028100	Hematite	8.264088458	8.4849893	3									
2	281	3	2	-6	330	0	0	0	0	0	0	0	0
3028101	Maghemite	8.264088458	1.8780885	3									
-6	330	2	281	3	2	0	0	0	0	0	0	0	0
3028102	Lepidocrocite	4.131959404	2.7609594	3									
-3	330	1	281	2	2	0	0	0	0	0	0	0	0
3047000	Hausmannite	59.23080599	-5.7063998	4									
3	470	4	2	-8	330	-2	1	0	0	0	0	0	0
3046000	Spinel	31.22917824	-9.2194753	4									
-8	330	1	460	2	30	4	2	0	0	0	0	0	0
3046001	Magnesioferrite	21.07414732	1.6258549	4									
-8	330	1	460	2	281	4	2	0	0	0	0	0	0
3050000	Natron	-11.7597488	-9.8373584	3									
2	500	1	140	10	2	0	0	0	0	0	0	0	0
3023100	Cupric Ferrite	16.64828495	8.7091744	4									
-8	330	1	231	2	281	4	2	0	0	0	0	0	0
5060000	Cerrusite	-13.52894786	-0.0988775	2									
1	600	1	140	0	0	0	0	0	0	0	0	0	0
5060001	Pb2OCO3	-5.230882722	-5.051923	4									
-2	330	2	600	1	2	1	140	0	0	0	0	0	0
5060002	Pb3O2CO3	3.067182413	-8.9791143	4									
-4	330	3	600	1	140	2	2	0	0	0	0	0	0
5060003	Hydrocerrusite	-18.76000023	-2.289E-07	4									
3	600	2	2	-2	330	2	140	0	0	0	0	0	0
5060004	Pb10(OH)6O(CO3)6	-47.98193555	-39.221936	4									
10	600	6	140	7	2	-8	330	0	0	0	0	0	0
5095000	Smithsonite	-10.91712544	-0.0523924	2									
1	950	1	140	0	0	0	0	0	0	0	0	0	0
5095001	ZnCO3:1H2O	-10.91729509	-0.6572951	3									
1	950	1	140	1	2	0	0	0	0	0	0	0	0
5095003	Hydrozincite	10.89490282	-1.907E-07	4									
5	950	2	140	-6	330	6	2	0	0	0	0	0	0
5016000	Otavite	-12.55272095	-0.4796117	2									
1	160	1	140	0	0	0	0	0	0	0	0	0	0
5023100	CuCO3	-13.4428165	-1.9428165	2									
1	231	1	140	0	0	0	0	0	0	0	0	0	0
5023101	Malachite	-5.058789653	1.373E-07	4									
2	231	2	2	-2	330	1	140	0	0	0	0	0	0
5023102	Azurite	-18.50160615	-1.4784056	4									
3	231	2	2	-2	330	2	140	0	0	0	0	0	0
5002000	Ag2CO3	-17.66075145	-6.1795668	2									
2	20	1	140	0	0	0	0	0	0	0	0	0	0
5054000	NiCO3	-11.20408893	-0.390067	2									
1	540	1	140	0	0	0	0	0	0	0	0	0	0
5028000	Siderite	-17.61539144	-7.0931411	2									
1	280	1	140	0	0	0	0	0	0	0	0	0	0
5047000	Rhodochrosite	-10.98255215	0	2									
1	470	1	140	0	0	0	0	0	0	0	0	0	0
5046000	Artinite	3.792426135	-6.9236472	4									
-2	330	2	460	1	140	5	2	0	0	0	0	0	0
5046001	Hydromagnesite	-23.25860589	-16.519959	4									
5	460	4	140	-2	330	6	2	0	0	0	0	0	0
5046002	Magnesite	-9.016954126	-1.3713386	2									
1	460	1	140	0	0	0	0	0	0	0	0	0	0
5046003	Nesquehonite	-9.017463079	-4.5722546	3									
1	460	1	140	3	2	0	0	0	0	0	0	0	0
5046004	MgCO3:5H2O	-9.017802381	-4.4778024	3									
1	460	1	140	5	2	0	0	0	0	0	0	0	0
5015000	Aragonite	-8.41062718	-0.1552424	2									
1	150	1	140	0	0	0	0	0	0	0	0	0	0
5015001	Calcite	-8.41062718	-0.0001136	2									
1	150	1	140	0	0	0	0	0	0	0	0	0	0
5015006	CaCO3xH2O	-8.410796831	-1.3389707	3									
1	150	1	140	1	2	0	0	0	0	0	0	0	0
5015005	Vaterite	-8.41062718	-0.6083363	2									
1	150	1	140	0	0	0	0	0	0	0	0	0	0
5015002	Dolomite (ordered)	-17.42758131	-0.7041719	3									
1	150	1	460	2	140	0	0	0	0	0	0	0	0
5015004	Dolomite (disordered)	-17.42758131	-1.3182092	3									
1	150	1	460	2	140	0	0	0	0	0	0	0	0
5015003	Huntite	-35.46148956	-6.4937695	3									
3	460	1	150	4	140	0	0	0	0	0	0	0	0
5010000	Witherite	-13.57749051	-4.988929	2									
1	100	1	140	0	0	0	0	0	0	0	0	0	0
5050001	Thermonatrite	-11.75822194	-12.492484	3									
2	500	1	140	1	2	0	0	0	0	0	0	0	0
5095002	ZnCO3	-10.91712544	-0.1171254	2									
1	950	1	140	0	0	0	0	0	0	0	0	0	0
5047002	MnCO3 (am)	-10.98255215	-0.4825521	2									
1	470	1	140	0	0	0	0	0	0	0	0	0	0
5260000	Pb(BO2)2	1.040112362	-5.6239782	4									
-2	2	-2	330	1	600	2	90	0	0	0	0	0	0
5295000	Zn(BO2)2	3.651934777	-4.6380652	4									
-2	2	-2	330	1	950	2	90	0	0	0	0	0	0
5216000	Cd(BO2)2	2.016339266	-7.8236607	4									
-2	2	-2	330	1	160	2	90	0	0	0	0	0	0
6060000	Larnakite	-1.846849553	-1.6150488	4									
-2	330	2	600	1	732	1	2	0	0	0	0	0	0
6060001	Pb3O2SO4	6.451215582	-4.9696649	4									

-4	330	3	600	1	732	2	2	0	0	0	0	0	0
6060002	Pb4O3SO4	14.74928072	-8.3942818	4									
-6	330	4	600	1	732	3	2	0	0	0	0	0	0
6060003	Anglesite	-10.14491469	-2.2435454	2									
1	600	1	732	0	0	0	0	0	0	0	0	0	0
6060004	Pb4(OH)6SO4	14.74877176	-6.3512282	4									
-6	330	4	600	1	732	6	2	0	0	0	0	0	0
6003000	AlOHSO4	-9.233504961	-6.003505	4									
-1	330	1	30	1	732	1	2	0	0	0	0	0	0
6003001	Al4(OH)10SO4	18.39441067	-4.3055893	4									
-10	330	4	30	1	732	10	2	0	0	0	0	0	0
6095000	Zn2(OH)2SO4	3.376625627	-4.1233744	4									
-2	330	2	950	2	2	1	732	0	0	0	0	0	0
6095001	Zn4(OH)6SO4	25.19606143	-3.2039386	4									
-6	330	4	950	6	2	1	732	0	0	0	0	0	0
6095002	Zn3O(SO4)2	-4.156296993	-25.46498	4									
-2	330	3	950	2	732	1	2	0	0	0	0	0	0
6095003	Zincosite	-7.533092272	-12.229254	2									
1	950	1	732	0	0	0	0	0	0	0	0	0	0
6095004	ZnSO4:1H2O	-7.533261923	-7.3042647	3									
1	950	1	732	1	2	0	0	0	0	0	0	0	0
6095005	Bianchite	-7.534110179	-5.7753227	3									
1	950	1	732	6	2	0	0	0	0	0	0	0	0
6095006	Goslarite	-7.53427983	-5.3912	3									
1	950	1	732	7	2	0	0	0	0	0	0	0	0
6016000	Cd3(OH)4SO4	9.379556993	-13.180443	4									
-4	330	3	160	4	2	1	732	0	0	0	0	0	0
6016001	Cd3OH2(SO4)2	-9.063253178	-15.773253	4									
-2	330	3	160	2	2	2	732	0	0	0	0	0	0
6016002	Cd4(OH)6SO4	18.65367938	-9.7463206	4									
-6	330	4	160	6	2	1	732	0	0	0	0	0	0
6016003	CdSO4	-9.168687783	-9.4789024	2									
1	160	1	732	0	0	0	0	0	0	0	0	0	0
6016004	CdSO4:1H2O	-9.168857434	-7.7354721	3									
1	160	1	732	1	2	0	0	0	0	0	0	0	0
6016005	CdSO4:2.67H2O	-9.169140751	-7.463113	3									
1	160	1	732	2.67	2	0	0	0	0	0	0	0	0
6023100	Antlerite	6.709270359	-2.0787296	4									
3	231	4	2	-4	330	1	732	0	0	0	0	0	0
6023101	Brochantite	15.0932972	-2.0114006	4									
4	231	6	2	-6	330	1	732	0	0	0	0	0	0
6023102	Langite	15.09312755	-3.9319046	4									
-6	330	4	231	7	2	1	732	0	0	0	0	0	0
6023103	CuOCuSO4	-1.674586833	-13.256464	4									
-2	330	2	231	1	2	1	732	0	0	0	0	0	0
6023104	CuSO4	-10.05878333	-13.676151	2									
1	231	1	732	0	0	0	0	0	0	0	0	0	0
6023105	Chalcanthite	-10.05963158	-7.3637149	3									
1	231	1	732	5	2	0	0	0	0	0	0	0	0
6002000	Ag2SO4	-14.27671828	-9.2989451	2									
2	20	1	732	0	0	0	0	0	0	0	0	0	0
6054000	Ni4(OH)6SO4	24.04820749	-7.9517925	4									
-6	330	4	540	1	732	6	2	0	0	0	0	0	0
6054001	Retgersite	-7.821073663	-5.7383598	3									
1	540	1	732	6	2	0	0	0	0	0	0	0	0
6054002	Morenosite	-7.821243314	-5.5633016	3									
1	540	1	732	7	2	0	0	0	0	0	0	0	0
6028000	Melanterite	-14.23254583	-11.83329	3									
1	280	1	732	7	2	0	0	0	0	0	0	0	0
6028100	Fe2(SO4)3	-47.06485101	-45.576759	2									
2	281	3	732	0	0	0	0	0	0	0	0	0	0
6028101	H-Jarosite	-24.49059039	-21.172523	4									
3	281	2	732	-5	330	7	2	0	0	0	0	0	0
6050000	Na-Jarosite	-19.45585556	-15.395628	5									
1	500	3	281	2	732	-6	330	6	2	0	0	0	0
6041002	K-Jarosite	-19.76950412	-9.7142869	5									
1	410	3	281	2	732	-6	330	6	2	0	0	0	0
6047000	MnSO4	-7.598518976	-10.783385	2									
1	470	1	732	0	0	0	0	0	0	0	0	0	0
6046000	Epsomite	-5.634108514	-3.4003218	3									
1	460	1	732	7	2	0	0	0	0	0	0	0	0
6015000	Anhydrite	-5.026594011	-0.7334156	2									
1	150	1	732	0	0	0	0	0	0	0	0	0	0
6015001	Gypsum	-5.026933313	-0.4076525	3									
1	150	1	732	2	2	0	0	0	0	0	0	0	0
6015002	Ettringite	43.58306594	-16.83632	5									
6	150	2	30	3	732	-12	330	38	2	0	0	0	0
6010000	Barite	-10.19345734	4.578E-07	2									
1	100	1	732	0	0	0	0	0	0	0	0	0	0
6050001	Mirabilite	-8.375715636	-6.5244361	3									
2	500	1	732	10	2	0	0	0	0	0	0	0	0
6050002	Thenardite	-8.374019124	-8.7803691	2									
2	500	1	732	0	0	0	0	0	0	0	0	0	0
6041000	K-Alum	-22.95760398	-17.507246	4									
1	410	1	30	2	732	12	2	0	0	0	0	0	0
6041001	Alunite	-4.536957748	-5.0859202	5									
1	410	3	30	2	732	-6	330	6	2	0	0	0	0
6102000	Ag2SeO3	-9.287647071	-1.7692003	3									
2	20	1	761	-1	330	0	0	0	0	0	0	0	0
6123100	CuSeO3:2H2O	-5.070051418	-6.03215	4									
1	231	1	761	-1	330	2	2	0	0	0	0	0	0
6154000	NiSeO3:2H2O	-2.831323847	-5.9337594	4									
1	761	1	540	2	2	-1	330	0	0	0	0	0	0
6128100	Fe2(SeO3)3:2H2O	-32.09797667	-11.471777	4									
3	761	2	281	2	2	-3	330	0	0	0	0	0	0
6128101	Fe2(OH)4SeO3	-5.190159454	-6.7440595	4									
1	761	2	281	4	2	-5	330	0	0	0	0	0	0
6147000	MnSeO3	-2.609447765	-3.7394478	3									

1	470	1	761	-1	330	0	0	0	0	0	0	0	0
6146000 MgSeO3:6H2O		-0.644867652	-3.6363292	4									
1	460	1	761	-1	330	6	2	0	0	0	0	0	0
6115000 CaSeO3:2H2O		-0.037862102	-3.0323251	4									
1	761	1	150	2	2	-1	330	0	0	0	0	0	0
6110000 BaSeO3		-5.204386128	-6.9230168	3									
1	100	1	761	-1	330	0	0	0	0	0	0	0	0
6150001 Na2SeO3:5H2O		-3.385796169	-13.685796	4									
2	500	1	761	-1	330	5	2	0	0	0	0	0	0
6160000 PbSeO4		-16.63371168	-9.6545001	2									
1	600	1	762	0	0	0	0	0	0	0	0	0	0
6195001 ZnSeO4:6H2O		-14.02290718	-12.502907	3									
1	950	1	762	6	2	0	0	0	0	0	0	0	0
6116001 CdSeO4:2H2O		-15.65782408	-13.807824	3									
1	160	1	762	2	2	0	0	0	0	0	0	0	0
6102001 Ag2SeO4		-20.76551528	-12.259229	2									
2	20	1	762	0	0	0	0	0	0	0	0	0	0
6123101 CuSeO4:5H2O		-16.54842858	-14.108429	3									
1	231	1	762	5	2	0	0	0	0	0	0	0	0
6154001 NiSeO4:6H2O		-14.30987066	-12.789871	3									
1	540	1	762	6	2	0	0	0	0	0	0	0	0
6147002 MnSeO4:5H2O		-14.08816423	-12.038164	3									
1	470	1	762	5	2	0	0	0	0	0	0	0	0
6146001 MgSeO4:6H2O		-12.12273586	-10.922736	3									
1	460	1	762	6	2	0	0	0	0	0	0	0	0
6115001 CaSeO4:2H2O		-11.51573031	-8.5727607	3									
1	150	1	762	2	2	0	0	0	0	0	0	0	0
6110001 BaSeO4		-16.68225434	-9.0180773	2									
1	100	1	762	0	0	0	0	0	0	0	0	0	0
6150002 Na2SeO4		-14.86281612	-16.142816	2									
2	500	1	762	0	0	0	0	0	0	0	0	0	0
6141001 K2SeO4		-15.49011324	-14.760113	2									
2	410	1	762	0	0	0	0	0	0	0	0	0	0
6233001 H2MoO4		-22.51456656	-9.1833086	2									
1	480	2	330	0	0	0	0	0	0	0	0	0	0
6260001 PbMoO4		-14.21633177	1.9041804	2									
1	600	1	480	0	0	0	0	0	0	0	0	0	0
6203001 Al2(MoO4)3		-49.12407135	-53.911997	2									
3	480	2	30	0	0	0	0	0	0	0	0	0	0
6295001 ZnMoO4		-11.60450936	-1.5783218	2									
1	480	1	950	0	0	0	0	0	0	0	0	0	0
6216001 CdMoO4		-13.24010487	1.0903846	2									
1	480	1	160	0	0	0	0	0	0	0	0	0	0
6223101 CuMoO4		-14.13020041	-0.940775	2									
1	480	1	231	0	0	0	0	0	0	0	0	0	0
6202001 Ag2MoO4		-18.34813537	-6.3090386	2									
2	20	1	480	0	0	0	0	0	0	0	0	0	0
6254001 NiMoO4		-11.89147284	-0.7373078	2									
1	480	1	540	0	0	0	0	0	0	0	0	0	0
6228001 FeMoO4		-18.30277536	-8.3147919	2									
1	480	1	280	0	0	0	0	0	0	0	0	0	0
6246001 MgMoO4		-9.704338042	-7.854338	2									
1	460	1	480	0	0	0	0	0	0	0	0	0	0
6215001 CaMoO4		-9.098011096	-1.1665726	2									
1	150	1	480	0	0	0	0	0	0	0	0	0	0
6215002 Powellite		-9.098011096	-1.4564343	2									
1	150	1	480	0	0	0	0	0	0	0	0	0	0
6210001 BaMoO4		-14.26487443	-7.2028571	2									
1	480	1	100	0	0	0	0	0	0	0	0	0	0
6250001 Na2MoO4		-12.44543621	-14.028158	2									
1	480	2	500	0	0	0	0	0	0	0	0	0	0
6250002 Na2MoO4:2H2O		-12.44577551	-13.669776	3									
1	480	2	500	2	2	0	0	0	0	0	0	0	0
6250003 Na2Mo2O7		-34.95983312	-17.841188	4									
2	480	2	500	-1	2	2	330	0	0	0	0	0	0
6241001 K2MoO4		-13.07273332	-16.366002	2									
1	480	2	410	0	0	0	0	0	0	0	0	0	0
7060006 PbHPO4		-28.84030116	-5.0353012	3									
1	600	1	330	1	580	0	0	0	0	0	0	0	0
7060007 Pb3(PO4)2		-49.38236754	-5.8523675	2									
3	600	2	580	0	0	0	0	0	0	0	0	0	0
7060002 Hydroxylpyromorphite		-69.92460357	-7.1346036	4									
5	600	3	580	1	2	-1	330	0	0	0	0	0	0
7060003 Plumbgummite		-38.35041253	-5.5604125	5									
-5	330	1	600	3	30	2	580	6	2	0	0	0	0
7060004 Hinsdalite		-19.65502605	-17.155026	6									
-6	330	1	600	3	30	1	580	1	732	6	2	0	0
7060005 Tsumebite		-12.15871814	-2.3687181	5									
-3	330	2	600	1	231	1	580	6	2	0	0	0	0
7095000 Zn3(PO4)2:4H2O		-41.5475789	-6.1275789	3									
3	950	2	580	4	2	0	0	0	0	0	0	0	0
7016000 Cd3(PO4)2		-46.45368683	-13.853687	2									
3	160	2	580	0	0	0	0	0	0	0	0	0	0
7023100 Cu3(PO4)2		-49.12397346	-12.273973	2									
3	231	2	580	0	0	0	0	0	0	0	0	0	0
7023101 Cu3(PO4)2:3H2O		-49.12448241	-14.004482	3									
3	231	2	580	3	2	0	0	0	0	0	0	0	0
7002000 Ag3PO4		-30.88888916	-13.298889	2									
3	20	1	580	0	0	0	0	0	0	0	0	0	0
7054000 Ni3(PO4)2		-42.40779075	-11.107791	2									
3	540	2	580	0	0	0	0	0	0	0	0	0	0
7028001 Vivianite		-61.6430555	-23.836095	3									
3	280	2	580	8	2	0	0	0	0	0	0	0	0
7028100 Strengite		-33.00657654	-6.6934455	3									
1	281	1	580	2	2	0	0	0	0	0	0	0	0
7047000 Mn3(PO4)2		-41.74318041	-17.833859	2									
3	470	2	580	0	0	0	0	0	0	0	0	0	0
7047001 MnHPO4		-26.29390545	-0.8939055	3									

1	470	1	580	1	330	0	0	0	0	0	0	0	0
7046002 Mg3(PO4)2		-35.84638635	-12.566386	2									
3	460	2	580	0	0	0	0	0	0	0	0	0	0
7046001 MgHPO4:3H2O		-24.32881638	-6.1538164	4									
1	460	1	330	1	580	3	2	0	0	0	0	0	0
7015003 Hydroxyapatite		-44.33300018	-1.831E-07	4									
5	150	3	580	1	2	-1	330	0	0	0	0	0	0
7015004 CaHPO4:2H2O		-23.72231979	-4.513862	4									
1	150	1	330	1	580	2	2	0	0	0	0	0	0
7015005 CaHPO4		-23.72198049	-4.1592765	3									
1	150	1	330	1	580	0	0	0	0	0	0	0	0
7015006 Ca3(PO4)2 (beta)		-34.02740551	-4.6062437	2									
3	150	2	580	0	0	0	0	0	0	0	0	0	0
7015007 Ca4H(PO4)3:3H2O		-57.74989495	-10.669895	4									
4	150	1	330	3	580	3	2	0	0	0	0	0	0
7010001 BaHPO4		-28.88884381	-9.1138438	3									
1	100	1	330	1	580	0	0	0	0	0	0	0	0
7210000 BaHAsO4:H2O		-25.44255374	-0.8025537	4									
1	100	1	61	1	330	1	2	0	0	0	0	0	0
7260000 Pb3(AsO4)2		-42.48944809	-6.9894481	2									
3	600	2	61	0	0	0	0	0	0	0	0	0	0
7203000 AlAsO4:2H2O		-24.48260136	-8.6826014	3									
1	30	1	61	2	2	0	0	0	0	0	0	0	0
7295000 Zn3AsO42:2.5H2O		-34.65440497	-7.154405	3									
3	950	2	61	2.5	2	0	0	0	0	0	0	0	0
7223100 Cu3(AsO4)2:2H2O		-42.23139331	-7.1313933	3									
3	231	2	61	2	2	0	0	0	0	0	0	0	0
7202001 Ag3AsO3		-12.86421739	-15.021517	3									
3	20	1	60	-3	330	0	0	0	0	0	0	0	0
7202002 Ag3AsO4		-27.44242944	-3.9424294	2									
3	20	1	61	0	0	0	0	0	0	0	0	0	0
7254000 Ni3(AsO4)2:8H2O		-35.5162285	-10.016229	3									
3	540	2	61	8	2	0	0	0	0	0	0	0	0
7228100 FeAsO4:2H2O		-29.56011682	-9.3601168	3									
1	281	1	61	2	2	0	0	0	0	0	0	0	0
7247000 Mn3(AsO4)2:8H2O		-34.85161816	-6.1516182	3									
3	470	2	61	8	2	0	0	0	0	0	0	0	0
7215000 Ca3(AsO4)2:4H2O		-27.13516466	-8.2351647	3									
3	150	2	61	4	2	0	0	0	0	0	0	0	0
8603000 Halloysite		11.17473566	-0.0839724	4									
2	30	2	770	1	2	-6	330	0	0	0	0	0	0
8603001 Kaolinite		11.17473566	2.3661811	4									
2	30	2	770	1	2	-6	330	0	0	0	0	0	0
8628000 Greenalite		5.390480945	-15.419519	4									
-6	330	3	280	2	770	1	2	0	0	0	0	0	0
8646000 Chrysotile		31.18579289	-2.8332388	4									
3	460	2	770	1	2	-6	330	0	0	0	0	0	0
8646003 Sepiolite		14.75345734	-2.0653797	4									
2	460	3	770	-4	330	-0.5	2	0	0	0	0	0	0
8646004 Sepiolite (A)		14.75345734	-4.0265427	4									
-0.5	2	2	460	3	770	-4	330	0	0	0	0	0	0

END OF THIS PROBLEM

Charge balance - Unspeciated:
Sum of cations= 0.021512201 Sum of anions= 0.0243862
Percent difference= 6.261654
Improved activity guesses prior to first iteration:

Log activity:	Al+3	-5.320945584
Log activity:	CO3-2	-7.813004898
Log activity:	Fe+2	-4.040057995
Log activity:	Fe+3	-17.46834704
Log activity:	Mn+2	-4.210422348
Log activity:	H4SiO4	-3.583692413
Log activity:	SO4-2	-1.988242234
Log activity:	H3AsO3	-41.43179828
Log activity:	Cu+2	-5.258201621
Log activity:	PO4-3	-12.18884243
Log activity:	SeO4-2	-25.37082366
Log activity:	HSeO3-1	-5.195532004
Log activity:	Sb(OH)3	-11.35654819
Log activity:	Sb(OH)6-1	-17.66654819
Log activity:	AsO4-3	-52.70743378

RESULTS:
Parameters of the component most out of balance:

Iter.	Name	Total mol	Diff fxn	Log activity	Residual
0	MoO4-2	1.00E-06	4.014E-06	-6	4.014E-06
1	MoO4-2	1.00E-06	1.222E-06	-6.283803	1.222E-06
2	MoO4-2	1.00E-06	1.688E-07	-6.485085	1.687E-07
3	MoO4-2	1.00E-06	-7.10E-09	-6.536722	7.00E-09
4	MoO4-2	1.00E-06	-2.93E-09	-6.53558	2.83E-09
5	MoO4-2	1.00E-06	-6.79E-10	-6.534855	5.79E-10
6	MoO4-2	1.00E-06	-1.41E-10	-6.534685	4.08E-11
7	Al+3	4.30E-05	8.22E-09	-6.799498	3.92E-09

ID	Name	Anal mol	Calc mol	Log Activity	Gamma	New logK
61	AsO4-3	3.70E-06	1.18E-12	-12.55062	2.38E-01	0
30	Al+3	4.30E-05	6.67E-07	-6.799551	2.38E-01	0
150	Ca+2	7.91E-03	5.60E-03	-2.528705	5.28E-01	0
140	CO3-2	1.85E-03	2.75E-08	-7.83758	5.28E-01	0
280	Fe+2	0.00009	4.906E-05	-4.586531	0.5281717	0
100	Ba+2	1.50E-06	1.17E-06	-6.208769	0.5281717	0
410	K+1	6.24E-04	6.11E-04	-3.283332	0.8524988	0
460	Mg+2	0.0015614	0.0011684	-3.209627	0.5281717	0
470	Mn+2	0.0000616	4.693E-05	-4.605752	0.5281717	0
500	Na+1	1.29E-03	1.26E-03	-2.969657	0.8524988	0
770	H4SiO4	2.61E-04	2.60E-04	-3.581743	1.006971	0
950	Zn+2	0.0000927	6.461E-05	-4.466899	0.5281717	0
732	SO4-2	0.0102751	0.0074827	-2.403167	0.5281717	0
20	Ag+1	1.50E-06	1.40E-06	-5.922229	0.8524988	0
740	Sb(OH)3	0.0000044	1.527E-14	-13.81316	1.006971	0
231	Cu+2	0.0000056	3.816E-06	-5.695645	0.5281717	0
600	Pb+2	2.20E-06	9.78E-07	-6.287079	0.5281717	0
540	Ni+2	0.0000108	7.77E-06	-5.386813	0.5281717	0
90	H3BO3	2.47E-04	2.47E-04	-3.604029	1.006971	0
160	Cd+2	5.00E-07	3.42E-07	-6.743069	0.5281717	0
580	PO4-3	3.77E-05	1.57E-12	-12.42677	0.2378176	0
762	SeO4-2	6.40E-06	3.42E-11	-10.74364	0.5281717	0
480	MoO4-2	1.00E-06	5.53E-07	-6.534647	0.5281717	0
2	H2O	-2.55629E-23	-7.07E-05	-0.00018	1	0
60	H3AsO3	1.00E-16	1.06E-16	-15.97241	1.006971	0
330	H+1	1.00E-09	1.17E-06	-6	0.8524988	0
281	Fe+3	1.20E-06	9.07E-11	-10.66602	0.2378176	0
1	E-1	1.00E-16	4.48E-08	-7.348802	0.8524988	0
761	HSeO3-1	1.00E-16	6.36E-06	-5.265767	0.8524988	0
741	Sb(OH)6-1	1.00E-16	4.398E-06	-5.426097	0.8524988	0

Part 4 of output file
Percentage distribution of components among type I and type II species

AsO4-3

0.012334787	% bound in species	3300612	H3AsO4
13.40644376	% bound in species	3300610	HAsO4-2
86.58118947	% bound in species	3300611	H2AsO4-

Al+3

1.551449323	% bound in species	3.00E+01	Al+3
2.531118149	% bound in species	303300	AlOH+2
1.603368291	% bound in species	303301	Al(OH)2+
0.172275671	% bound in species	3.03E+05	Al(OH)3 (aq)
0.086533874	% bound in species	3.03E+05	Al(OH)4-
8.537802843	% bound in species	307320	AlSO4+
1.262282136	% bound in species	307321	Al(SO4)2-
16.57731193	% bound in species	3.06E+05	AlHPO4+
1.759712998	% bound in species	305800	Al2PO4+3
65.72719282	% bound in species	301400	Al2(OH)2CO3+2
0.183807956	% bound in species	3.08E+05	AlH3SiO4+2

Ca+2

70.86598603	% bound in species	1.50E+02	Ca+2
28.91581454	% bound in species	1.51E+06	CaSO4 (aq)
0.016079187	% bound in species	1.51E+06	CaHPO4 (aq)
0.01564697	% bound in species	1.51E+06	CaH2PO4+
0.181978056	% bound in species	1.50E+06	CaHCO3+

CO3-2

28.37218989	% bound in species	3.30E+06	HCO3-
69.82373206	% bound in species	3.30E+06	H2CO3* (aq)
0.021232848	% bound in species	9.50E+06	ZnHCO3+
0.012204807	% bound in species	4.70E+06	MnHCO3+
0.165783619	% bound in species	4.60E+06	MgHCO3+
0.77854124	% bound in species	1.50E+06	CaHCO3+
0.016400319	% bound in species	5.00E+06	NaHCO3 (aq)

0.764474136 % bound in species	301400 Al2(OH)2CO3+2

Fe+2

69.56113197 % bound in species	2.80E+02 Fe+2
29.83401814 % bound in species	2.81E+06 FeSO4 (aq)
0.302464769 % bound in species	2.81E+06 FeH2PO4+
0.128929142 % bound in species	2.81E+06 FeHPO4 (aq)
0.168216259 % bound in species	2.80E+06 FeHCO3+

Ba+2

78.04883803 % bound in species	1.00E+02 Ba+2
21.8251758 % bound in species	1.01E+06 BaSO4 (aq)
0.119649087 % bound in species	1.00E+06 BaHCO3+

K+1

97.91725397 % bound in species	4.10E+02 K+1
2.079769146 % bound in species	4.11E+06 KSO4-

Mg+2

74.83163178 % bound in species	4.60E+02 Mg+2
0.010848461 % bound in species	4.60E+06 MgMoO4(aq)
24.93721275 % bound in species	4.61E+06 MgSO4 (aq)
0.023437528 % bound in species	4.61E+06 MgHPO4 (aq)
0.196267344 % bound in species	4.60E+06 MgHCO3+

Mn+2

76.18921196 % bound in species	4.70E+02 Mn+2
23.32071951 % bound in species	4.71E+06 MnSO4 (aq)
0.094379515 % bound in species	4.71E+06 MnHPO4 (aq)
0.366244259 % bound in species	4.70E+06 MnHCO3+
0.029111954 % bound in species	4.70E+06 MnCO3 (aq)

Na+1

97.8918802 % bound in species	5.00E+02 Na+1
2.081129758 % bound in species	5.01E+06 NaSO4-
0.023592227 % bound in species	5.00E+06 NaHCO3 (aq)

H4SiO4

99.75455381 % bound in species	7.70E+02 H4SiO4
0.207704772 % bound in species	7.71E+06 H4SiO4SO4-2
0.030305659 % bound in species	3.08E+05 AlH3SiO4+2

Zn+2

69.70230892 % bound in species	9.50E+02 Zn+2
0.013188297 % bound in species	9.50E+06 ZnOH+
27.68837557 % bound in species	9.51E+06 ZnSO4 (aq)
2.074500973 % bound in species	9.51E+06 Zn(SO4)2-2
0.067024073 % bound in species	9.51E+06 ZnHPO4 (aq)
0.030579153 % bound in species	9.50E+06 ZnCO3 (aq)
0.423398257 % bound in species	9.50E+06 ZnHCO3+

SO4-2

72.82379988 % bound in species	7.32E+02 SO4-2
0.035729616 % bound in species	3.07E+05 AlSO4+
0.010564979 % bound in species	3.07E+05 Al(SO4)2-
0.249799275 % bound in species	9.51E+06 ZnSO4 (aq)
0.037431509 % bound in species	9.51E+06 Zn(SO4)2-2
0.014643443 % bound in species	2.32E+06 CuSO4 (aq)
0.027630554 % bound in species	5.41E+06 NiSO4 (aq)
0.204764291 % bound in species	2.81E+06 FeSO4 (aq)
0.139809455 % bound in species	4.71E+06 MnSO4 (aq)
3.789448379 % bound in species	4.61E+06 MgSO4 (aq)
22.25525348 % bound in species	1.51E+06 CaSO4 (aq)
0.260265754 % bound in species	5.01E+06 NaSO4-
0.12628299 % bound in species	4.11E+06 KSO4-

Ag+1

93.53774102 % bound in species	2.00E+01 Ag+1
6.460695716 % bound in species	2.07E+05 AgSO4-

Sb(OH)3

99.99698671 % bound in species	7.40E+02 Sb(OH)3

Cu+2

68.13853506 % bound in species	2.31E+02 Cu+2
0.625099803 % bound in species	2.31E+06 CuOH+
26.86835955 % bound in species	2.32E+06 CuSO4 (aq)
0.423035547 % bound in species	2.32E+06 CuHPO4 (aq)
3.058939118 % bound in species	2.31E+06 CuCO3 (aq)
0.825836228 % bound in species	2311402 CuHCO3+
0.057735711 % bound in species	2310900 CuH2BO3+

Pb+2

44.43487907 % bound in species	6.00E+02 Pb+2
0.418456166 % bound in species	6.00E+06 PbOH+
45.1144071 % bound in species	6.01E+06 PbSO4 (aq)
2.048285724 % bound in species	6.01E+06 Pb(SO4)2-2
0.012190777 % bound in species	6.01E+06 PbH2PO4+
0.026044046 % bound in species	6.01E+06 PbHPO4 (aq)
1.147895287 % bound in species	6.00E+06 PbCO3 (aq)
6.79555565 % bound in species	6.00E+06 PbHCO3+

Ni+2

71.94311304 % bound in species	5.40E+02 Ni+2
26.28765721 % bound in species	5.41E+06 NiSO4 (aq)
0.030197655 % bound in species	5.41E+06 NiHPO4 (aq)
0.020378277 % bound in species	5.40E+06 NiCO3 (aq)
1.704082949 % bound in species	5.40E+06 NiHCO3+

H3BO3

99.937699	% bound in species	9.00E+01 H3BO3
0.051594483	% bound in species	3.30E+06 H2BO3-

Cd+2

68.4206143	% bound in species	1.60E+02 Cd+2
27.60802367	% bound in species	1.61E+06 CdSO4 (aq)
3.379507978	% bound in species	1.61E+06 Cd(SO4)2-2
0.161499418	% bound in species	1.61E+06 CdHPO4 (aq)
0.416570317	% bound in species	1.60E+06 CdHCO3+
0.012228267	% bound in species	1.60E+06 CdCO3 (aq)

PO4-3

6.142169778	% bound in species	3.31E+06 HPO4-2
64.0096425	% bound in species	3.31E+06 H2PO4-
0.565797816	% bound in species	2.81E+06 FeH2PO4+
0.24117793	% bound in species	2.81E+06 FeHPO4 (aq)
0.930331232	% bound in species	2.82E+06 FeHPO4+
0.970697431	% bound in species	4.61E+06 MgHPO4 (aq)
3.372913358	% bound in species	1.51E+06 CaHPO4 (aq)
3.282247781	% bound in species	1.51E+06 CaH2PO4+
0.034796404	% bound in species	5.01E+06 NaHPO4-
0.010910865	% bound in species	4.11E+06 KHPO4-
18.90777079	% bound in species	3.06E+05 AlHPO4+
1.003547806	% bound in species	3.06E+05 Al2PO4+3
0.164804288	% bound in species	9.51E+06 ZnHPO4 (aq)
0.06283808	% bound in species	2.32E+06 CuHPO4 (aq)
0.15421135	% bound in species	4.71E+06 MnHPO4 (aq)
0.038329654	% bound in species	4.11E+06 KH2PO4 (aq)
0.078924254	% bound in species	5.01E+06 NaH2PO4 (aq)

SeO4-2

86.10240536	% bound in species	7.62E+02 SeO4-2
13.36805091	% bound in species	1.51E+06 CaSeO4 (aq)
0.238711895	% bound in species	9.51E+06 ZnSeO4 (aq)
0.064273111	% bound in species	5.41E+06 NiSeO4 (aq)
0.223403748	% bound in species	4.71E+06 MnSeO4 (aq)

MoO4-2

55.28143689	% bound in species	480 MoO4-2
16.93877358	% bound in species	4.60E+06 MgMoO4(aq)
27.39924336	% bound in species	1.50E+06 CaMoO4(aq)
0.371948986	% bound in species	3.30E+06 HMoO4-

H2O

0.01285855	% bound in species	6.00E+06 PbOH+
1.520196114	% bound in species	3.03E+05 AlOH+2
1.925974294	% bound in species	3.03E+05 Al(OH)2+
0.310407643	% bound in species	3.03E+05 Al(OH)3 (aq)
0.207889876	% bound in species	3.03E+05 Al(OH)4-
0.01707605	% bound in species	9.50E+06 ZnOH+
0.048894092	% bound in species	2.31E+06 CuOH+
0.318565957	% bound in species	2.81E+06 FeOH+2
56.12972275	% bound in species	2.81E+06 Fe(OH)2+
0.017940051	% bound in species	2.81E+06 Fe(OH)3 (aq)
39.47592218	% bound in species	3.01E+05 Al2(OH)2CO3+2

H3AsO3

99.95576193	% bound in species	6.00E+01 H3AsO3
0.044238067	% bound in species	3300600 H2AsO3-

H+1

0.037546627	% bound in species	3.30E+02 H+1
0.074118626	% bound in species	3.31E+06 HPO4-2
1.544830875	% bound in species	3.31E+06 H2PO4-
0.01365516	% bound in species	2.81E+06 FeH2PO4+
0.011226468	% bound in species	2.82E+06 FeHPO4+
0.011713574	% bound in species	4.61E+06 MgHPO4 (aq)
0.040701529	% bound in species	1.51E+06 CaHPO4 (aq)
0.079214904	% bound in species	1.51E+06 CaH2PO4+
0.228163343	% bound in species	3.06E+05 AlHPO4+
0.015877401	% bound in species	3.30E+06 HAsO4-2
0.205078145	% bound in species	3.30E+06 H2AsO4-
16.78714773	% bound in species	3.30E+06 HCO3-
82.62607218	% bound in species	3.30E+06 H2CO3* (aq)
0.012562969	% bound in species	9.50E+06 ZnHCO3+
0.098090212	% bound in species	4.60E+06 MgHCO3+
0.460644274	% bound in species	1.50E+06 CaHCO3+

Fe+3

1.103022233	% bound in species	2.81E+06 FeOH+2
97.17349078	% bound in species	2813301 Fe(OH)2+
0.020705576	% bound in species	2.81E+06 Fe(OH)3 (aq)
1.696225095	% bound in species	2.82E+06 FeHPO4+

E-1

0.067462389	% bound in species	4.70E+06 MnO4-
99.93253761	% bound in species	4.70E+06 MnO4-2

HSeO3-1

99.39453833	% bound in species	7.61E+02 HSeO3-1
0.573709589	% bound in species	3.31E+06 SeO3-2
0.031441154	% bound in species	3.31E+06 H2SeO3 (aq)

Sb(OH)6-1

99.94407402	% bound in species	7.41E+02 Sb(OH)6-1
0.055925981	% bound in species	7.41E+06 Sb(OH)5 (aq)

Part 5 of output file
Provisional mass distribution

idx	Name	Dissolved Mol/kg	Percent	Sorbed Mol/kg	Percent	Precipitated Mol/kg	Percent
61	AsO4-3	3.70E-06	100	0	0	0	0
30	Al+3	4.30E-05	100	0	0	0	0
150	Ca+2	7.91E-03	100	0	0	0	0
140	CO3-2	1.85E-03	100	0	0	0	0
280	Fe+2	7.05224E-05	100	0	0	0	0
100	Ba+2	1.5E-06	100	0	0	0	0
410	K+1	0.000623899	100	0	0	0	0
460	Mg+2	0.001561395	100	0	0	0	0
470	Mn+2	6.15998E-05	100	0	0	0	0
500	Na+1	1.28E-03	100	0	0	0	0
770	H4SiO4	0.0002608	100	0	0	0	0
950	Zn+2	9.26997E-05	100	0	0	0	0
732	SO4-2	0.010275071	100	0	0	0	0
20	Ag+1	1.5E-06	100	0	0	0	0
740	Sb(OH)3	1.52699E-14	100	0	0	0	0
231	Cu+2	5.59999E-06	100	0	0	0	0
600	Pb+2	2.2E-06	100	0	0	0	0
540	Ni+2	1.08E-05	100	0	0	0	0
90	H3BO3	0.0002473	100	0	0	0	0
160	Cd+2	4.99999E-07	100	0	0	0	0
580	PO4-3	3.77E-05	100	0	0	0	0
762	SeO4-2	3.96803E-11	100	0	0	0	0
480	MoO4-2	9.99998E-07	100	0	0	0	0
2	H2O	7.15945E-05	100	0	0	0	0
60	H3AsO3	1.05868E-16	100	0	0	0	0
330	H+1	0.003124175	100	0	0	0	0
281	Fe+3	2.06774E-05	100	0	0	0	0
1	E-1	-4.43849E-52	100	0	0	0	0
761	HSeO3-1	6.39995E-06	100	0	0	0	0
741	Sb(OH)6-1	4.4E-06	100	0	0	0	0

Charge balance: SPECIATED

Sum of cations=	0.015852388	Sum of anions=	0.0155807
Percent difference=	0.864231329		
Provisional ionic stre	0.03017138		
Provisional pH=	6		
Provisional pe=	7.348801726	or Eh=	412.85469

Part 6 of output file
Saturation indices and stoichiometry of all supersaturated minerals

ID	Name	log IAP	Sat. Index	No. of comp	Stoichiometry on line below								
2000	Ag metal	-13.27103024	1.2172828	2									
1	20	1	1	0	0	0	0	0	0	0	0	0	0
2074102	SbO2	-24.77417866	3.0499213	4									
1	741	1	1	2	330	-4	2	0	0	0	0	0	0
2077000	Chalcedony	-3.581382504	0.1514487	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2077002	Quartz	-3.581382504	0.6261356	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2003001	Boehmite	11.20008858	1.5297796	3									
-3	330	1	30	2	2	0	0	0	0	0	0	0	0
2003002	Diaspore	11.20008858	3.3706872	3									
-3	330	1	30	2	2	0	0	0	0	0	0	0	0
2003003	Gibbsite (C)	11.19990858	2.4854273	3									
1	30	3	2	-3	330	0	0	0	0	0	0	0	0
2003004	Al(OH)3 (Soil)	11.19990858	1.9354273	3									
1	30	3	2	-3	330	0	0	0	0	0	0	0	0
2003005	Imogolite	18.81861466	4.0218568	4									
2	30	1	770	3	2	-6	330	0	0	0	0	0	0
2028100	Ferrihydrite	7.333441712	3.201652	3									
1	281	3	2	-3	330	0	0	0	0	0	0	0	0
2028101	Fe3(OH)8	22.07999246	1.8579925	4									
-8	330	2	281	1	280	8	2	0	0	0	0	0	0
2028102	Goethite	7.33362171	6.2803525	3									
1	281	2	2	-3	330	0	0	0	0	0	0	0	0
2028103	Ferrihydrite (aged)	7.333441712	4.6434417	3									
1	281	-3	330	3	2	0	0	0	0	0	0	0	0
3003000	Al2O3	22.40035717	0.3480411	3									
2	30	3	2	-6	330	0	0	0	0	0	0	0	0
3028000	Magnetite	22.08071245	16.742631	4									
-8	330	2	281	1	280	4	2	0	0	0	0	0	0
3028001	Hercynite	29.8136462	4.0072267	4									
-8	330	1	280	2	30	4	2	0	0	0	0	0	0
3028100	Hematite	14.66742342	14.888324	3									
2	281	3	2	-6	330	0	0	0	0	0	0	0	0
3028101	Maghemite	14.66742342	8.2814234	3									
-6	330	2	281	3	2	0	0	0	0	0	0	0	0
3028102	Lepidocrocite	7.33362171	5.9626217	3									
-3	330	1	281	2	2	0	0	0	0	0	0	0	0
3046001	Magnesioferrite	23.45761664	4.0093242	4									
-8	330	1	460	2	281	4	2	0	0	0	0	0	0
3023100	Cupric Ferrite	20.97159818	13.032488	4									
-8	330	1	231	2	281	4	2	0	0	0	0	0	0
6003000	AlOHSO4	-3.202898164	0.0271018	4									
-1	330	1	30	1	732	1	2	0	0	0	0	0	0
6003001	Al4(OH)10SO4	30.39682759	7.6968276	4									
-10	330	4	30	1	732	10	2	0	0	0	0	0	0
6050000	Na-Jarosite	-3.775125216	0.2851025	5									
1	500	3	281	2	732	-6	330	6	2	0	0	0	0
6041002	K-Jarosite	-4.088800803	5.9664164	5									
1	410	3	281	2	732	-6	330	6	2	0	0	0	0
6010000	Barite	-8.611935274	1.5815225	2									

1	100	1	732	0	0	0	0	0	0	0	0	0	0
6041001	Alunite	7.510599817	6.9616373	5									
1	410	3	30	2	732	-6	330	6	2	0	0	0	0
6128100	Fe2(SeO3)3:2H2O	-19.12969715	1.4965028	4									
3	761	2	281	2	2	-3	330	0	0	0	0	0	0
6128101	Fe2(OH)4SeO3	3.401476564	1.8475766	4									
1	761	2	281	4	2	-5	330	0	0	0	0	0	0
6260001	PbMoO4	-12.82172554	3.2987866	2									
1	600	1	480	0	0	0	0	0	0	0	0	0	0
6216001	CdMoO4	-13.27771566	1.0527738	2									
1	480	1	160	0	0	0	0	0	0	0	0	0	0
6223101	CuMoO4	-12.23029176	0.9591337	2									
1	480	1	231	0	0	0	0	0	0	0	0	0	0
7060002	Hydroxylpyromorphite	-62.71589677	0.0741032	4									
5	600	3	580	1	2	-1	330	0	0	0	0	0	0
7060003	Plumbgummite	-21.54036102	11.249639	5									
-5	330	1	600	3	30	2	580	6	2	0	0	0	0
7028100	Strengite	-23.09315216	3.2199789	3									
1	281	1	580	2	2	0	0	0	0	0	0	0	0
7047001	MnHPO4	-23.03252587	2.3674741	3									
1	470	1	580	1	330	0	0	0	0	0	0	0	0
7015003	Hydroxyapatite	-43.92402728	0.4089727	4									
5	150	3	580	1	2	-1	330	0	0	0	0	0	0
8603000	Halloysite	15.23723216	3.9785241	4									
2	30	2	770	1	2	-6	330	0	0	0	0	0	0
8603001	Kaolinite	15.23723216	6.4286776	4									
2	30	2	770	1	2	-6	330	0	0	0	0	0	0

Iterations=		8	Solid:	Ferrihydrite	precipitates		
Iterations=		8	Solid:	Barite	precipitates		
	8	PO4-3	0.0000377	-6.819E-06	-12.42677	6.816E-06	
	9	PO4-3	0.0000377	6.969E-06	-12.37709	6.965E-06	
	10	PO4-3	0.0000377	1.115E-06	-12.41481	1.111E-06	
	11	PO4-3	0.0000377	4.693E-08	-12.41879	4.316E-08	
	12	Cd+2	0.0000005	6.2E-11	-6.743172	1.2E-11	
Iterations=		13	Solid:	Al(OH)3 (So	precipitates		
	13	Cd+2	0.0000005	-1.684E-07	-6.743211	1.684E-07	
	14	Cd+2	0.0000005	2.185E-07	-6.621192	2.184E-07	
	15	Cd+2	0.0000005	4.295E-08	-6.715833	4.29E-08	
	16	Cd+2	0.0000005	1.903E-09	-6.742131	1.853E-09	
	17	Cd+2	0.0000005	6.387E-11	-6.743381	1.387E-11	
Iterations=		18	Solid:	Hydroxyapat	precipitates		
	18	H3BO3	0.0002473	1.693E-06	-3.604042	1.668E-06	
	19	H3BO3	0.0002473	-1.224E-06	-3.607018	1.199E-06	
	20	H3BO3	0.0002473	-4.316E-07	-3.604851	4.069E-07	
	21	Ni+2	0.0000108	3.688E-08	-5.38565	3.58E-08	
	22	Ni+2	0.0000108	1.502E-09	-5.386818	4.224E-10	
Iterations=		23	Solid:	Imogolite	precipitates		
	23	Ni+2	0.0000108	-3.662E-06	-5.386865	3.661E-06	
	24	Ni+2	0.0000108	4.609E-06	-5.254145	4.608E-06	
	25	Ni+2	0.0000108	8.348E-07	-5.360521	8.337E-07	
	26	Ni+2	0.0000108	3.682E-08	-5.385654	3.574E-08	
	27	Ni+2	0.0000108	1.495E-09	-5.38682	4.154E-10	
Iterations=		28	Solid	Al(OH)3 (So	dissolves		
	28	H4SiO4	0.0002393	-5.411E-05	-3.732745	5.408E-05	
	29	H4SiO4	0.0002393	-9.218E-07	-3.621625	8.979E-07	
	30	H4SiO4	0.0002393	-3.879E-07	-3.619685	3.64E-07	
	31	Ni+2	0.0000108	3.682E-08	-5.385653	3.574E-08	
	32	Ni+2	0.0000108	1.495E-09	-5.386819	4.148E-10	
ID		Name	Anal mol	Calc mol	Log Activity	Gamma	New logK
	61	AsO4-3	0.0000037	1.18E-12	-12.5504	0.2385787	0
	160	Cd+2	0.0000005	3.416E-07	-6.743084	0.5289223	0
	150	Ca+2	0.0079083	0.0055767	-2.53023	0.5289223	0
	140	CO3-2	0.0018485	2.77E-08	-7.834173	0.5289223	0
	480	MoO4-2	0.000001	5.53E-07	-6.533894	0.5289223	0
	762	SeO4-2	0.0000064	3.413E-11	-10.74348	0.5289223	0
	410	K+1	0.0006239	0.0006109	-3.28321	0.8528016	0
	460	Mg+2	0.0015614	0.0011668	-3.2096	0.5289223	0
	470	Mn+2	0.0000616	4.688E-05	-4.605612	0.5289223	0
	500	Na+1	0.001285	0.0012578	-2.969535	0.8528016	0
	90	H3BO3	0.0002473	0.0002471	-3.604046	1.006931	0
	950	Zn+2	0.0000927	6.451E-05	-4.466977	0.5289223	0
	732	SO4-2	0.0102751	0.0075037	-2.401332	0.5289223	0
	20	Ag+1	0.0000015	1.403E-06	-5.922191	0.8528016	0
	740	Sb(OH)3	0.0000044	1.528E-14	-13.813	1.006931	0
	231	Cu+2	0.0000056	3.813E-06	-5.695361	0.5289223	0
	600	Pb+2	0.0000022	9.743E-07	-6.287916	0.5289223	0
	540	Ni+2	0.0000108	7.758E-06	-5.386866	0.5289223	0
	770	H4SiO4	0.0002608	0.0002388	-3.618883	1.006931	0
	2	H2O	-1.52466E-20	-0.000307	-0.00018	1	0
	60	H3AsO3	1E-16	1.059E-16	-15.97219	1.006931	0
	330	H+1	1E-09	1.173E-06	-6	0.8528016	0
	280	Fe+2	0.00009	3.079E-08	-7.788183	0.5289223	0
	1	E-1	1E-16	4.479E-08	-7.348802	0.8528016	0
	761	HSeO3-1	1E-16	6.361E-06	-5.265607	0.8528016	0
	741	Sb(OH)6-1	1E-16	4.398E-06	-5.42594	0.8528016	0
	281	Fe+3	0.0000012	5.685E-14	-13.86767	0.2385787	0
	100	Ba+2	0.0000015	3.051E-08	-7.792125	0.5289223	0
	30	Al+3	0.000043	6.768E-09	-8.79191	0.2385787	0
	580	PO4-3	0.0000377	1.153E-12	-12.56056	0.2385787	0

Type I - Components of species in solution

ID		Name	Calc mol	Activity	Log activity	Gamma	New logk
	330	H+1	1.17261E-06	0.000001	-6	0.8528016	0.06915203
	30	Al+3	6.76797E-09	1.615E-09	-8.79191	0.2385787	0.62236825
	150	Ca+2	0.005576711	0.0029496	-2.53023	0.5289223	0.27660811
	140	CO3-2	2.76972E-08	1.465E-08	-7.834173	0.5289223	0.27660811
	280	Fe+2	3.07911E-08	1.629E-08	-7.788183	0.5289223	0.27660811

281	Fe+3	5.68458E-14	1.356E-14	-13.86767	0.2385787	0.62236825
410	K+1	0.00061086	0.0005209	-3.28321	0.8528016	0.06915203
460	Mg+2	0.001166831	0.0006172	-3.2096	0.5289223	0.27660811
470	Mn+2	4.68809E-05	2.48E-05	-4.605612	0.5289223	0.27660811
500	Na+1	0.001257815	0.0010727	-2.969535	0.8528016	0.06915203
770	H4SiO4	0.000238846	0.0002405	-3.618883	1.006931	-0.0029999
950	Zn+2	6.45105E-05	3.412E-05	-4.466977	0.5289223	0.27660811
732	SO4-2	0.007503711	0.0039689	-2.401332	0.5289223	0.27660811
480	MoO4-2	5.52986E-07	2.925E-07	-6.533894	0.5289223	0.27660811
61	AsO4-3	1.18023E-12	2.816E-13	-12.5504	0.2385787	0.62236825
231	Cu+2	3.81283E-06	2.017E-06	-5.695361	0.5289223	0.27660811
600	Pb+2	9.74298E-07	5.153E-07	-6.287916	0.5289223	0.27660811
540	Ni+2	7.75786E-06	4.103E-06	-5.386866	0.5289223	0.27660811
90	H3BO3	0.000247146	0.0002489	-3.604046	1.006931	-0.0029999
160	Cd+2	3.41605E-07	1.807E-07	-6.743084	0.5289223	0.27660811
580	PO4-3	1.15295E-12	2.751E-13	-12.56056	0.2385787	0.62236825
762	SeO4-2	3.41297E-11	1.805E-11	-10.74348	0.5289223	0.27660811
761	HSeO3-1	6.36128E-06	5.425E-06	-5.265607	0.8528016	0.06915203
740	Sb(OH)3	1.52755E-14	1.538E-14	-13.813	1.006931	-0.0029999
741	Sb(OH)6-1	4.39756E-06	3.75E-06	-5.42594	0.8528016	0.06915203
60	H3AsO3	1.05879E-16	1.066E-16	-15.97219	1.006931	-0.0029999
100	Ba+2	3.05129E-08	1.614E-08	-7.792125	0.5289223	0.27660811
20	Ag+1	1.40269E-06	1.196E-06	-5.922191	0.8528016	0.06915203

Type II - Other species in solution or adsorbed

ID	Name	Calc mol	Activity	Log activity	Gamma	New logk
4803300	H2Mo6O21-4	1.24973E-33	9.781E-35	-34.00962	0.078265	54.2996393
4604800	MgMoO4(aq)	1.69698E-07	1.709E-07	-6.767323	1.006931	2.97317158
1504800	CaMoO4(aq)	2.73516E-07	2.754E-07	-6.560018	1.006931	2.50110654
3300020	OH-	3.58107E-09	3.054E-09	-8.51514	0.8528016	-14.445808
9503304	Zn2OH+3	1.25611E-12	2.997E-13	-12.52334	0.2385787	-8.9668377
6003300	PbOH+	9.18503E-09	7.833E-09	-8.106072	0.8528016	-7.7488233
6003301	Pb(OH)2 (aq)	4.11836E-12	4.147E-12	-11.38228	1.006931	-17.097
6003302	Pb(OH)3-	4.89436E-17	4.174E-17	-16.37946	0.8528016	-28.021848
6003303	Pb2OH+3	4.46022E-13	1.064E-13	-12.97301	0.2385787	-5.7746316
6003304	Pb3(OH)4+2	2.78831E-20	1.475E-20	-19.83127	0.5289223	-24.69019
6003306	Pb4(OH)4+4	1.88345E-22	1.474E-23	-22.83148	0.078265	-20.572661
303300	AlOH+2	1.10613E-08	5.851E-09	-8.232804	0.5289223	-5.1641059
303301	Al(OH)2+	7.01436E-09	5.982E-09	-8.223164	0.8528016	-11.361742
303303	Al(OH)3 (aq)	7.53963E-10	7.592E-10	-9.11965	1.006931	-18.3302
303302	Al(OH)4-	3.78565E-10	3.228E-10	-9.491011	0.8528016	-24.62923
9503300	ZnOH+	1.2219E-08	1.042E-08	-7.982117	0.8528016	-9.4458077
9503301	Zn(OH)2 (aq)	4.32179E-10	4.352E-10	-9.361337	1.006931	-16.896999
9503302	Zn(OH)3-	1.62418E-15	1.385E-15	-14.85852	0.8528016	-28.321849
9503303	Zn(OH)4-2	4.17745E-22	2.21E-22	-21.6557	0.5289223	-40.911392
1603300	CdOH+	5.2506E-12	4.478E-12	-11.34894	0.8528016	-10.536527
1603301	Cd(OH)2 (aq)	9.11077E-16	9.174E-16	-15.03744	1.006931	-20.297001
1603302	Cd(OH)3-	1.06054E-22	9.044E-23	-22.04362	0.8528016	-33.230847
1603303	Cd(OH)4-2	1.75714E-30	9.294E-31	-30.0318	0.5289223	-47.01139
1603304	Cd2OH+3	2.06E-17	4.915E-18	-17.3085	0.2385787	-9.1997843
2313300	CuOH+	3.5016E-08	2.986E-08	-7.524886	0.8528016	-7.7601927
2313305	Cu2OH+3	1.86589E-12	4.452E-13	-12.35148	0.2385787	-6.3382127
2313303	Cu(OH)4-2	1.56282E-23	8.266E-24	-23.0827	0.5289223	-41.11001
2313302	Cu(OH)3-	5.41068E-15	4.614E-15	-14.3359	0.8528016	-26.570847
2313301	Cu(OH)2 (aq)	1.61153E-11	1.623E-11	-10.78976	1.006931	-17.097039
2313304	Cu2(OH)2+2	5.1348E-11	2.716E-11	-10.56608	0.5289223	-10.898395
203300	AgOH (aq)	1.19572E-12	1.204E-12	-11.91937	1.006931	-12
203301	Ag(OH)2-	1.38868E-18	1.184E-18	-17.92655	0.8528016	-23.934848
5403300	NiOH+	2.01497E-10	1.718E-10	-9.764883	0.8528016	-10.308685
5403301	Ni(OH)2 (aq)	4.12833E-13	4.157E-13	-12.38123	1.006931	-18.996999
5403302	Ni(OH)3-	4.90622E-18	4.184E-18	-17.37841	0.8528016	-29.921847
2803300	FeOH+	2.32182E-12	1.98E-12	-11.70332	0.8528016	-9.8458083
2803302	Fe(OH)2 (aq)	4.02061E-18	4.048E-18	-17.39271	1.006931	-21.607166
2803301	Fe(OH)3-	1.30636E-22	1.114E-22	-21.95309	0.8528016	-32.095215
2813300	FeOH+2	1.43156E-10	7.572E-11	-10.1208	0.5289223	-1.9763393
2813301	Fe(OH)2+	1.26252E-08	1.077E-08	-7.967915	0.8528016	-6.0307332
2813302	Fe(OH)3 (aq)	2.69121E-12	2.71E-12	-11.56705	1.006931	-15.701842
2813303	Fe(OH)4-	1.15904E-14	9.884E-15	-14.00505	0.8528016	-24.067513
2813304	Fe2(OH)2+4	8.97657E-19	7.026E-20	-19.15332	0.078265	-2.3111888
2813305	Fe3(OH)4+5	1.70448E-23	3.183E-25	-24.49721	0.0186724	-5.1646771
4703300	MnOH+	2.04775E-10	1.746E-10	-9.757875	0.8528016	-11.082931
4703302	Mn(OH)4-2	2.41145E-29	1.275E-29	-28.89433	0.5289223	-48.01139
4700020	MnO4-	5.98843E-56	5.107E-56	-55.29184	0.8528016	-135.36036
4700021	MnO4-2	1.10766E-52	5.859E-53	-52.2322	0.5289223	-124.74447
4603300	MgOH+	7.03308E-10	5.998E-10	-9.222006	0.8528016	-11.943074
1503300	CaOH+	1.76503E-10	1.505E-10	-9.8224	0.8528016	-13.222838
1003300	BaOH+	2.26716E-16	1.933E-16	-15.71367	0.8528016	-13.852212
303305	Al3(OH)4+5	1.45484E-16	2.717E-18	-17.56598	0.0186724	-13.460735
303304	Al2(OH)2+4	1.36685E-13	1.07E-14	-13.97071	0.078265	-7.2800987
2313306	Cu3(OH)4+2	2.60505E-15	1.378E-15	-14.86079	0.5289223	-21.497381
4703304	Mn2(OH)3+	9.25524E-16	7.893E-16	-15.10276	0.8528016	-23.821849
4703303	Mn2OH+3	6.51575E-14	1.555E-14	-13.8084	0.2385787	-9.9746319
4103300	KOH (aq)	2.74568E-12	2.765E-12	-11.55835	1.006931	-14.27796
5003300	NaOH (aq)	3.76012E-12	3.786E-12	-11.4218	1.006931	-14.455083
7413300	Sb(OH)5 (aq)	2.46173E-09	2.479E-09	-8.60576	1.006931	2.81700003
3307320	HSO4-	3.03185E-07	2.586E-07	-6.587445	0.8528016	1.88303901
6007320	PbSO4 (aq)	9.94837E-07	1.002E-06	-5.999248	1.006931	2.68700016
6007321	Pb(SO4)2-2	4.52927E-08	2.396E-08	-7.62058	0.5289223	3.74660814
307320	AlSO4+	3.7509E-08	3.199E-08	-7.495017	0.8528016	3.76737714
307321	Al(SO4)2-	5.56904E-09	4.749E-09	-8.323372	0.8528016	5.34035421
9507320	ZnSO4 (aq)	2.57721E-05	2.595E-05	-4.58585	1.006931	2.27945922
9507321	Zn(SO4)2-2	1.93627E-06	1.024E-06	-5.989641	0.5289223	3.55660808
1607320	CdSO4 (aq)	1.38625E-07	1.396E-07	-6.855159	1.006931	2.28625725
1607321	Cd(SO4)2-2	1.70161E-08	9E-09	-8.045748	0.5289223	3.77660811
2317320	CuSO4 (aq)	1.51204E-06	1.523E-06	-5.817436	1.006931	2.27625726
2317321	CuHSO4+	2.05333E-12	1.751E-12	-11.75669	0.8528016	2.40915194
207320	AgSO4-	9.72946E-08	8.297E-08	-7.081063	0.8528016	1.31161118
5407320	NiSO4 (aq)	2.85084E-06	2.871E-06	-5.542027	1.006931	2.24317156

5407321	Ni(SO4)2-2	8.0738E-10	4.27E-10	-9.36953	0.5289223	1.0966081
2807320	FeSO4 (aq)	1.32813E-08	1.337E-08	-7.873761	1.006931	2.31275401
2817320	FeSO4+	6.57855E-13	5.61E-13	-12.25102	0.8528016	4.08713268
2817321	Fe(SO4)2-	3.98682E-14	3.4E-14	-13.46853	0.8528016	5.27096128
4707320	MnSO4 (aq)	1.44316E-05	1.453E-05	-4.837687	1.006931	2.16625737
4607320	MgSO4 (aq)	0.000391056	0.0003938	-3.404761	1.006931	2.2031716
1507320	CaSO4 (aq)	0.002288466	0.0023043	-2.637456	1.006931	2.2911065
5007320	NaSO4-	2.68537E-05	2.29E-05	-4.640148	0.8528016	0.79987126
4107320	KSO4-	1.30E-05	1.111E-05	-4.95422	0.8528016	0.79947468
7707320	H4SiO4SO4-2	4.99E-07	2.638E-07	-6.578776	0.5289223	-0.2819535
1007320	BaSO4 (aq)	8.5811E-09	8.641E-09	-8.063457	1.006931	2.12700021
3307611	SeO3-2	3.66785E-08	1.94E-08	-7.712197	0.5289223	-8.169981
3307610	H2SeO3 (aq)	2.01E-09	2.027E-09	-8.693148	1.006931	2.56945942
1607610	Cd(SeO3)2-2	1.33E-16	7.01E-17	-16.1543	0.5289223	-10.603392
207610	AgSeO3-1	1.95593E-11	1.668E-11	-10.7778	0.8528016	-5.5208481
207611	Ag(SeO3)2-3	1.34575E-17	3.211E-18	-17.49341	0.2385787	-12.417632
2817610	FeHSeO3+2	2.14E-16	1.134E-16	-15.9453	0.5289223	3.46458884
3307620	HSeO4-1	6.48961E-16	5.534E-16	-15.25693	0.8528016	1.55569428
1507620	CaSeO4 (aq)	5.28804E-12	5.325E-12	-11.27371	1.006931	1.9970001
9507620	ZnSeO4 (aq)	9.47E-14	9.54E-14	-13.02045	1.006931	2.18700016
9507621	Zn(SeO4)2-2	3.3318E-24	1.762E-24	-23.75393	0.5289223	2.47660816
1607620	CdSeO4 (aq)	6.03E-16	6.074E-16	-15.21656	1.006931	2.26700008
5407620	NiSeO4 (aq)	2.55E-14	2.569E-14	-13.59027	1.006931	2.53706934
4707620	MnSeO4 (aq)	8.87E-14	8.933E-14	-13.04902	1.006931	2.29706933
3305800	HPO4-2	1.70E-06	8.988E-07	-6.046345	0.5289223	12.7908197
3305801	H2PO4-	1.77E-05	1.512E-05	-4.820502	0.8528016	19.8092059
3305802	H3PO4	1.79843E-09	1.811E-09	-8.742108	1.006931	21.8154489
5405801	NiH2PO4+	4.19E-10	3.569E-10	-9.447422	0.8528016	20.569152
5405800	NiHPO4 (aq)	2.40E-09	2.413E-09	-8.617423	1.006931	15.327
1005800	BaHPO4 (aq)	1.72E-12	1.727E-12	-11.76268	1.006931	14.5870003
2805800	FeH2PO4+	9.85E-11	8.4E-11	-10.07574	0.8528016	22.3421527
2805801	FeHPO4 (aq)	4.20E-11	4.229E-11	-10.37374	1.006931	15.9720005
2815801	FeH2PO4+2	4.99325E-15	2.641E-15	-14.57822	0.5289223	24.1266085
2815800	FeHPO4+	1.62E-10	1.381E-10	-9.859764	0.8528016	22.6376164
4605800	MgPO4-	6.80E-12	5.801E-12	-11.23653	0.8528016	4.60277649
4605802	MgHPO4 (aq)	2.69E-07	2.708E-07	-6.567315	1.006931	15.1998426
1505800	CaHPO4 (aq)	9.31E-07	9.377E-07	-6.027945	1.006931	15.0598423
1505801	CaPO4-	2.08E-09	1.774E-09	-8.751162	0.8528016	6.40877672
1505802	CaH2PO4+	9.05839E-07	7.725E-07	-6.112101	0.8528016	21.047837
5005800	NaHPO4-	9.63961E-09	8.221E-09	-8.085093	0.8528016	13.5141517
4105800	KHPO4-	3.02263E-09	2.578E-09	-8.588767	0.8528016	13.3241521
305801	AlHPO4+	5.32948E-08	4.545E-08	-7.342467	0.8528016	20.0791523
305800	Al2PO4+3	2.87072E-11	6.849E-12	-11.16438	0.2385787	19.6023678
6005801	PbH2PO4+	1.96643E-10	1.677E-10	-9.775473	0.8528016	21.142152
6005800	PbHPO4 (aq)	4.20269E-10	4.232E-10	-9.373473	1.006931	15.4720005
1605800	CdHPO4 (aq)	5.93415E-10	5.975E-10	-9.223641	1.006931	16.077
9505800	ZnHPO4 (aq)	4.56526E-08	4.597E-08	-7.337535	1.006931	15.6869997
2315800	CuHPO4 (aq)	1.74214E-08	1.754E-08	-7.755918	1.006931	16.4970001
4705800	MnHPO4 (aq)	4.27397E-08	4.304E-08	-7.366169	1.006931	15.7970003
4105804	K2HPO4 (aq)	2.34435E-12	2.361E-12	-11.62698	1.006931	13.4970001
4105803	K2PO4-	1.59285E-17	1.358E-17	-16.86698	0.8528016	2.32915202
4105802	KH2PO4 (aq)	1.06226E-08	1.07E-08	-7.970768	1.006931	19.8699993
4105801	KPO4-2	5.29211E-15	2.799E-15	-14.55298	0.5289223	1.56739645
5005804	Na2HPO4 (aq)	6.56707E-12	6.613E-12	-11.17963	1.006931	13.3169998
5005803	Na2PO4-	1.44386E-16	1.231E-16	-15.90963	0.8528016	2.65915194
5005802	NaH2PO4 (aq)	2.1873E-08	2.202E-08	-7.657093	1.006931	19.8699993
5005801	NaPO4-2	1.26552E-14	6.694E-15	-14.17434	0.5289223	1.63236187
3300601	HAsO3-2	3.04131E-28	1.609E-28	-27.79355	0.5289223	-23.54475
3300600	H2AsO3-	4.68412E-20	3.995E-20	-19.39852	0.8528016	-9.357183
3300612	H3AsO4	4.56636E-10	4.598E-10	-9.33743	1.006931	21.2099705
3300610	HAsO4-2	4.95584E-07	2.621E-07	-6.58149	0.5289223	12.2455184
3300611	H2AsO4-	3.20398E-06	2.732E-06	-5.563462	0.8528016	19.056091
7400020	Sb(OH)4-1	2.72878E-20	2.327E-20	-19.63318	0.8528016	-11.750848
7403302	Sb(OH)2+	4.32841E-19	3.691E-19	-18.43282	0.8528016	1.44915202
3301400	HCO3-	0.000528403	0.0004506	-3.346187	0.8528016	10.5571379
3301401	H2CO3* (aq)	0.001300908	0.0013099	-2.882753	1.006931	16.9484195
6001400	Pb(CO3)2-2	1.82115E-12	9.632E-13	-12.01626	0.5289223	10.2166077
6001401	PbCO3 (aq)	2.54045E-08	2.558E-08	-7.592089	1.006931	6.52700031
9501401	ZnCO3 (aq)	2.8566E-08	2.876E-08	-7.54115	1.006931	4.75700033
9501400	ZnHCO3+	3.95369E-07	3.372E-07	-6.47215	0.8528016	11.8981525
1601400	CdHCO3+	2.09843E-09	1.79E-09	-8.747257	0.8528016	11.899152
6001402	PbHCO3+	1.50336E-07	1.282E-07	-6.89209	0.8528016	13.2991516
1601401	CdCO3 (aq)	6.1623E-11	6.205E-11	-10.20726	1.006931	4.36699998
1601403	Cd(CO3)2-2	1.24503E-15	6.585E-16	-15.18143	0.5289223	7.50660813
2311400	CuCO3 (aq)	1.72769E-07	1.74E-07	-6.759534	1.006931	6.76700008
2311402	CuHCO3+	4.66249E-08	3.976E-08	-7.400534	0.8528016	12.1981517
2311401	Cu(CO3)2-2	1.29688E-11	6.86E-12	-11.16371	0.5289223	10.4766079
5401401	NiCO3 (aq)	2.218E-09	2.233E-09	-8.651039	1.006931	4.56700027
5401400	NiHCO3+	1.85402E-07	1.581E-07	-6.801039	0.8528016	12.4891521
2801400	FeHCO3+	7.5127E-11	6.407E-11	-10.19336	0.8528016	11.4981519
4701400	MnHCO3+	2.27375E-07	1.939E-07	-6.712409	0.8528016	11.7965279
4601400	MgCO3 (aq)	5.93167E-09	5.973E-09	-8.223823	1.006931	2.81695018
4601401	MgHCO3+	3.08774E-06	2.633E-06	-5.579512	0.8528016	11.5334134
1501400	CaHCO3+	1.44487E-05	1.232E-05	-4.909323	0.8528016	11.5242318
1501401	CaCO3 (aq)	5.88382E-08	5.925E-08	-7.227341	1.006931	3.13406229
1001401	BaCO3 (aq)	8.92835E-14	8.99E-14	-13.04623	1.006931	2.5770693
1001400	BaHCO3+	4.71949E-11	4.025E-11	-10.39526	0.8528016	11.3001935
5001400	NaCO3-	5.30039E-10	4.52E-10	-9.344845	0.8528016	1.52801576
5001401	NaHCO3 (aq)	3.05645E-07	3.078E-07	-6.511783	1.006931	10.2889256
301400	Al2(OH)2CO3+2	1.47318E-09	7.792E-10	-9.108352	0.5289223	4.58660805
9501402	Zn(CO3)2-2	2.76239E-13	1.461E-13	-12.83532	0.5289223	7.5766083
4701401	MnCO3 (aq)	1.80807E-08	1.821E-08	-7.739785	1.006931	4.69699991
4601402	Mg2CO3+2	4.10426E-11	2.171E-11	-10.66337	0.5289223	3.86660803
3307701	H2SiO4-2	2.57941E-16	1.364E-16	-15.86509	0.5289223	-23.969598
3307700	H3SiO4-	1.77967E-08	1.518E-08	-7.818813	0.8528016	-10.130779
307700	AlH3SiO4+2	7.37422E-10	3.9E-10	-9.408892	0.5289223	-2.7214915
2810900	FeH2BO3+2	7.85039E-14	4.152E-14	-13.38172	0.5289223	-1.6333919
6000901	Pb(H2BO3)2 (aq)	1.55235E-15	1.563E-15	-14.80601	1.006931	-13.313

6000900	PbH2BO3+	4.337E-11	3.699E-11	-10.43196	0.8528016	-6.4708479
1600901	Cd(H2BO3)2 (aq)	1.08598E-17	1.094E-17	-16.96118	1.006931	-15.013
1600900	CdH2BO3+	2.5236E-12	2.152E-12	-11.66713	0.8528016	-7.2508481
9500901	Zn(H2BO3)2 (aq)	8.35469E-15	8.413E-15	-14.07507	1.006931	-14.403
9500900	ZnH2BO3+	1.43922E-10	1.227E-10	-9.911024	0.8528016	-7.7708481
2310901	Cu(H2BO3)2 (aq)	3.1882E-13	3.21E-13	-12.49345	1.006931	-11.593
2310900	CuH2BO3+	3.23403E-09	2.758E-09	-8.559408	0.8528016	-5.1908482
903300	H10(BO3)4-2	2.29441E-18	1.214E-18	-17.91594	0.5289223	-15.223142
3300900	H2BO3-	1.27543E-07	1.088E-07	-6.963496	0.8528016	-9.2902974
3300901	H5(BO3)2-	2.99986E-11	2.558E-11	-10.59205	0.8528016	-9.3148062
3300902	H8(BO3)3-	4.76604E-13	4.064E-13	-12.39099	0.8528016	-7.509703
200901	AgH2BO3 (aq)	2.69627E-12	2.715E-12	-11.56624	1.006931	-8.0429999
4600901	MgH2BO3+	2.7218E-09	2.321E-09	-8.634297	0.8528016	-7.7514978
1500901	CaH2BO3+	1.98199E-08	1.69E-08	-7.77205	0.8528016	-7.5686211
1000901	BaH2BO3+	5.82381E-14	4.967E-14	-13.30394	0.8528016	-7.8386211
5000901	NaH2BO3 (aq)	2.41779E-10	2.435E-10	-9.613582	1.006931	-9.0429999
3304801	HMoO4-	3.72461E-09	3.176E-09	-8.498071	0.8528016	4.10497478
3304802	MoO3(H2O)3(aq)	8.61242E-11	8.672E-11	-10.06187	1.006931	8.46901922
3304803	Mo7O24-6	1.01713E-36	3.295E-39	-38.4821	0.0032399	57.7439133
3304804	HMo7O24-5	7.4799E-38	1.397E-39	-38.8549	0.0186724	62.6104344
304801	AlMo6O21-3	4.16998E-29	9.949E-30	-29.00223	0.2385787	55.6148686
204801	Ag2MoO4 (aq)	1.61353E-19	1.625E-19	-18.78922	1.006931	-0.4139486
4803302	H3Mo8O28-5	5.63091E-45	1.051E-46	-45.97822	0.0186724	74.0210114
4803301	Mo8O26-4	7.26738E-47	5.688E-48	-47.24505	0.078265	78.1314502

Type III - Species with fixed activity

ID	Name	Calc mol	Log mol	New logK	dH
2	H2O	-0.000306997	-3.5128664	0.00018	0
600610	H3AsO3/AsO4	5.92623E-18	-17.227222	41.275636	-138.85
330	H+1	-0.002882129	-2.5402866	6	0
2802810	Fe+2/Fe+3	-8.99557E-05	-4.0459713	13.428289	-42.7
3300021	O2 (g)	-2.14889E-05	-4.667785	-53.39485	571.66
7617620	HSeO3-/SeO4-2	6.39999E-06	-5.1938205	38.175292	-201.2
7407410	Sb(OH)3/Sb(OH)6-	-4.40002E-06	-5.3565452	24.31	0

Type IV - Finite solids (present at equilibrium)

ID	Name	Calc mol	Log mol	New logK	dH
2028100	Ferrihydrite	9.11428E-05	-4.0402777	-4.13179	100.4
6010000	Barite	1.46086E-06	-5.8353923	10.193457	-23
2003005	Imogolite	2.1437E-05	-4.6688369	-14.79676	193.6
7015003	Hydroxyapatite	5.3182E-06	-5.2742353	44.333	0

Type V - Undersaturated solids (not present at equilibrium)

ID	Name	Calc mol	Log mol	New logK	dH
2003004	Al(OH)3 (Soil)	0.877140291	-0.0569309	-9.264481	105
5023101	Malachite	0.006816083	-2.1664651	5.0587897	44.2
5047000	Rhodochrosite	0.034895346	-1.4572325	10.982552	1.88
5015001	Calcite	0.011123061	-1.9537757	8.4106272	8
5095003	Hydrozincite	1.2612E-13	-12.899216	-10.8949	236.5
5060003	Hydrocerrusite	0.000168867	-3.7724542	18.76	0

Type VI - Excluded species (not present in mole balance)

ID	Name	Calc mol	Log mol	New logK	dH
3301404	CH4 (g)	0	-83.192453	43.431594	-257.133
3301403	CO2 (g)	0.024372117	-1.6131067	18.220886	-10
1	E-1	4.47918E-08	-7.3488017	0	0

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Percentage distribution of components among type I and type II species

AsO4-3

0.012341418	% bound in species	3300612	H3AsO4
13.394082	% bound in species	3300610	HAsO4-2
86.59354468	% bound in species	3300611	H2AsO4-

Cd+2

68.32000378	% bound in species	160	Cd+2
27.72458265	% bound in species	1607320	CdSO4 (aq)
3.40317176	% bound in species	1607321	Cd(SO4)2-2
0.118681412	% bound in species	1605800	CdHPO4 (aq)
0.419680562	% bound in species	1601400	CdHCO3+
0.012324431	% bound in species	1601401	CdCO3 (aq)

Ca+2

70.75412488	% bound in species	150	Ca+2
29.03475368	% bound in species	1507320	CaSO4 (aq)
0.011814871	% bound in species	1505800	CaHPO4 (aq)
0.011492763	% bound in species	1505802	CaH2PO4+
0.183316928	% bound in species	1501400	CaHCO3+

CO3-2

28.58545453	% bound in species	3301400	HCO3-
70.37635045	% bound in species	3301401	H2CO3* (aq)
0.021388596	% bound in species	9501400	ZnHCO3+
0.010029824	% bound in species	5401400	NiHCO3+
0.012300518	% bound in species	4701400	MnHCO3+
0.167039945	% bound in species	4601401	MgHCO3+
0.781644025	% bound in species	1501400	CaHCO3+
0.016534744	% bound in species	5001401	NaHCO3 (aq)

MoO4-2

55.29799961	% bound in species	480	MoO4-2
16.96963829	% bound in species	4604800	MgMoO4(aq)
27.35129283	% bound in species	1504800	CaMoO4(aq)
0.372456951	% bound in species	3304801	HMoO4-

SeO4-2

86.12531264	% bound in species	762	SeO4-2

13.3442082	% bound in species	1507620	CaSeO4 (aq)
0.23908119	% bound in species	9507620	ZnSeO4 (aq)
0.064376306	% bound in species	5407620	NiSeO4 (aq)
0.22386194	% bound in species	4707620	MnSeO4 (aq)

K+1

97.90940512	% bound in species	410	K+1
2.088406602	% bound in species	4107320	KSO4-

Mg+2

74.7286797	% bound in species	460	Mg+2
0.010868177	% bound in species	4604800	MgMoO4(aq)
25.04487048	% bound in species	4607320	MgSO4 (aq)
0.017225218	% bound in species	4605802	MgHPO4 (aq)
0.197751488	% bound in species	4601401	MgHCO3+

Mn+2

76.10429776	% bound in species	470	Mn+2
23.42752623	% bound in species	4707320	MnSO4 (aq)
0.069381594	% bound in species	4705800	MnHPO4 (aq)
0.369110287	% bound in species	4701400	MnHCO3+
0.029351352	% bound in species	4701401	MnCO3 (aq)

Na+1

97.88393014	% bound in species	500	Na+1
2.089770661	% bound in species	5007320	NaSO4-
0.023785491	% bound in species	5001401	NaHCO3 (aq)

H3BO3

99.93780217	% bound in species	90	H3BO3
0.051574173	% bound in species	3300900	H2BO3-

Zn+2

69.58968475	% bound in species	950	Zn+2
0.013181021	% bound in species	9503300	ZnOH+
27.80122725	% bound in species	9507320	ZnSO4 (aq)
2.088722897	% bound in species	9507321	Zn(SO4)2-2
0.049246951	% bound in species	9505800	ZnHPO4 (aq)
0.030815145	% bound in species	9501401	ZnCO3 (aq)
0.426497404	% bound in species	9501400	ZnHCO3+

SO4-2

73.03745211	% bound in species	732	SO4-2
0.250852985	% bound in species	9507320	ZnSO4 (aq)
0.037693471	% bound in species	9507321	Zn(SO4)2-2
0.014717492	% bound in species	2317320	CuSO4 (aq)
0.027748728	% bound in species	5407320	NiSO4 (aq)
0.140469845	% bound in species	4707320	MnSO4 (aq)
3.806350684	% bound in species	4607320	MgSO4 (aq)
22.27481032	% bound in species	1507320	CaSO4 (aq)
0.261380628	% bound in species	5007320	NaSO4-
0.12682407	% bound in species	4107320	KSO4-

Ag+1

93.51216314	% bound in species	20	Ag+1
6.486273442	% bound in species	207320	AgSO4-

Sb(OH)3

99.9969879	% bound in species	740	Sb(OH)3

Cu+2

68.0853007	% bound in species	231	Cu+2
0.625277119	% bound in species	2313300	CuOH+
27.00041907	% bound in species	2317320	CuSO4 (aq)
0.311091583	% bound in species	2315800	CuHPO4 (aq)
3.085122842	% bound in species	2311400	CuCO3 (aq)
0.832576445	% bound in species	2311402	CuHCO3+
0.057749818	% bound in species	2310900	CuH2BO3+

Pb+2

44.2858713	% bound in species	600	Pb+2
0.417497394	% bound in species	6003300	PbOH+
45.21944536	% bound in species	6007320	PbSO4 (aq)
2.058738609	% bound in species	6007321	Pb(SO4)2-2
0.019102952	% bound in species	6005800	PbHPO4 (aq)
1.154740835	% bound in species	6001401	PbCO3 (aq)
6.833383356	% bound in species	6001402	PbHCO3+

Ni+2

71.8310574	% bound in species	540	Ni+2
26.39633931	% bound in species	5407320	NiSO4 (aq)
0.022189478	% bound in species	5405800	NiHPO4 (aq)
0.020536742	% bound in species	5401401	NiCO3 (aq)
1.716656434	% bound in species	5401400	NiHCO3+

H4SiO4

99.78391579	% bound in species	770	H4SiO4
0.208341113	% bound in species	7707320	H4SiO4SO4-2

H2O

3.058987399	% bound in species	3300020	OH-
7.845955659	% bound in species	6003300	PbOH+
9.448649843	% bound in species	303300	AlOH+2
11.98348757	% bound in species	303301	Al(OH)2+
1.93213109	% bound in species	303303	Al(OH)3 (aq)
1.293498961	% bound in species	303302	Al(OH)4-
10.43759019	% bound in species	9503300	ZnOH+
0.738344338	% bound in species	9503301	Zn(OH)2 (aq)

29.91105522	% bound in species	2313300	CuOH+
0.027531823	% bound in species	2313301	Cu(OH)2 (aq)
0.087724024	% bound in species	2313304	Cu2(OH)2+2
0.172121143	% bound in species	5403300	NiOH+
0.122285751	% bound in species	2813300	FeOH+2
21.5690985	% bound in species	2813301	Fe(OH)2+
0.174921198	% bound in species	4703300	MnOH+
0.600773942	% bound in species	4603300	MgOH+
0.150770882	% bound in species	1503300	CaOH+
2.516814013	% bound in species	301400	Al2(OH)2CO3+2

H3AsO3

99.95577938	% bound in species	60	H3AsO3
0.044220615	% bound in species	3300600	H2AsO3-

H+1

0.036672092	% bound in species	330	H+1
0.053143028	% bound in species	3305800	HPO4-2
1.10882541	% bound in species	3305801	H2PO4-
0.029123194	% bound in species	1505800	CaHPO4 (aq)
0.056658416	% bound in species	1505802	CaH2PO4+
0.015498916	% bound in species	3300610	HAsO4-2
0.200402847	% bound in species	3300611	H2AsO4-
16.52527445	% bound in species	3301400	HCO3-
81.36925054	% bound in species	3301401	H2CO3* (aq)
0.012364764	% bound in species	9501400	ZnHCO3+
0.096565928	% bound in species	4601401	MgHCO3+
0.451869045	% bound in species	1501400	CaHCO3+

Fe+2

69.52109228	% bound in species	280	Fe+2
29.98682475	% bound in species	2807320	FeSO4 (aq)
0.222385404	% bound in species	2805800	FeH2PO4+
0.09483118	% bound in species	2805801	FeHPO4 (aq)
0.169624093	% bound in species	2801400	FeHCO3+

E-1

0.067534239	% bound in species	4700020	MnO4-
99.93246576	% bound in species	4700021	MnO4-2

HSeO3-1

99.39513836	% bound in species	761	HSeO3-1
0.573102264	% bound in species	3307611	SeO3-2
0.031453757	% bound in species	3307610	H2SeO3 (aq)

Sb(OH)6-1

99.94405195	% bound in species	741	Sb(OH)6-1
0.05594805	% bound in species	7413300	Sb(OH)5 (aq)

Fe+3

1.106838502	% bound in species	2813300	FeOH+2
97.61361628	% bound in species	2813301	Fe(OH)2+
0.02080757	% bound in species	2813302	Fe(OH)3 (aq)
1.252166707	% bound in species	2815800	FeHPO4+

Ba+2

77.95224	% bound in species	100	Ba+2
21.92243011	% bound in species	1007320	BaSO4 (aq)
0.120570529	% bound in species	1001400	BaHCO3+

Al+3

5.367554928	% bound in species	30	Al+3
8.772478901	% bound in species	303300	AlOH+2
5.562958393	% bound in species	303301	Al(OH)2+
0.597954188	% bound in species	303303	Al(OH)3 (aq)
0.300233169	% bound in species	303302	Al(OH)4-
29.74769931	% bound in species	307320	AlSO4+
4.416705452	% bound in species	307321	Al(SO4)2-
42.2671243	% bound in species	305801	AlHPO4+
0.045534283	% bound in species	305800	Al2PO4+3
2.336703994	% bound in species	301400	Al2(OH)2CO3+2
0.58483593	% bound in species	307700	AlH3SiO4+2

PO4-3

7.814393621	% bound in species	3305800	HPO4-2
81.5233824	% bound in species	3305801	H2PO4-
0.011020711	% bound in species	5405800	NiHPO4 (aq)
1.236852386	% bound in species	4605802	MgHPO4 (aq)
4.282407529	% bound in species	1505800	CaHPO4 (aq)
4.165656432	% bound in species	1505802	CaH2PO4+
0.044329407	% bound in species	5005800	NaHPO4-
0.013900077	% bound in species	4105800	KHPO4-
0.245085363	% bound in species	305801	AlHPO4+
0.209941259	% bound in species	9505800	ZnHPO4 (aq)
0.080115161	% bound in species	2315800	CuHPO4 (aq)
0.196545944	% bound in species	4705800	MnHPO4 (aq)
0.048850057	% bound in species	4105802	KH2PO4 (aq)
0.100586617	% bound in species	5005802	NaH2PO4 (aq)

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Equilibrated mass distribution

idx	Name	Dissolved		Sorbed		Precipitated	
		Mol/kg	Percent	Mol/kg	Percent	Mol/kg	Percent
61	AsO4-3	3.70003E-06	100	0	0	0	0
160	Cd+2	5.00007E-07	100	0	0	0	0
150	Ca+2	0.007881817	99.66376	0	0	2.6591E-05	0.3362371
140	CO3-2	0.001848502	100	0	0	0	0

480	MoO4-2	1.00001E-06	100	0	0	0	0
762	SeO4-2	3.9628E-11	100	0	0	0	0
410	K+1	0.000623903	100	0	0	0	0
460	Mg+2	0.001561423	100	0	0	0	0
470	Mn+2	6.16009E-05	100	0	0	0	0
500	Na+1	0.001285006	100	0	0	0	0
90	H3BO3	0.0002473	100	0	0	0	0
950	Zn+2	9.27013E-05	100	0	0	0	0
732	SO4-2	0.010273785	99.98579	0	0	1.4609E-06	0.0142173
20	Ag+1	1.50001E-06	100	0	0	0	0
740	Sb(OH)3	1.5276E-14	100	0	0	0	0
231	Cu+2	5.60007E-06	100	0	0	0	0
600	Pb+2	2.20002E-06	100	0	0	0	0
540	Ni+2	1.08002E-05	100	0	0	0	0
770	H4SiO4	0.000239363	91.7803	0	0	2.1437E-05	8.219695
2	H2O	1.17067E-07	100	0	0	0	0
60	H3AsO3	1.05926E-16	100	0	0	0	0
330	H+1	0.003197543	100	0	0	0	0
280	Fe+2	4.42903E-08	100	0	0	0	0
1	E-1	-4.43363E-52	100	0	0	0	0
761	HSeO3-1	6.39999E-06	100	0	0	0	0
741	Sb(OH)6-1	4.40002E-06	100	0	0	0	0
281	Fe+3	1.29338E-08	0.0141887	0	0	9.1143E-05	99.98581
100	Ba+2	3.9143E-08	2.609534	0	0	1.4609E-06	97.39046
30	Al+3	1.2609E-07	0.2932335	0	0	4.2874E-05	99.70676
580	PO4-3	2.17454E-05	57.6801	0	0	1.5955E-05	42.3199

Charge balance: SPECIATED

Sum of cations=	0.015626703	Sum of anions=	0.0156186
Percent difference=	0.025954598		
Equilibrium ionic stre	0.029999011		
Equilibrium pH=	6		
Equilibrium pe=	7.348801726	or Eh=	412.85469

Part 6 of output file

Saturation indices and stoichiometry of all minerals

ID	Name	log IAP	Sat. Index	No. of comp	Stoichiometry on line below								
1960003	Sb2O3(s)	-27.62546745	-19.145467	2									
2	740	-3	2	0	0	0	0	0	0	0	0	0	0
1960000	Zn-Al LDH	14.35596895	-5.4740311	5									
2	950	1	30	0.5	140	-6	330	6	2	0	0	0	0
74001	Sb metal	-53.85886891	-41.391405	4									
1	740	3	330	3	1	-3	2	0	0	0	0	0	0
60000	Pb metal	-20.98551969	-25.223181	2									
1	600	2	1	0	0	0	0	0	0	0	0	0	0
95000	Zn metal	-19.1645809	-46.376759	2									
1	950	2	1	0	0	0	0	0	0	0	0	0	0
16000	Cd metal (alpha)	-21.44068761	-35.654508	2									
1	160	2	1	0	0	0	0	0	0	0	0	0	0
16001	Cd metal (gamma)	-21.44068761	-35.763284	2									
1	160	2	1	0	0	0	0	0	0	0	0	0	0
2000	Ag metal	-13.27099226	1.2173208	2									
1	20	1	1	0	0	0	0	0	0	0	0	0	0
1474003	AlSb	-84.69718382	-150.32128	5									
1	740	6	1	1	30	3	330	-3	2	0	0	0	0
1474002	ZnSb	-73.02344981	-84.546554	5									
1	740	5	1	1	950	3	330	-3	2	0	0	0	0
1474004	CdSb	-75.29955652	-74.741938	5									
1	740	5	1	3	330	1	160	-3	2	0	0	0	0
1474006	Ag4Sb	-93.67184568	-37.490046	5									
1	740	6	1	3	20	3	330	-3	2	0	0	0	0
1474001	Breithauptite	-73.94333835	-54.529866	5									
1	740	5	1	3	330	1	540	-3	2	0	0	0	0
1474009	Mn2Sb	-92.46529935	-153.5449	5									
2	470	1	740	7	1	3	330	-3	2	0	0	0	0
1474005	Mg2Sb3	-197.3910142	-272.07481	5									
2	460	3	740	9	330	13	1	-9	2	0	0	0	0
1474010	Ca3Sb2	-159.4012381	-309.17547	5									
3	150	2	740	6	330	12	1	-6	2	0	0	0	0
1474008	NaSb	-64.177206	-88.210294	5									
1	500	1	740	3	330	4	1	-3	2	0	0	0	0
1474007	Na3Sb	-84.81388019	-183.27608	5									
3	500	1	740	3	330	6	1	-3	2	0	0	0	0
2076100	SeO2	-11.26542743	-11.377019	3									
1	761	1	330	-1	2	0	0	0	0	0	0	0	0
2076200	SeO3	-22.74329564	-45.145789	3									
1	762	2	330	-1	2	0	0	0	0	0	0	0	0
2074100	Sb2O5	-22.85062054	-11.810621	3									
2	741	2	330	-7	2	0	0	0	0	0	0	0	0
2074102	SbO2	-24.774022	3.050078	4									
1	741	1	1	2	330	-4	2	0	0	0	0	0	0
2074001	Sb2O4	-0.928043998	-4.9616079	4									
2	740	-2	2	-2	330	-2	1	0	0	0	0	0	0
2074002	Sb4O6 (cubic)	-55.2509349	-36.123136	3									
4	740	0	330	-6	2	0	0	0	0	0	0	0	0
2074003	Sb4O6 (rhombic)	-55.2509349	-37.191234	3									
4	740	0	330	-6	2	0	0	0	0	0	0	0	0
2074006	Senarmontite	-27.62546745	-15.901032	2									
2	740	-3	2	0	0	0	0	0	0	0	0	0	0
2074007	Valentinite	-27.62546745	-17.448981	2									
2	740	-3	2	0	0	0	0	0	0	0	0	0	0
2077000	Chalcedony	-3.618522678	0.1143086	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2077001	Cristobalite	-3.618522678	-0.0828515	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2077002	Quartz	-3.618522678	0.5889954	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2077003	SiO2 (am,gel)	-3.618522678	-0.7785918	2									

1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2077004 SiO2 (am,ppt)		-3.618522678	-0.737919	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2060000 Massicot		5.711903764	-7.7984974	3									
1	600	1	2	-2	330	0	0	0	0	0	0	0	0
2060001 Litharge		5.711903764	-7.5859962	3									
1	600	1	2	-2	330	0	0	0	0	0	0	0	0
2060002 PbO:0.3H2O		5.711844365	-7.2681556	3									
-2	330	1	600	1.33	2	0	0	0	0	0	0	0	0
2060003 Plattnerite		32.40932722	-19.940388	4									
-4	330	-2	1	1	600	2	2	0	0	0	0	0	0
2060004 Pb(OH)2		5.711723766	-2.9815189	3									
-2	330	1	600	2	2	0	0	0	0	0	0	0	0
2060005 Pb2O(OH)2		11.42362753	-14.766372	3									
2	600	3	2	-4	330	0	0	0	0	0	0	0	0
2003000 Al(OH)3 (am)		9.207550273	-2.6226156	3									
1	30	3	2	-3	330	0	0	0	0	0	0	0	0
2003001 Boehmite		9.207730271	-0.4625788	3									
-3	330	1	30	2	2	0	0	0	0	0	0	0	0
2003002 Diaspore		9.207730271	1.3783289	3									
-3	330	1	30	2	2	0	0	0	0	0	0	0	0
2003003 Gibbsite (C)		9.207550273	0.493069	3									
1	30	3	2	-3	330	0	0	0	0	0	0	0	0
2003004 Al(OH)3 (Soil)		9.207550273	-0.056931	3									
1	30	3	2	-3	330	0	0	0	0	0	0	0	0
2003005 Imogolite		14.79675787	0	4									
2	30	1	770	3	2	-6	330	0	0	0	0	0	0
2095000 Zn(OH)2 (am)		7.532662556	-5.7359573	3									
1	950	2	2	-2	330	0	0	0	0	0	0	0	0
2095002 Zn(OH)2 (beta)		7.532662556	-4.992941	3									
1	950	2	2	-2	330	0	0	0	0	0	0	0	0
2095003 Zn(OH)2 (gamma)		7.532662556	-4.9605048	3									
1	950	2	2	-2	330	0	0	0	0	0	0	0	0
2095007 Zn(OH)2 (delta)		7.532662556	-4.3113374	3									
1	950	-2	330	2	2	0	0	0	0	0	0	0	0
2095004 Zn(OH)2 (epsilon)		7.532662556	-4.7309919	3									
1	950	2	2	-2	330	0	0	0	0	0	0	0	0
2095006 Zincite		7.532842555	-4.5289004	3									
1	950	1	2	-2	330	0	0	0	0	0	0	0	0
2016001 Cd(OH)2		5.256555842	-9.265591	3									
1	160	2	2	-2	330	0	0	0	0	0	0	0	0
2023100 Cu(OH)2		6.30427905	-3.4787156	3									
1	231	2	2	-2	330	0	0	0	0	0	0	0	0
2023101 Tenorite(am)		6.304459048	-2.7875569	3									
1	231	1	2	-2	330	0	0	0	0	0	0	0	0
2023103 Tenorite(c)		6.304459048	-1.9378632	3									
1	231	-2	330	1	2	0	0	0	0	0	0	0	0
2002000 Ag2O		0.155438937	-12.84195	3									
2	20	1	2	-2	330	0	0	0	0	0	0	0	0
2054000 Ni(OH)2 (am)		6.612774012	-7.167809	3									
1	540	2	2	-2	330	0	0	0	0	0	0	0	0
2054001 Ni(OH)2 (c)		6.612774012	-4.177226	3									
1	540	-2	330	2	2	0	0	0	0	0	0	0	0
2028001 Fe(OH)2 (am)		4.211457074	-10.128847	3									
1	280	2	2	-2	330	0	0	0	0	0	0	0	0
2028002 Fe(OH)2 (c)		4.211457074	-8.6785429	3									
1	280	-2	330	2	2	0	0	0	0	0	0	0	0
2028100 Ferrihydrite		4.131789752	4.768E-08	3									
1	281	3	2	-3	330	0	0	0	0	0	0	0	0
2028101 Fe3(OH)8		12.47503658	-7.7469634	4									
-8	330	2	281	1	280	8	2	0	0	0	0	0	0
2028102 Goethite		4.131969751	3.0787006	3									
1	281	2	2	-3	330	0	0	0	0	0	0	0	0
2028103 Ferrihydrite (aged)		4.131789752	1.4417898	3									
1	281	-3	330	3	2	0	0	0	0	0	0	0	0
2047000 Pyrolusite		34.09163169	-9.8127388	4									
1	470	2	2	-4	330	-2	1	0	0	0	0	0	0
2047003 Pyrochroite		7.394028234	-8.7002987	3									
1	470	2	2	-2	330	0	0	0	0	0	0	0	0
2047100 Manganite		20.74282996	-4.59717	4									
1	470	2	2	-3	330	-1	1	0	0	0	0	0	0
2048001 MoO3		-18.53371407	-10.533714	3									
1	480	2	330	-1	2	0	0	0	0	0	0	0	0
2046000 Brucite		8.790039698	-9.3679685	3									
1	460	2	2	-2	330	0	0	0	0	0	0	0	0
2046001 Periclase		8.790219697	-14.197412	3									
-2	330	1	460	1	2	0	0	0	0	0	0	0	0
2046002 Mg(OH)2 (active)		8.790039698	-10.00396	3									
1	460	2	2	-2	330	0	0	0	0	0	0	0	0
2015000 Lime		9.469590012	-25.029345	3									
-2	330	1	150	1	2	0	0	0	0	0	0	0	0
2015001 Portlandite		9.469410014	-14.428283	3									
1	150	2	2	-2	330	0	0	0	0	0	0	0	0
2010001 Ba(OH)2:8H2O		4.206074678	-20.692057	3									
1	100	10	2	-2	330	0	0	0	0	0	0	0	0
2074005 Cu(SbO3)2		32.0738385	-13.136661	4									
2	740	1	231	-6	330	-4	1	0	0	0	0	0	0
3006000 Arsenolite		-31.94383736	-30.285034	2									
2	60	-3	2	0	0	0	0	0	0	0	0	0	0
3006001 Claudetite		-31.94383736	-30.339864	2									
2	60	-3	2	0	0	0	0	0	0	0	0	0	0
3006100 As2O5		-61.10026145	-26.380934	3									
2	61	6	330	-3	2	0	0	0	0	0	0	0	0
3060000 Pb2O3		38.12123098	-22.918769	4									
-6	330	-2	1	2	600	3	2	0	0	0	0	0	0
3060001 Minium		43.83313475	-33.604082	4									
-8	330	-2	1	3	600	4	2	0	0	0	0	0	0
3003000 Al2O3		18.41564054	-3.6366756	3									

2	30	3	2	-6	330	0	0	0	0	0	0	0	0
3028000 Magnetite		12.47575657	7.1376749	4									
-8	330	2	281	1	280	4	2	0	0	0	0	0	0
3028001 Hercynite		22.62727761	-3.1791419	4									
-8	330	1	280	2	30	4	2	0	0	0	0	0	0
3028100 Hematite		8.264119501	8.4850203	3									
2	281	3	2	-6	330	0	0	0	0	0	0	0	0
3028101 Maghemite		8.264119501	1.8781195	3									
-6	330	2	281	3	2	0	0	0	0	0	0	0	0
3028102 Lepidocrocite		4.131969751	2.7609698	3									
-3	330	1	281	2	2	0	0	0	0	0	0	0	0
3047000 Hausmannite		48.88004815	-16.057158	4									
3	470	4	2	-8	330	-2	1	0	0	0	0	0	0
3046000 Spinel		27.20586024	-13.242793	4									
-8	330	1	460	2	30	4	2	0	0	0	0	0	0
3046001 Magnesioferrite		17.0543392	-2.3939532	4									
-8	330	1	460	2	281	4	2	0	0	0	0	0	0
3050000 Natron		-13.77504359	-11.852653	3									
2	500	1	140	10	2	0	0	0	0	0	0	0	0
3023100 Cupric Ferrite		14.56857855	6.629468	4									
-8	330	1	231	2	281	4	2	0	0	0	0	0	0
5060000 Cerrusite		-14.1220891	-0.6920187	2									
1	600	1	140	0	0	0	0	0	0	0	0	0	0
5060001 Pb2OCO3		-8.410185339	-8.2312256	4									
-2	330	2	600	1	2	1	140	0	0	0	0	0	0
5060002 Pb3O2CO3		-2.698281574	-14.744578	4									
-4	330	3	600	1	140	2	2	0	0	0	0	0	0
5060003 Hydrocerrusite		-22.53245444	-3.7724544	4									
3	600	2	2	-2	330	2	140	0	0	0	0	0	0
5060004 Pb10(OH)6O(CO3)6		-61.88545956	-53.12546	4									
10	600	6	140	7	2	-8	330	0	0	0	0	0	0
5095000 Smithsonite		-12.30115031	-1.4364173	2									
1	950	1	140	0	0	0	0	0	0	0	0	0	0
5095001 ZnCO3:1H2O		-12.30133031	-2.0413303	3									
1	950	1	140	1	2	0	0	0	0	0	0	0	0
5095003 Hydrozincite		-2.004312959	-12.899216	4									
5	950	2	140	-6	330	6	2	0	0	0	0	0	0
5016000 Otavite		-14.57725703	-2.5041478	2									
1	160	1	140	0	0	0	0	0	0	0	0	0	0
5023100 CuCO3		-13.52953382	-2.0295338	2									
1	231	1	140	0	0	0	0	0	0	0	0	0	0
5023101 Malachite		-7.22525477	-2.166465	4									
2	231	2	2	-2	330	1	140	0	0	0	0	0	0
5023102 Azurite		-20.75478859	-3.731588	4									
3	231	2	2	-2	330	2	140	0	0	0	0	0	0
5002000 Ag2CO3		-19.67855393	-8.1973693	2									
2	20	1	140	0	0	0	0	0	0	0	0	0	0
5054000 NiCO3		-13.22103886	-2.407017	2									
1	540	1	140	0	0	0	0	0	0	0	0	0	0
5028000 Siderite		-15.62235579	-5.1001054	2									
1	280	1	140	0	0	0	0	0	0	0	0	0	0
5047000 Rhodochrosite		-12.43978463	-1.4572325	2									
1	470	1	140	0	0	0	0	0	0	0	0	0	0
5046000 Artinite		-2.254273469	-12.970347	4									
-2	330	2	460	1	140	5	2	0	0	0	0	0	0
5046001 Hydromagnesite		-35.38577298	-28.647126	4									
5	460	4	140	-2	330	6	2	0	0	0	0	0	0
5046002 Magnesite		-11.04377317	-3.3981577	2									
1	460	1	140	0	0	0	0	0	0	0	0	0	0
5046003 Nesquehonite		-11.04431317	-6.5991047	3									
1	460	1	140	3	2	0	0	0	0	0	0	0	0
5046004 MgCO3:5H2O		-11.04467316	-6.5046732	3									
1	460	1	140	5	2	0	0	0	0	0	0	0	0
5015000 Aragonite		-10.36440286	-2.1090181	2									
1	150	1	140	0	0	0	0	0	0	0	0	0	0
5015001 Calcite		-10.36440286	-1.9538893	2									
1	150	1	140	0	0	0	0	0	0	0	0	0	0
5015006 CaCO3xH2O		-10.36458285	-3.2927567	3									
1	150	1	140	1	2	0	0	0	0	0	0	0	0
5015005 Vaterite		-10.36440286	-2.5621119	2									
1	150	1	140	0	0	0	0	0	0	0	0	0	0
5015002 Dolomite (ordered)		-21.40817603	-4.6847666	3									
1	150	1	460	2	140	0	0	0	0	0	0	0	0
5015004 Dolomite (disordered)		-21.40817603	-5.2988039	3									
1	150	1	460	2	140	0	0	0	0	0	0	0	0
5015003 Huntite		-43.49572237	-14.528002	3									
3	460	1	150	4	140	0	0	0	0	0	0	0	0
5010000 Witherite		-15.6262982	-7.0377367	2									
1	100	1	140	0	0	0	0	0	0	0	0	0	0
5050001 Thermonatrite		-13.7734236	-14.507685	3									
2	500	1	140	1	2	0	0	0	0	0	0	0	0
5095002 ZnCO3		-12.30115031	-1.5011503	2									
1	950	1	140	0	0	0	0	0	0	0	0	0	0
5047002 MnCO3 (am)		-12.43978463	-1.9397846	2									
1	470	1	140	0	0	0	0	0	0	0	0	0	0
5260000 Pb(BO2)2		-1.495649089	-8.1597396	4									
-2	2	-2	330	1	600	2	90	0	0	0	0	0	0
5295000 Zn(BO2)2		0.325289701	-7.9647103	4									
-2	2	-2	330	1	950	2	90	0	0	0	0	0	0
5216000 Cd(BO2)2		-1.950817012	-11.790817	4									
-2	2	-2	330	1	160	2	90	0	0	0	0	0	0
6060000 Larnakite		-2.977344479	-2.7455438	4									
-2	330	2	600	1	732	1	2	0	0	0	0	0	0
6060001 Pb3O2SO4		2.734559285	-8.6863211	4									
-4	330	3	600	1	732	2	2	0	0	0	0	0	0
6060002 Pb4O3SO4		8.44646305	-14.697099	4									
-6	330	4	600	1	732	3	2	0	0	0	0	0	0
6060003 Anglesite		-8.689248243	-0.787879	2									

1	600	1	732	0	0	0	0	0	0	0	0	0	0
6060004 Pb4(OH)6SO4		8.445923053	-12.654077	4									
-6	330	4	600	1	732	6	2	0	0	0	0	0	0
6003000 AlOHSO4		-5.193421736	-1.9634217	4									
-1	330	1	30	1	732	1	2	0	0	0	0	0	0
6003001 Al4(OH)10SO4		22.42922908	-0.2707709	4									
-10	330	4	30	1	732	10	2	0	0	0	0	0	0
6095000 Zn2(OH)2SO4		0.664353103	-6.8356469	4									
-2	330	2	950	2	2	1	732	0	0	0	0	0	0
6095001 Zn4(OH)6SO4		15.72967821	-12.670322	4									
-6	330	4	950	6	2	1	732	0	0	0	0	0	0
6095002 Zn3O(SO4)2		-6.203776352	-27.512459	4									
-2	330	3	950	2	732	1	2	0	0	0	0	0	0
6095003 Zincosite		-6.868309453	-11.564471	2									
1	950	1	732	0	0	0	0	0	0	0	0	0	0
6095004 ZnSO4:1H2O		-6.868489452	-6.6394922	3									
1	950	1	732	1	2	0	0	0	0	0	0	0	0
6095005 Bianchite		-6.869389446	-5.110602	3									
1	950	1	732	6	2	0	0	0	0	0	0	0	0
6095006 Goslarite		-6.869569445	-4.7264896	3									
1	950	1	732	7	2	0	0	0	0	0	0	0	0
6016000 Cd3(OH)4SO4		1.368695518	-21.191304	4									
-4	330	3	160	4	2	1	732	0	0	0	0	0	0
6016001 Cd3OH2(SO4)2		-13.03227649	-19.742276	4									
-2	330	3	160	2	2	2	732	0	0	0	0	0	0
6016002 Cd4(OH)6SO4		6.62525136	-21.774749	4									
-6	330	4	160	6	2	1	732	0	0	0	0	0	0
6016003 CdSO4		-9.144416167	-9.4546308	2									
1	160	1	732	0	0	0	0	0	0	0	0	0	0
6016004 CdSO4:1H2O		-9.144596165	-7.7112108	3									
1	160	1	732	1	2	0	0	0	0	0	0	0	0
6016005 CdSO4:2.67H2O		-9.144896764	-7.438869	3									
1	160	1	732	2.67	2	0	0	0	0	0	0	0	0
6023100 Antlerite		4.51186514	-4.2761349	4									
3	231	4	2	-4	330	1	732	0	0	0	0	0	0
6023101 Brochantite		10.81614419	-6.2885536	4									
4	231	6	2	-6	330	1	732	0	0	0	0	0	0
6023102 Langite		10.81596419	-8.2090679	4									
-6	330	4	231	7	2	1	732	0	0	0	0	0	0
6023103 CuOCuSO4		-1.792233911	-13.374111	4									
-2	330	2	231	1	2	1	732	0	0	0	0	0	0
6023104 CuSO4		-8.096692959	-11.714061	2									
1	231	1	732	0	0	0	0	0	0	0	0	0	0
6023105 Chalcanthite		-8.097592953	-5.4016763	3									
1	231	1	732	5	2	0	0	0	0	0	0	0	0
6002000 Ag2SO4		-14.24571307	-9.2679399	2									
2	20	1	732	0	0	0	0	0	0	0	0	0	0
6054000 Ni4(OH)6SO4		12.05012404	-19.949876	4									
-6	330	4	540	1	732	6	2	0	0	0	0	0	0
6054001 Retgersite		-7.78927799	-5.7065642	3									
1	540	1	732	6	2	0	0	0	0	0	0	0	0
6054002 Morenosite		-7.789457989	-5.5315163	3									
1	540	1	732	7	2	0	0	0	0	0	0	0	0
6028000 Melanterite		-10.19077493	-7.7915191	3									
1	280	1	732	7	2	0	0	0	0	0	0	0	0
6028100 Fe2(SO4)3		-34.93933652	-33.451245	2									
2	281	3	732	0	0	0	0	0	0	0	0	0	0
6028101 H-Jarosite		-16.40693476	-13.088868	4									
3	281	2	732	-5	330	7	2	0	0	0	0	0	0
6050000 Na-Jarosite		-13.37629013	-9.3160624	5									
1	500	3	281	2	732	-6	330	6	2	0	0	0	0
6041002 K-Jarosite		-13.68996526	-3.6347481	5									
1	410	3	281	2	732	-6	330	6	2	0	0	0	0
6047000 MnSO4		-7.006943775	-10.19181	2									
1	470	1	732	0	0	0	0	0	0	0	0	0	0
6046000 Epsomite		-5.612192302	-3.3784056	3									
1	460	1	732	7	2	0	0	0	0	0	0	0	0
6015000 Anhydrite		-4.931561995	-0.6383836	2									
1	150	1	732	0	0	0	0	0	0	0	0	0	0
6015001 Gypsum		-4.931921993	-0.3126412	3									
1	150	1	732	2	2	0	0	0	0	0	0	0	0
6015002 Ettringite		32.02396463	-28.395421	5									
6	150	2	30	3	732	-12	330	38	2	0	0	0	0
6010000 Barite		-10.19345734	4.578E-07	2									
1	100	1	732	0	0	0	0	0	0	0	0	0	0
6050001 Mirabilite		-8.342202732	-6.4909232	3									
2	500	1	732	10	2	0	0	0	0	0	0	0	0
6050002 Thenardite		-8.340402744	-8.7467527	2									
2	500	1	732	0	0	0	0	0	0	0	0	0	0
6041000 K-Alum		-16.87994423	-11.429586	4									
1	410	1	30	2	732	12	2	0	0	0	0	0	0
6041001 Alunite		1.537316304	0.9883538	5									
1	410	3	30	2	732	-6	330	6	2	0	0	0	0
6102000 Ag2SeO3		-11.10998849	-3.5915418	3									
2	20	1	761	-1	330	0	0	0	0	0	0	0	0
6123100 CuSeO3:2H2O		-4.961328381	-5.923427	4									
1	231	1	761	-1	330	2	2	0	0	0	0	0	0
6154000 NiSeO3:2H2O		-4.652833419	-7.755269	4									
1	761	1	540	2	2	-1	330	0	0	0	0	0	0
6128100 Fe2(SeO3)3:2H2O		-25.53252279	-4.9063228	4									
3	761	2	281	2	2	-3	330	0	0	0	0	0	0
6128101 Fe2(OH)4SeO3		-3.001667928	-4.5555679	4									
1	761	2	281	4	2	-5	330	0	0	0	0	0	0
6147000 MnSeO3		-3.871219199	-5.0012192	3									
1	470	1	761	-1	330	0	0	0	0	0	0	0	0
6146000 MgSeO3:6H2O		-2.476287728	-5.4677493	4									
1	460	1	761	-1	330	6	2	0	0	0	0	0	0
6115000 CaSeO3:2H2O		-1.796197417	-4.7906604	4									

1	761	1	150	2	2	-1	330	0	0	0	0	0	0
6110000 BaSeO3		-7.057732764	-8.7763635	3									
1	100	1	761	-1	330	0	0	0	0	0	0	0	0
6150001 Na2SeO3:5H2O		-5.205578163	-15.505578	4									
2	500	1	761	-1	330	5	2	0	0	0	0	0	0
6160000 PbSeO4		-17.03139188	-10.05218	2									
1	600	1	762	0	0	0	0	0	0	0	0	0	0
6195001 ZnSeO4:6H2O		-15.21153308	-13.691533	3									
1	950	1	762	6	2	0	0	0	0	0	0	0	0
6116001 CdSeO4:2H2O		-17.4869198	-15.63692	3									
1	160	1	762	2	2	0	0	0	0	0	0	0	0
6102001 Ag2SeO4		-22.5878567	-14.08157	2									
2	20	1	762	0	0	0	0	0	0	0	0	0	0
6123101 CuSeO4:5H2O		-16.43973659	-13.999737	3									
1	231	1	762	5	2	0	0	0	0	0	0	0	0
6154001 NiSeO4:6H2O		-16.13142162	-14.611422	3									
1	540	1	762	6	2	0	0	0	0	0	0	0	0
6147002 MnSeO4:5H2O		-15.3499874	-13.299987	3									
1	470	1	762	5	2	0	0	0	0	0	0	0	0
6146001 MgSeO4:6H2O		-13.95415594	-12.754156	3									
1	460	1	762	6	2	0	0	0	0	0	0	0	0
6115001 CaSeO4:2H2O		-13.27406563	-10.331096	3									
1	150	1	762	2	2	0	0	0	0	0	0	0	0
6110001 BaSeO4		-18.53560097	-10.871424	2									
1	100	1	762	0	0	0	0	0	0	0	0	0	0
6150002 Na2SeO4		-16.68254638	-17.962546	2									
2	500	1	762	0	0	0	0	0	0	0	0	0	0
6141001 K2SeO4		-17.30989663	-16.579897	2									
2	410	1	762	0	0	0	0	0	0	0	0	0	0
6233001 H2MoO4		-18.53389407	-5.2026362	2									
1	480	2	330	0	0	0	0	0	0	0	0	0	0
6260001 PbMoO4		-12.8218103	3.2987018	2									
1	600	1	480	0	0	0	0	0	0	0	0	0	0
6203001 Al2(MoO4)3		-37.18550167	-41.973427	2									
3	480	2	30	0	0	0	0	0	0	0	0	0	0
6295001 ZnMoO4		-11.00087151	-0.9746839	2									
1	480	1	950	0	0	0	0	0	0	0	0	0	0
6216001 CdMoO4		-13.27697823	1.0535112	2									
1	480	1	160	0	0	0	0	0	0	0	0	0	0
6223101 CuMoO4		-12.22925502	0.9601704	2									
1	480	1	231	0	0	0	0	0	0	0	0	0	0
6202001 Ag2MoO4		-18.37827513	-6.3391783	2									
2	20	1	480	0	0	0	0	0	0	0	0	0	0
6254001 NiMoO4		-11.92076006	-0.7665951	2									
1	480	1	540	0	0	0	0	0	0	0	0	0	0
6228001 FeMoO4		-14.322077	-4.3340936	2									
1	480	1	280	0	0	0	0	0	0	0	0	0	0
6246001 MgMoO4		-9.743494372	-7.8934944	2									
1	460	1	480	0	0	0	0	0	0	0	0	0	0
6215001 CaMoO4		-9.064124057	-1.1326856	2									
1	150	1	480	0	0	0	0	0	0	0	0	0	0
6215002 Powellite		-9.064124057	-1.4225473	2									
1	150	1	480	0	0	0	0	0	0	0	0	0	0
6210001 BaMoO4		-14.3260194	-7.2640021	2									
1	480	1	100	0	0	0	0	0	0	0	0	0	0
6250001 Na2MoO4		-12.47296481	-14.055687	2									
1	480	2	500	0	0	0	0	0	0	0	0	0	0
6250002 Na2MoO4:2H2O		-12.4733248	-13.697325	3									
1	480	2	500	2	2	0	0	0	0	0	0	0	0
6250003 Na2Mo2O7		-31.00667887	-13.888034	4									
2	480	2	500	-1	2	2	330	0	0	0	0	0	0
6241001 K2MoO4		-13.10031506	-16.393584	2									
1	480	2	410	0	0	0	0	0	0	0	0	0	0
7060006 PbHPO4		-24.84847298	-1.043473	3									
1	600	1	330	1	580	0	0	0	0	0	0	0	0
7060007 Pb3(PO4)2		-43.9848622	-0.4548622	2									
3	600	2	580	0	0	0	0	0	0	0	0	0	0
7060002 Hydroxylpyromorphite		-63.12143142	-0.3314314	4									
5	600	3	580	1	2	-1	330	0	0	0	0	0	0
7060003 Plumbgummite		-27.78583892	5.0041611	5									
-5	330	1	600	3	30	2	580	6	2	0	0	0	0
7060004 Hinsdalite		-11.62661418	-9.1266142	6									
-6	330	1	600	3	30	1	580	1	732	6	2	0	0
7060005 Tsumebite		-12.83283017	-3.0428302	5									
-3	330	2	600	1	231	1	580	6	2	0	0	0	0
7095000 Zn3(PO4)2:4H2O		-38.52276583	-3.1027658	3									
3	950	2	580	4	2	0	0	0	0	0	0	0	0
7016000 Cd3(PO4)2		-45.35036597	-12.750366	2									
3	160	2	580	0	0	0	0	0	0	0	0	0	0
7023100 Cu3(PO4)2		-42.20719635	-5.3571964	2									
3	231	2	580	0	0	0	0	0	0	0	0	0	0
7023101 Cu3(PO4)2:3H2O		-42.20773635	-7.0877363	3									
3	231	2	580	3	2	0	0	0	0	0	0	0	0
7002000 Ag3PO4		-30.32712834	-12.737128	2									
3	20	1	580	0	0	0	0	0	0	0	0	0	0
7054000 Ni3(PO4)2		-41.28171147	-9.9817115	2									
3	540	2	580	0	0	0	0	0	0	0	0	0	0
7028001 Vivianite		-48.48710227	-10.680142	3									
3	280	2	580	8	2	0	0	0	0	0	0	0	0
7028100 Strengite		-26.428587	-0.115456	3									
1	281	1	580	2	2	0	0	0	0	0	0	0	0
7047000 Mn3(PO4)2		-38.9379488	-15.028627	2									
3	470	2	580	0	0	0	0	0	0	0	0	0	0
7047001 MnHPO4		-23.16616852	2.2338315	3									
1	470	1	580	1	330	0	0	0	0	0	0	0	0
7046002 Mg3(PO4)2		-34.74991441	-11.469914	2									
3	460	2	580	0	0	0	0	0	0	0	0	0	0
7046001 MgHPO4:3H2O		-21.77069705	-3.595697	4									

1	460	1	330	1	580	3	2	0	0	0	0	0	0
7015003 Hydroxyapatite		-44.33300018	-1.831E-07	4									
5	150	3	580	1	2	-1	330	0	0	0	0	0	0
7015004 CaHPO4:2H2O		-21.09114673	-1.8826889	4									
1	150	1	330	1	580	2	2	0	0	0	0	0	0
7015005 CaHPO4		-21.09078674	-1.5280827	3									
1	150	1	330	1	580	0	0	0	0	0	0	0	0
7015006 Ca3(PO4)2 (beta)		-32.71180346	-3.2906417	2									
3	150	2	580	0	0	0	0	0	0	0	0	0	0
7015007 Ca4H(PO4)3:3H2O		-53.80313019	-6.7231302	4									
4	150	1	330	3	580	3	2	0	0	0	0	0	0
7010001 BaHPO4		-26.35268208	-6.5776821	3									
1	100	1	330	1	580	0	0	0	0	0	0	0	0
7210000 BaHAsO4:H2O		-26.34270606	-1.7027061	4									
1	100	1	61	1	330	1	2	0	0	0	0	0	0
7260000 Pb3(AsO4)2		-43.96455016	-8.4645502	2									
3	600	2	61	0	0	0	0	0	0	0	0	0	0
7203000 AlAsO4:2H2O		-21.34267045	-5.5426705	3									
1	30	1	61	2	2	0	0	0	0	0	0	0	0
7295000 Zn3AsO42:2.5H2O		-38.50218379	-11.002184	3									
3	950	2	61	2.5	2	0	0	0	0	0	0	0	0
7223100 Cu3(AsO4)2:2H2O		-42.18724431	-7.0872443	3									
3	231	2	61	2	2	0	0	0	0	0	0	0	0
7202001 Ag3AsO3		-15.73876027	-17.89606	3									
3	20	1	60	-3	330	0	0	0	0	0	0	0	0
7202002 Ag3AsO4		-30.31697232	-6.8169723	2									
3	20	1	61	0	0	0	0	0	0	0	0	0	0
7254000 Ni3(AsO4)2:8H2O		-41.26283941	-15.762839	3									
3	540	2	61	8	2	0	0	0	0	0	0	0	0
7228100 FeAsO4:2H2O		-26.41843097	-6.218431	3									
1	281	1	61	2	2	0	0	0	0	0	0	0	0
7247000 Mn3(AsO4)2:8H2O		-38.91907675	-10.219077	3									
3	470	2	61	8	2	0	0	0	0	0	0	0	0
7215000 Ca3(AsO4)2:4H2O		-32.69221141	-13.792211	3									
3	150	2	61	4	2	0	0	0	0	0	0	0	0
8603000 Halloysite		11.17823519	-0.0804728	4									
2	30	2	770	1	2	-6	330	0	0	0	0	0	0
8603001 Kaolinite		11.17823519	2.3696807	4									
2	30	2	770	1	2	-6	330	0	0	0	0	0	0
8628000 Greenalite		5.397505865	-15.412494	4									
-6	330	3	280	2	770	1	2	0	0	0	0	0	0
8646000 Chrysotile		19.13325374	-14.885778	4									
3	460	2	770	1	2	-6	330	0	0	0	0	0	0
8646003 Sepiolite		6.724241366	-10.094596	4									
2	460	3	770	-4	330	-0.5	2	0	0	0	0	0	0
8646004 Sepiolite (A)		6.724241366	-12.055759	4									
-0.5	2	2	460	3	770	-4	330	0	0	0	0	0	0

END OF THIS PROBLEM

Charge balance - Unspeciated:
Sum of cations= 0.021512201 Sum of anions= 0.0254862
Percent difference= 8.455606
Improved activity guesses prior to first iteration:

Log activity:	Al+3	-4.382150879
Log activity:	CO3-2	-11.68609139
Log activity:	Fe+2	-4.04000569
Log activity:	Fe+3	-17.46829474
Log activity:	Mn+2	-4.210419318
Log activity:	H4SiO4	-3.583692413
Log activity:	SO4-2	-1.968388157
Log activity:	H3AsO3	-29.43179834
Log activity:	Cu+2	-5.251876302
Log activity:	PO4-3	-16.16913877
Log activity:	SeO4-2	-31.38505801
Log activity:	HSeO3-1	-5.209766384
Log activity:	Sb(OH)3	-9.356634189
Log activity:	Sb(OH)6-1	-21.66663416
Log activity:	AsO4-3	-50.70743379

RESULTS:
Parameters of the component most out of balance:

Iter.	Name	Total mol	Diff fxn	Log activity	Residual
0	MoO4-2	1.00E-06	8.056E-06	-6	8.056E-06
1	MoO4-2	1.00E-06	1.478E-06	-6.52777	1.478E-06
2	MoO4-2	1.00E-06	1.208E-07	-6.840094	1.207E-07
3	MoO4-2	1.00E-06	-1.14E-09	-6.882104	1.04E-09
4	MoO4-2	1.00E-06	-4.50E-10	-6.881948	3.50E-10
5	Cd+2	5.00E-07	-6.15E-11	-6.748789	1.15E-11

ID	Name	Anal mol	Calc mol	Log Activity	Gamma	New logK
61	AsO4-3	3.70E-06	1.36E-16	-16.49525	2.36E-01	0
30	Al+3	4.30E-05	5.53E-06	-5.884557	2.36E-01	0
150	Ca+2	7.91E-03	5.55E-03	-2.534906	5.26E-01	0
140	CO3-2	1.85E-03	3.94E-12	-11.68336	5.26E-01	0
280	Fe+2	9.00E-05	6.18E-05	-4.487598	5.26E-01	0
100	Ba+2	1.50E-06	1.16E-06	-6.213938	5.26E-01	0
410	K+1	0.0006239	0.0006103	-3.284164	0.851711	0
460	Mg+2	1.56E-03	1.16E-03	-3.214951	0.5262222	0
470	Mn+2	6.16E-05	4.67E-05	-4.609651	0.5262222	0
500	Na+1	0.001285	0.001257	-2.970386	0.851711	0
770	H4SiO4	0.0002608	0.0002602	-3.581591	1.007076	0
950	Zn+2	9.27E-05	6.41E-05	-4.472293	0.5262222	0
732	SO4-2	1.08E-02	7.87E-03	-2.383069	0.5262222	0
20	Ag+1	0.0000015	1.399E-06	-5.923952	0.851711	0
740	Sb(OH)3	0.0000044	1.445E-12	-11.83693	1.007076	0
231	Cu+2	5.60E-06	3.97E-06	-5.680437	0.5262222	0
600	Pb+2	0.0000022	1.041E-06	-6.261225	0.5262222	0
540	Ni+2	0.0000108	7.816E-06	-5.385861	0.5262222	0
90	H3BO3	2.47E-04	2.47E-04	-3.603716	1.007076	0
160	Cd+2	0.0000005	3.389E-07	-6.748751	0.5262222	0
580	PO4-3	3.77E-05	2.22E-16	-16.2819	0.2358471	0
762	SeO4-2	6.40E-06	3.34E-13	-12.75494	0.5262222	0
480	MoO4-2	1.00E-06	2.49E-07	-6.881816	0.5262222	0
2	H2O	-2.56E-23	-9.39E-06	-0.000185	1	0
60	H3AsO3	1.00E-16	1.20E-14	-13.91704	1.007076	0
330	H+1	0.000000001	1.17E-04	-4	0.851711	0
281	Fe+3	1.20E-06	1.15E-08	-8.567083	0.2358471	0
1	E-1	1.00E-16	4.48E-10	-9.348804	0.851711	0
761	HSeO3-1	1.00E-16	6.20E-06	-5.277068	0.851711	0
741	Sb(OH)6-1	1.00E-16	4.17E-06	-5.44988	0.851711	0

Part 4 of output file
Percentage distribution of components among type I and type II species

AsO4-3

1.401069832	% bound in species	3.30E+06	H3AsO4
0.152859655	% bound in species	3.30E+06	HAsO4-2
98.44607051	% bound in species	3300611	H2AsO4-

Al+3

12.86317401	% bound in species	30	Al+3
0.208886688	% bound in species	3.03E+05	AlOH+2
73.5940953	% bound in species	3.07E+05	AlSO4+
11.39597373	% bound in species	307321	Al(SO4)2-
1.904522316	% bound in species	305801	AlHPO4+
0.016746349	% bound in species	3.06E+05	Al2PO4+3
0.01517467	% bound in species	3.08E+05	AlH3SiO4+2

Ca+2

70.12086145	% bound in species	1.50E+02	Ca+2
29.85326497	% bound in species	1507320	CaSO4 (aq)
0.021553037	% bound in species	1505802	CaH2PO4+

CO3-2

0.405052128	% bound in species	3.30E+06	HCO3-
99.58052377	% bound in species	3.30E+06	H2CO3* (aq)
0.010957179	% bound in species	1.50E+06	CaHCO3+

Fe+2

68.79409904	% bound in species	2.80E+02	Fe+2
30.78529309	% bound in species	2.81E+06	FeSO4 (aq)
0.416416719	% bound in species	2.81E+06	FeH2PO4+

Ba+2

77.41188407	% bound in species	1.00E+02	Ba+2
22.58634423	% bound in species	1.01E+06	BaSO4 (aq)

K+1

97.82063557	% bound in species	4.10E+02	K+1

	2.176128517	% bound in species	4107320 KSO4-
Mg+2			
	74.19439939	% bound in species	4.60E+02 Mg+2
	25.79768972	% bound in species	4.61E+06 MgSO4 (aq)
Mn+2			
	75.78877056	% bound in species	4.70E+02 Mn+2
	24.20473446	% bound in species	4.71E+06 MnSO4 (aq)
Na+1			
	97.81835715	% bound in species	5.00E+02 Na+1
	2.178065862	% bound in species	5.01E+06 NaSO4-
H4SiO4			
	99.77899869	% bound in species	7.70E+02 H4SiO4
	0.218424926	% bound in species	7.71E+06 H4SiO4SO4-2
Zn+2			
	69.09779294	% bound in species	9.50E+02 Zn+2
	28.63923974	% bound in species	9.51E+06 ZnSO4 (aq)
	2.255936977	% bound in species	9.51E+06 Zn(SO4)2-2
SO4-2			
	72.66682433	% bound in species	7.32E+02 SO4-2
	0.292482594	% bound in species	3.31E+06 HSO4-
	0.010191038	% bound in species	6.01E+06 PbSO4 (aq)
	0.292335281	% bound in species	3.07E+05 AlSO4+
	0.090535665	% bound in species	3.07E+05 Al(SO4)2-
	0.245250239	% bound in species	9.51E+06 ZnSO4 (aq)
	0.038637135	% bound in species	9.51E+06 Zn(SO4)2-2
	0.015075195	% bound in species	2.32E+06 CuSO4 (aq)
	0.027526677	% bound in species	5.41E+06 NiSO4 (aq)
	0.255622311	% bound in species	2.81E+06 FeSO4 (aq)
	0.13773645	% bound in species	4.71E+06 MnSO4 (aq)
	3.721028306	% bound in species	4.61E+06 MgSO4 (aq)
	21.80937869	% bound in species	1.51E+06 CaSO4 (aq)
	0.258550891	% bound in species	5.01E+06 NaSO4-
	0.125421338	% bound in species	4.11E+06 KSO4-
Ag+1			
	93.25381634	% bound in species	2.00E+01 Ag+1
	6.746168405	% bound in species	2.07E+05 AgSO4-
Sb(OH)3			
	99.71703874	% bound in species	7.40E+02 Sb(OH)3
	0.282959475	% bound in species	7.40E+06 Sb(OH)2+
Cu+2			
	70.82903177	% bound in species	2.31E+02 Cu+2
	29.14114827	% bound in species	2.32E+06 CuSO4 (aq)
	0.01221026	% bound in species	2.31E+06 CuHCO3+
Pb+2			
	47.33555515	% bound in species	6.00E+02 Pb+2
	50.14477915	% bound in species	6.01E+06 PbSO4 (aq)
	2.393593072	% bound in species	6.01E+06 Pb(SO4)2-2
	0.018078554	% bound in species	6.01E+06 PbH2PO4+
	0.102967674	% bound in species	6.00E+06 PbHCO3+
Ni+2			
	72.3689457	% bound in species	5.40E+02 Ni+2
	27.5906479	% bound in species	5.41E+06 NiSO4 (aq)
	0.024381825	% bound in species	5.40E+06 NiHCO3+
H3BO3			
	99.99931348	% bound in species	9.00E+01 H3BO3
Cd+2			
	67.78211204	% bound in species	1.60E+02 Cd+2
	28.53713982	% bound in species	1.61E+06 CdSO4 (aq)
	3.672636218	% bound in species	1.61E+06 Cd(SO4)2-2
PO4-3			
	0.086060229	% bound in species	3.31E+06 HPO4-2
	89.43790925	% bound in species	3.31E+06 H2PO4-
	0.906038123	% bound in species	3.31E+06 H3PO4
	0.992819621	% bound in species	2.81E+06 FeH2PO4+
	1.63248456	% bound in species	2.82E+06 FeHPO4+
	0.013384085	% bound in species	4605802 MgHPO4 (aq)
	0.046412373	% bound in species	1505800 CaHPO4 (aq)
	4.52112653	% bound in species	1.51E+06 CaH2PO4+
	2.17225625	% bound in species	3.06E+05 AlHPO4+
	0.053398935	% bound in species	4.11E+06 KH2PO4 (aq)
	0.109979217	% bound in species	5.01E+06 NaH2PO4 (aq)
SeO4-2			
	86.17554564	% bound in species	7.62E+02 SeO4-2
	0.163231193	% bound in species	3.31E+06 HSeO4-1
	13.1396789	% bound in species	1.51E+06 CaSeO4 (aq)
	0.235070558	% bound in species	9.51E+06 ZnSeO4 (aq)
	0.064224307	% bound in species	5.41E+06 NiSeO4 (aq)
	0.220754065	% bound in species	4.71E+06 MnSeO4 (aq)
MoO4-2			
	24.94693154	% bound in species	4.80E+02 MoO4-2
	7.522183242	% bound in species	4.60E+06 MgMoO4(aq)
	12.14295221	% bound in species	1.50E+06 CaMoO4(aq)

16.73850806	% bound in species	3.30E+06	HMoO4-
38.64942478	% bound in species	3.30E+06	MoO3(H2O)3(aq)

H2O

0.015014171	% bound in species	6.00E+06	PbOH+
13.78965756	% bound in species	3.03E+05	AlOH+2
0.174218837	% bound in species	3.03E+05	Al(OH)2+
0.018554486	% bound in species	9.50E+06	ZnOH+
0.055708233	% bound in species	2.31E+06	CuOH+
44.1361028	% bound in species	2.81E+06	FeOH+2
77.54937041	% bound in species	2.81E+06	Fe(OH)2+

H3AsO3

99.99955697	% bound in species	6.00E+01	H3AsO3

H+1

2.994802164	% bound in species	3.30E+02	H+1
0.807581807	% bound in species	3.31E+06	HSO4-
1.720090934	% bound in species	3.31E+06	H2PO4-
0.026137708	% bound in species	3.31E+06	H3PO4
0.019094141	% bound in species	2.81E+06	FeH2PO4+
0.015698164	% bound in species	2.82E+06	FeHPO4+
0.08695137	% bound in species	1.51E+06	CaH2PO4+
0.020888672	% bound in species	3.06E+05	AlHPO4+
0.185818321	% bound in species	3.30E+06	H2AsO4-
0.190981376	% bound in species	3.30E+06	HCO3-
93.90408871	% bound in species	3.30E+06	H2CO3* (aq)
0.019716564	% bound in species	3.30E+06	MoO3(H2O)3(aq)

Fe+3

0.873678634	% bound in species	2.81E+02	Fe+3
21.86155018	% bound in species	2.81E+06	FeOH+2
19.20592605	% bound in species	2.81E+06	Fe(OH)2+
10.43763437	% bound in species	2.82E+06	FeSO4+
0.659723695	% bound in species	2.82E+06	Fe(SO4)2-
0.144848141	% bound in species	2.82E+06	FeH2PO4+2
46.8008543	% bound in species	2.82E+06	FeHPO4+
0.01199767	% bound in species	2.81E+06	FeH2BO3+2

E-1

6.307504328	% bound in species	4700020	MnO4-
93.69249567	% bound in species	4.70E+06	MnO4-2

HSeO3-1

96.93070574	% bound in species	7.61E+02	HSeO3-1
3.063025506	% bound in species	3.31E+06	H2SeO3 (aq)

Sb(OH)6-1

94.7059053	% bound in species	7.41E+02	Sb(OH)6-1
5.294094697	% bound in species	7.41E+06	Sb(OH)5 (aq)

Part 5 of output file

Provisional mass distribution

idx	Name	Dissolved		Sorbed		Precipitated	
		Mol/kg	Percent	Mol/kg	Percent	Mol/kg	Percent
61	AsO4-3	3.70E-06	1.00E+02	0	0	0	0
30	Al+3	4.30E-05	1.00E+02	0	0	0	0
150	Ca+2	7.91E-03	1.00E+02	0	0	0	0
140	CO3-2	1.85E-03	1.00E+02	0	0	0	0
280	Fe+2	8.98838E-05	100	0	0	0	0
100	Ba+2	1.50E-06	1.00E+02	0	0	0	0
410	K+1	6.24E-04	1.00E+02	0	0	0	0
460	Mg+2	1.56E-03	1.00E+02	0	0	0	0
470	Mn+2	6.16E-05	1.00E+02	0	0	0	0
500	Na+1	1.28E-03	1.00E+02	0	0	0	0
770	H4SiO4	2.61E-04	1.00E+02	0	0	0	0
950	Zn+2	9.27E-05	1.00E+02	0	0	0	0
732	SO4-2	1.08E-02	1.00E+02	0	0	0	0
20	Ag+1	1.50E-06	1.00E+02	0	0	0	0
740	Sb(OH)3	1.45E-12	1.00E+02	0	0	0	0
231	Cu+2	5.60E-06	1.00E+02	0	0	0	0
600	Pb+2	2.20E-06	1.00E+02	0	0	0	0
540	Ni+2	1.08E-05	1.00E+02	0	0	0	0
90	H3BO3	2.47E-04	1.00E+02	0	0	0	0
160	Cd+2	5.00E-07	1.00E+02	0	0	0	0
580	PO4-3	3.77E-05	1.00E+02	0	0	0	0
762	SeO4-2	3.88E-13	1.00E+02	0	0	0	0
480	MoO4-2	1.00E-06	1.00E+02	0	0	0	0
2	H2O	6.51E-07	1.00E+02	0	0	0	0
60	H3AsO3	1.20E-14	1.00E+02	0	0	0	0
330	H+1	3.92E-03	1.00E+02	0	0	0	0
281	Fe+3	1.31503E-06	100	0	0	0	0
1	E-1	-4.71E-60	1.00E+02	0	0	0	0
761	HSeO3-1	6.40E-06	1.00E+02	0	0	0	0
741	Sb(OH)6-1	4.40E-06	1.00E+02	0	0	0	0

Charge balance: SPECIATED

Sum of cations=	0.01582059	Sum of anions=	1.59E-02
Percent difference=	0.162107068		
Provisional ionic stre	0.030623679		
Provisional pH=	4		
Provisional pe=	9.348804123	or Eh=	5.25E+02

Part 6 of output file

Saturation indices and stoichiometry of all supersaturated minerals

ID	Name	log IAP	Sat. Index	No. of comp	Stoichiometry on line below
2074102	SbO2	-2.28E+01	5.03E+00	4	

1	741	1.00E+00	1.00E+00	2	330	-4	2	0	0	0	0	0	0
2077000	Chalcedony	-3.581221108	0.1516101	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2077002	Quartz	-3.581221108	0.626297	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2028102	Goethite	3.43E+00	2.3792782	3									
1	281	2.00E+00	2	-3	330	0	0	0	0	0	0	0	0
2028103	Ferrihydrite (aged)	3.43E+00	0.7423626	3									
1	281	-3.00E+00	330	3	2	0	0	0	0	0	0	0	0
3028000	Magnetite	1.04E+01	5.039415	4									
-8	330	2	281	1	280	4	2	0	0	0	0	0	0
3028100	Hematite	6.865279529	7.0861804	3									
2	281	3	2	-6	330	0	0	0	0	0	0	0	0
3028101	Maghemite	6.865279529	0.4792795	3									
-6	330	2	281	3	2	0	0	0	0	0	0	0	0
3028102	Lepidocrocite	3.43E+00	2.0615474	3									
-3	330	1	281	2	2	0	0	0	0	0	0	0	0
3023100	Cupric Ferrite	9.184657559	1.245547	4									
-8	330	1	231	2	281	4	2	0	0	0	0	0	0
6041002	K-Jarosite	-9.752659347	0.3025579	5									
1	410	3	281	2	732	-6	330	6	2	0	0	0	0
6010000	Barite	-8.597006753	1.596451	2									
1	100	1	732	0	0	0	0	0	0	0	0	0	0
6260001	PbMoO4	-13.14304054	2.9774716	2									
1	600	1	480	0	0	0	0	0	0	0	0	0	0
6216001	CdMoO4	-13.6305674	0.6999221	2									
1	480	1	160	0	0	0	0	0	0	0	0	0	0
6223101	CuMoO4	-12.56225311	0.6271723	2									
1	480	1	231	0	0	0	0	0	0	0	0	0	0
7028100	Strengite	-24.84935324	1.4637778	3									
1	281	1	580	2	2	0	0	0	0	0	0	0	0
7047001	MnHPO4	-24.89155196	0.508448	3									
1	470	1	580	1	330	0	0	0	0	0	0	0	0

Iterations=		6 Solid:	Barite	precipitates		
6	SeO4-2	6.4E-06	-9.187E-07	-12.75494	9.181E-07	
7	SeO4-2	6.4E-06	9.361E-07	-12.68764	9.354E-07	
8	SeO4-2	6.4E-06	1.13E-07	-12.74692	1.123E-07	
9	SeO4-2	6.4E-06	5.718E-09	-12.75452	5.078E-09	
10	Cd+2	0.0000005	7.786E-11	-6.748669	2.786E-11	
Iterations=		11 Solid:	K-Jarosite	precipitates		
11	PO4-3	0.0000377	-5.547E-06	-16.2819	5.543E-06	
12	PO4-3	0.0000377	5.985E-06	-16.21075	5.981E-06	
13	PO4-3	0.0000377	7.492E-07	-16.26936	7.454E-07	
14	Cd+2	0.0000005	-3.764E-10	-6.749552	3.264E-10	
15	PO4-3	0.0000377	-1.858E-08	-16.27897	1.481E-08	
16	PO4-3	0.0000377	-8.698E-09	-16.27947	4.928E-09	
17	Cd+2	0.0000005	-8.957E-11	-6.74861	3.957E-11	
ID	Name	Anal mol	Calc mol	Log Activity	Gamma	New logK
61	AsO4-3	0.0000037	1.355E-16	-16.49521	0.2360394	0
30	Al+3	0.000043	5.53E-06	-5.884285	0.2360394	0
150	Ca+2	0.0079083	0.0055456	-2.534727	0.5264128	0
140	CO3-2	0.0018485	3.938E-12	-11.68337	0.5264128	0
280	Fe+2	0.00009	4.918E-05	-4.586849	0.5264128	0
480	MoO4-2	0.000001	2.494E-07	-6.881809	0.5264128	0
762	SeO4-2	0.0000064	3.34E-13	-12.7549	0.5264128	0
460	Mg+2	0.0015614	0.0011585	-3.214776	0.5264128	0
470	Mn+2	0.0000616	4.669E-05	-4.609478	0.5264128	0
500	Na+1	0.001285	0.001257	-2.970343	0.8517882	0
770	H4SiO4	0.0002608	0.0002602	-3.581594	1.007066	0
950	Zn+2	0.0000927	6.406E-05	-4.472103	0.5264128	0
732	SO4-2	0.0108251	0.0078588	-2.383318	0.5264128	0
20	Ag+1	0.0000015	1.399E-06	-5.923897	0.8517882	0
740	Sb(OH)3	0.0000044	1.446E-12	-11.8369	1.007066	0
231	Cu+2	0.0000056	3.967E-06	-5.680259	0.5264128	0
600	Pb+2	0.0000022	1.041E-06	-6.261015	0.5264128	0
540	Ni+2	0.0000108	7.816E-06	-5.385684	0.5264128	0
90	H3BO3	0.0002473	0.0002473	-3.60372	1.007066	0
160	Cd+2	0.0000005	3.389E-07	-6.748555	0.5264128	0
580	PO4-3	0.0000377	2.226E-16	-16.27953	0.2360394	0
2	H2O	0	-3.736E-05	-0.000185	1	0
60	H3AsO3	1E-16	1.202E-14	-13.917	1.007066	0
330	H+1	1E-09	0.0001174	-4	0.8517882	0
281	Fe+3	1.2E-06	9.134E-09	-8.666334	0.2360394	0
1	E-1	1E-16	4.479E-10	-9.348804	0.8517882	0
761	HSeO3-1	1E-16	6.204E-06	-5.277031	0.8517882	0
741	Sb(OH)6-1	1E-16	4.167E-06	-5.449844	0.8517882	0
100	Ba+2	0.0000015	2.941E-08	-7.810139	0.5264128	0
410	K+1	0.0006239	0.0006042	-3.28847	0.8517882	0

Type I - Components of species in solution

ID	Name	Calc mol	Activity	Log activity	Gamma	New logk
330	H+1	0.0001174	0.0001	-4	0.8517882	0.0696684
30	Al+3	5.53006E-06	1.305E-06	-5.884285	0.2360394	0.62701558
150	Ca+2	0.005545569	0.0029193	-2.534727	0.5264128	0.27867359
140	CO3-2	3.93828E-12	2.073E-12	-11.68337	0.5264128	0.27867359
280	Fe+2	4.91841E-05	2.589E-05	-4.586849	0.5264128	0.27867359
281	Fe+3	9.13443E-09	2.156E-09	-8.666334	0.2360394	0.62701558
410	K+1	0.000604224	0.0005147	-3.28847	0.8517882	0.0696684
460	Mg+2	0.001158504	0.0006099	-3.214776	0.5264128	0.27867359
470	Mn+2	4.6687E-05	2.458E-05	-4.609478	0.5264128	0.27867359
500	Na+1	0.001256971	0.0010707	-2.970343	0.8517882	0.0696684
770	H4SiO4	0.000260224	0.0002621	-3.581594	1.007066	-0.0030579
950	Zn+2	6.40575E-05	3.372E-05	-4.472103	0.5264128	0.27867359
732	SO4-2	0.00785879	0.004137	-2.383318	0.5264128	0.27867359
480	MoO4-2	2.49382E-07	1.313E-07	-6.881809	0.5264128	0.27867359
61	AsO4-3	1.35458E-16	3.197E-17	-16.49521	0.2360394	0.62701558
231	Cu+2	3.96657E-06	2.088E-06	-5.680259	0.5264128	0.27867359

600	Pb+2	1.0415E-06	5.483E-07	-6.261015	0.5264128	0.27867359
540	Ni+2	7.81609E-06	4.114E-06	-5.385684	0.5264128	0.27867359
90	H3BO3	0.000247299	0.000249	-3.60372	1.007066	-0.0030579
160	Cd+2	3.38936E-07	1.784E-07	-6.748555	0.5264128	0.27867359
580	PO4-3	2.22579E-16	5.254E-17	-16.27953	0.2360394	0.62701558
762	SeO4-2	3.34021E-13	1.758E-13	-12.7549	0.5264128	0.27867359
761	HSeO3-1	6.2035E-06	5.284E-06	-5.277031	0.8517882	0.0696684
740	Sb(OH)3	1.44559E-12	1.456E-12	-11.8369	1.007066	-0.0030579
741	Sb(OH)6-1	4.167E-06	3.549E-06	-5.449844	0.8517882	0.0696684
60	H3AsO3	1.20211E-14	1.211E-14	-13.917	1.007066	-0.0030579
100	Ba+2	2.94126E-08	1.548E-08	-7.810139	0.5264128	0.27867359
20	Ag+1	1.39885E-06	1.192E-06	-5.923897	0.8517882	0.0696684

Type II - Other species in solution or adsorbed

ID	Name	Calc mol	Activity	Log activity	Gamma	New logk
4803300	H2Mo6O21-4	1.04136E-19	7.997E-21	-20.09709	0.0767902	54.3079012
4604800	MgMoO4(aq)	7.52537E-08	7.579E-08	-7.120414	1.007066	2.97311357
1504800	CaMoO4(aq)	1.21482E-07	1.223E-07	-6.91243	1.007066	2.50104852
3300020	OH-	3.58529E-11	3.054E-11	-10.51514	0.8517882	-14.445291
9503304	Zn2OH+3	1.23999E-14	2.927E-15	-14.5336	0.2360394	-8.9621904
6003300	PbOH+	9.78348E-11	8.333E-11	-10.07918	0.8517882	-7.7483069
6003301	Pb(OH)2 (aq)	4.38084E-16	4.412E-16	-15.35538	1.007066	-17.097058
6003302	Pb(OH)3-	5.21314E-23	4.44E-23	-22.35257	0.8517882	-28.021331
6003303	Pb2OH+3	5.10271E-15	1.204E-15	-14.91921	0.2360394	-5.7699843
6003304	Pb3(OH)4+2	3.37358E-28	1.776E-28	-27.75058	0.5264128	-24.688124
6003306	Pb4(OH)4+4	2.45924E-30	1.888E-31	-30.72389	0.0767902	-20.564399
303300	AlOH+2	8.98441E-08	4.73E-08	-7.325184	0.5264128	-5.1620404
303301	Al(OH)2+	5.677E-10	4.836E-10	-9.315549	0.8517882	-11.361226
303303	Al(OH)3 (aq)	6.09399E-13	6.137E-13	-12.21204	1.007066	-18.330258
303302	Al(OH)4-	3.06381E-15	2.61E-15	-14.58341	0.8517882	-24.628713
9503300	ZnOH+	1.20898E-10	1.03E-10	-9.987248	0.8517882	-9.4452913
9503301	Zn(OH)2 (aq)	4.27041E-14	4.301E-14	-13.36647	1.007066	-16.897057
9503302	Zn(OH)3-	1.60698E-21	1.369E-21	-20.86366	0.8517882	-28.321332
9503303	Zn(OH)4-2	4.14793E-30	2.184E-30	-29.66084	0.5264128	-40.909326
1603300	CdOH+	5.19097E-14	4.422E-14	-13.35442	0.8517882	-10.536011
1603301	Cd(OH)2 (aq)	8.99532E-20	9.059E-20	-19.04293	1.007066	-20.297059
1603302	Cd(OH)3-	1.04848E-28	8.931E-29	-28.04911	0.8517882	-33.230331
1603303	Cd(OH)4-2	1.74334E-38	9.177E-39	-38.03729	0.5264128	-47.009325
1603304	Cd2OH+3	2.03033E-19	4.792E-20	-19.31945	0.2360394	-9.195137
2313300	CuOH+	3.62978E-10	3.092E-10	-9.509788	0.8517882	-7.7596763
2313305	Cu2OH+3	2.02177E-14	4.772E-15	-14.32128	0.2360394	-6.3335654
2313303	Cu(OH)4-2	1.62577E-31	8.558E-32	-31.06762	0.5264128	-41.107944
2313302	Cu(OH)3-	5.60862E-21	4.777E-21	-20.32081	0.8517882	-26.570331
2313301	Cu(OH)2 (aq)	1.6683E-15	1.68E-15	-14.77467	1.007066	-17.097097
2313304	Cu2(OH)2+2	5.53074E-15	2.911E-15	-14.53589	0.5264128	-10.896329
203300	AgOH (aq)	1.19086E-14	1.199E-14	-13.92108	1.007066	-12.000058
203301	Ag(OH)2-	1.38485E-22	1.18E-22	-21.92827	0.8517882	-23.934331
5403300	NiOH+	2.02284E-12	1.723E-12	-11.76371	0.8517882	-10.308169
5403301	Ni(OH)2 (aq)	4.13894E-17	4.168E-17	-16.38005	1.007066	-18.997057
5403302	Ni(OH)3-	4.92528E-24	4.195E-24	-23.37724	0.8517882	-29.921331
2803300	FeOH+	3.69551E-11	3.148E-11	-10.50199	0.8517882	-9.8452919
2803302	Fe(OH)2 (aq)	6.39084E-19	6.436E-19	-18.19138	1.007066	-21.607224
2803301	Fe(OH)3-	2.07921E-25	1.771E-25	-24.75177	0.8517882	-32.094699
2813300	FeOH+2	2.28669E-07	1.204E-07	-6.919466	0.5264128	-1.9742738
2813301	Fe(OH)2+	2.00946E-07	1.712E-07	-6.766589	0.8517882	-6.0302168
2813302	Fe(OH)3 (aq)	4.27771E-13	4.308E-13	-12.36573	1.007066	-15.7019
2813303	Fe(OH)4-	1.84472E-17	1.571E-17	-16.80374	0.8517882	-24.066996
2813304	Fe2(OH)2+4	2.31225E-12	1.776E-13	-12.75066	0.0767902	-2.3029269
2813305	Fe3(OH)4+5	7.0549E-16	1.279E-17	-16.89322	0.0181255	-5.1517678
4703300	MnOH+	2.032E-12	1.731E-12	-11.76175	0.8517882	-11.082415
4703302	Mn(OH)4-2	2.40137E-37	1.264E-37	-36.89821	0.5264128	-48.009325
4700020	MnO4-	5.94233E-62	5.062E-62	-61.29571	0.8517882	-135.35985
4700021	MnO4-2	1.10305E-60	5.807E-61	-60.23608	0.5264128	-124.7424
4603300	MgOH+	6.95795E-12	5.927E-12	-11.22719	0.8517882	-11.942558
1503300	CaOH+	1.7489E-12	1.49E-12	-11.8269	0.8517882	-13.222322
1003300	BaOH+	2.17761E-18	1.855E-18	-17.73169	0.8517882	-13.851696
303305	Al3(OH)4+5	7.91734E-16	1.435E-17	-16.84313	0.0181255	-13.447825
303304	Al2(OH)2+4	9.1038E-12	6.991E-13	-12.15547	0.0767902	-7.2718368
2313306	Cu3(OH)4+2	2.90515E-23	1.529E-23	-22.81551	0.5264128	-21.495316
4703304	Mn2(OH)3+	9.10245E-22	7.753E-22	-21.11051	0.8517882	-23.821332
4703303	Mn2OH+3	6.46957E-16	1.527E-16	-15.81614	0.2360394	-9.9699845
4103300	KOH (aq)	2.71223E-14	2.731E-14	-13.56362	1.007066	-14.278018
5003300	NaOH (aq)	3.75259E-14	3.779E-14	-13.42261	1.007066	-14.455141
7413300	Sb(OH)5 (aq)	2.32961E-07	2.346E-07	-6.62966	1.007066	2.81694202
3307320	HSO4-	3.16401E-05	2.695E-05	-4.569431	0.8517882	1.88355538
6007320	PbSO4 (aq)	1.10309E-06	1.111E-06	-5.954333	1.007066	2.68694214
6007321	Pb(SO4)2-2	5.26045E-08	2.769E-08	-7.557651	0.5264128	3.74867362
307320	AlSO4+	3.16439E-05	2.695E-05	-4.569378	0.8517882	3.76789351
307321	Al(SO4)2-	4.89722E-06	4.171E-06	-5.379719	0.8517882	5.34087057
9507320	ZnSO4 (aq)	2.65448E-05	2.673E-05	-4.572962	1.007066	2.2794012
9507321	Zn(SO4)2-2	2.08898E-06	1.1E-06	-5.958739	0.5264128	3.55867356
1607320	CdSO4 (aq)	1.42668E-07	1.437E-07	-6.842616	1.007066	2.28619924
1607321	Cd(SO4)2-2	1.83435E-08	9.656E-09	-8.015191	0.5264128	3.77867359
2317320	CuSO4 (aq)	1.63163E-06	1.643E-06	-5.78432	1.007066	2.27619925
2317321	CuHSO4+	2.21866E-10	1.89E-10	-9.723577	0.8517882	2.40966831
207320	AgSO4-	1.01138E-07	8.615E-08	-7.064756	0.8517882	1.31212755
5407320	NiSO4 (aq)	2.97928E-06	3E-06	-5.52283	1.007066	2.24311355
5407321	Ni(SO4)2-2	8.838E-10	4.652E-10	-9.33232	0.5264128	1.09867358
2807320	FeSO4 (aq)	2.20054E-05	2.216E-05	-4.654413	1.007066	2.312696
2817320	FeSO4+	1.09143E-07	9.297E-08	-7.031671	0.8517882	4.08764905
2817321	Fe(SO4)2-	6.89458E-09	5.873E-09	-8.231161	0.8517882	5.27147765
4707320	MnSO4 (aq)	1.49075E-05	1.501E-05	-4.823538	1.007066	2.16619935
4607320	MgSO4 (aq)	0.000402735	0.0004056	-3.391923	1.007066	2.20311358
1507320	CaSO4 (aq)	0.002360495	0.0023772	-2.623939	1.007066	2.29104849
5007320	NaSO4-	2.79722E-05	2.383E-05	-4.622942	0.8517882	0.80038763
4107320	KSO4-	1.34339E-05	1.144E-05	-4.941466	0.8517882	0.79999105
7707320	H4SiO4SO4-2	5.69115E-07	2.996E-07	-6.523474	0.5264128	-0.279888
1007320	BaSO4 (aq)	8.57995E-09	8.641E-09	-8.063457	1.007066	2.1269422

3307611	SeO3-2	3.58966E-10	1.89E-10	-9.72362	0.5264128	-8.1679155
3307610	H2SeO3 (aq)	1.96051E-07	1.974E-07	-6.704572	1.007066	2.5694014
1607610	Cd(SeO3)2-2	1.24754E-20	6.567E-21	-20.18262	0.5264128	-10.601327
207610	AgSeO3-1	1.89994E-13	1.618E-13	-12.79093	0.8517882	-5.5203318
207611	Ag(SeO3)2-3	1.28545E-21	3.034E-22	-21.51796	0.2360394	-12.412984
2817610	FeHSeO3+2	3.33648E-11	1.756E-11	-10.75538	0.5264128	3.46665432
3307620	HSeO4-1	6.32865E-16	5.391E-16	-15.26836	0.8517882	1.55621065
1507620	CaSeO4 (aq)	5.09701E-14	5.133E-14	-13.28963	1.007066	1.99694208
9507620	ZnSeO4 (aq)	9.11883E-16	9.183E-16	-15.037	1.007066	2.18694214
9507621	Zn(SeO4)2-2	3.13885E-28	1.652E-28	-27.7819	0.5264128	2.47867364
1607620	CdSeO4 (aq)	5.80079E-18	5.842E-18	-17.23345	1.007066	2.26694206
5407620	NiSeO4 (aq)	2.49131E-16	2.509E-16	-15.60051	1.007066	2.53701133
4707620	MnSeO4 (aq)	8.56316E-16	8.624E-16	-15.06431	1.007066	2.29701132
3305800	HPO4-2	3.26102E-08	1.717E-08	-7.76532	0.5264128	12.7928852
3305801	H2PO4-	3.38993E-05	2.888E-05	-4.539477	0.8517882	19.8097223
3305802	H3PO4	3.43447E-07	3.459E-07	-6.461082	1.007066	21.8153909
5405801	NiH2PO4+	8.02515E-10	6.836E-10	-9.165215	0.8517882	20.5696684
5405800	NiHPO4 (aq)	4.58909E-11	4.622E-11	-10.33522	1.007066	15.326942
1005800	BaHPO4 (aq)	3.14247E-14	3.165E-14	-13.49967	1.007066	14.5869422
2805800	FeH2PO4+	2.99425E-07	2.55E-07	-6.59338	0.8517882	22.3426691
2805801	FeHPO4 (aq)	1.27515E-09	1.284E-09	-8.89138	1.007066	15.9719425
2815801	FeH2PO4+2	1.52338E-09	8.019E-10	-9.095865	0.5264128	24.128674
2815800	FeHPO4+	4.92343E-07	4.194E-07	-6.377401	0.8517882	22.6381328
4605800	MgPO4-	1.28524E-15	1.095E-15	-14.96068	0.8517882	4.60329286
4605802	MgHPO4 (aq)	5.07548E-09	5.111E-09	-8.291465	1.007066	15.1997846
1505800	CaHPO4 (aq)	1.76005E-08	1.772E-08	-7.751417	1.007066	15.0597843
1505801	CaPO4-	3.93581E-13	3.352E-13	-12.47463	0.8517882	6.40929309
1505802	CaH2PO4+	1.71433E-06	1.46E-06	-5.835574	0.8517882	21.0483534
5005800	NaHPO4-	1.8399E-10	1.567E-10	-9.804875	0.8517882	13.5146681
4105800	KHPO4-	5.71041E-11	4.864E-11	-10.313	0.8517882	13.3246685
305801	AlHPO4+	8.23857E-07	7.018E-07	-6.153816	0.8517882	20.0796686
305800	Al2PO4+3	3.6217E-09	8.549E-10	-9.068103	0.2360394	19.6070151
6005801	PbH2PO4+	4.00057E-10	3.408E-10	-9.467546	0.8517882	21.1426684
6005800	PbHPO4 (aq)	8.53879E-12	8.599E-12	-11.06555	1.007066	15.4719425
1605800	CdHPO4 (aq)	1.11907E-11	1.127E-11	-10.94809	1.007066	16.076942
9505800	ZnHPO4 (aq)	8.61603E-10	8.677E-10	-9.061635	1.007066	15.6869417
2315800	CuHPO4 (aq)	3.4447E-10	3.469E-10	-9.45979	1.007066	16.4969421
4705800	MnHPO4 (aq)	8.08972E-10	8.147E-10	-9.089009	1.007066	15.7969423
4105804	K2HPO4 (aq)	4.36989E-14	4.401E-14	-13.35647	1.007066	13.4969421
4105803	K2PO4-	2.97301E-21	2.532E-21	-20.59647	0.8517882	2.32966839
4105802	KH2PO4 (aq)	2.00419E-08	2.018E-08	-7.695002	1.007066	19.8699413
4105801	KPO4-2	1.00337E-18	5.282E-19	-18.27721	0.5264128	1.56946193
5005804	Na2HPO4 (aq)	1.24947E-13	1.258E-13	-12.90022	1.007066	13.3169418
5005803	Na2PO4-	2.75075E-20	2.343E-20	-19.63022	0.8517882	2.65966831
5005802	NaH2PO4 (aq)	4.16934E-08	4.199E-08	-7.376875	1.007066	19.8699413
5005801	NaPO4-2	2.42411E-18	1.276E-18	-17.89412	0.5264128	1.63442735
3300601	HAsO3-2	3.46989E-30	1.827E-30	-29.73836	0.5264128	-23.542685
3300600	H2AsO3-	5.32518E-20	4.536E-20	-19.34333	0.8517882	-9.3566667
3300612	H3AsO4	5.18443E-08	5.221E-08	-7.282241	1.007066	21.2099125
3300610	HAsO4-2	5.65422E-09	2.976E-09	-8.526301	0.5264128	12.2475839
3300611	H2AsO4-	3.64247E-06	3.103E-06	-5.508272	0.8517882	19.0566073
7400020	Sb(OH)4-1	2.58574E-20	2.203E-20	-19.65708	0.8517882	-11.750331
7403302	Sb(OH)2+	4.10161E-15	3.494E-15	-14.45671	0.8517882	1.44966839
3301400	HCO3-	7.48665E-06	6.377E-06	-5.195381	0.8517882	10.5576543
3301401	H2CO3* (aq)	0.001840749	0.0018538	-2.731948	1.007066	16.9483615
6001400	Pb(CO3)2-2	3.89874E-20	2.052E-20	-19.68775	0.5264128	10.2186732
6001401	PbCO3 (aq)	3.82437E-12	3.851E-12	-11.41438	1.007066	6.52694229
9501401	ZnCO3 (aq)	3.99459E-12	4.023E-12	-11.39547	1.007066	4.75694231
9501400	ZnHCO3+	5.53603E-09	4.716E-09	-8.32647	0.8517882	11.8986689
1601400	CdHCO3+	2.93593E-11	2.501E-11	-10.60192	0.8517882	11.8996683
6001402	PbHCO3+	2.26614E-09	1.93E-09	-8.714383	0.8517882	13.2996679
1601401	CdCO3 (aq)	8.61033E-15	8.671E-15	-14.06192	1.007066	4.36694197
1601403	Cd(CO3)2-2	2.47391E-23	1.302E-23	-22.88529	0.5264128	7.50867361
2311400	CuCO3 (aq)	2.53114E-11	2.549E-11	-10.59363	1.007066	6.76694206
2311402	CuHCO3+	6.83978E-10	5.826E-10	-9.234626	0.8517882	12.1986681
2311401	Cu(CO3)2-2	2.70197E-19	1.422E-19	-18.84699	0.5264128	10.4786734
5401401	NiCO3 (aq)	3.14696E-13	3.169E-13	-12.49905	1.007066	4.56694226
5401400	NiHCO3+	2.63401E-09	2.244E-09	-8.649051	0.8517882	12.4896685
2801400	FeHCO3+	1.6922E-09	1.441E-09	-8.841216	0.8517882	11.4986683
4701400	MnHCO3+	3.19301E-09	2.72E-09	-8.565469	0.8517882	11.7970443
4601400	MgCO3 (aq)	8.29371E-13	8.352E-13	-12.07819	1.007066	2.81689216
4601401	MgHCO3+	4.32301E-08	3.682E-08	-7.433882	0.8517882	11.5339298
1501400	CaHCO3+	2.02607E-07	1.726E-07	-6.763015	0.8517882	11.5247482
1501401	CaCO3 (aq)	8.23967E-12	8.298E-12	-11.08103	1.007066	3.13400427
1001401	BaCO3 (aq)	1.21201E-17	1.221E-17	-16.91344	1.007066	2.57701129
1001400	BaHCO3+	6.4151E-13	5.464E-13	-12.26246	0.8517882	11.3007099
5001400	NaCO3-	7.49587E-14	6.385E-14	-13.19485	0.8517882	1.52853213
5001401	NaHCO3 (aq)	4.31676E-09	4.347E-09	-8.361785	1.007066	10.2888676
301400	Al2(OH)2CO3+2	1.36888E-11	7.206E-12	-11.14231	0.5264128	4.58867353
9501402	Zn(CO3)2-2	5.49334E-21	2.892E-21	-20.53884	0.5264128	7.57867378
4701401	MnCO3 (aq)	2.5357E-12	2.554E-12	-11.59284	1.007066	4.69694189
4601402	Mg2CO3+2	5.69842E-15	3E-15	-14.52292	0.5264128	3.8686735
3307701	H2SiO4-2	2.82406E-20	1.487E-20	-19.8278	0.5264128	-23.967532
3307700	H3SiO4-	1.94153E-10	1.654E-10	-9.781525	0.8517882	-10.130262
307700	AlH3SiO4+2	6.52671E-09	3.436E-09	-8.463979	0.5264128	-2.719426
2810900	FeH2BO3+2	1.25493E-10	6.606E-11	-10.18005	0.5264128	-1.6313264
6000901	Pb(H2BO3)2 (aq)	1.65381E-19	1.665E-19	-18.77846	1.007066	-13.313058
6000900	PbH2BO3+	4.6231E-13	3.938E-13	-12.40474	0.8517882	-6.4703316
1600901	Cd(H2BO3)2 (aq)	1.07385E-21	1.081E-21	-20.966	1.007066	-15.013058
1600900	CdH2BO3+	2.49685E-14	2.127E-14	-13.67228	0.8517882	-7.2503318
9500901	Zn(H2BO3)2 (aq)	8.26795E-19	8.326E-19	-18.07954	1.007066	-14.403058
9500900	ZnH2BO3+	1.4251E-12	1.214E-12	-11.91582	0.8517882	-7.7703318
2310901	Cu(H2BO3)2 (aq)	3.30554E-17	3.329E-17	-16.4777	1.007066	-11.593058
2310900	CuH2BO3+	3.35497E-11	2.858E-11	-10.54398	0.8517882	-5.1903318
903300	H10(BO3)4-2	2.31228E-22	1.217E-22	-21.91463	0.5264128	-15.221077
3300900	H2BO3-	1.2779E-09	1.089E-09	-8.96317	0.8517882	-9.2897811
3300901	H5(BO3)2-	3.00794E-13	2.562E-13	-12.5914	0.8517882	-9.3142899
3300902	H8(BO3)3-	4.78247E-15	4.074E-15	-14.39002	0.8517882	-7.5091866

200901	AgH2BO3 (aq)	2.68735E-14	2.706E-14	-13.56762	1.007066	-8.0430579
4600901	MgH2BO3+	2.69477E-11	2.295E-11	-10.63915	0.8517882	-7.7509815
1500901	CaH2BO3+	1.96538E-10	1.674E-10	-9.776221	0.8517882	-7.5681048
1000901	BaH2BO3+	5.59803E-16	4.768E-16	-15.32163	0.8517882	-7.8381048
5000901	NaH2BO3 (aq)	2.41479E-12	2.432E-12	-11.61406	1.007066	-9.0430579
3304801	HMoO4-	1.67372E-07	1.426E-07	-6.845987	0.8517882	4.10549114
3304802	MoO3(H2O)3(aq)	3.86502E-07	3.892E-07	-6.40979	1.007066	8.4689612
3304803	Mo7O24-6	3.89562E-23	1.209E-25	-24.91749	0.0031041	57.7625026
3304804	HMo7O24-5	2.83E-22	5.125E-24	-23.29029	0.0181255	62.6233437
304801	AlMo6O21-3	2.79E-16	6.575E-17	-16.18209	0.2360394	55.6195159
204801	Ag2MoO4 (aq)	7.18438E-20	7.235E-20	-19.14055	1.007066	-0.4140066
4803302	H3Mo8O28-5	9.554E-26	1.732E-27	-26.76152	0.0181255	74.0339206
4803301	Mo8O26-4	1.22E-25	9.368E-27	-26.02835	0.0767902	78.1397121

Type III - Species with fixed activity

ID	Name	Calc mol	Log mol	New logK	dH
2	H2O	-3.74E-05	-4.4275587	0.0001848	0
600610	H3AsO3/AsO4	1.19211E-14	-13.923683	41.275636	-138.85
330	H+1	-0.003903918	-2.4084993	4	0
2802810	Fe+2/Fe+3	-1.85E-05	-4.732494	13.428289	-42.7
3300021	O2 (g)	-3.62857E-06	-5.4402647	-53.39485	571.66
7617620	HSeO3-/SeO4-2	6.40E-06	-5.1938235	38.175292	-201.2
7407410	Sb(OH)3/Sb(OH)6-	-4.40E-06	-5.3565508	24.31	0

Type IV - Finite solids (present at equilibrium)

ID	Name	Calc mol	Log mol	New logK	dH
6010000	Barite	1.46201E-06	-5.8350506	10.193457	-23
6041002	K-Jarosite	6.22E-06	-5.2060834	10.055217	101.8

Type V - Undersaturated solids (not present at equilibrium)

ID	Name	Calc mol	Log mol	New logK	dH
2028100	Ferrihydrite	1.59E-01	-0.7986782	-4.13179	100.4
5060003	Hydrocerrusite	4.07241E-16	-15.390149	18.76	0
5095003	Hydrozincite	2.38E-33	-32.623263	-10.8949	236.5
5023101	Malachite	1.03E-10	-9.9854647	5.0587897	44.2
5047000	Rhodochrosite	4.89E-06	-5.3102924	10.982552	1.88
5015001	Calcite	1.56E-06	-5.8074673	8.4106272	8
2003005	Imogolite	7.12E-07	-6.1474772	-14.79676	193.6
2003004	Al(OH)3 (Soil)	0.000709053	-3.149321	-9.264481	105
7015003	Hydroxyapatite	6.61583E-14	-13.179416	44.333	0

Type VI - Excluded species (not present in mole balance)

ID	Name	Calc mol	Log mol	New logK	dH
3301403	CO2 (g)	0.034490852	-1.4622961	18.220886	-10
1	E-1	4.47915E-10	-9.3488041	0	0
3301404	CH4 (g)	0	-83.041652	43.431594	-257.133

Part 4 of output file

Percentage distribution of components among type I and type II species

AsO4-3

1.401209637	% bound in species	3300612	H3AsO4
0.152817995	% bound in species	3300610	HAsO4-2
98.44597236	% bound in species	3300611	H2AsO4-

Al+3

12.86082891	% bound in species	30	Al+3
0.208943159	% bound in species	303300	AlOH+2
73.59172928	% bound in species	307320	AlSO4+
11.38906778	% bound in species	307321	Al(SO4)2-
1.915979088	% bound in species	305801	AlHPO4+
0.016845419	% bound in species	305800	Al2PO4+3
0.015178654	% bound in species	307700	AlH3SiO4+2

Ca+2

70.12499445	% bound in species	150	Ca+2
29.84900409	% bound in species	1507320	CaSO4 (aq)
0.021678108	% bound in species	1505802	CaH2PO4+

CO3-2

0.405011558	% bound in species	3301400	HCO3-
99.58058479	% bound in species	3301401	H2CO3* (aq)
0.010960587	% bound in species	1501400	CaHCO3+

Fe+2

68.79671697	% bound in species	280	Fe+2
30.78025631	% bound in species	2807320	FeSO4 (aq)
0.418824416	% bound in species	2805800	FeH2PO4+

MoO4-2

24.93837819	% bound in species	480	MoO4-2
7.525441511	% bound in species	4604800	MgMoO4(aq)
12.14830377	% bound in species	1504800	CaMoO4(aq)
16.73731394	% bound in species	3304801	HMoO4-
38.65056242	% bound in species	3304802	MoO3(H2O)3(aq)

SeO4-2

86.16627783	% bound in species	762	SeO4-2
0.16325797	% bound in species	3307620	HSeO4-1
13.14856414	% bound in species	1507620	CaSeO4 (aq)
0.235235269	% bound in species	9507620	ZnSeO4 (aq)
0.064267477	% bound in species	5407620	NiSeO4 (aq)
0.220900902	% bound in species	4707620	MnSeO4 (aq)

Mg+2

74.19825606	% bound in species	460	Mg+2
25.79382815	% bound in species	4607320	MgSO4 (aq)

Mn+2

75.79246321	% bound in species	470	Mn+2
24.2010325	% bound in species	4707320	MnSO4 (aq)

Na+1

97.81956213	% bound in species	500	Na+1
2.176842756	% bound in species	5007320	NaSO4-

H4SiO4

99.77920422	% bound in species	770	H4SiO4
0.218218759	% bound in species	7707320	H4SiO4SO4-2

Zn+2

69.10356776	% bound in species	950	Zn+2
28.63585747	% bound in species	9507320	ZnSO4 (aq)
2.253536824	% bound in species	9507321	Zn(SO4)2-2

SO4-2

72.69292148	% bound in species	732	SO4-2
0.292667106	% bound in species	3307320	HSO4-
0.010203416	% bound in species	6007320	PbSO4 (aq)
0.292702628	% bound in species	307320	AlSO4+
0.090597411	% bound in species	307321	Al(SO4)2-
0.245536628	% bound in species	9507320	ZnSO4 (aq)
0.038645662	% bound in species	9507321	Zn(SO4)2-2
0.01509242	% bound in species	2317320	CuSO4 (aq)
0.027558036	% bound in species	5407320	NiSO4 (aq)
0.203547297	% bound in species	2807320	FeSO4 (aq)
0.137892395	% bound in species	4707320	MnSO4 (aq)
3.725254263	% bound in species	4607320	MgSO4 (aq)
21.83431248	% bound in species	1507320	CaSO4 (aq)
0.258739685	% bound in species	5007320	NaSO4-
0.124262269	% bound in species	4107320	KSO4-

Ag+1

93.25742672	% bound in species	20	Ag+1
6.74255803	% bound in species	207320	AgSO4-

Sb(OH)3

99.71706718	% bound in species	740	Sb(OH)3
0.282931041	% bound in species	7403302	Sb(OH)2+

Cu+2

70.83316608	% bound in species	231	Cu+2
29.1369724	% bound in species	2317320	CuSO4 (aq)
0.012214176	% bound in species	2311402	CuHCO3+

Pb+2

47.34157892	% bound in species	600	Pb+2
50.1410471	% bound in species	6007320	PbSO4 (aq)
2.391150901	% bound in species	6007321	Pb(SO4)2-2
0.018184705	% bound in species	6005801	PbH2PO4+
0.103007795	% bound in species	6001402	PbHCO3+

Ni+2

72.37294208	% bound in species	540	Ni+2
27.58660738	% bound in species	5407320	NiSO4 (aq)
0.024389568	% bound in species	5401400	NiHCO3+

H3BO3

99.99932657	% bound in species	90	H3BO3

Cd+2

67.78885985	% bound in species	160	Cd+2
28.53422545	% bound in species	1607320	CdSO4 (aq)
3.66878741	% bound in species	1607321	Cd(SO4)2-2

PO4-3

0.086500005	% bound in species	3305800	HPO4-2
89.91936183	% bound in species	3305801	H2PO4-
0.911007214	% bound in species	3305802	H3PO4
0.794238357	% bound in species	2805800	FeH2PO4+
1.305959136	% bound in species	2815800	FeHPO4+
0.013462922	% bound in species	4605802	MgHPO4 (aq)
0.04668611	% bound in species	1505800	CaHPO4 (aq)
4.547333571	% bound in species	1505802	CaH2PO4+
2.18531545	% bound in species	305801	AlHPO4+
0.053162073	% bound in species	4105802	KH2PO4 (aq)
0.110593369	% bound in species	5005802	NaH2PO4 (aq)

H2O

0.019994804	% bound in species	6003300	PbOH+
18.36171717	% bound in species	303300	AlOH+2
0.232045349	% bound in species	303301	Al(OH)2+
0.024708385	% bound in species	9503300	ZnOH+
0.074182919	% bound in species	2313300	CuOH+
46.73381332	% bound in species	2813300	FeOH+2
82.13598285	% bound in species	2813301	Fe(OH)2+

H3AsO3

99.99955701	% bound in species	60	H3AsO3

H+1

2.994338034	% bound in species	330	H+1
0.806993277	% bound in species	3307320	HSO4-
1.729232773	% bound in species	3305801	H2PO4-
0.026279271	% bound in species	3305802	H3PO4
0.015273941	% bound in species	2805800	FeH2PO4+

0.012557403	% bound in species	2815800	FeHPO4+
0.087449445	% bound in species	1505802	CaH2PO4+
0.021012822	% bound in species	305801	AlHPO4+
0.185805503	% bound in species	3300611	H2AsO4-
0.190950012	% bound in species	3301400	HCO3-
93.89812921	% bound in species	3301401	H2CO3* (aq)
0.019715796	% bound in species	3304802	MoO3(H2O)3(aq)

Fe+3

0.870926769	% bound in species	281	Fe+3
21.80255816	% bound in species	2813300	FeOH+2
19.15930262	% bound in species	2813301	Fe(OH)2+
10.40632116	% bound in species	2817320	FeSO4+
0.657367047	% bound in species	2817321	Fe(SO4)2-
0.145247541	% bound in species	2815801	FeH2PO4+2
46.94264842	% bound in species	2815800	FeHPO4+
0.011965179	% bound in species	2810900	FeH2BO3+2

E-1

6.309109456	% bound in species	4700020	MnO4-
93.69089054	% bound in species	4700021	MnO4-2

HSeO3-1

96.93053792	% bound in species	761	HSeO3-1
3.063328899	% bound in species	3307610	H2SeO3 (aq)

Sb(OH)6-1

94.7054	% bound in species	741	Sb(OH)6-1
5.294599995	% bound in species	7413300	Sb(OH)5 (aq)

Ba+2

77.41540938	% bound in species	100	Ba+2
22.58281791	% bound in species	1007320	BaSO4 (aq)

K+1

97.82183954	% bound in species	410	K+1
2.174906475	% bound in species	4107320	KSO4-

Part 5 of output file
Equilibrated mass distribution

idx	Name	Dissolved		Sorbed		Precipitated	
		Mol/kg	Percent	Mol/kg	Percent	Mol/kg	Percent
61	AsO4-3	3.69997E-06	100	0	0	0	0
30	Al+3	4.29993E-05	100	0	0	0	0
150	Ca+2	0.00790812	100	0	0	0	0
140	CO3-2	0.001848502	100	0	0	0	0
280	Fe+2	7.14919E-05	100	0	0	0	0
480	MoO4-2	9.99991E-07	100	0	0	0	0
762	SeO4-2	3.87647E-13	100	0	0	0	0
460	Mg+2	0.001561362	100	0	0	0	0
470	Mn+2	6.15985E-05	100	0	0	0	0
500	Na+1	0.001284989	100	0	0	0	0
770	H4SiO4	0.0002608	100	0	0	0	0
950	Zn+2	9.26979E-05	100	0	0	0	0
732	SO4-2	0.010810943	99.87154	0	0	1.3906E-05	0.1284602
20	Ag+1	1.49999E-06	100	0	0	0	0
740	Sb(OH)3	1.44969E-12	100	0	0	0	0
231	Cu+2	5.59987E-06	100	0	0	0	0
600	Pb+2	2.19997E-06	100	0	0	0	0
540	Ni+2	1.07997E-05	100	0	0	0	0
90	H3BO3	0.0002473	100	0	0	0	0
160	Cd+2	4.99988E-07	100	0	0	0	0
580	PO4-3	3.76997E-05	100	0	0	0	0
2	H2O	4.89301E-07	100	0	0	0	0
60	H3AsO3	1.20211E-14	100	0	0	0	0
330	H+1	0.003920736	100	0	0	0	0
281	Fe+3	1.04882E-06	5.320099	0	0	1.8665E-05	94.6799
1	E-1	-4.70932E-60	100	0	0	0	0
761	HSeO3-1	6.39995E-06	100	0	0	0	0
741	Sb(OH)6-1	4.39996E-06	100	0	0	0	0
100	Ba+2	3.79933E-08	2.532885	0	0	1.462E-06	97.46712
410	K+1	0.000617678	99.00275	0	0	6.2218E-06	0.9972445

Charge balance: SPECIATED

Sum of cations=	0.015787212	Sum of anions=	0.0158572
Percent difference=	0.221284397		
Equilibrium ionic stre	0.030579162		
Equilibrium pH=	4		
Equilibrium pe=	9.348804123	or Eh=	525.21456

Part 6 of output file
Saturation indices and stoichiometry of all minerals

ID	Name	log IAP	Sat. Index	No. of comp	Stoichiometry on line below								
1960003	Sb2O3(s)	-23.67324232	-15.193242	2									
2	740	-3	2	0	0	0	0	0	0	0	0	0	0
1960000	Zn-Al LDH	3.328715422	-16.501285	5									
2	950	1	30	0.5	140	-6	330	6	2	0	0	0	0
74001	Sb metal	-51.88275634	-39.415292	4									
1	740	3	330	3	1	-3	2	0	0	0	0	0	0
60000	Pb metal	-24.95862331	-29.196285	2									
1	600	2	1	0	0	0	0	0	0	0	0	0	0
95000	Zn metal	-23.1697117	-50.38189	2									
1	950	2	1	0	0	0	0	0	0	0	0	0	0
16000	Cd metal (alpha)	-25.44616358	-39.659984	2									
1	160	2	1	0	0	0	0	0	0	0	0	0	0
16001	Cd metal (gamma)	-25.44616358	-39.76876	2									
1	160	2	1	0	0	0	0	0	0	0	0	0	0

2000 Ag metal		-15.2727014	-0.7843883	2									
1	20	1	1	0	0	0	0	0	0	0	0	0	0
1474003 AlSb		-85.81345413	-151.43755	5									
1	740	6	1	1	30	3	330	-3	2	0	0	0	0
1474002 ZnSb		-75.05246804	-86.575572	5									
1	740	5	1	1	950	3	330	-3	2	0	0	0	0
1474004 CdSb		-77.32891992	-76.771302	5									
1	740	5	1	3	330	1	160	-3	2	0	0	0	0
1474006 Ag4Sb		-97.70086054	-41.519061	5									
1	740	6	1	3	20	3	330	-3	2	0	0	0	0
1474001 Breithauptite		-75.96604841	-56.552576	5									
1	740	5	1	3	330	1	540	-3	2	0	0	0	0
1474009 Mn2Sb		-98.49692798	-159.57653	5									
2	470	1	740	7	1	3	330	-3	2	0	0	0	0
1474005 Mg2Sb3		-199.4730379	-274.15684	5									
2	460	3	740	9	330	13	1	-9	2	0	0	0	0
1474010 Ca3Sb2		-167.4625199	-317.23675	5									
3	150	2	740	6	330	12	1	-6	2	0	0	0	0
1474008 NaSb		-64.20190359	-88.234992	5									
1	500	1	740	3	330	4	1	-3	2	0	0	0	0
1474007 Na3Sb		-88.84019808	-187.3024	5									
3	500	1	740	3	330	6	1	-3	2	0	0	0	0
2076100 SeO2		-9.276846481	-9.3884385	3									
1	761	1	330	-1	2	0	0	0	0	0	0	0	0
2076200 SeO3		-20.75471469	-43.157208	3									
1	762	2	330	-1	2	0	0	0	0	0	0	0	0
2074100 Sb2O5		-18.89839541	-7.8583954	3									
2	741	2	330	-7	2	0	0	0	0	0	0	0	0
2074102 SbO2		-22.79790943	5.0261906	4									
1	741	1	1	2	330	-4	2	0	0	0	0	0	0
2074001 Sb2O4		3.024181136	-1.0093827	4									
2	740	-2	2	-2	330	-2	1	0	0	0	0	0	0
2074002 Sb4O6 (cubic)		-47.34648464	-28.218686	3									
4	740	0	330	-6	2	0	0	0	0	0	0	0	0
2074003 Sb4O6 (rhombic)		-47.34648464	-29.286784	3									
4	740	0	330	-6	2	0	0	0	0	0	0	0	0
2074006 Senarmontite		-23.67324232	-11.948807	2									
2	740	-3	2	0	0	0	0	0	0	0	0	0	0
2074007 Valentinite		-23.67324232	-13.496756	2									
2	740	-3	2	0	0	0	0	0	0	0	0	0	0
2077000 Chalcedony		-3.581224505	0.1516067	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2077001 Cristobalite		-3.581224505	-0.0455533	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2077002 Quartz		-3.581224505	0.6262936	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2077003 SiO2 (am,gel)		-3.581224505	-0.7412937	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2077004 SiO2 (am,ppt)		-3.581224505	-0.7006208	2									
1	770	-2	2	0	0	0	0	0	0	0	0	0	0
2060000 Massicot		1.73880014	-11.771601	3									
1	600	1	2	-2	330	0	0	0	0	0	0	0	0
2060001 Litharge		1.73880014	-11.5591	3									
1	600	1	2	-2	330	0	0	0	0	0	0	0	0
2060002 PbO:0.3H2O		1.738739159	-11.241261	3									
-2	330	1	600	1.33	2	0	0	0	0	0	0	0	0
2060003 Plattnerite		28.43622359	-23.913491	4									
-4	330	-2	1	1	600	2	2	0	0	0	0	0	0
2060004 Pb(OH)2		1.738615348	-6.9546273	3									
-2	330	1	600	2	2	0	0	0	0	0	0	0	0
2060005 Pb2O(OH)2		3.477415488	-22.712585	3									
2	600	3	2	-4	330	0	0	0	0	0	0	0	0
2003000 Al(OH)3 (am)		6.115160197	-5.7150057	3									
1	30	3	2	-3	330	0	0	0	0	0	0	0	0
2003001 Boehmite		6.115344989	-3.554964	3									
-3	330	1	30	2	2	0	0	0	0	0	0	0	0
2003002 Diaspore		6.115344989	-1.7140564	3									
-3	330	1	30	2	2	0	0	0	0	0	0	0	0
2003003 Gibbsite (C)		6.115160197	-2.5993211	3									
1	30	3	2	-3	330	0	0	0	0	0	0	0	0
2003004 Al(OH)3 (Soil)		6.115160197	-3.1493211	3									
1	30	3	2	-3	330	0	0	0	0	0	0	0	0
2003005 Imogolite		8.649280682	-6.1474772	4									
2	30	1	770	3	2	-6	330	0	0	0	0	0	0
2095000 Zn(OH)2 (am)		3.527526966	-9.7410929	3									
1	950	2	2	-2	330	0	0	0	0	0	0	0	0
2095002 Zn(OH)2 (beta)		3.527526966	-8.9980766	3									
1	950	2	2	-2	330	0	0	0	0	0	0	0	0
2095003 Zn(OH)2 (gamma)		3.527526966	-8.9656404	3									
1	950	2	2	-2	330	0	0	0	0	0	0	0	0
2095007 Zn(OH)2 (delta)		3.527526966	-8.316473	3									
1	950	-2	330	2	2	0	0	0	0	0	0	0	0
2095004 Zn(OH)2 (epsilon)		3.527526966	-8.7361275	3									
1	950	2	2	-2	330	0	0	0	0	0	0	0	0
2095006 Zincite		3.527711758	-8.5340312	3									
1	950	1	2	-2	330	0	0	0	0	0	0	0	0
2016001 Cd(OH)2		1.251075081	-13.271072	3									
1	160	2	2	-2	330	0	0	0	0	0	0	0	0
2023100 Cu(OH)2		2.319371518	-7.4636232	3									
1	231	2	2	-2	330	0	0	0	0	0	0	0	0
2023101 Tenorite(am)		2.319556311	-6.7724596	3									
1	231	1	2	-2	330	0	0	0	0	0	0	0	0
2023103 Tenorite(c)		2.319556311	-5.9227659	3									
1	231	-2	330	1	2	0	0	0	0	0	0	0	0
2002000 Ag2O		-3.847979348	-16.845368	3									
2	20	1	2	-2	330	0	0	0	0	0	0	0	0
2054000 Ni(OH)2 (am)		2.613946593	-11.166636	3									
1	540	2	2	-2	330	0	0	0	0	0	0	0	0

2054001 Ni(OH)2 (c)		2.613946593	-8.1760534	3									
1	540	-2	330	2	2	0	0	0	0	0	0	0	0
2028001 Fe(OH)2 (am)		3.412781222	-10.927523	3									
1	280	2	2	-2	330	0	0	0	0	0	0	0	0
2028002 Fe(OH)2 (c)		3.412781222	-9.4772188	3									
1	280	-2	330	2	2	0	0	0	0	0	0	0	0
2028100 Ferrihydrite		3.333111504	-0.7986782	3									
1	281	3	2	-3	330	0	0	0	0	0	0	0	0
2028101 Fe3(OH)8		10.07900423	-10.142996	4									
-8	330	2	281	1	280	8	2	0	0	0	0	0	0
2028102 Goethite		3.333296296	2.2800271	3									
1	281	2	2	-3	330	0	0	0	0	0	0	0	0
2028103 Ferrihydrite (aged)		3.333111504	0.6431115	3									
1	281	-3	330	3	2	0	0	0	0	0	0	0	0
2047000 Pyrolusite		30.08776109	-13.816609	4									
1	470	2	2	-4	330	-2	1	0	0	0	0	0	0
2047003 Pyrochroite		3.390152844	-12.704174	3									
1	470	2	2	-2	330	0	0	0	0	0	0	0	0
2047100 Manganite		16.73895697	-8.601043	4									
1	470	2	2	-3	330	-1	1	0	0	0	0	0	0
2048001 MoO3		-14.88162451	-6.8816245	3									
1	480	2	330	-1	2	0	0	0	0	0	0	0	0
2046000 Brucite		4.784854217	-13.373154	3									
1	460	2	2	-2	330	0	0	0	0	0	0	0	0
2046001 Periclase		4.785039009	-18.202592	3									
-2	330	1	460	1	2	0	0	0	0	0	0	0	0
2046002 Mg(OH)2 (active)		4.784854217	-14.009146	3									
1	460	2	2	-2	330	0	0	0	0	0	0	0	0
2015000 Lime		5.465087709	-29.033847	3									
-2	330	1	150	1	2	0	0	0	0	0	0	0	0
2015001 Portlandite		5.464902917	-18.43279	3									
1	150	2	2	-2	330	0	0	0	0	0	0	0	0
2010001 Ba(OH)2:8H2O		0.188012627	-24.710119	3									
1	100	10	2	-2	330	0	0	0	0	0	0	0	0
2074005 Cu(SbO3)2		32.0411609	-13.169339	4									
2	740	1	231	-6	330	-4	1	0	0	0	0	0	0
3006000 Arsenolite		-27.83344389	-26.17464	2									
2	60	-3	2	0	0	0	0	0	0	0	0	0	0
3006001 Claudetite		-27.83344389	-26.229471	2									
2	60	-3	2	0	0	0	0	0	0	0	0	0	0
3006100 As2O5		-56.98986798	-22.270541	3									
2	61	6	330	-3	2	0	0	0	0	0	0	0	0
3060000 Pb2O3		30.17502373	-30.864976	4									
-6	330	-2	1	2	600	3	2	0	0	0	0	0	0
3060001 Minium		31.91382387	-45.523393	4									
-8	330	-2	1	3	600	4	2	0	0	0	0	0	0
3003000 Al2O3		12.23087477	-9.8214413	3									
2	30	3	2	-6	330	0	0	0	0	0	0	0	0
3028000 Magnetite		10.0797434	4.7416617	4									
-8	330	2	281	1	280	4	2	0	0	0	0	0	0
3028001 Hercynite		15.64384079	-10.162579	4									
-8	330	1	280	2	30	4	2	0	0	0	0	0	0
3028100 Hematite		6.666777385	6.8876782	3									
2	281	3	2	-6	330	0	0	0	0	0	0	0	0
3028101 Maghemite		6.666777385	0.2807774	3									
-6	330	2	281	3	2	0	0	0	0	0	0	0	0
3028102 Lepidocrocite		3.333296296	1.9622963	3									
-3	330	1	281	2	2	0	0	0	0	0	0	0	0
3047000 Hausmannite		36.86843636	-28.068769	4									
3	470	4	2	-8	330	-2	1	0	0	0	0	0	0
3046000 Spinel		17.01591378	-23.43274	4									
-8	330	1	460	2	30	4	2	0	0	0	0	0	0
3046001 Magnesioferrite		11.45181639	-7.996476	4									
-8	330	1	460	2	281	4	2	0	0	0	0	0	0
3050000 Natron		-17.62590117	-15.703511	3									
2	500	1	140	10	2	0	0	0	0	0	0	0	0
3023100 Cupric Ferrite		8.986333695	1.0472232	4									
-8	330	1	231	2	281	4	2	0	0	0	0	0	0
5060000 Cerrusite		-17.94438206	-4.5143117	2									
1	600	1	140	0	0	0	0	0	0	0	0	0	0
5060001 Pb2OCO3		-16.20558192	-16.026622	4									
-2	330	2	600	1	2	1	140	0	0	0	0	0	0
5060002 Pb3O2CO3		-14.46678178	-26.513079	4									
-4	330	3	600	1	140	2	2	0	0	0	0	0	0
5060003 Hydrocerrusite		-34.15014878	-15.390149	4									
3	600	2	2	-2	330	2	140	0	0	0	0	0	0
5060004 Pb10(OH)6O(CO3)6		-100.7116462	-91.951646	4									
10	600	6	140	7	2	-8	330	0	0	0	0	0	0
5095000 Smithsonite		-16.15547045	-5.2907374	2									
1	950	1	140	0	0	0	0	0	0	0	0	0	0
5095001 ZnCO3:1H2O		-16.15565524	-5.8956552	3									
1	950	1	140	1	2	0	0	0	0	0	0	0	0
5095003 Hydrozincite		-21.72836	-32.623263	4									
5	950	2	140	-6	330	6	2	0	0	0	0	0	0
5016000 Otavite		-18.43192233	-6.3588131	2									
1	160	1	140	0	0	0	0	0	0	0	0	0	0
5023100 CuCO3		-17.36362589	-5.8636259	2									
1	231	1	140	0	0	0	0	0	0	0	0	0	0
5023101 Malachite		-15.04425438	-9.9854646	4									
2	231	2	2	-2	330	1	140	0	0	0	0	0	0
5023102 Azurite		-32.40788027	-15.38468	4									
3	231	2	2	-2	330	2	140	0	0	0	0	0	0
5002000 Ag2CO3		-23.53116155	-12.049977	2									
2	20	1	140	0	0	0	0	0	0	0	0	0	0
5054000 NiCO3		-17.06905082	-6.2550289	2									
1	540	1	140	0	0	0	0	0	0	0	0	0	0
5028000 Siderite		-16.27021619	-5.7479658	2									
1	280	1	140	0	0	0	0	0	0	0	0	0	0

5047000 Rhodochrosite		-16.29284457	-5.3102924	2									
1	470	1	140	0	0	0	0	0	0	0	0	0	0
5046000 Artinite		-10.11384336	-20.829917	4									
-2	330	2	460	1	140	5	2	0	0	0	0	0	0
5046001 Hydromagnesite		-54.80845773	-48.069811	4									
5	460	4	140	-2	330	6	2	0	0	0	0	0	0
5046002 Magnesite		-14.8981432	-7.2525277	2									
1	460	1	140	0	0	0	0	0	0	0	0	0	0
5046003 Nesquehonite		-14.89869757	-10.453489	3									
1	460	1	140	3	2	0	0	0	0	0	0	0	0
5046004 MgCO3:5H2O		-14.89906716	-10.359067	3									
1	460	1	140	5	2	0	0	0	0	0	0	0	0
5015000 Aragonite		-14.2180945	-5.9627098	2									
1	150	1	140	0	0	0	0	0	0	0	0	0	0
5015001 Calcite		-14.2180945	-5.807581	2									
1	150	1	140	0	0	0	0	0	0	0	0	0	0
5015006 CaCO3xH2O		-14.21827929	-7.1464532	3									
1	150	1	140	1	2	0	0	0	0	0	0	0	0
5015005 Vaterite		-14.2180945	-6.4158036	2									
1	150	1	140	0	0	0	0	0	0	0	0	0	0
5015002 Dolomite (ordered)		-29.11623769	-12.392828	3									
1	150	1	460	2	140	0	0	0	0	0	0	0	0
5015004 Dolomite (disordered)		-29.11623769	-13.006866	3									
1	150	1	460	2	140	0	0	0	0	0	0	0	0
5015003 Huntite		-58.91252408	-29.944804	3									
3	460	1	150	4	140	0	0	0	0	0	0	0	0
5010000 Witherite		-19.49350645	-10.904945	2									
1	100	1	140	0	0	0	0	0	0	0	0	0	0
5050001 Thermonatrite		-17.62423803	-18.3585	3									
2	500	1	140	1	2	0	0	0	0	0	0	0	0
5095002 ZnCO3		-16.15547045	-5.3554704	2									
1	950	1	140	0	0	0	0	0	0	0	0	0	0
5047002 MnCO3 (am)		-16.29284457	-5.7928446	2									
1	470	1	140	0	0	0	0	0	0	0	0	0	0
5260000 Pb(BO2)2		-5.468086459	-12.132177	4									
-2	2	-2	330	1	600	2	90	0	0	0	0	0	0
5295000 Zn(BO2)2		-3.679174841	-11.969175	4									
-2	2	-2	330	1	950	2	90	0	0	0	0	0	0
5216000 Cd(BO2)2		-5.955626726	-15.795627	4									
-2	2	-2	330	1	160	2	90	0	0	0	0	0	0
6060000 Larnakite		-6.905532819	-6.6737321	4									
-2	330	2	600	1	732	1	2	0	0	0	0	0	0
6060001 Pb3O2SO4		-5.166732679	-16.587613	4									
-4	330	3	600	1	732	2	2	0	0	0	0	0	0
6060002 Pb4O3SO4		-3.427932539	-26.571495	4									
-6	330	4	600	1	732	3	2	0	0	0	0	0	0
6060003 Anglesite		-8.644332959	-0.7429637	2									
1	600	1	732	0	0	0	0	0	0	0	0	0	0
6060004 Pb4(OH)6SO4		-3.428486916	-24.528487	4									
-6	330	4	600	1	732	6	2	0	0	0	0	0	0
6003000 AlOHSO4		-4.267788109	-1.0377881	4									
-1	330	1	30	1	732	1	2	0	0	0	0	0	0
6003001 Al4(OH)10SO4		14.07769248	-8.6223075	4									
-10	330	4	30	1	732	10	2	0	0	0	0	0	0
6095000 Zn2(OH)2SO4		-3.327894375	-10.827894	4									
-2	330	2	950	2	2	1	732	0	0	0	0	0	0
6095001 Zn4(OH)6SO4		3.727159556	-24.67284	4									
-6	330	4	950	6	2	1	732	0	0	0	0	0	0
6095002 Zn3O(SO4)2		-10.18313092	-31.491814	4									
-2	330	3	950	2	732	1	2	0	0	0	0	0	0
6095003 Zincosite		-6.855421341	-11.551583	2									
1	950	1	732	0	0	0	0	0	0	0	0	0	0
6095004 ZnSO4:1H2O		-6.855606133	-6.6266089	3									
1	950	1	732	1	2	0	0	0	0	0	0	0	0
6095005 Bianchite		-6.856530095	-5.0977426	3									
1	950	1	732	6	2	0	0	0	0	0	0	0	0
6095006 Goslarite		-6.856714888	-4.7136351	3									
1	950	1	732	7	2	0	0	0	0	0	0	0	0
6016000 Cd3(OH)4SO4		-6.629723064	-29.189723	4									
-4	330	3	160	4	2	1	732	0	0	0	0	0	0
6016001 Cd3OH2(SO4)2		-17.01267137	-23.722671	4									
-2	330	3	160	2	2	2	732	0	0	0	0	0	0
6016002 Cd4(OH)6SO4		-5.378647984	-33.778648	4									
-6	330	4	160	6	2	1	732	0	0	0	0	0	0
6016003 CdSO4		-9.131873226	-9.4420878	2									
1	160	1	732	0	0	0	0	0	0	0	0	0	0
6016004 CdSO4:1H2O		-9.132058018	-7.6986727	3									
1	160	1	732	1	2	0	0	0	0	0	0	0	0
6016005 CdSO4:2.67H2O		-9.132366621	-7.4263389	3									
1	160	1	732	2.67	2	0	0	0	0	0	0	0	0
6023100 Antlerite		-3.424833752	-12.212834	4									
3	231	4	2	-4	330	1	732	0	0	0	0	0	0
6023101 Brochantite		-1.105462234	-18.21016	4									
4	231	6	2	-6	330	1	732	0	0	0	0	0	0
6023102 Langite		-1.105647026	-20.130679	4									
-6	330	4	231	7	2	1	732	0	0	0	0	0	0
6023103 CuOCuSO4		-5.744020478	-17.325898	4									
-2	330	2	231	1	2	1	732	0	0	0	0	0	0
6023104 CuSO4		-8.063576788	-11.680945	2									
1	231	1	732	0	0	0	0	0	0	0	0	0	0
6023105 Chalcanthite		-8.06450075	-5.3685841	3									
1	231	1	732	5	2	0	0	0	0	0	0	0	0
6002000 Ag2SO4		-14.23111245	-9.2533393	2									
2	20	1	732	0	0	0	0	0	0	0	0	0	0
6054000 Ni4(OH)6SO4		0.072838065	-31.927162	4									
-6	330	4	540	1	732	6	2	0	0	0	0	0	0
6054001 Retgersite		-7.770110468	-5.6873966	3									
1	540	1	732	6	2	0	0	0	0	0	0	0	0

6054002 Morenosite		-7.77029526	-5.5123536	3									
1	540	1	732	7	2	0	0	0	0	0	0	0	0
6028000 Melanterite		-6.971460631	-4.5722048	3									
1	280	1	732	7	2	0	0	0	0	0	0	0	0
6028100 Fe2(SO4)3		-24.48262191	-22.99453	2									
2	281	3	732	0	0	0	0	0	0	0	0	0	0
6028101 H-Jarosite		-10.76693169	-7.4488644	4									
3	281	2	732	-5	330	7	2	0	0	0	0	0	0
6050000 Na-Jarosite		-9.737090016	-5.6768623	5									
1	500	3	281	2	732	-6	330	6	2	0	0	0	0
6041002 K-Jarosite		-10.0552172	5.329E-15	5									
1	410	3	281	2	732	-6	330	6	2	0	0	0	0
6047000 MnSO4		-6.992795463	-10.177662	2									
1	470	1	732	0	0	0	0	0	0	0	0	0	0
6046000 Epsomite		-5.599387636	-3.365601	3									
1	460	1	732	7	2	0	0	0	0	0	0	0	0
6015000 Anhydrite		-4.91804539	-0.624867	2									
1	150	1	732	0	0	0	0	0	0	0	0	0	0
6015001 Gypsum		-4.918414975	-0.2991342	3									
1	150	1	732	2	2	0	0	0	0	0	0	0	0
6015002 Ettringite		13.86608837	-46.553297	5									
6	150	2	30	3	732	-12	330	38	2	0	0	0	0
6010000 Barite		-10.19345734	4.578E-07	2									
1	100	1	732	0	0	0	0	0	0	0	0	0	0
6050001 Mirabilite		-8.325852061	-6.4745726	3									
2	500	1	732	10	2	0	0	0	0	0	0	0	0
6050002 Thenardite		-8.324004136	-8.7303541	2									
2	500	1	732	0	0	0	0	0	0	0	0	0	0
6041000 K-Alum		-13.94160902	-8.4912508	4									
1	410	1	30	2	732	12	2	0	0	0	0	0	0
6041001 Alunite		-1.709071118	-2.2580336	5									
1	410	3	30	2	732	-6	330	6	2	0	0	0	0
6102000 Ag2SeO3		-13.12482583	-5.6063791	3									
2	20	1	761	-1	330	0	0	0	0	0	0	0	0
6123100 CuSeO3:2H2O		-6.957659755	-7.9197584	4									
1	231	1	761	-1	330	2	2	0	0	0	0	0	0
6154000 NiSeO3:2H2O		-6.663084681	-9.7655202	4									
1	761	1	540	2	2	-1	330	0	0	0	0	0	0
6128100 Fe2(SeO3)3:2H2O		-21.16413164	-0.5379316	4									
3	761	2	281	2	2	-3	330	0	0	0	0	0	0
6128101 Fe2(OH)4SeO3		-2.610438681	-4.1643387	4									
1	761	2	281	4	2	-5	330	0	0	0	0	0	0
6147000 MnSeO3		-5.886508845	-7.0165088	3									
1	470	1	761	-1	330	0	0	0	0	0	0	0	0
6146000 MgSeO3:6H2O		-4.492916226	-7.4843778	4									
1	460	1	761	-1	330	6	2	0	0	0	0	0	0
6115000 CaSeO3:2H2O		-3.812128357	-6.8065914	4									
1	761	1	150	2	2	-1	330	0	0	0	0	0	0
6110000 BaSeO3		-9.087170722	-10.805801	3									
1	100	1	761	-1	330	0	0	0	0	0	0	0	0
6150001 Na2SeO3:5H2O		-7.218641481	-17.518641	4									
2	500	1	761	-1	330	5	2	0	0	0	0	0	0
6160000 PbSeO4		-19.01591455	-12.036703	2									
1	600	1	762	0	0	0	0	0	0	0	0	0	0
6195001 ZnSeO4:6H2O		-17.22811169	-15.708112	3									
1	950	1	762	6	2	0	0	0	0	0	0	0	0
6116001 CdSeO4:2H2O		-19.5038244	-17.653824	3									
1	160	1	762	2	2	0	0	0	0	0	0	0	0
6102001 Ag2SeO4		-24.60269404	-16.096408	2									
2	20	1	762	0	0	0	0	0	0	0	0	0	0
6123101 CuSeO4:5H2O		-18.43608234	-15.996082	3									
1	231	1	762	5	2	0	0	0	0	0	0	0	0
6154001 NiSeO4:6H2O		-18.14169206	-16.621692	3									
1	540	1	762	6	2	0	0	0	0	0	0	0	0
6147002 MnSeO4:5H2O		-17.36530102	-15.315301	3									
1	470	1	762	5	2	0	0	0	0	0	0	0	0
6146001 MgSeO4:6H2O		-15.97078443	-14.770784	3									
1	460	1	762	6	2	0	0	0	0	0	0	0	0
6115001 CaSeO4:2H2O		-15.28999657	-12.347027	3									
1	150	1	762	2	2	0	0	0	0	0	0	0	0
6110001 BaSeO4		-20.56503893	-12.900862	2									
1	100	1	762	0	0	0	0	0	0	0	0	0	0
6150002 Na2SeO4		-18.69558573	-19.975586	2									
2	500	1	762	0	0	0	0	0	0	0	0	0	0
6141001 K2SeO4		-19.33184009	-18.60184	2									
2	410	1	762	0	0	0	0	0	0	0	0	0	0
6233001 H2MoO4		-14.8818093	-1.5505514	2									
1	480	2	330	0	0	0	0	0	0	0	0	0	0
6260001 PbMoO4		-13.14282437	2.9776878	2									
1	600	1	480	0	0	0	0	0	0	0	0	0	0
6203001 Al2(MoO4)3		-32.41399876	-37.201924	2									
3	480	2	30	0	0	0	0	0	0	0	0	0	0
6295001 ZnMoO4		-11.35391275	-1.3277251	2									
1	480	1	950	0	0	0	0	0	0	0	0	0	0
6216001 CdMoO4		-13.63036464	0.7001248	2									
1	480	1	160	0	0	0	0	0	0	0	0	0	0
6223101 CuMoO4		-12.5620682	0.6273572	2									
1	480	1	231	0	0	0	0	0	0	0	0	0	0
6202001 Ag2MoO4		-18.72960386	-6.6905071	2									
2	20	1	480	0	0	0	0	0	0	0	0	0	0
6254001 NiMoO4		-12.26749312	-1.1133281	2									
1	480	1	540	0	0	0	0	0	0	0	0	0	0
6228001 FeMoO4		-11.4686585	-1.4806751	2									
1	480	1	280	0	0	0	0	0	0	0	0	0	0
6246001 MgMoO4		-10.0965855	-8.2465855	2									
1	460	1	480	0	0	0	0	0	0	0	0	0	0
6215001 CaMoO4		-9.416536801	-1.4850983	2									
1	150	1	480	0	0	0	0	0	0	0	0	0	0

Appendix E
Additional Information

Appendix A: Installation and Operation of Minewall Stations

The following is taken from Appendix D of Morin and Hutt (1997), based on information in MEND (1995).

Equipment (for each station):

❶ 3 m of 90°-bent, flexible plastic bathtub edging
❷ 2 tubes of pure silicon bathroom sealant (must be pure silicon)
❸ 1 sheet of clear plastic 1 m by 1 m
❹ 8 black metal clasps often used for holding unbound reports
❺ 1 L of distilled water in a squeeze bottle which allows the direction and pressure of water to be controlled

Installation Procedure (see Figure A-1):

❶ Select a relatively flat surface of rock, preferably with no surface fractures, measuring no more than 1 m by 1 m.
❷ Mark the intended perimeter of the station on the surface with a pencil, with three, four, or five limbs of plastic edging.
❸ The lowest, or bottom, limb must slope downwards from horizontal so that all water caught on it will drain in one direction for collection and later analysis.
❹ Cut the plastic edging to the length required for each limb.
❺ Install each limb by using pure silicon sealant as glue.
❻ Ensure silicon sealant fills all open spaces between the edging and the rock surface so that no water can pass underneath.
❼ Ensure each limb overlaps so that no large gaps exist at any junction; seal any smaller gaps with silicon.
❽ Ensure the upper limb(s) will divert wall runoff around the sides of the station so that the water will not flow over the isolated area.
❾ With 1 L of distilled water, wash the entire isolated surface within the edging, rinsing out any loose rock/dust and ensuring all water is caught by the edging and directed to the bottom limb where the water can then be caught in a bottle.
❿ Cut the clear plastic sheet to extend 2 cm over each limb, then loosely attach the plastic sheet with the metal clasps, ensuring the plastic sheet does not touch the rock surface but prevents all precipitation or runoff from reaching the isolated rock surface.

Regular Sampling:

❶ Carefully remove the plastic sheet and place it somewhere clean and dry.
❷ Inspect the station for loose edging and broken seals against the rock; repair any problems after sampling (below), but avoid losing rinse water through any broken seals.
❸ Record a note if there is any condensation and if any water may have condensed and trickled out of the station between sampling events.
❹ Place a calibrated collection bottle at the downstream (outflow) end of the lower limb (trough) to catch all subsequent rinse water.

❺ With a calibrated squeeze bottle, spray at least 200 mL onto the isolated rock surface to rinse the entire area thoroughly; use as little water as possible; it is important to catch all rinse water in the collection bottle; record the volume of water sprayed on the rock.

❻ Record the amount of water recovered in the collection bottle.

❼ Analyze the water in the collection bottle like any other water sample, including pH, acidity, alkalinity, sulfate, dissolved metals, and total metals as desired.

❽ As a quality-assurance procedure for one round of sampling, also filter a similar volume of the distilled water through a 0.45 µm filter, then analyze like all other water samples

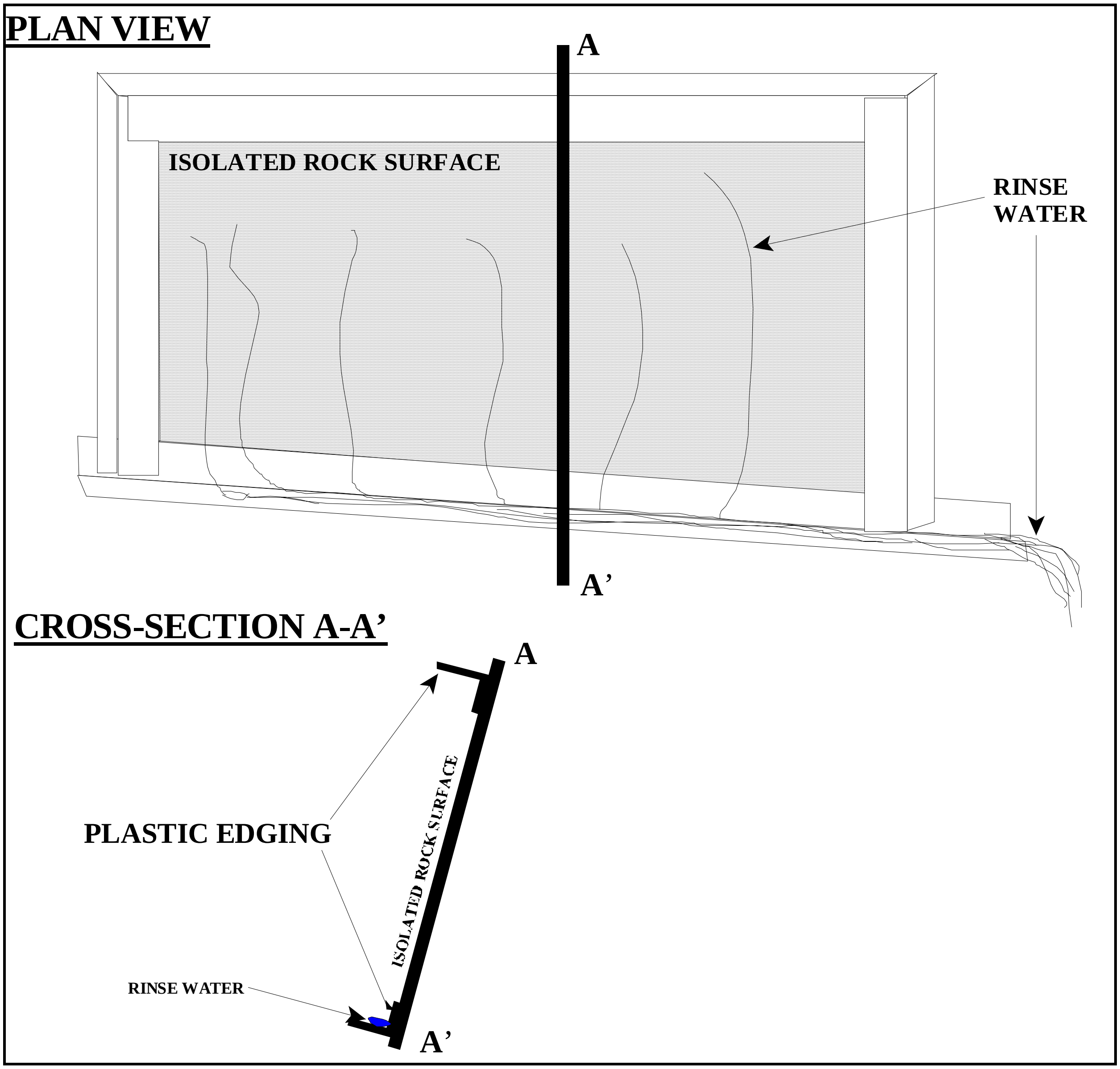

FIGURE A-1. Example of a MINEWALL Station (Plan View and Cross-Section).