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Crandon Mining Company

Waste Characterization Update Report

Crandon Project
Crandon, Wisconsin

December 1995

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Crandon Mining Company

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RHINELANDER, WI 54501-3161

Jerome D. Goodrich, Jr.
PRESIDENT

December 13, 1995

Mr. Bill Tans
Wisconsin Department of Natural Resources
Bureau of Environmental Analysis and Review
P.O. Box 7921
Madison, WI 53707

Mr. David L. Ballman, Ecologist
U.S. Army Corps of Engineers
St. Paul District
190 Fifth Street East
St. Paul, MN 55101

Dear Mr. Tans and Mr. Ballman:

Re: Crandon Project - Waste Characterization Update Report

Crandon Mining Company (CMC) is pleased to submit the enclosed *Waste Characterization Update Report* for the Crandon Project. The report has been prepared to provide additional waste characterization information to your agencies as the review of the Crandon Project moves forward. The report presents data collected regarding the project's waste characterization studies since the submittal of the May, 1995 baseline condition section of the project's *Environmental Impact Report*. Also included are calculations regarding reaction rates and interpretations.

The report has been prepared on behalf of CMC by Foth & Van Dyke and Associates Inc, Lawrence Consulting Ltd., and Thresher & Son, Inc. As noted on the attached distribution list, CMC has distributed the document to appropriate state and federal agencies, to local officials, and to various interested parties. It is our understanding that the Wisconsin Department of Natural Resources (WDNR) and the U.S. Army Corps of Engineers (USCOE) will be responsible for distribution of the document to their appropriate staff members.

If you or your staff have any questions regarding the interim report, please contact me at (715) 365-1450.

Sincerely,

Jerome D. Goodrich, Jr.
President
Crandon Mining Company

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12/13/95

Waste Characterization Update Report

93C049

Prepared for
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Dec - 13 - 95

Prepared by
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December 1995

Crandon Project Waste Characterization Update Report

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1 Introduction

Crandon Mining Company (CMC) is carrying out a laboratory test program to characterize the behavior of waste rock and tailings materials which are to be disposed of under various modes of deposition or to be used as construction materials within the Crandon Project area. The data generated from the work also provides the information for use in establishing source terms for the tailings management area and reflooded mine to evaluate the effectiveness of project design from a groundwater protection perspective. This report provides a summary of the status of the waste characterization program and includes a record of data obtained in the test program since the issuance of the project's *Environmental Impact Report* (EIR) in May, 1995 (Foth & Van Dyke, 1995a).

Descriptions of the objectives and methods of the waste characterization tests have been provided in the project's *Notification of Intent to Collect Data & Detailed Scope of Study* (Foth & Van Dyke, 1994) and in Section 3.5 of the EIR (Foth & Van Dyke, 1995a). Revisions to the original methodologies used for testing were detailed in correspondence from CMC to Mr. Larry Lynch of the Wisconsin Department of Natural Resources (WDNR) dated May 23, 1994, September 30, 1994, February 9, 1995, and February 22, 1995 (CMC, 1994a & b and 1995a & b).

Wastes to be produced during mining and milling operations will be mainly tailings and waste rock, with smaller quantities of other materials. Tailings will comprise the largest quantity of waste at a projected 44,000,000 tons. Tailings produced by milling and flotation will be classified into coarse and fine fractions. Coarse tailings will be used, either cemented or non-cemented, as mine backfill. Fine tailings will be deposited in the tailings management area (TMA). When backfill is not required, whole (unclassified) tailings will be deposited in the TMA.

The estimated quantity of waste rock produced during underground development and mining operations will be 700,000 to 1,050,000 tons, respectively. It is proposed to use rock that can be demonstrated to be non-reactive (Type I) as construction aggregate, road base, and fill. Rock that is shown to be potentially reactive (Type II) will be used for interior embankments and grading layers within the contained TMA. Approximately 50 percent of the waste rock produced during mine operations will be placed in the mined-out stopes together with backfill tailings. The waste rock placed in the backfilled stopes will represent approximately 3 percent of the total backfilled stope volume.

Other wastes, including wastewater treatment solids and reclaim pond solids, will be produced in relatively small quantities and will be placed in the TMA. An estimate of waste types and quantities is further described in Section 4.1 of the *Tailings Management Area Feasibility Report/Plan of Operation* (Foth & Van Dyke, 1995b).

The results of the acid-base accounting (ABA) and bulk chemical tests contained within this report validate the method of forming, and the appropriateness of, the waste rock and tailings composites, and confirm the presence of carbonate minerals in all waste rock and tailings composites. These carbonate minerals account for the neutralization potential of the samples. The carbonate minerals positively affect the kinetic tests by decreasing oxidation effects and increasing the time before which low pH conditions may occur in the waste rock and tailings.

2 Objectives of Waste Characterization Tests

The behavior of the wastes generated during mine development and operations and the potential impact they will have on the environment will depend on the characteristics of the various rock units comprising the wastes and their methods and place of disposal. To establish this behavior a waste characterization program for the Crandon Project was developed with the objective of determining:

- Which waste rock can be classified as Type I for construction purposes outside of the contained TMA and which waste rock will need to be placed in the TMA (Type II).
- How the fine and whole tailings will behave in the TMA.
- What the best engineering judgement and practical worst case water quality in the TMA will be.
- What the behavior of cemented and non-cemented tailings used in backfill will be.
- What the best engineering judgement and practical worst case quality of water in the reflooded mine will be at closure.
- If a waste rock classification system, described in literature by Brodie, et al. (1991), can be used in the field to predict ABA values and waste leachability.

To address these issues, the following analyses and test procedures have been and/or are currently being carried out on various samples of Crandon Project waste rock and tailings:

- Acid-base accounting tests to determine (a) the sulfur content to calculate the potential of the waste to produce acid, and (b) the potential capacity of the waste to neutralize acidic drainage.
- Kinetic leaching tests to determine the ability of the material to produce acidic drainage and specifically to determine oxidation rates, neutralization rates, metal leaching rates, and water quality as a function of time.
- Detailed multi-element analyses of the waste rock, tailings, and leachate.
- An assessment to determine radiological properties and if asbestiform minerals are present.
- Waste rock classification (WRC).

It should be noted that the purpose of completing WRC evaluation work in addition to ABA and kinetic testing is to determine if there is a good correlation between the WRC technique, and ABA and waste leachability in order to determine if WRC could be considered as a technique that could be used in the mine to assist in the segregation of waste rock into the Type I and Type II categories.

3 Scope of Report

In May of 1995 CMC issued the baseline conditions section of the Crandon Project EIR (Foth & Van Dyke, 1995a) which contained the results of waste characterization work completed through approximately the first quarter of 1995. Data presented in that report consisted of:

- The results of bulk chemistry testing of the composites being used in the kinetic tests.
- Preliminary static test procedures using ABA data and WRC assessments for the composites being used in the kinetic tests.
- Results of the kinetic tests through the first quarter of 1995.
- The results of radiological testing, testing for the presence of asbestiform minerals, and EP Toxicity testing.

Since the first quarter of 1995 the following additional waste characterization data has been collected:

- Waste rock ABA and bulk chemistry information to provide data to assess the appropriateness of the compositing methodology used to prepare the master waste rock composites.
- ABA evaluations of the tailings.
- Bulk chemical tests of the tailings to evaluate the variability within the tailings composites.
- Waste rock and tailings kinetic test results.

Laboratory reports for selected data collected since the first quarter of 1995 are included in Appendices 1, 2, and 3 of this report. A discussion of the ABA and bulk chemistry data collected since the May submittal is included in this report along with a comparison of this data to that reported in the May submittal. ABA and WRC data collected in 1994 but not included in the May submittal is included in this report. In addition, the report contains a compilation of all kinetic test data collected to date (Appendix 4) along with a preliminary interpretation of the data. The report contains preliminary conclusions based on the work completed to date.

It should be noted that the purpose of this update report is to provide a status summary of waste characterization work completed since the May submittal to allow the agencies to proceed with their evaluation of the TMA design.

4 Additional Waste Rock Static Test Results

Additional waste rock static tests performed since those reported in the May, 1995 EIR (Foth & Van Dyke, 1995a) consist of ABA and bulk chemical analyses. The additional ABA and bulk chemical tests were conducted to assess the appropriateness of the compositing methodology used to prepare the master waste rock composites. These test results are discussed below. In addition, a discussion of ABA test results and WRC evaluations completed in 1994, but not included in the May, 1995 EIR is also presented below.

4.1 1994 Waste Rock ABA and WRC Test Work

An initial screening of the potential reactivity of a wide range of waste rock that could be produced was conducted during the spring and summer of 1994. The purpose of the screening was to determine 1) the widest range of ABA values that might be encountered; 2) the relative chemical reactivity of waste rock samples by examining the sulfide mineral content and grain size distribution coupled with the alkali mineral content and grain size distribution; and 3) if valid waste rock composites could be prepared for kinetic testing based upon sulfide mineral content alone. To accomplish the screening, diamond drill core that intercepted areas of potential preproduction waste rock development were examined by a qualified geologist (Richard Côté of Rio Algom) and categorized according to relative concentration of sulfide and alkali minerals content (CMC, 1994b). Each core intercept, which ranged from about 25 to 200 feet in length, was divided into large continuous areas of low, average and/or high sulfide mineral content. Within each of these categories a 1-foot interval was identified as representative of each range of sulfide mineral content. Upon completion of the core evaluation for sulfide mineral content, and before sampling, the cores were examined by John E. Thresher, Jr. of Thresher & Son, Inc., and Ken Markart of WDNR. With very few minor exceptions, both individuals concurred with the Côté evaluation. Samples for ABA testing were then selected primarily from the highest sulfide mineral concentrations within a core. Samples containing high sulfide mineral concentrations were also collected from the Crandon Formation (the ore horizon) to expand the range of sulfide mineral content in the data base.

Approximately 75 percent of the intervals chosen for evaluation and analysis were from the core sections containing the highest relative sulfide mineral content, in some cases even if that interval represented less than one percent of the entire core interval. No intervals containing the lowest sulfide mineral concentration were chosen for evaluation and analysis. The sample selection was not intended to be a statistical representation of the waste rock that might be encountered but, as stated above, was to obtain data from a wide range of sulfide mineral content alone.

An explanation of the ABA terms used in this text and tables is included in Appendix 1.1, along with a comparison of these terms to those used by Lakefield Research and by Chemex Labs. The results of the ABA testing of the selected intervals are included in Appendix 1.2, and are summarized in Tables 1 through 4 of Appendix 1.3. The resulting neutralization potential (NP) and maximum potential acidity (AP) values for the samples are shown in Figure 1a. A few data sets containing high AP and/or NP values were not plotted so that the scale of all the NP-AP plots in Figure 1 would be the same. The results indicate that about one-quarter of the samples have an NP/AP value of less than 1, thus indicating that they might be acid generating, which was expected considering the fact that relatively high sulfide mineral content was emphasized in the sampling. What was unexpected is that about two-thirds of the high sulfide mineral content

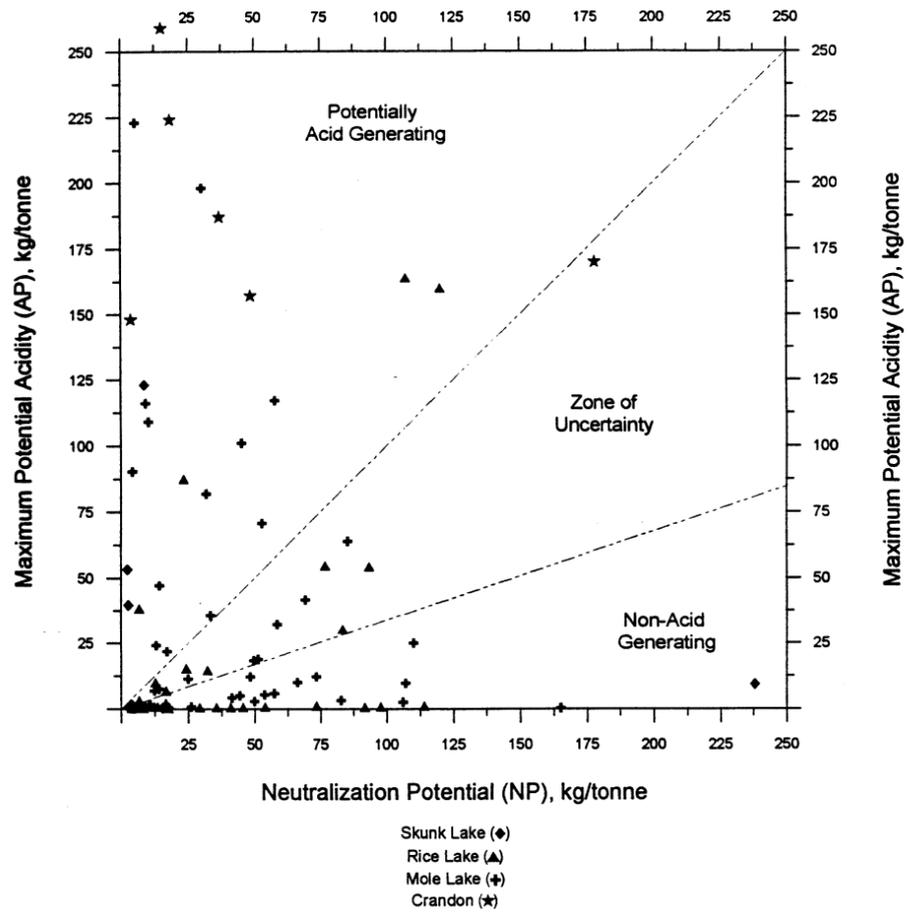


Figure 1a. Acid-Base Accounting Results of the Samples Used in the 1994 Evaluation of ABA Variability within the Hanging Wall and Ore Formations

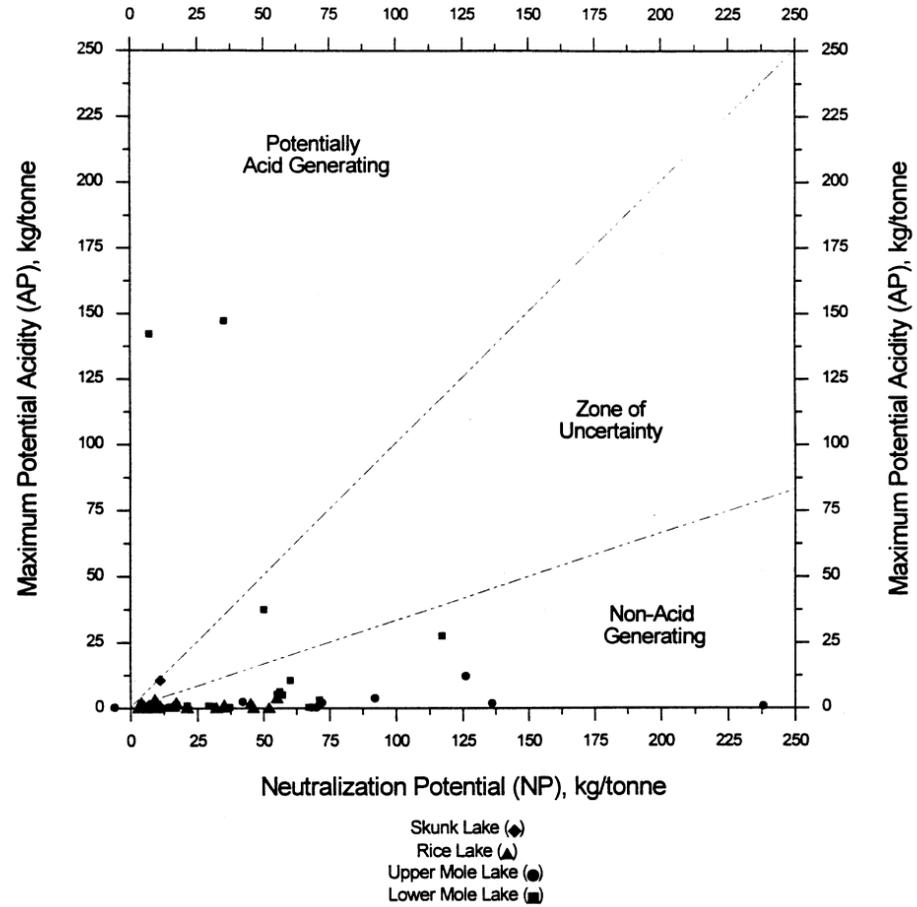


Figure 1b. Acid-Base Accounting Results of the Samples Used in the 1995 Evaluation of ABA Variability within the Four Master Waste Rock Composites

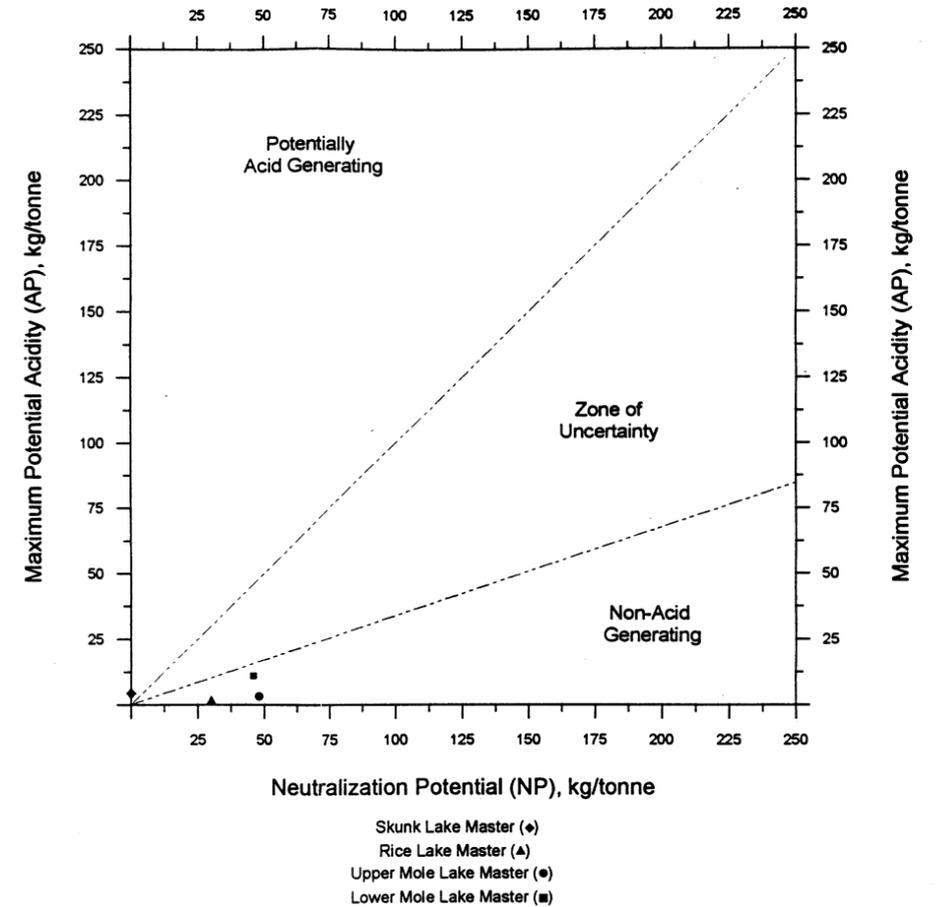


Figure 1c. Acid-Base Accounting Results for the Four Master Waste Rock Composites Used in the Waste Characterization Kinetic Tests

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Crandon Mining Company

FIGURE 1
RESULTS OF ABA TESTS IN TERMS OF
CALCULATED NEUTRALIZATION POTENTIAL (NP) AND
MAXIMUM POTENTIAL ACIDITY (AP)

Scale:	AS SHOWN	Date:	DECEMBER 1995
Prepared By:	Foth & Van Dyke	By:	JRB2

samples would be classified as potentially non-acid producing. These results indicated that there are two apparently independent variables in the potential waste rock materials: 1) sulfide mineral content; and 2) alkali mineral content. Since carbonate mineral-filled fractures were not abundant, it was concluded that the alkali minerals, presumably carbonates, are dispersed in the fine grain matrix of the rocks, and as such are not readily recognized.

Two conclusions were reached as a result of the 1994 ABA screening. The first conclusion was that the sulfide mineral content, and sulfide mineral content variability, within the Mole Lake Formation was greatest in an area within 100 feet of the contact with the Crandon Formation (known as the hanging wall contact). This area will contain the drifts adjacent to the Crandon Formation when the access drifts along the strike of the ore body are developed. It was therefore decided to test the Mole Lake rocks within 100 feet of the Crandon Formation contact separately from the rest of the Mole Lake rocks. As a matter of convenience, the Mole Lake rocks within 100 feet of the hanging wall contact were categorized as the Lower Mole Lake Formation while the rest of the Mole Lake rocks were categorized as the Upper Mole Lake Formation (the terms lower and upper are used in the standard stratigraphic sense).

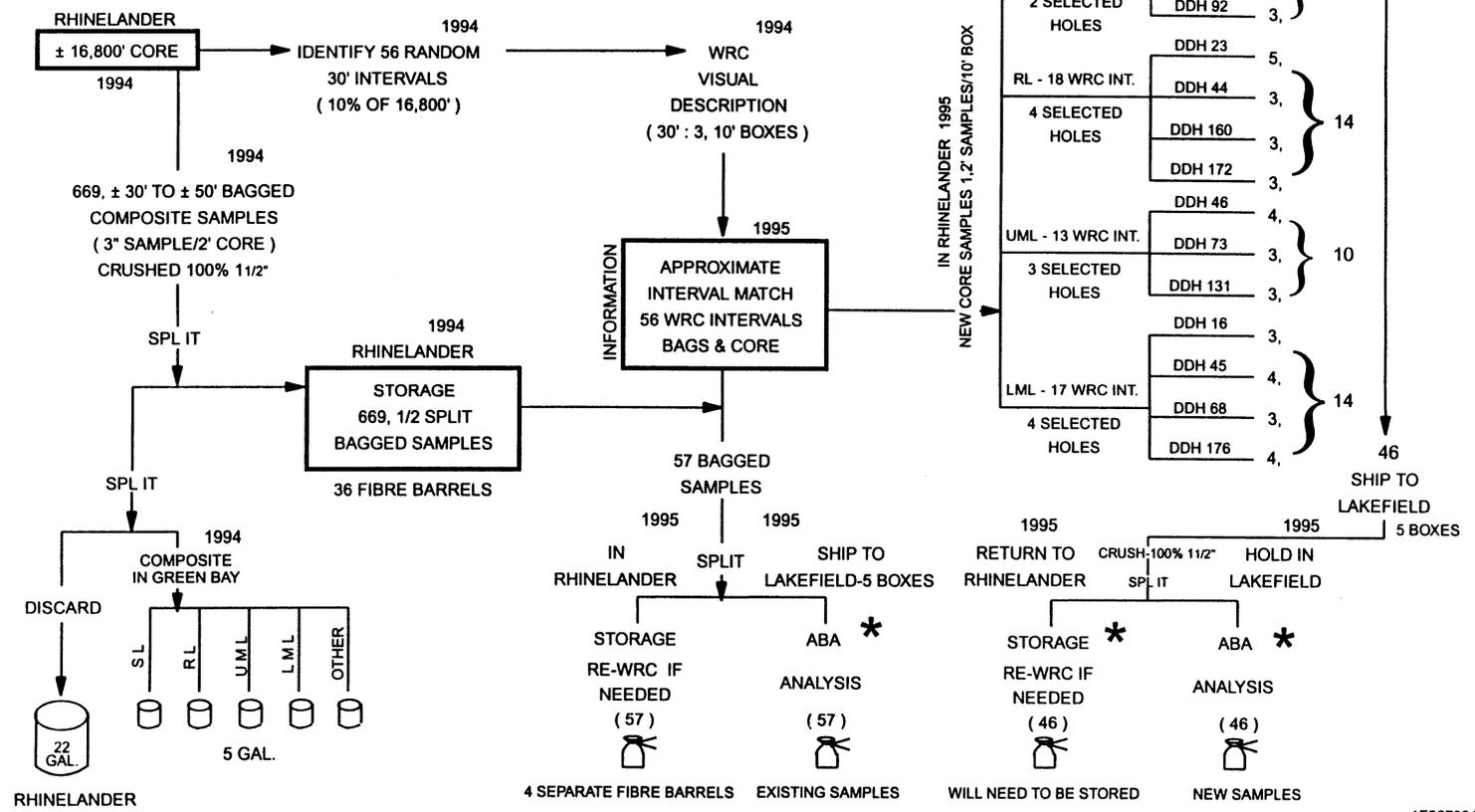
Secondly, it was concluded that sufficient testing of the oxidation and leachability (kinetic testing) of the waste rock could be performed by preparing and testing a statistically representative composite for each of the four (Skunk Lake, Rice Lake, Upper Mole Lake, and Lower Mole Lake) geologic hanging wall formations. The method used to prepare the four "master" waste rock composites has been described in Section 3.5.5.2.1 of the project's EIR (Foth & Van Dyke, 1995a).

During the spring and summer of 1994 work to evaluate the WRC potential of the waste rock was also completed on the 1-foot interval core sections used for the ABA work described above. Data and calculations regarding this work are included in Appendix 1. A second WRC evaluation was completed in the fall of 1994 to evaluate the variation of properties in the master waste rock composites. To accomplish this evaluation, continuous 30-foot core intervals were randomly selected from the four hanging wall formations in areas expected to produce waste rock. The randomly selected cores represent 10 percent of the core footage used to prepare the master waste rock composites. The results of these evaluations are also presented in Tables 1 through 4 of Appendix 1.3. The raw data is contained in Appendix 3.5-32 of the project's EIR (Foth & Van Dyke, 1995a).

4.2 1995 Waste Rock ABA Test Work

In 1995, parameter variability within the master waste rock composites was further tested using a two level validation approach. For the first level, 46 core intervals that had been crushed, bagged and stored in CMC's Rhineland core storage facility were analyzed for ABA and bulk chemical values. This was the same core material used to create the master waste rock composites. The second level of validation consisted of collecting 2-foot samples of continuous core per 10-foot per core box in 13 of the 46 crushed core intervals. ABA and bulk chemical tests were also performed on these 2-foot intervals to assess parameter variability within individual crushed core intervals. A flow sheet showing the collection and processing of the core used for all of the waste characterization tests is shown in Figure 2. The results of the additional 1995 waste rock ABA tests are included in Appendix 1.4. An ABA data summary, calculated statistics, and a comparison to the master composite for each of the Skunk Lake, Rice Lake, and Upper and Lower Mole lake formations are contained in Appendices 1.5 through 1.8.

ABA - ANALYSIS
 57 EXISTING BAGGED SAMPLES. 46 NEW CORE SAMPLES
 * SELECTION CRITERIA - BEST MATCH CORE OR BAG INTERVAL WITH WRC INTERVAL
 - MULTI HOLE IN EACH FORMATION



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Crandon Mining Company

FIGURE 2
 WASTE CHARACTERIZATION FLOW SHEET

Scale:	NONE	Date:	DECEMBER 1995
Prepared By:	Foth & Van Dyke	By:	JRB2

As seen by the data, calculations, and comparisons shown in Appendices 1.5 through 1.8, the range of NP/AP values increases in the intervals from the Skunk Lake to the Rice Lake to the Upper Mole Lake and Lower Mole Lake formations as would be expected from the proximity of each formation to the Crandon Formation. As shown in Figure 1b, nearly all of the NP/AP values are within the zone predicted to be non-acid generating, which is also the case for the master composites shown in Figure 1c. The range of NP/AP values within the selected intervals of all four formations, as shown in Figure 1b, is very limited and shows that variations within each formation is on a scale greater than 30 feet, thereby suggesting that it is not likely that major ABA changes would be expected in rock removed while developing, for instance, an 18-foot diameter drift. Two main conclusions are evident from the review of the two level ABA validation results. The first is that the data validates the conclusion presented in the EIR that oxidation of the master waste rock composites will not likely produce acidic leachate, a conclusion supported by the current kinetic test data. The second conclusion is that the statistical sample collected to prepare the master waste rock composites comprise a valid representation of each formation.

4.3 1995 Waste Rock Bulk Chemistry Test Work

The bulk chemical composition of the two level validation waste rock samples discussed above were determined in 1995. The results of the analyses are contained in Appendix 2. Among the parameters analyzed is CO₂, the presence of which in the samples would verify the presence of carbonate mineral(s) within the waste rock. Carbonate minerals are the most likely source of the neutralization potential previously measured in the samples. A preliminary review of the 1995 data shows the presence of CO₂ which indicates that carbonate minerals are present in the rock and are responsible for the neutralization potential of the rock.

5 Additional Tailings Static Test Results

ABA and bulk chemical composition testing of the fine and coarse tailings materials was also conducted in 1995. (See Appendices 1 and 2 for raw laboratory data). Two sets of ABA analyses were completed for comparative purposes by Lakefield Research and Chemex Labs, respectively. The results of the ABA and bulk chemistry analyses are presented in Table 1. Appendix 1.1 contains an explanation of the ABA units used in Table 1. It was found that the tailings samples contained between 1.0-1.76 percent CO₂ (equivalent to about 2.5 percent calcite), thus verifying the presence of a substance with a significant neutralizing potential. Even though the tailings samples contain 24-30 percent sulfide sulfur, the presence of the carbonate minerals will prevent the tailings from rapidly producing acidic leachate under strongly oxidizing conditions.

The results also show that, although the tailings have a strong long term potential for acid generation under exposed and unsaturated or partly saturated conditions, neutralization potential (NP) values are significant and range from 21 to 35 kg of CaCO₃ equivalent per tonne. The CO₂ analyses allow the calculation of the carbonate content of the tailings. For example, for 1.53 percent CO₂:

$$\text{CaCO}_3 \text{ content} = 1.53\% (\% \text{ CO}_2) * \frac{100.1 \text{ (molecular weight of CaCO}_3\text{)}}{44 \text{ (molecular weight of CO}_2\text{)}} = 3.48\%$$

$$\text{Therefore, the NP value based on CO}_2 \text{ analysis} = 3.48\% * \frac{1000}{100} \text{ kg/tonne} = 34.8 \text{ kg/tonne}$$

The range of NP values based on CO₂ analysis is, therefore, 23 to 40 kg/tonne.

The data shows the NP values based on CO₂ analysis correlate well with those determined using the acid-base accounting procedure. This indicates that the NP from tailings is essentially all from carbonate minerals and should provide adequate protective neutralization of oxidation products that might be produced in exposed and free-draining tailings at the margins of the TMA between deposition events in the same area.

Table 1

1995 ABA and Bulk Chemical Data for the Tailings Composites

ABA Data

Composite	S %	S ²⁻ %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	NP AP	NP SAP	NP-CO ₂ SAP	Paste pH
Fine Tailings ¹	30.3	24.0	1.76	35	40	947	750	-912	0.04	0.05	0.05	6.61
Fine Tailings ²	31.1	30.0	1.3	26	30	972	938	-946	0.03	0.03	0.03	6.3
Coarse Tailings ¹	29.6	28.2	1.58	29	36	925	881	-896	0.03	0.03	0.04	5.59
Coarse Tailings ²	28.4	28.4	1.0	21	23	888	888	-867	0.02	0.02	0.03	6.3

Bulk Chemical Composition

Composite	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
Fine Tailings ¹	18,900	3,300	41	<5.5	7,260	57	95	<2.2	575	301,000	3.0	4,675	11,600	570	<5.5	933	<2.2	135	975	25	<22	<11	6,830	1.76
Coarse Tailings ¹	19,700	2,950	42	<5.5	7,280	56	91	<2.2	538	294,000	2.5	4,950	11,900	575	<5.5	998	<2.2	129	930	28	<22	<11	6,000	1.58

¹Results from Lakefield Research, Lakefield, Ontario.

²Results from Chemex Labs, Vancouver, British Columbia.

Prepared by: JET
Checked by: DJL

6 Additional Kinetic Test Data and Calculations

This section discusses detailed information concerning the physical dimensions of the composites and test conditions not included in the project's EIR (Foth & Van Dyke, 1995a), weekly measured and analyzed data collected since the submission of the EIR (Foth & Van Dyke, 1995a), and preliminary calculations based upon the kinetic test results.

6.1 Physical Test Dimensions and Conditions

The physical test dimensions and conditions for the composites used in the kinetic tests are included in Appendix 3.1. The calculated sample volume, expanded surface area, porosity, pore volume, and pore volumes leached through October 11, 1995 are included in Tables 2 and 3 for the waste rock and tailings samples, respectively.

As seen in Table 2, the calculated pore volumes leached from the waste rock composites through October 11, 1995 ranged from approximately 8 to 18, depending upon the size of the composite. As shown in Table 3, the leached pore volumes calculated for the tailings composites vary from 2 to 47 depending upon the size of the composite, the grain size of the material and the conditions under which the composite has been leached. The calculated pore volumes leached through the TMA whole tailings and lime amended whole tailings composites, which have always been leached under alternating wet and dry (W/D) conditions, vary from 27 to 32. The calculated pore volumes leached through the TMA fine and whole tailings composites which have been leached under saturated, followed by alternating W/D conditions, vary from 27 to 47. The calculated pore volumes leached through the backfill tailings composites which have been leached under alternating W/D conditions, followed by saturated, conditions, vary from 2 to 12. Only small quantities of leachate are removed from the saturated backfill samples most weeks for the determination of pH, conductivity and temperature and the analysis of alkalinity. In addition, the cemented backfill composites consist of fragments of cemented tailings which consequently results in a high composite porosity.

6.2 Kinetic Test Results

Laboratory reports for the weekly laboratory measurements and alkalinity/acidity analyses for the project's kinetic tests are included in Appendix 3. A summary of this data and that for the periodic metals and sulfate analyses completed since the first quarter of 1995, and pertinent calculations are contained in Appendix 4.

6.2.1 Weekly Tests

The results of weekly tests of several composites are described in this section to illustrate the trends being observed in the leachate data. The results of the weekly pH, conductivity, and alkalinity data for the Upper Mole Lake master composite are shown in Figure 3. These results, which are typical of each of the master waste rock composites, show that pH has remained steady and near neutral. In addition, conductivity and alkalinity have declined during the testing, indicating a decline in dissolved substances and neutralization potential.

Table 2

Calculated Composite Volume, Exposed Surface Area, Porosity, Pore Volume, and Number of Pore Volumes Leached for the Waste Rock Composites

Composite	Sample Volume (cm ³)	Exposed Surface Area (cm ²)	Porosity ¹ (%)	Pore Volume (cm ³)	Volume Leachate Extracted ² (mL)	Pore Volumes Leached
Skunk Lake Master	58,400	1,640	42	24,500	245,000	10
Rice Lake Master	79,200	1,640	36	28,500	245,000	8.6
Upper Mole Lake Master	83,300	1,640	36	30,000	245,000	8.2
Lower Mole Lake Master	50,000	1,640	38	19,000	245,000	13
Skunk Lake High [S]	43,800	1,640	33	14,500	245,000	17
Rice Lake High [S]	45,800	1,640	29	13,300	245,000	18
Upper Mole Lake High [S]	47,900	1,640	35	16,800	245,000	15
Lower Mole Lake High [S]	43,800	1,640	32	14,000	245,000	18

¹Assumes average particle density of 2.5 g/cm³.

²4,800 mL deionized water per week (cycle) used to leach each composite, total volume through October 11, 1995.

Prepared by: JET

Checked by: SGL

Table 3

Calculated Composite Volume, Exposed Surface Area, Porosity, Pore Volume, and Number of Pore Volumes Leached for the Tailings Composites

Composite	Sample Volume (cm ³)	Exposed Surface Area (cm ²)	Porosity ⁴ (%)	Pore Volume (cm ³)	Volume Leachate Extracted ⁵ (mL)	Pore Volumes Leached
TMA Fine Tailings ¹	11,800	1,680	53	6,250	168,000	27
TMA Whole Tailings ¹	10,400	1,730	34	3,540	168,000	47
TMA Whole Tailings ²	16,700	1,730	45	7,520	245,000	32
TMA Lime Amended Whole Tailings ²	19,400	1,800	46	8,920	245,000	27
Backfill Coarse Tailings ³	8,070	611	70	5,650	56,800	10
Backfill Cemented Coarse Tailings ³	38,900	611	80	31,100	61,800	2.0
Backfill Whole Tailings ³	6,970	611	69	4,810	56,800	12
Backfill Cemented Whole Tailings ³	38,900	611	80	31,100	62,500	2.0

¹Leached under saturated, followed by alternating W/D, conditions.

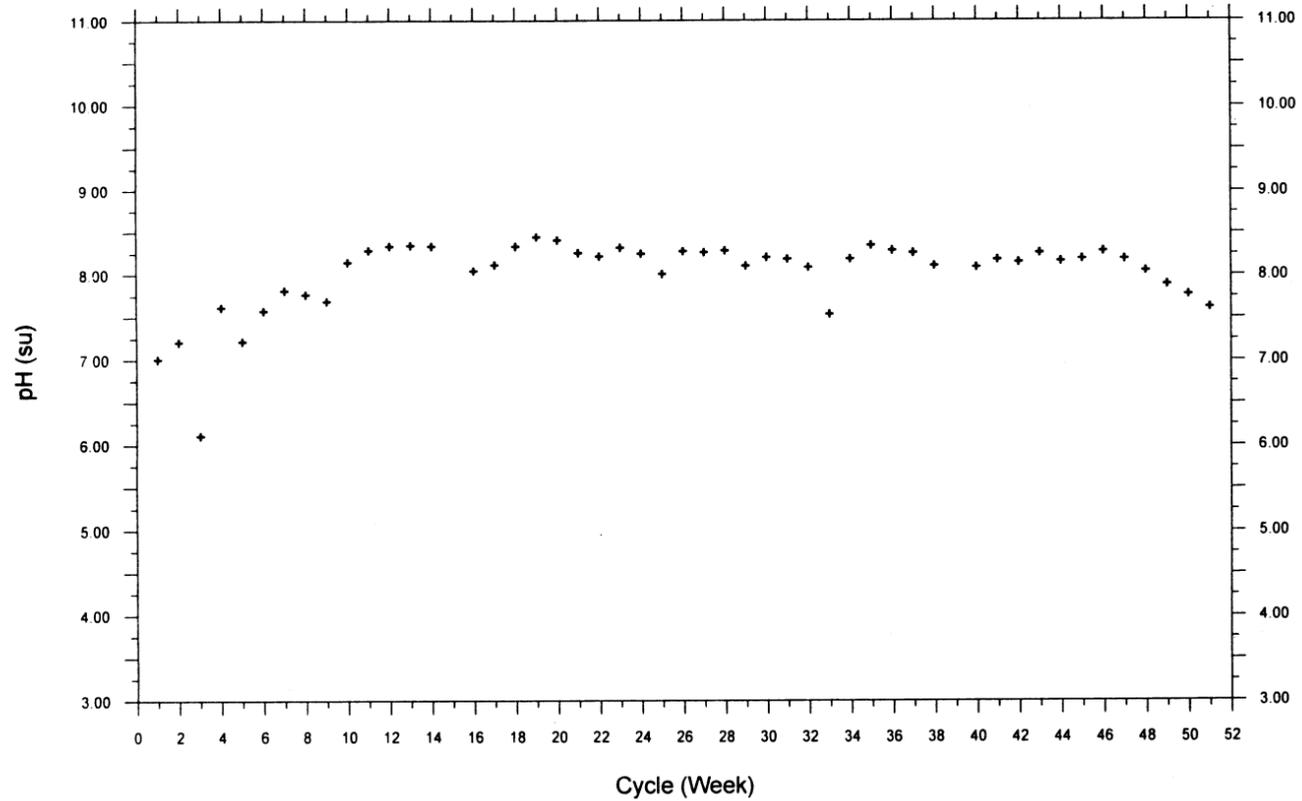
²Leached under alternating W/D conditions.

³Leached under alternating W/D, followed by saturated, conditions.

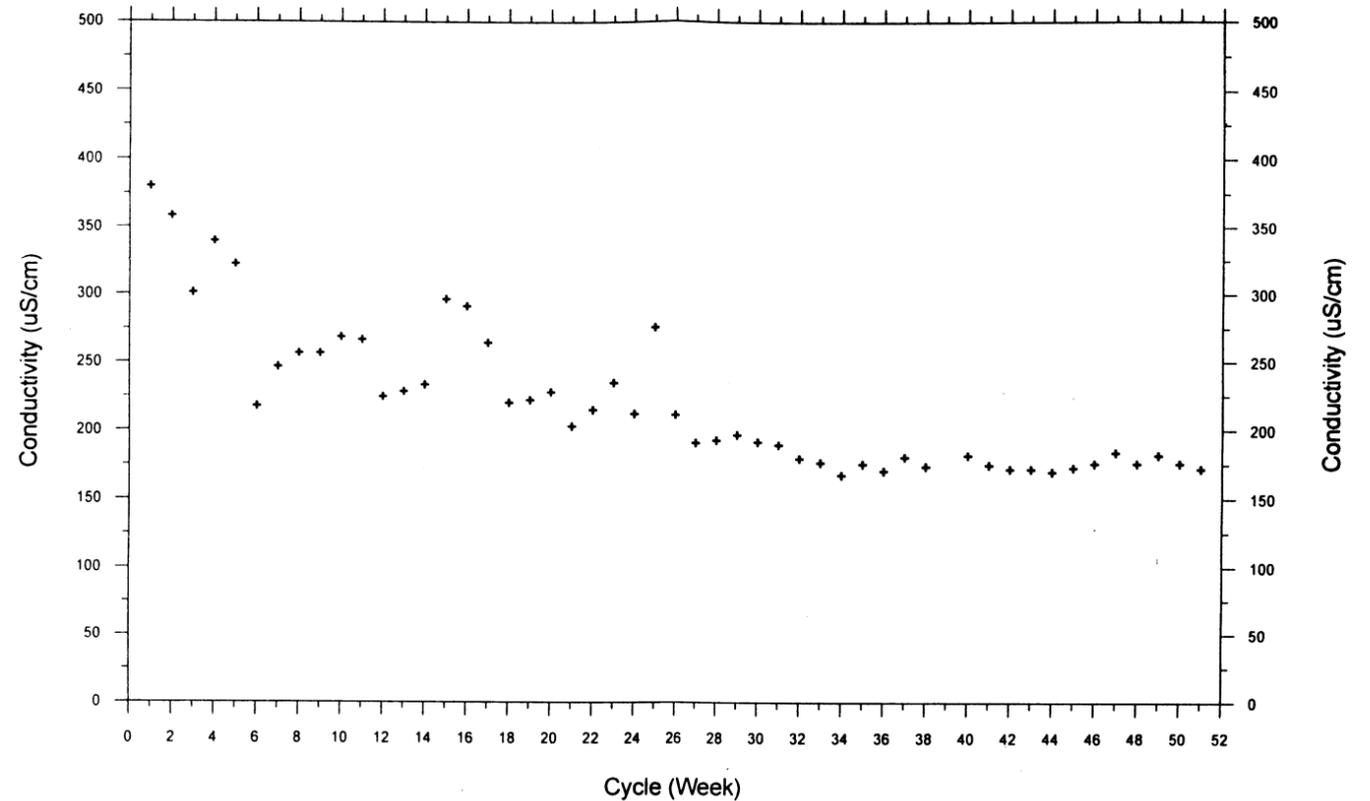
⁴Assumes average particle density of 3.3 g/cm³.

⁵4,800 mL deionized water per W/D cycle used to leach each composite, most saturated leachings extracted lower volumes, total volume through October 11, 1995.

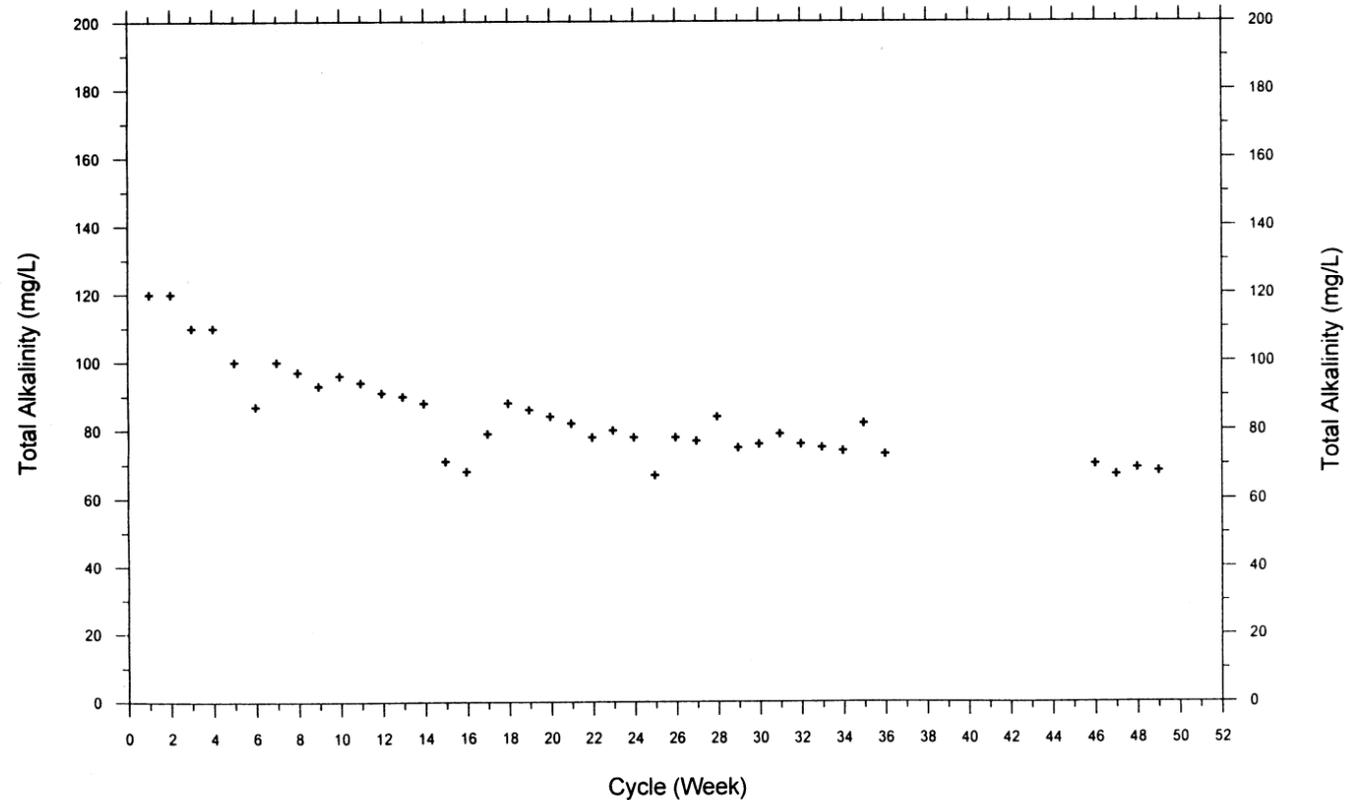
Prepared by: JET
Checked by: SGL



Upper Mole Lake Master Waste Rock Composite
Leached Under Alternating W/D Conditions



Upper Mole Lake Master Waste Rock Composite
Leached Under Alternating W/D Conditions



Upper Mole Lake Master Waste Rock Composite
Leached Under Alternating W/D Conditions

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FIGURE 3
UPPER MOLE LAKE
MASTER WASTE ROCK COMPOSITE
WEEKLY ANALYSES

Scale: AS SHOWN Date: DECEMBER 1995

Prepared By: Foth & Van Dyke By: JR82

The results of the weekly pH, conductivity, and alkalinity/acidity data for the Upper Mole Lake high-sulfur composite are shown in Figure 4. These results, which are similar to those of the Rice Lake high-sulfur composite, show the initial pH values were near neutral and thereafter progressively declined to values less than 3. When pH had declined to about 3, conductivity and acidity values began to increase indicating that biotic oxidation became active at this point.

The pH measured in the Lower Mole Lake high-sulfur leachate has always been below 4. During the testing, the pH values have declined to less than 3. When the pH became less than approximately 3, conductivity and acidity values increased similar to the trends noted in the Upper Mole Lake and Rice Lake high-sulfur composites.

The pH, conductivity, and alkalinity measured in the leachate collected from the Skunk Lake high-sulfur composite show trends similar to the master waste rock composites. It is expected that pH will eventually become strongly acidic in this composite and that conductivity and alkalinity trends similar to the other high-sulfur composites will be observed.

The results of the weekly pH, conductivity, and alkalinity/acidity data for the TMA fine tailings composite are shown in Figure 5. This composite was reacted under saturated conditions for the first 17 weeks of the test, after which it has been subjected to leaching under alternating wet/dry (W/D) conditions. The pH of the leachate was found to be near neutral under saturated conditions. Under alternating W/D conditions, the leachate pH declined to about 4 where it remained for about 16 weeks. After week 44 the pH increased to near neutral values where it has remained. Conductivity values have steadily declined during the testing. Alkalinity and acidity values have varied with pH during the testing. It is expected that the leachate from this composite will become strongly acidic when the remaining neutralization potential has been consumed.

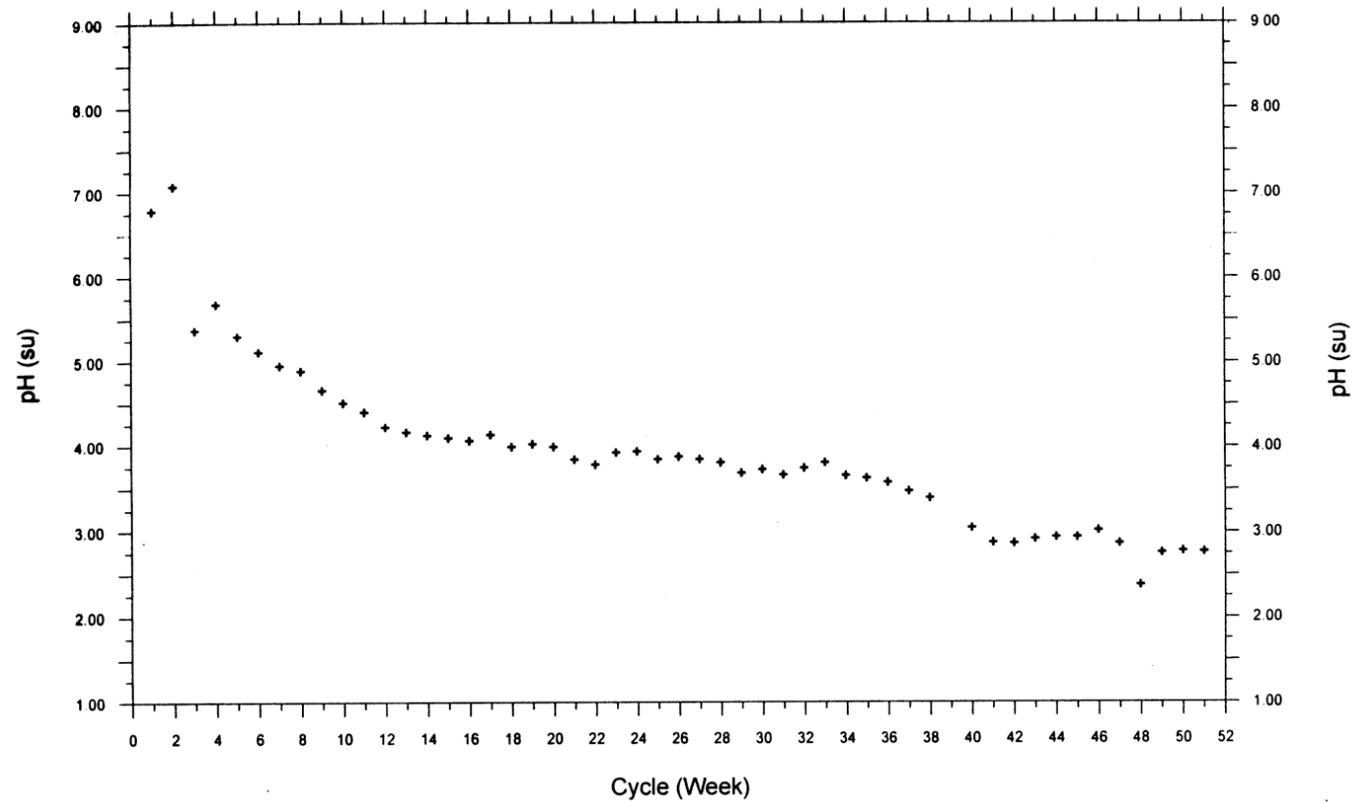
The results of the weekly pH, conductivity, and alkalinity data for the TMA whole tailings composite are shown in Figure 6. This composite has been subjected to testing similar to the TMA fine tailings composite. The results strongly contrast with those of the TMA fine tailings composite. For the whole tailings composite, pH has remained near neutral, and conductivity and alkalinity values have declined. It is also expected that the pH in this composite will become strongly acidic when the remaining neutralization potential has been consumed.

6.2.2 Calculations and Overall Trend Analyses

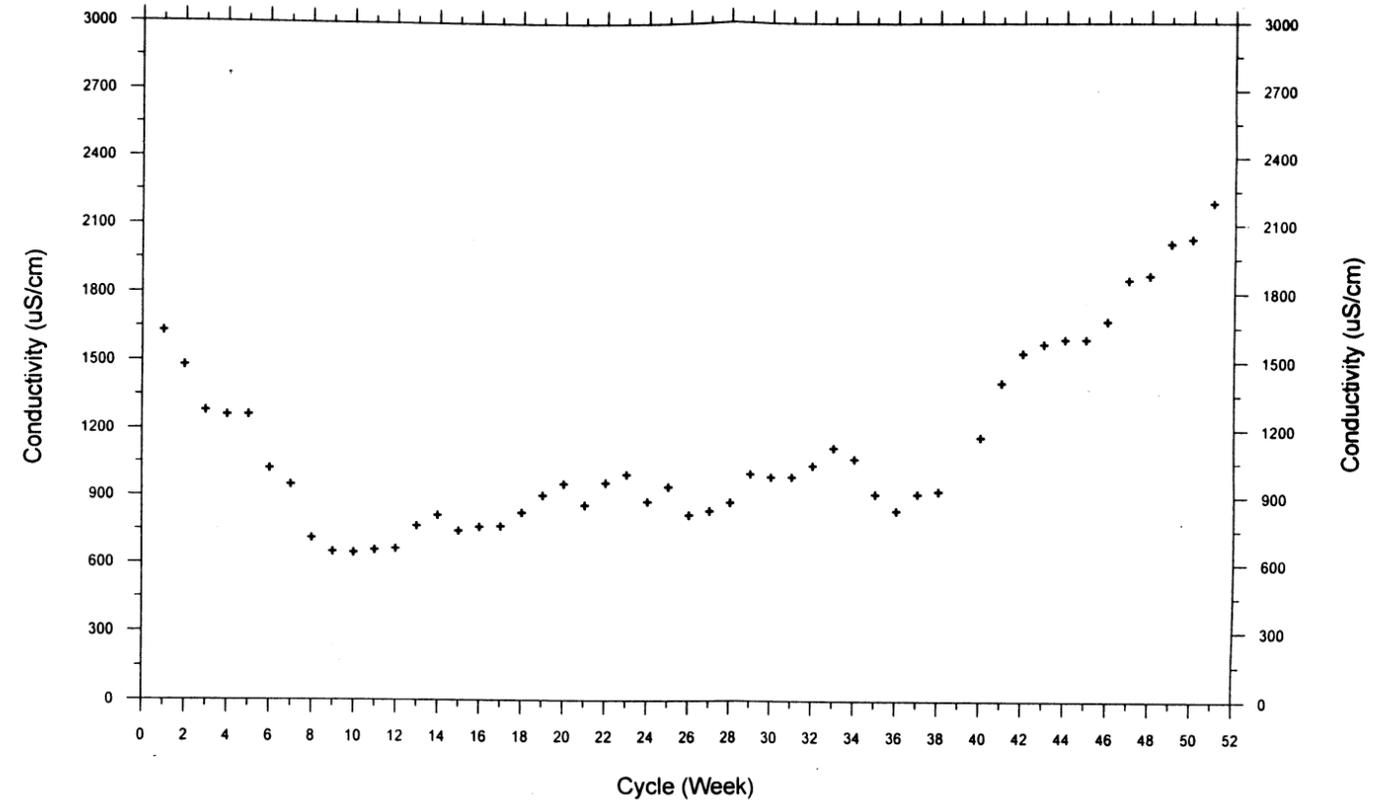
Preliminary trend analyses of the kinetic test data have been calculated through June 6, 1995, and July 25, 1995, for the waste rock and tailings composites, respectively. Tabulated data and trend analyses are presented in Appendix 4 in a series of tables for each composite. These tables include: sample characterization; parameters measured weekly; leachate analyses; cumulative mass flux; cumulative metal extractions; metal extraction rates; and, oxidation and neutralization results. The methods of calculating the trends are included in Appendix 4.1. Summaries of the preliminary calculations are discussed below for the major composite groups.

6.2.2.1 TMA Tailings

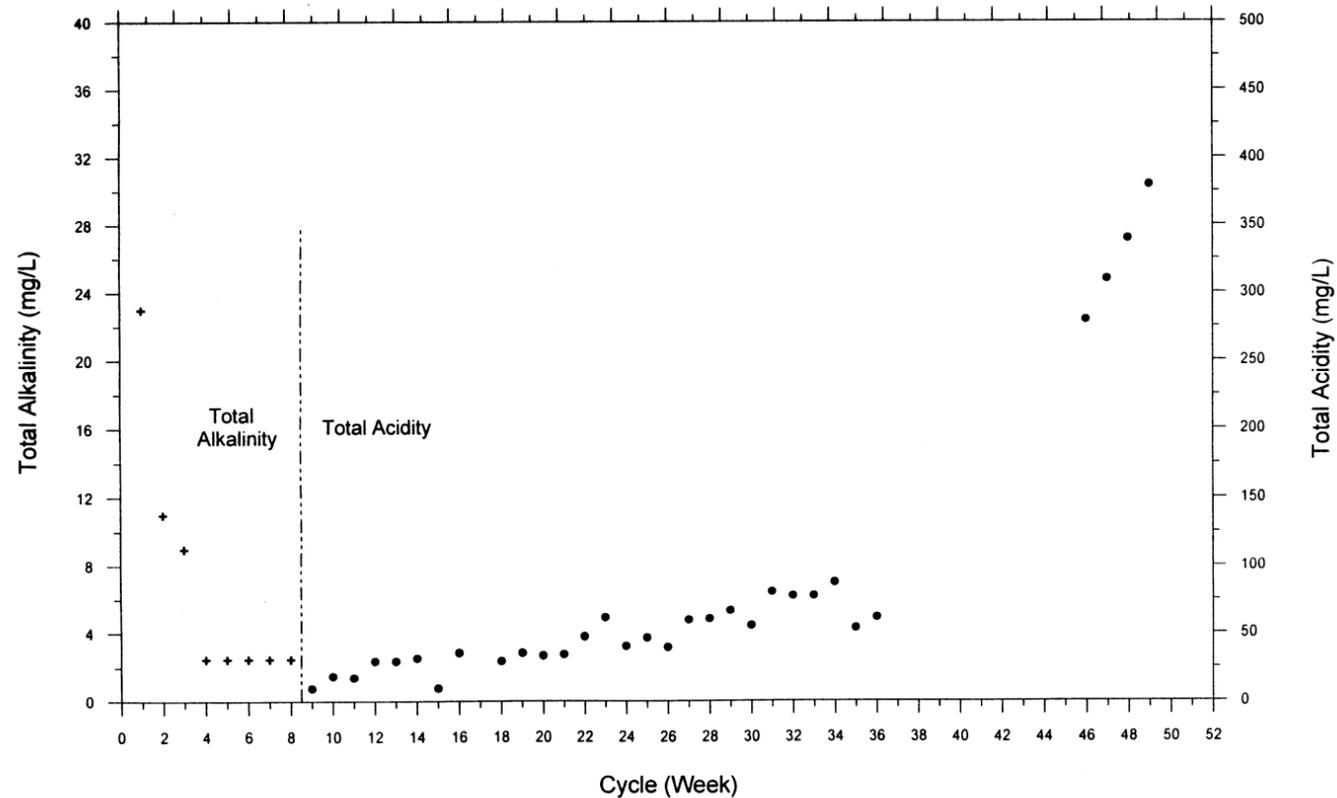
A summary of the results for TMA tailings tests is included in Table 4.



Upper Mole Lake High Sulfur Waste Rock Composite
Leached Under Alternating W/D Conditions



Upper Mole Lake High Sulfur Waste Rock Composite
Leached Under Alternating W/D Conditions



Upper Mole Lake High Sulfur Waste Rock Composite
Leached Under Alternating W/D Conditions

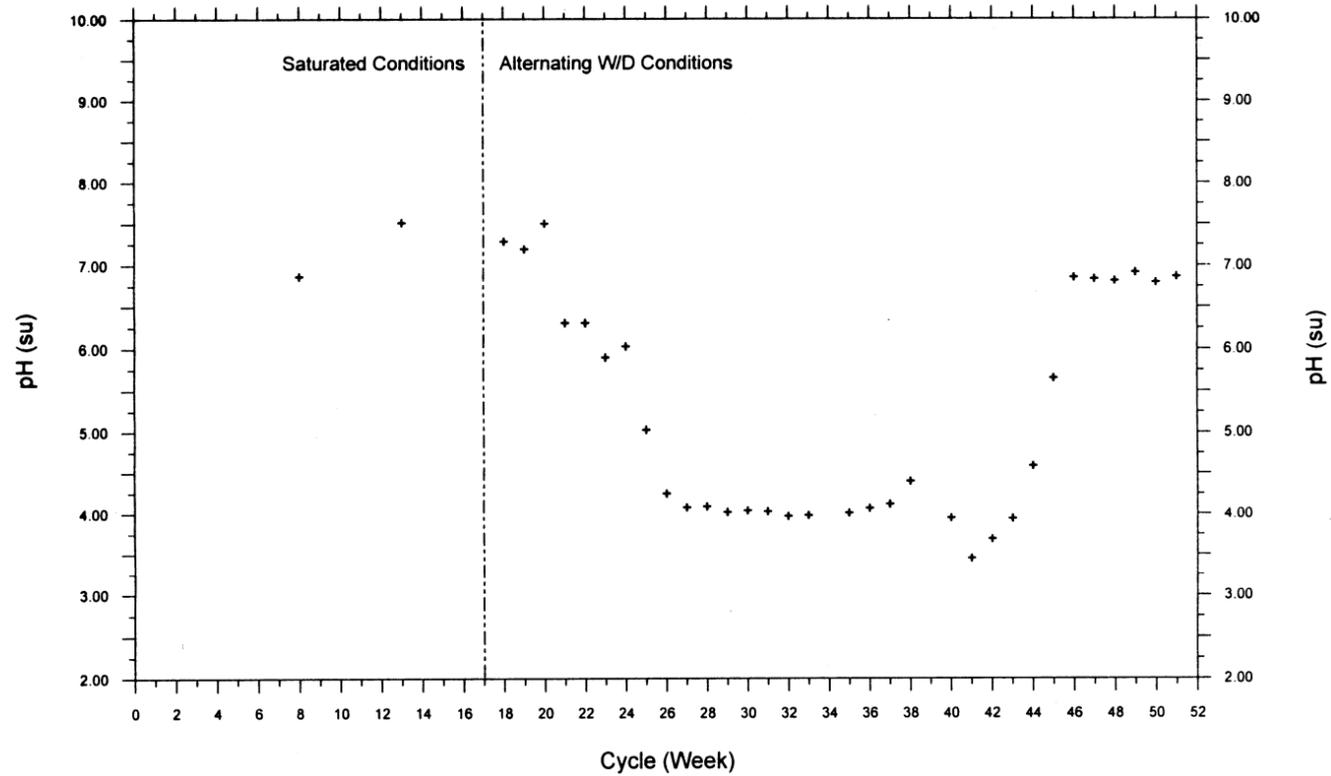
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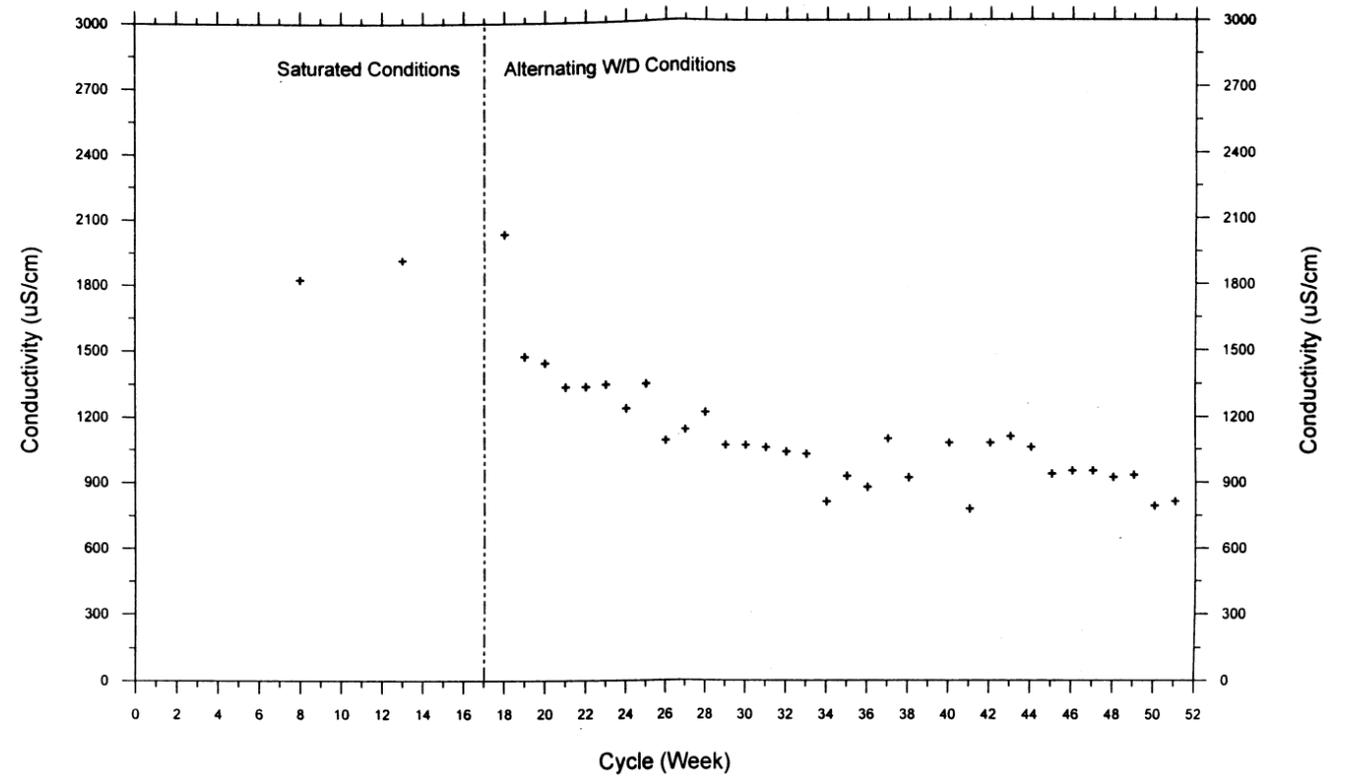
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FIGURE 4
UPPER MOLE LAKE
HIGH SULFUR COMPOSITE
WEEKLY ANALYSES

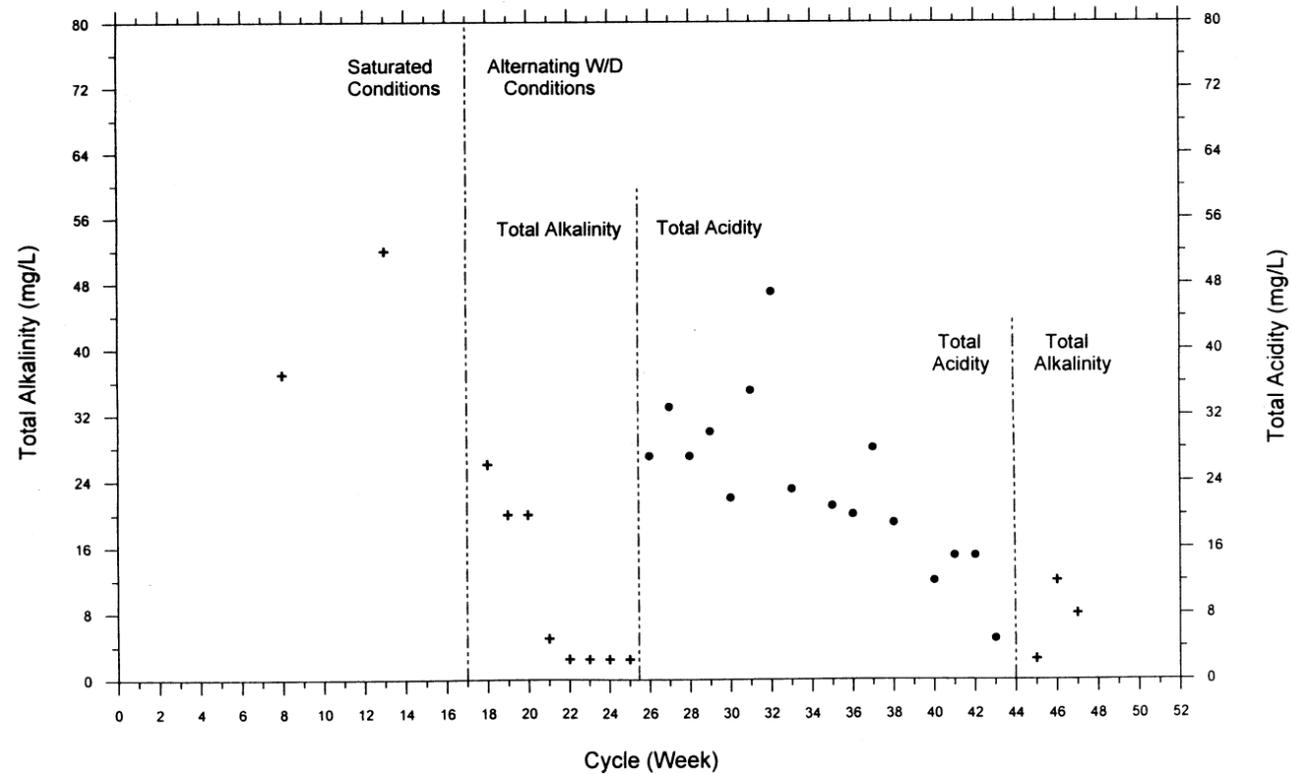
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Prepared By: Foth & Van Dyke	By: JRB2



Fine Tailings Composite
Leached Under Saturated, Followed by Alternating W/D, Conditions



Fine Tailings Composite
Leached Under Saturated, Followed by Alternating W/D, Conditions



Fine Tailings Composite
Leached Under Saturated, Followed by Alternating W/D, Conditions

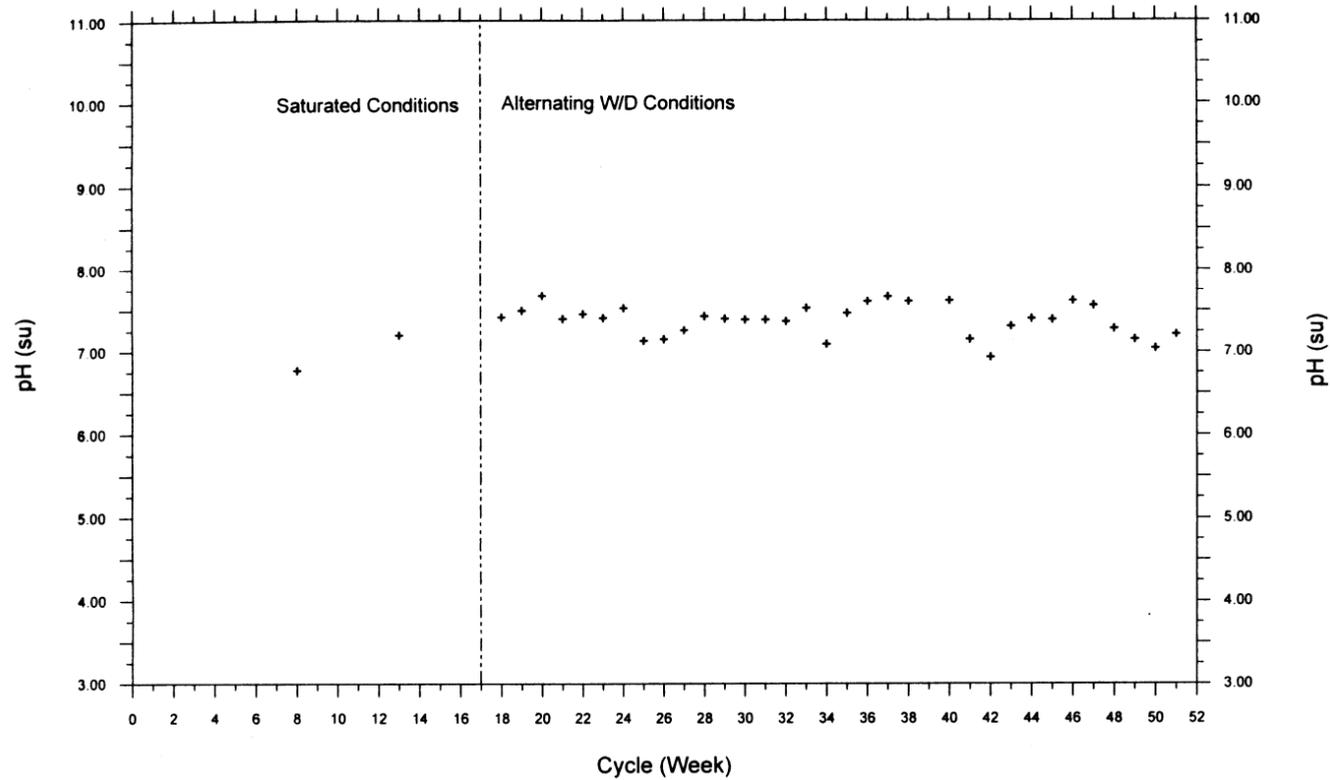
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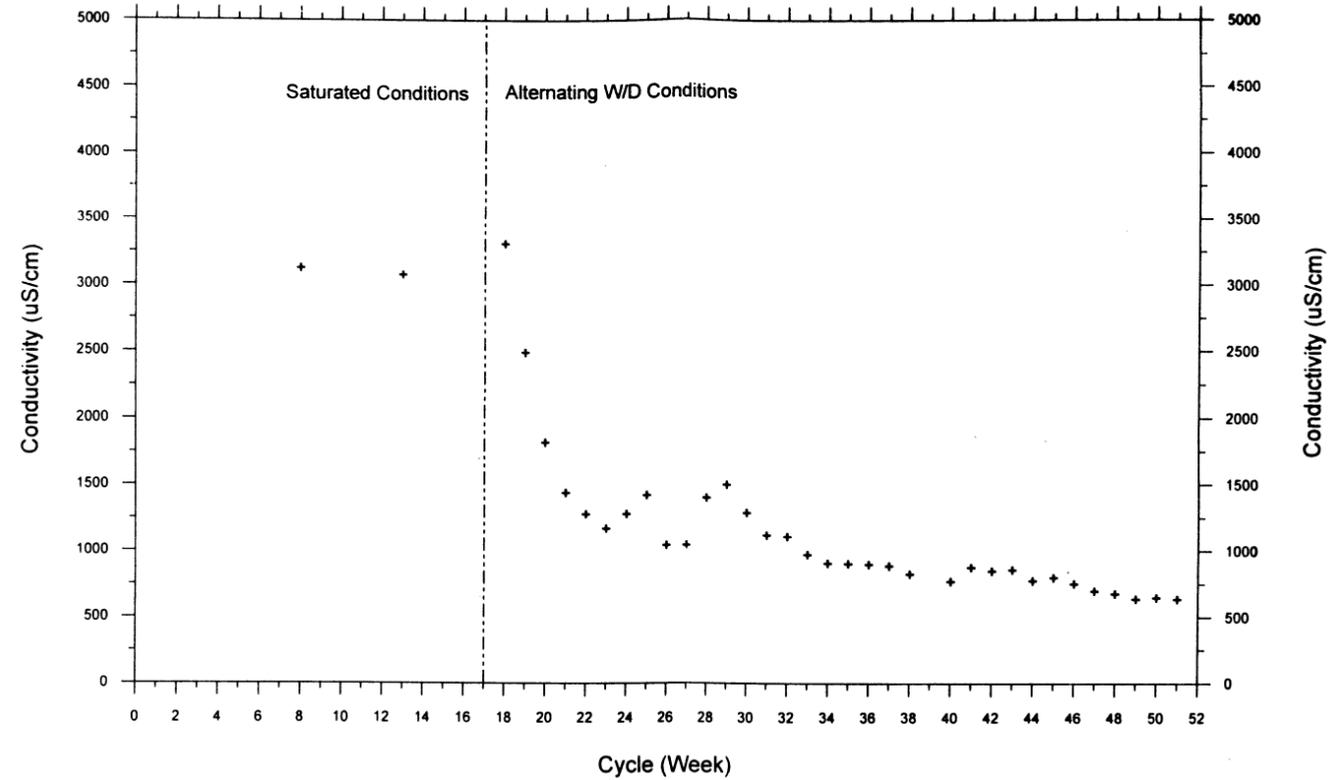
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FIGURE 5
TMA
FINE TAILINGS COMPOSITE
WEEKLY ANALYSES

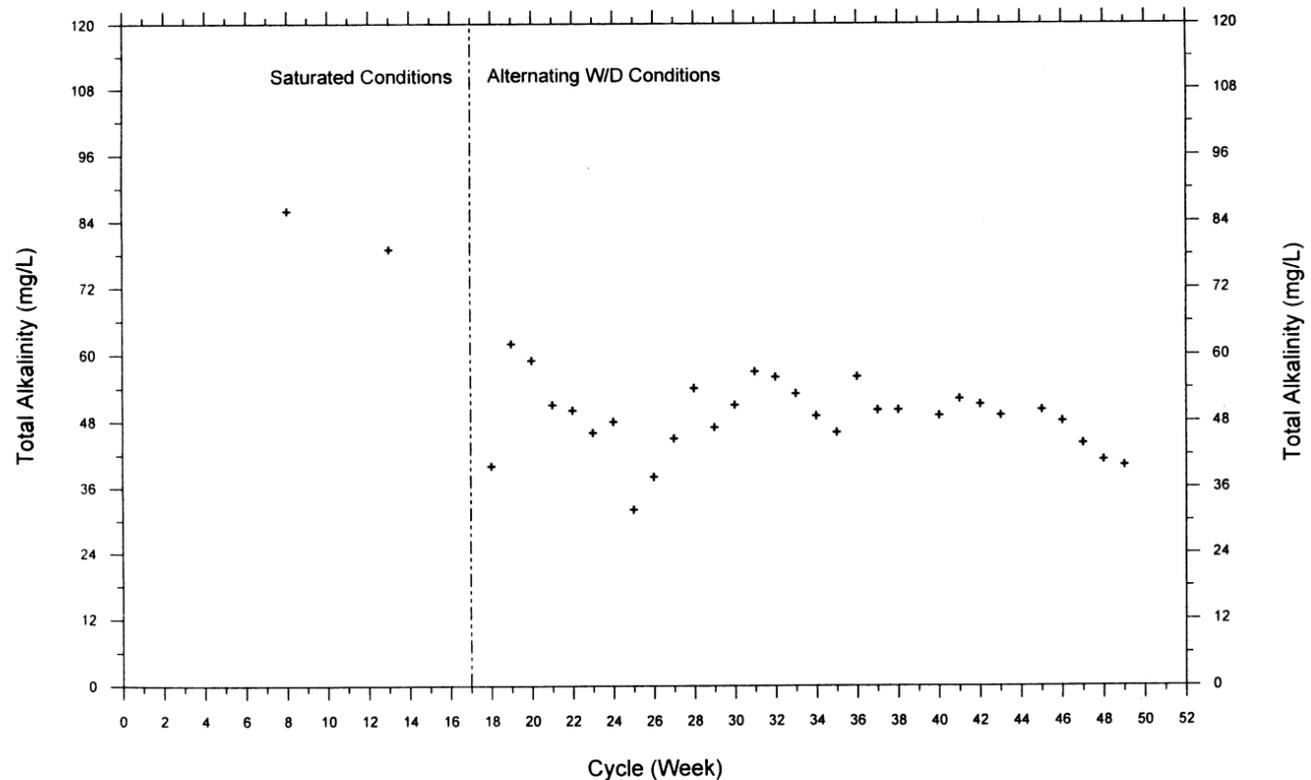
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Whole Tailings Composite
Leached Under Saturated, Followed by Alternating W/D, Conditions



Whole Tailings Composite
Leached Under Saturated, Followed by Alternating W/D, Conditions



Whole Tailings Composite
Leached Under Saturated, Followed by Alternating W/D, Conditions

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FIGURE 6
TMA
WHOLE TAILINGS COMPOSITE
WEEKLY ANALYSES

Scale: AS SHOWN Date: DECEMBER 1995

Prepared By: Foth & Van Dyke By: JR82

Table 4

Summary of Kinetic Leaching Test Data for TMA Tailings

Tailings	Depletion (%)		Depletion Rate (mg/kg/week)		pH	Alkalinity (mg/L as CaCO ₃)	Water Quality	Metals Extraction
	S	NP	S	NP				
Whole	0.4	16.0	102	138	6.9	51	Elevated Mn and Zn	17% Mn, others low
Fine	0.9	6.9	185	91	3.7	15	Elevated Mn and Zn	8% Mn, Zn, others low

Prepared by: RWL
Checked by: JET

Oxidation of sulfide in both fine and whole tailings is proceeding, resulting in NP depletions of 16 and 6.9 percent for whole and fine tailings, respectively. Oxidation rates are, however, declining in both tests. After 23 pore volumes, in the test on whole tailings, pH is still at 6.9 whereas pH has dropped to 3.7 in the test on fine tailings. In both cases, leachates contain elevated manganese and zinc concentrations. All other metals of concern are in low concentration. A review of the data shows that water quality is similar in both tests despite the lower pH in the fine tailings. The quantities of metals extracted are low except for manganese and zinc.

At current NP depletion rates, the time required to deplete NP to 50 percent of the original value can be calculated as follows, using whole tailings as an example. Fifty percent is used in this and all other calculations for other tailings and waste rock as a more conservative estimate of the available NP. In tailings, however, higher availability of NP might be the case as a result of (a) the slow rates of water transport, giving greater time for reaction of the neutralizing minerals with acidic leachate, and (b) the fine particle size of the material.

The following calculations of the time for 50 percent oxidation are for exposed tailings in a strongly oxidizing environment.

From Table 4, NP depletion for whole tailings = 16.0% and NP depletion rate = 138 mg/kg/week.

From data in Table 1, NP of whole tailings = 28.3 kg/tonne¹

$$\text{NP depleted to date} = \frac{0.16 * 28.3 \text{ kg/tonne}}{1,000 \text{ kg/tonne}} * 1,000,000 \text{ mg/kg} = 4,528 \text{ mg/kg}$$

¹Based on the average of the two laboratory values for fine and coarse tailings proportioned as whole tailings consisting of 60% and 40% fine and coarse tailings, respectively.

$$50\% \text{ percent of the NP of the tailings} = \frac{0.5 * 28.3 \text{ kg/tonne}}{1,000 \text{ kg/tonne}} * 1,000,000 \text{ mg/kg} = 14,150 \text{ mg/kg}$$

$$\text{Therefore, time to 50\% depletion in whole tailings} = \frac{(14,150 - 4,528) \text{ mg/kg}}{138 \text{ mg/kg/week}} * \frac{1 \text{ year}}{52 \text{ weeks}} = 1.34 \text{ years}$$

For the fine tailings, the time required for 50 percent NP depletion is calculated to be approximately three years. Although it has been concluded that both tailings samples are potentially strongly acid generating in the long term, the time for onset of strong acidity and corresponding high metal loadings will be longer than the two months in which the surface of the tailings will be potentially exposed in the TMA before being covered with fresh tailings. It should be noted that the tests are being conducted under conditions which are very conducive to oxidation. In actual operation, tailings will be either saturated or partially saturated and pore water will be alkaline as a result of the pH of the discharged process water. Under actual conditions, therefore, the rate of NP depletion is expected to be significantly lower.

6.2.2.2 Whole Tailings and Lime-Amended Whole Tailings

A summary of the results for tests on whole tailings, with and without lime amendment, that have always been leached under W/D conditions, is provided in Table 5.

Table 5

Summary of Kinetic Leaching Test Data for Whole Tailings (Wet/Dry Cycles)

Tailings	Depletion (%)		Depletion Rate (mg/kg/week)		pH	Alkalinity (mg/L as CaCO ₃)	Water Quality	Metals Extraction
	S	NP	S	NP				
Whole	0.4	13.0	91	97	6.4	20	Elevated Mn, Zn and Pb	5% Mn, others low
Lime-amended	0.03	2.2	18	44	7.7	24	low concentrations of metals	Very low

Prepared by: RWL
Checked by: JET

The results for whole tailings without lime amendment are essentially the same as shown for the whole tailings in Table 4 and as described above. Lead concentrations are elevated in the leachate in addition to manganese and zinc.

With the lime amendment, oxidation rates are lower than for the whole tailings without lime resulting from the higher pH in the pore water and, therefore, NP depletion rates are also lower. Depletion rates are, however, dropping steadily. Therefore, the actual time required for

depletion is expected to be significantly longer than if calculated based on the current depletion rate. Metal extractions and concentrations of metals in leachates from the test on lime-amended tailings are low.

6.2.2.3 Backfill Tailings

A summary of the results for tests to evaluate the leaching behavior of cemented and non-cemented tailings for backfill is provided in Table 6.

Table 6

Summary of Kinetic Leaching Test Data for Backfill Tailings

Tailings	Depletion (%)		Depletion Rate (mg/kg/week)		pH	Alkalinity (mg/L as CaCO ₃)	Water Quality	Metals Extraction
	S	NP	S	NP				
Whole	0.4	10.5	30.9	37.6	6.4	63	Elevated Mn and Zn	Low
Coarse	0.5	14.6	20.7	25.9	6.8	90	Elevated Mn and Zn	Low
Cemented Whole	0.4	9.4	41.5	44.1	8.4	6	low concentrations of metals	Very low
Cemented Coarse	0.5	4.8	10.0	20.2	10.8	320	low concentrations of metals	Very Low

Prepared by: RWL
Checked by: JET

For tests on backfill tailings, sulfide oxidation rates and NP depletion rates are lower than for other tests on tailings due to the fact that most of the testing has been under submerged conditions. In all cases, over half of the sulfide oxidation, NP depletion and the leaching of most metals were achieved in the initial four to six cycles due to the initial testing under wet/dry conditions. For some metals, for example, copper and zinc, concentrations have been reduced under saturated conditions, resulting in negative mass fluxes. In all cases, NP depletion rates are declining from initial relatively high rates and predicted times to depletion are expected to increase as testing continues.

Leachates from uncemented tailings contain elevated manganese and zinc concentrations. For tests on cemented tailings, very low concentrations of all metals are observed. For tests on cemented tailings, the pH of leachates remain in the alkaline range with values of 8.4 and 10.8 for whole and coarse tailings, respectively.

6.2.2.4 Waste Rock Master Composites

A summary of the results for tests on the waste rock master composites is provided in Table 7.

Table 7

Summary of Kinetic Leaching Test Data for Waste Rock Master Composites

High-Sulfur Composite	Depletion (%)		Depletion Rate (mg/kg/week)		pH	Alkalinity (mg/L as CaCO ₃)	Water Quality	Metals Extraction
	S	NP	S	NP				
Skunk Lake	1.5	9.4	1.4	2.3	7.1	14	low concentrations of metals	very low
Rice Lake	1.4	7.8	0.4	2.6	8.1	70	low concentrations of metals	very low
Upper Mole Lake	1.1	0.2	0.5	2.9	8.2	73	low concentrations of metals	very low
Lower Mole Lake	0.6	0.4	1.1	4.5	8.0	62	low concentrations of metals	very low

Prepared by: RWL
Checked by: JET

In all four tests to date, leachates remain neutral to slightly alkaline with alkalinities ranging from 14 mg/L (Skunk Lake) to 73 mg/L (Upper Mole Lake). Concentrations of metals and their corresponding percentage extractions are low for all leachates.

Due to the low sulfur contents, sulfate production rates remain very low, with Skunk Lake the highest at 2.3 mg/kg/week of sulfate. In all cases, rates of oxidation are declining steadily and it could be postulated that the leaching of already-soluble sulfates in the composites contributed significantly to the relatively higher rates in the early stages of testing. NP depletion rates are correspondingly low and also declining.

With the observed decreasing oxidation and depletion rates, predictions of the times to 50 percent depletion are expected to increase as testing continues. Furthermore, it is possible that, due to the very low sulfur contents, further testing will indicate that sulfur oxidation will slow to insignificant rates.

6.2.2.5 High-Sulfur Waste Rock Composites

A summary of the results for tests on the high-sulfur waste rock composites is provided in Table 8.

Table 8

Summary of Kinetic Leaching Test Data for High-Sulfur Waste Rock Composites

High-Sulfur Composite	Depletion (%)		Depletion Rate (mg/kg/week)		pH	Alkalinity (mg/L as CaCO ₃)	Water Quality	Metals Extraction
	S	NP	S	NP				
Skunk Lake	0.3	3.9	12.4	14.0	7.3	17	Elevated Mn and Zn	Low
Rice Lake	0.9	97.2	38.8	14.3	2.7	450	Elevated Concentrations	Low
Upper Mole Lake	0.6	11.4	24.7	23.7	2.9	62	Elevated Concentrations	Low
Lower Mole Lake	2.2	12.3	68.6	65.4	3.3	140	Elevated Concentrations	Low

Prepared by: RWL
Checked by: JET

In three of the four tests in June of 1995 (Rice Lake, Upper Mole Lake, and Lower Mole Lake), acidic leachates were being produced with pH values of 2.7, 2.9, and 3.3, respectively. Elevated concentrations are observed for many metals analyzed although overall metal extractions are low. In the case of Rice Lake, the NP depletion value can be calculated to be 97 percent. For the Mole Lake composites, however, calculated NP values are only 11.4 and 12.3 percent despite the acidic leachates being produced. Low apparent neutralization availability is not unusual in laboratory tests on waste rock due to the very short leachate path length in a test cell or column which does not allow time for the relatively rapid downward moving acidic drainage to be neutralized. In practice, higher utilization of NP may occur.

The Skunk Lake composite has not yet produced acidic drainage despite high potential and the current leachate pH is about 7.3. Oxidation rates are significantly lower for this composite compared with those for the Rice Lake, Upper Mole Lake, and Lower Mole Lake composites. Oxidation and NP depletion rates are, however, increasing which would result in a shorter predicted time for NP depletion. Only elevated manganese and zinc concentrations are observed in leachates from this composite.

7 Conclusions

Static tests and kinetic leaching tests have been completed, or are continuing, on tailings and waste rock materials from the Crandon Project to evaluate the behavior of the materials under simulated disposal conditions. The principal conclusions that can be drawn from the results to date are as follows:

1. Carbonate minerals are present in all waste rock and tailings composites and account for the neutralization potential of those materials. These data support the identical conclusions previously reported that were based upon total carbon analyses.
2. The variability in ABA and bulk chemical values within each formation, and within large intervals within each formation, is related to the proximity of the formation to the Crandon Formation. The Lower Mole Lake Formation, which is next to the Crandon Formation, has the highest ABA and bulk chemical variabilities of the four formations. Overall, however, the parameter variabilities are small and demonstrate the appropriateness of using statistically prepared composites to characterize the waste rock.
3. In an unprotected environment, whole and fine tailings tested under free-draining, wet/dry leach cycles are predicted to be acid generating in the long term. However, the rates of oxidation and NP depletion are such that it can be further predicted that protective neutralization will be provided for a time period well in excess of that in which some tailings will be exposed under the proposed disposal schedule of the TMA. In actual practice, the saturated and partially saturated conditions of the TMA will result in longer periods of protection before acidic drainage is formed.
4. Tests on tailings under saturated conditions to evaluate mine backfill are producing reduced oxidation rates compared with tests under free-draining conditions. Oxidation rates and NP depletion rates are declining.
5. Leachates from the testing of the waste rock master composites remain neutral to slightly alkaline. In all cases oxidation rates and NP depletion rates are very low. Rates of oxidation and NP depletion are declining.
6. Three of the four high-sulfur waste rock composites are producing acidic leachates with corresponding elevated metal concentrations. It is expected that the fourth composite (Skunk Lake) will produce acidic leachate within one further year of testing.
7. The data collected from the current waste characterization work, in conjunction with that collected through 1982 waste characterization work completed by the Colorado School of Mines Research Institute (CSMRI, 1982) is suitable for use in predicting the water quality in the TMA and in the reflooded mine. Further discussion regarding the derivation of the TMA source term can be found in Appendix N-2 of the May, 1995, *Tailings Management Area Feasibility Report/Plan of Operation* (Foth & Van Dyke, 1995b).

8 References

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Appendix 1

Data Regarding Samples Used in the Waste Characterization Studies to Determine ABA and WRC Values

- Appendix 1.1** **Explanation of ABA Units**
- Appendix 1.2** **Lakefield Research 1994 ABA Data**
- Appendix 1.3** **Summary of 1994 ABA Determinations and WRC Values for the Initial Investigation**
- Appendix 1.4** **Chemex 1995 ABA Data and Lakefield Research 1995 ABA Data**
- Appendix 1.5** **Skunk Lake Formation 1995 ABA Determinations**
- Appendix 1.6** **Rice Lake Formation 1995 ABA Determinations**
- Appendix 1.7** **Upper Mole Lake Formation 1995 ABA Determinations**
- Appendix 1.8** **Lower Mole Lake Formation 1995 ABA Determinations**
- Appendix 1.9** **1994 Waste Rock Classification (WRC) Evaluations**

Appendix 1.1
Explanation of ABA Units

Appendix 1.1

Explanation of ABA Units Used in the Text and Appendix Tables, and a Comparison of These Terms With Those Used by Lakefield Research and Chemex Labs

Text and Appendix Tables	Lakefield Research	Chemex Labs
S (total sulfur content)	S	S (total)
S ²⁻ (sulfide sulfur content)	S ⁼	S (sulfide)
CO ₂ (carbon dioxide content)	not used	CO ₂ (inorg.)
NP (total neutralization potential)	NP	not used
NP-CO ₂ (neutralization potential due to carbonate minerals)	not used	Mod Neu Potent.
AP (total acid production potential)	MPA (maximum potential acidity)	not used
SAP (acid production potential due to sulfide mineral content)	not used	Mod. Ma Acid
Net NP (net neutralization potential) (Net NP = NP - AP)	CNNP (common net neutralization potential)	Net Neu Potent (equal to NP-CO ₂ minus SAP)

Appendix 1.2
Lakefield Research 1994 ABA Data

Revisions to Lakefield Research Sample ID Nos.

Lakefield Research Data

#9 H21: 1127-1128
#38 H98: 884-885
#64 H154: 1681-1682
#89 H160: 2481-2482

Core Intervals Described and Sampled

should read H21: 1527-1528
should read H98: 844-845
should read H155: 1661-1662
should read H160: 2421-2422

These revisions are required to correct the mislabeling of the collected samples submitted for analysis. The correct intervals in all cases are those shown in the WRC data included in Appendix 1.9.

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Rhineland, WI, 54501-3161 - U.S.A.

Attn : K. W. Collison

F : (715)365-1457

Lakefield, August 30, 1994

Date Rec. : August 30, 1994

LR. Ref. : JUN7302.C94

Reference : ---

Project : 9446241

CERTIFICATE OF ANALYSIS

No.	Sample ID	C	N HCL HCL	HCL added mL	NaOH added mL	HCL (mL) consumed	NP *	MPA *	CNNP *	NP/MPA	S %	S= %	Paste pH units
1	H6 775-776	1.0499	0.0934	40	21.25	17.69	41.3	4.06	37.2	10.2	0.13	0.12	8.77
2	H9 139-140	1.0499	0.0934	40	37.10	1.049	2.449	53.4	-50.95	0.05	1.71	1.71	8.27
3	H9 159-160	1.0499	0.0934	40	37.25	0.8912	2.081	281.3	-279.21	0.01	9.11	9.11	6.77
4	H9 339-340	1.0499	0.0934	40	36.40	1.784	4.166	0.63	3.54	6.61	0.02	0.02	8.69
5	H9 380-381	0.9627	0.5119	40	40.30	1.203	15.4	0.31	15.1	49.7	0.01	0.01	8.50
6	H16 2325-2326	0.9270	0.5099	40	38.60	4.218	53.8	0.94	52.9	57.2	0.03	0.02	9.09
7	H20 707-708	1.0499	0.0934	40	19.70	19.32	45.1	101.3	-56.20	0.45	3.24	2.73	8.19
8	H21 1122-1123	1.0499	0.0934	40	28.60	9.973	23.3	87.5	-64.20	0.27	2.80	2.44	8.69
9	H21 1127-1128	0.9270	0.5099	40	29.20	12.93	164.8	0.31	164.5	531.6	0.01	0.01	9.10
10	H21 1647-1648	1.0499	0.0934	40	28.00	10.60	24.8	11.3	13.5	2.19	0.36	0.36	8.81
11	H21 1754-1755	0.9270	0.5099	40	28.05	14.00	178.5	169.7	8.80	1.05	5.43	5.37	8.93
12	H23 974-975	1.0499	0.0934	40	32.90	5.458	12.7	10.0	2.70	1.27	0.32	0.32	8.75
13	H23 1456-1457	0.9270	0.5099	40	36.15	6.489	82.7	3.13	79.6	26.4	0.10	0.10	8.63
14	H231492.5-1495.5	1.0499	0.0934	40	25.50	13.23	30.9	1012.5	-981.60	0.03	33.3	33.3	7.05
15	H24 1028-1029	1.0499	0.0934	40	35.35	2.886	6.739	3.13	3.61	2.15	0.10	0.10	8.79

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No.	Sample ID	C	N HCL	HCL added mL	NaOH added mL	HCL (mL) consumed	NP *	MPA *	CNNP *	NP/MPA	S %	S= %	Paste pH units
16	H24 1132-1133	1.0499	0.0934	40	32.60	5.773	13.5	0.94	12.6	14.4	0.03	0.03	8.79
17	H35 2315-2316	0.9270	0.5099	40	34.20	8.297	105.8	2.50	103.3	42.3	0.08	0.08	8.74
18	H35 2373-2373.5	0.9319	0.5099	80	73.70	11.32	144.3	956.3	-812.00	0.15	29.7	29.7	8.83
19	H37 2184-2185	0.9270	0.5099	40	38.30	4.496	57.3	5.94	51.4	9.65	0.19	0.19	8.88
20	H42 2235-2236	0.9270	0.5099	40	37.30	5.423	69.1	41.6	27.5	1.66	1.33	0.94	8.98
21	H44 329-330	1.0499	0.0934	40	36.55	1.626	3.797	1.56	2.24	2.43	0.05	0.04	8.79
22	H44 555-556	1.0499	0.0934	40	37.05	1.101	2.571	0.63	1.94	4.08	0.02	0.02	8.88
23	H44 883-884	1.0499	0.0934	40	31.10	7.348	17.2	0.63	16.6	27.3	0.02	0.02	8.82
24	H45 1767-1768	1.0499	0.0934	40	33.85	4.461	10.4	1.25	9.15	8.32	0.04	0.04	9.22
25	H46 1834-1835	0.9270	0.5099	40	39.30	3.569	45.5	0.63	44.9	72.2	0.02	0.02	9.47
26	H46 2009-2010	0.9319	0.5099	80	76.60	8.616	109.8	25.0	84.8	4.39	0.80	0.80	9.07
27	H46 2295-2296	0.9270	0.5099	40	35.95	6.674	85.1	63.8	21.3	1.33	2.04	2.04	8.78
28	H68 1971-1972	1.0499	0.0934	40	27.50	11.13	26.0	0.94	25.1	27.7	0.03	0.03	8.82
29	H73 1549-1550	1.0499	0.0934	40	31.15	7.296	17.0	21.9	-4.90	0.78	0.70	0.70	8.72
30	H73 1581.5-1582	1.0499	0.0934	40	18.30	20.79	48.5	156.9	-108.40	0.31	5.10	5.10	8.28
31	H74 352-353	1.0499	0.0934	40	36.50	1.679	3.920	0.63	3.29	6.22	0.02	0.01	8.51
32	H74 570-571	1.0499	0.0934	40	36.20	1.994	4.656	0.00	4.66	15.0	< 0.01	< 0.01	8.97
33	H85 836-837	0.9270	0.5099	40	17.85	23.45	298.9	4.38	294.5	68.2	0.14	0.14	8.38
34	H91 949-950	1.0485	0.0934	40	34.38	3.953	9.230	115.9	-106.67	0.08	3.79	3.79	7.19
35	H92 725-726	1.0485	0.0934	40	36.41	1.824	4.259	90.3	-86.04	0.05	2.95	2.95	6.38
36	H92 734-735	1.0485	0.0934	40	34.58	3.743	8.740	1.25	7.49	6.99	0.04	0.03	8.12
37	H98 556-557	1.0485	0.0934	40	36.05	2.202	5.142	0.63	4.51	8.16	0.02	0.02	8.49
38	H98 884-885	1.0485	0.0934	40	34.74	3.575	8.348	0.31	8.04	26.9	0.01	0.01	8.59

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No.	Sample ID	C	N HCL	HCL added mL	NaOH added mL	HCL (mL) consumed	NP *	MPA *	CNNP *	NP/MPA	S %	S= %	Paste pH units
39	H98 1304-1305	1.0485	0.0934	40	18.40	20.71	48.4	12.2	36.2	3.97	0.39	0.37	8.73
40	H128 2112-2113	0.9324	0.5099	40	38.45	4.149	52.9	70.6	-17.70	0.75	2.26	2.26	8.33
41	H128 2312-2312.5	1.0485	0.0934	40	35.20	3.093	7.222	350.0	-342.77	0.02	11.2	10.4	7.19
42	H131 579-579.5	0.9324	0.5099	40	34.50	7.832	99.8	55.6	44.2	1.79	1.78	1.40	8.53
43	H131 1168-1169	1.0485	0.0934	40	30.94	7.559	17.7	0.31	17.4	57.1	0.01	0.01	8.72
44	H131 1207-1208	0.9270	0.5099	40	40.60	2.364	30.1	197.5	-167.40	0.15	6.32	6.32	8.32
45	H131 1234-1235	1.0485	0.0934	40	34.03	4.320	10.1	109.4	-99.30	0.09	3.50	3.27	7.82
46	H131 1302-1303	0.9270	0.5099	40	42.10	0.9733	12.4	6.88	5.52	1.80	0.22	0.22	8.73
47	H131 1346-1347	0.9270	0.5099	40	41.95	1.112	14.2	47.2	-33.00	0.30	1.51	1.35	8.88
48	H131 1469-1470	0.9270	0.5099	40	38.80	4.032	51.4	18.8	32.6	2.73	0.60	0.60	8.26
49	H132 1133-1133.5	0.9270	0.5099	40	39.90	3.013	38.4	337.5	-299.10	0.11	10.8	10.8	7.32
50	H132 1139-1140	0.9270	0.5099	40	38.95	3.893	49.6	18.4	31.2	2.70	0.61	0.61	7.62
51	H133 1224-1225	0.9270	0.5099	40	38.61	4.209	53.7	5.31	48.4	10.1	0.17	0.16	8.19
52	H133 1297.5-1298	0.9324	0.5099	40	39.80	2.890	36.8	187.2	-150.40	0.20	5.99	5.69	7.61
53	H138 1797-1798	1.0485	0.0934	40	32.45	5.976	14.0	7.50	6.50	1.87	0.24	0.14	7.77
54	H140 2361-2369	0.9324	0.5099	40	40.20	2.518	32.1	14.7	17.4	2.18	0.47	0.43	8.64
55	H142 714-715	1.0485	0.0934	40	36.89	1.321	3.085	0.31	2.78	9.95	0.01	0.01	8.54
56	H142 791-793	1.0485	0.0934	40	34.63	3.690	8.616	123.1	-114.48	0.07	3.94	3.94	7.70
57	H143 748-749	1.0485	0.0934	40	35.42	2.862	6.683	38.4	-31.71	0.17	1.23	1.23	8.25
58	H143 1110-1111	0.9324	0.5099	40	42.45	0.4196	5.349	222.8	-217.45	0.02	7.13	6.96	7.26
59	H143 1128.5-1129	0.9270	0.5099	40	41.60	1.437	18.3	224.4	-206.10	0.08	7.18	7.18	7.67
60	H144 722-723	0.9259	0.5099	80	66.20	18.71	238.5	9.06	229.4	26.3	0.32	0.31	8.12
61	H149 1119-1120	0.9270	0.5099	40	42.10	0.9733	12.4	0.94	11.5	13.2	0.03	0.03	8.78

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No.	Sample ID	C	N HCL	HCL added mL	NaOH added mL	HCL (mL) consumed	NP *	MPA *	CNNP *	NP/MPA	S %	S= %	Paste pH units
62	H149 1641-1642	0.9324	0.5099	40	38.70	3.916	49.9	2.81	47.1	17.8	0.09	0.09	8.80
63	H154 1595-1596	0.9270	0.5099	40	37.55	5.191	66.2	10.0	56.2	6.62	0.32	0.32	9.06
64	H154 1681-1682	1.0485	0.0934	40	29.70	8.860	20.7	283.1	-262.40	0.07	9.06	9.06	7.67
65	H155 130-131	1.0485	0.0934	40	35.05	3.250	7.589	0.63	6.96	12.0	0.02	0.02	8.45
66	H155 305-306	1.0485	0.0934	40	35.35	2.936	6.856	1.88	4.98	3.65	0.06	0.06	8.34
67	H155 349-350	1.0485	0.0934	40	37.10	1.101	2.571	39.7	-37.12	0.06	1.27	1.21	6.85
68	H155 492-493	1.0490	0.0934	40	36.50	1.711	3.995	0.31	4.00	12.9	0.01	0.01	7.96
69	H155 627-628	1.0490	0.0934	40	36.35	1.869	4.364	0.31	4.05	14.1	0.01	0.01	7.73
70	H155 756-757	1.0490	0.0934	40	36.07	2.163	5.051	0.31	4.74	16.3	0.01	0.01	8.13
71	H155 893-894	1.0490	0.0934	40	31.31	7.156	16.7	6.88	9.82	2.43	0.22	0.22	8.04
72	H155 1053-1054	1.0490	0.0934	40	35.10	3.180	7.425	0.31	7.12	24.0	0.01	0.01	8.78
73	H155 1194-1195	1.0490	0.0934	40	31.00	7.481	17.5	0.31	17.2	56.5	0.01	0.01	8.18
74	H155 1274-1275	0.9281	0.5099	40	41.05	1.901	24.2	15.3	8.90	1.58	0.49	0.49	8.44
75	H155 1342-1342	0.9281	0.5099	40	41.80	1.205	15.4	0.94	14.5	16.4	0.03	0.02	8.51
76	H155 1509-1510	0.9281	0.5099	40	40.10	2.783	35.5	0.63	34.9	56.3	0.02	0.02	9.24
77	H155 1549-1550	0.9335	0.5099	80	76.70	8.401	107.1	164.1	-57.00	0.65	5.25	5.25	8.03
78	H155 1582-1583	0.9281	0.5099	40	36.05	6.542	83.4	30.3	53.1	2.75	0.97	0.97	8.45
79	H155 1661-1662	0.9335	0.5099	80	75.60	9.427	120.2	160.0	-39.80	0.75	5.12	4.91	8.08
80	H155 1808-1809	0.9335	0.5099	80	78.00	7.187	91.6	0.63	91.0	145.4	0.02	0.02	9.21
81	H155 1962-1963	0.9335	0.5099	80	79.25	6.020	76.7	54.7	22.0	1.40	1.75	1.75	8.32
82	H155 2089-2090	1.0490	0.0934	40	31.40	7.061	16.5	2.19	14.3	7.53	0.07	0.07	9.02
83	H155 2241-2242	0.9281	0.5099	40	36.90	5.753	73.3	1.25	72.1	58.6	0.04	0.04	8.80
84	H155 2248-2249	1.0490	0.0934	40	26.20	12.52	29.2	0.63	28.6	46.3	0.02	0.02	9.02

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No.	Sample ID	C	N HCL	HCL added mL	NaOH added mL	HCL (mL) consumed	NP *	MPA *	CNNP *	NP/MPA	S %	S= %	Paste pH units
85	H159 1767-1768	0.9335	0.5099	80	76.70	8.401	107.1	9.69	97.4	11.1	0.31	0.31	9.10
86	H159 1917-1918	0.9335	0.5099	80	79.95	5.367	68.4	1031.3	-962.90	0.07	34.1	33.9	7.90
87	H160 2020-2021	0.9281	0.5099	40	34.85	7.656	97.6	0.94	96.7	103.8	0.03	0.03	8.81
88	H160 2434-2435	0.9281	0.5099	40	38.15	4.593	58.5	32.2	26.3	1.82	1.03	1.00	8.42
89	H160 2481-2482	1.0490	0.0934	40	24.50	14.30	33.4	35.6	-2.20	0.94	1.14	1.14	9.19
90	H163 1782-1783	0.9281	0.5099	40	39.65	3.201	40.8	0.63	40.2	64.8	0.02	0.02	8.56
91	H163 1835-1836	0.9335	0.5099	80	77.85	7.327	93.4	54.4	39.0	1.72	1.74	1.57	8.71
92	H163 1874-1875	0.9335	0.5099	80	76.10	8.961	114.2	1.25	113.0	91.4	0.04	0.03	8.83
93	H165 2289-2290	0.9281	0.5099	40	36.90	5.753	73.3	12.2	61.1	6.01	0.39	0.37	8.85
94	H172 1093-1094	1.0490	0.0934	40	36.56	1.649	3.850	0.31	3.54	12.4	0.01	0.01	8.97
95	H176 926-927	0.9335	0.5099	80	80.85	4.527	57.7	116.6	-58.90	0.49	3.73	3.65	7.83
96	H242 615-616	0.9281	0.5099	40	40.40	2.505	31.9	81.9	-50.00	0.39	2.62	2.62	7.89
97	H248 910-911	1.0490	0.0934	40	36.62	1.586	3.703	148.4	-144.69	0.02	4.75	4.49	7.23
98	H249 1996.5-1997	0.9281	0.5099	40	42.65	0.4165	5.309	478.1	-472.79	0.01	15.3	15.3	5.09
99	H251 1142-1142.5	1.0490	0.0934	40	32.02	6.411	15.0	259.4	-244.40	0.06	8.30	8.19	7.88
100	H269 896-897	1.0540	0.0934	40	32.65	5.587	13.0	24.1	-11.10	0.54	0.79	0.79	8.11
101	H270 2082-2083	1.0540	0.0934	40	33.65	4.533	10.6	1.56	9.04	6.79	0.05	0.04	9.00
102	H271 2209-2210	1.0540	0.0934	40	19.95	18.97	44.3	5.00	39.3	8.86	0.16	0.16	9.19
-- duplicates --													
103	H21 1647-1648	1.0499	0.0934	40	28.00	10.60	24.8	11.3	13.5	2.19	0.36	0.36	8.81
104	H37 2184-2185	0.9281	0.5099	40	38.05	4.686	59.7	6.88	52.8	8.68	0.22	0.19	8.88
105	H73 1549-1550	1.0499	0.0934	40	31.20	7.243	16.9	20.9	-4.00	0.81	0.67	0.67	8.72
106	H98 1304-1305	1.0485	0.0934	40	19.50	19.55	45.6	11.6	34.0	3.93	0.37	0.37	8.73
107	H132 1133-1133.5	0.9270	0.5099	40	39.75	3.152	40.2	331.3	-291.10	0.12	10.6	10.6	7.32

LAKEFIELD RESEARCH

A Division of Falconbridge Limited

P.O. Box 4300, 185 Concession St., Lakefield, Ontario, K0L 2H0

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JUN7302.C94

No.	Sample ID	C	N HCL	HCL added mL	NaOH added mL	HCL (mL) consumed	NP *	MPA *	CNMP *	NP/MPA	S %	S= %	Paste pH units
108	H143 1128.5-1129	0.9270	0.5099	40	41.60	1.437	18.3	225.9	-207.60	0.08	7.12	7.12	7.67
109	H155 627-628	1.0490	0.0934	40	36.32	1.900	4.437	0.31	4.44	14.3	0.01	0.01	7.73
110	H155 1661-1662	0.9335	0.5099	80	74.60	10.36	132.1	154.7	-22.60	0.85	4.95	4.95	8.08
111	H160 2481-2482	1.0490	0.0934	40	24.20	14.61	34.1	36.3	-2.20	0.94	1.16	1.16	9.19
112	H251 1142-1142.5	1.0490	0.0934	40	31.10	7.376	17.2	258.4	-241.20	0.07	8.27	7.87	7.88

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Constant (C) = (mL acid in blank) / (mL base in blank)
mL acid consumed = (mL acid added) - (mL base added x C)

*NP(Neutralization Potential)
= (mL acid consumed) x (25) x (N of acid)
* A(Maximum Potential Acidity)
= % Sulphur x 31.25
*CNNP(Common Net Neutralization Potential)
= NP-MPA

*Results expresses as tonnes CaCO3 eq/1000 tonnes material

** Samples H23 1492.5-1493 and H23 1495-1495.5 were combined. The assay reported is the composite of these two samples

For samples with S values of <0.01 a value of 0.01 were used in the NP/MPA calculation

II


Dave Hevenor

A MEMBER OF IAETL CANADA

Accredited by CAEAL for specific tests registered with the Association

REFERENCES AND METHODOLOGIES

Sulphur (Sulphide)

$$\% \text{ Sulphate S} = \frac{\text{weight of BaSO}_4 \times 0.1374}{\text{sample weight (g)}} \times 100$$

The factor for converting BaSO₄ to S is 0.1374

$$\% \text{ Sulphide S} = \% \text{ S in residue (step 5)} \times \frac{\text{weight of residue (g)}}{\text{weight of sample (g)}}$$

References:

1. Hildebrand, W.F., G.E.F. Lundell, H.A. Bright and J.I. Hoffman, Applied Inorganic Analysis, 1953, 2nd Edition, John Wiley and Sons Inc., New York, pp. 711-722
2. Kolthoff, I.M., and E.B. Sandell, Textbook of Quantitative Inorganic Analysis, 1948, Revised Edition, The MacMillan Company, New York, pp 329-343
3. Furman, N.H., Scott's Standard Methods of Chemical Analysis, 1962, 6th Edition, Van Nostrand Company Inc., New York, Volume 1, pp. 1003-1011, 1037
4. Ingles, J.C., Manual of Analytical Methods for the Uranium Concentrating Plant, April, 1958, Dept. of Energy, Mines and Resources, Mines Branch, Ottawa, Mines Branch Monograph 866, Method No. S-1, Pt.III
5. LECO Instruction Manual, CS 244-784-000, 1986, Leco Corporation

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6. Sobek, A.A., W.A. Schullere, J.R. Freeman, and R.M. Smith, Field and Laboratory Methods Applicable to Overburden and Minesoils, 1978, U.S. Environmental Protection Agency. Report No. EPA 600/2-78-054

At the request of Crandon Mining Company, the acid neutralization potential test in the above mentioned reference was modified to reflect the recommendations presented in:

7. Brogton, L.M., R.W. Chambers and A. Robertson. 1992. Minerock Guidelines: Design and Control of Drainage Water Quality. Saskatchewan Environment and Public Safety Report No. 93301. Prince Albert, Saskatchewan.

Appendix 1.3

Summary of 1994 ABA Determinations and WRC Values for the Initial Investigation

(Includes Table 3.5-20 from the Crandon Project May 22, 1995, Environmental Impact Report pertaining to the interpretation of WRC values.)

Taken from Section 3.5 of the May 22, 1995, Crandon Project Environmental Impact Report, with term ARD redefined as Waste Rock Classification (WRC).

Table 3.5-20

**Summary of the Waste Rock Classification (WRC) Values
for the Waste Rock Master Composites**

Geologic Formation	WRC Range -20 to +2	WRC Range +2 to +24	WRC Range +24 to +46	WRC Range +46 to +68
Skunk Lake	0	8 (100%)	0	0
Rice Lake	3 (17%)	15 (83%)	0	0
Upper Mole Lake	3 (23%)	10 (77%)	0	0
Lower Mole Lake	0	14 (82%)	3 (18%)	0

The total range of potential WRC values has been divided into four ranges of equal value. The number of core intercepts per geologic formation with values within each range are shown. Also shown is the relative percentage that the number within the range represents of all core intercepts evaluated within a given formation.

1. A WRC value of -20 represents geologic material least likely to produce acid rock drainage.
2. A WRC value of +68 represents geologic material most likely to produce acid rock drainage.
3. WRC Values Predicted Behavior
 - 20 to +2 likely non acid generating
 - +2 to +24 potentially non acid generating
 - +24 to +46 potentially acid generating
 - +46 to +68 likely acid generating

Prepared by: JET
Checked by: DJL

Appendix 1.3 Table 1

Skunk Lake Formation Summary of the 1994 ABA Determinations and WRC Values for the Initial Investigation

Main Interval	ABA/WRC Evaluated Interval	S %	S ² %	NP kg/tonne	AP kg/tonne	Net NP kg/tonne	$\frac{NP}{AP}$	WRC Value*
DDH 9 139-190	DDH 9 139-140	1.71	1.71	2.4	53.4	-51	0.04	14
DDH 9 139-190	DDH 9 159-160	9.11	9.11	2.1	281	-279	0.01	16
DDH 9 300-400	DDH 9 339-340	0.02	0.02	4.2	0.6	3.6	7.0	6
DDH 9 300-400	DDH 9 380-381	0.01	0.01	15.4	0.3	15.1	51.3	12
DDH 44 310-340	DDH 44 329-330	0.05	0.04	3.8	1.6	2.2	2.4	14
DDH 44 530-560	DDH 44 555-556	0.02	0.02	2.6	0.6	2.0	4.3	12
DDH 74 330-360	DDH 74 352-353	0.02	0.01	3.9	0.6	3.3	6.5	14
DDH 98 525-560	DDH 98 556-557	0.02	0.02	5.1	0.6	4.5	8.5	12
DDH 142 700-800	DDH 142 714-715	0.01	0.01	3.1	0.3	2.8	10.3	10
DDH 142 700-800	DDH 142 791-793	3.94	3.94	8.6	123	-114	0.1	30
DDH 144 660-750	DDH 144 722-723	0.32	0.31	238	9.1	229	26.2	-4
DDH 155 125-150	DDH 155 130-131	0.02	0.02	7.6	0.6	7.0	12.7	12
DDH 155 280-308	DDH 155 305-306	0.06	0.06	6.8	1.9	4.9	3.6	12
DDH 155 335-350	DDH 155 349-350	1.27	1.21	2.6	39.7	-37.1	0.1	10
DDH 155 490-510	DDH 155 492-493	0.01	0.01	4.0	0.3	3.7	13.3	10
DDH 155 615-635	DDH 155 627-628	0.01	0.01	4.4	0.3	4.1	14.7	10
DDH 155 735-760	DDH 155 756-757	0.01	0.01	5.0	0.3	4.7	16.7	10

*Refer to Table 3.5-20 of the May 22, 1995, Crandon Project EIR for interpretation of WRC values.

Appendix 1.3 Table 2

Rice Lake Formation Summary of the 1994 ABA Determinations and WRC Values for the Initial Investigation

Main Interval	ABA/WRC Evaluated Interval	S %	S ² %	NP kg/tonne	AP kg/tonne	Net NP kg/tonne	<u>NP</u> / <u>AP</u>	WRC Value*
DDH 16 2300-2380	DDH 16 2325-2326	0.03	0.02	53.8	0.9	52.9	59.8	10
DDH 21 1120-1150	DDH 21 1122-1123	2.80	2.44	23.3	87.5	-64.2	0.3	17
DDH 23 930-1050	DDH 23 974-975	0.32	0.32	12.7	10.0	2.7	1.3	20
DDH 24 940-1170	DDH 24 1028-1029	0.10	0.10	6.7	3.1	3.6	2.2	6
DDH 24 940-1170	DDH 24 1132-1133	0.03	0.03	13.5	0.9	12.6	15.0	14
DDH 46 1800-1980	DDH 46 1834-1835	0.02	0.02	45.5	0.6	44.9	75.8	9
DDH 74 560-590	DDH 74 570-571	<0.01	<0.01	4.6	0.3	4.3	15.3	9
DDH 98 820-850	DDH 98 844-845	0.01	0.01	8.3	0.3	8.0	27.7	14
DDH 140 2300-2500	DDH 140 2361-2369	0.47	0.43	32.1	14.7	17.4	2.2	22
DDH 143 700-770	DDH 143 748-749	1.23	1.23	6.7	38.4	-31.7	0.2	14
DDH 149 1100-1150	DDH 149 1119-1120	0.03	0.03	12.4	0.9	11.5	13.8	14
DDH 155 890-915	DDH 155 893-894	0.22	0.22	16.7	6.9	9.8	2.4	10
DDH 155 1040-1060	DDH 155 1053-1054	0.01	0.01	7.4	0.3	7.1	24.7	10
DDH 155 1185-1210	DDH 155 1194-1195	0.01	0.01	17.5	0.3	17.2	58.3	10
Requested by WDNR ¹	DDH 155 1274-1275	0.49	0.49	24.2	15.3	8.9	1.6	8
DDH 155 1340-1360	DDH 155 1342-1343	0.03	0.02	15.4	0.9	14.5	17.1	10
DDH 155 1490-1510	DDH 155 1509-1510	0.02	0.02	35.5	0.6	34.9	59.2	10

Appendix 1.3 Table 2 (Continued)

Main Interval	ABA/WRC Evaluated Interval	S %	S ² %	NP kg/tonne	AP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	WRC Value*
Requested by WDNR ¹	DDH 155 1549-1550	5.25	5.25	107	164	-57.0	0.7	6
Requested by WDNR ¹	DDH 155 1582-1583	0.97	0.97	83.4	30.3	53.1	2.8	6
DDH 155 1640-1675	DDH 155 1661-1662	5.12	4.91	120	160	-40.0	0.8	20
DDH 155 1790-1810	DDH 155 1808-1809	0.02	0.02	91.6	0.6	91.0	153	4
DDH 155 1940-1960	DDH 155 1962-1963	1.75	1.75	76.7	54.7	22.0	1.4	14
DDH 155 2080-2105	DDH 155 2089-2090	0.07	0.07	16.5	2.2	14.3	7.5	10
DDH 155 2240-2260	DDH 155 2241-2242	0.04	0.04	73.3	1.2	72.1	61.1	4
DDH 155 2240-2260	DDH 155 2248-2249	0.02	0.02	29.2	0.6	28.6	48.7	10
DDH 160 2000-2030	DDH 160 2020-2021	0.03	0.03	97.6	0.9	96.7	108	16
DDH 163 1750-1950 ²	DDH 163 1782-1783	0.02	0.02	40.8	0.6	40.2	68.0	7
DDH 163 1750-1950	DDH 163 1835-1836	1.74	1.57	93.4	54.4	39.0	1.7	14
DDH 163 1750-1950 ²	DDH 163 1874-1875	0.04	0.03	114	1.2	113	95.0	6
DDH 172 1070-1100	DDH 172 1093-1094	0.01	0.01	3.8	0.3	3.5	12.7	19
DDH 155 1640-1675	DDH 155 1661-1662	9.06	9.06	20.7	283	-262	0.07	20

*Refer to Table 3.5-20 of the May 22, 1995, Crandon Project EIR for interpretation of WRC values.

¹Samples collected outside the interval evaluated by request of WDNR.

²Two separate "average" samples were collected from the same main interval.

Appendix 1.3 Table 3

Mole Lake Formation Summary of the 1994 ABA Determinations and WRC Values for the Initial Investigation

Main Interval	ABA/WRC Evaluated Interval	S %	S ² %	NP kg/tonne	AP kg/tonne	Net NP kg/tonne	<u>NP</u> <u>AP</u>	WRC Value*
DDH 6 740-780	DDH 6 775-776	0.13	0.12	41.3	4.1	37.2	10.1	14
DDH 20 700-750	DDH 20 707-708	3.24	2.73	45.1	101	-55.9	0.4	14
DDH 21 1520-1550	DDH 21 1527-1528	0.01	0.01	165	0.3	165	550	6
DDH 21 1620-1670	DDH 21 1647-1648	0.36	0.36	24.8	11.3	13.5	2.2	14
DDH 23 1400-1460	DDH 23 1456-1457	0.10	0.10	82.7	3.1	79.6	26.7	16
DDH 23 1500-1600	DDH 23 1549-1550	--	--	--	--	--	--	12
DDH 35 2270-2350	DDH 35 2315-2316	0.08	0.08	106	2.5	104	42.4	12
DDH 37 2160-2200	DDH 37 2184-2185	0.19	0.19	57.3	5.9	51.4	9.7	10
DDH 42 2210-2250	DDH 42 2235-2236	1.33	0.94	69.1	41.6	27.5	1.7	12
DDH 44 869-890	DDH 44 883-884	0.02	0.02	17.2	0.6	16.6	28.7	16
DDH 45 1730-1770	DDH 45 1767-1768	0.04	0.04	10.4	1.2	9.2	8.7	11
DDH 46 1800-2000	DDH 46 2009-2010	0.80	0.80	110	25.0	85.0	4.4	16
DDH 46 2200-2320	DDH 46 2295-2296	2.04	2.04	85.1	63.8	21.3	1.3	11
DDH 68 1930-2020	DDH 68 1971-1972	0.03	0.03	26.0	0.9	25.1	28.9	14
DDH 73 1500-1600	DDH 73 1549-1550	0.70	0.70	17.0	21.9	-4.9	0.8	16
DDH 85 800-840	DDH 85 836-837	0.14	0.14	299	4.4	295	68.0	14
DDH 91 949-981	DDH 91 949-950	3.79	3.79	9.2	116	-107	0.1	10
DDH 92 700-780	DDH 92 725-726	2.95	2.95	4.2	90.3	-86.1	0.05	16

Appendix 1.3 Table 3 (Continued)

Main Interval	ABA/WRC Evaluated Interval	S %	S ² %	NP kg/tonne	AP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	WRC Value*
DDH 92 700-780	DDH 92 734-735	0.04	0.03	8.7	1.2	7.5	7.3	14
DDH 98 1280-1330	DDH 98 1304-1305	0.39	0.37	48.4	12.2	36.2	4.0	16
DDH 128 2100-2130	DDH 128 2112-2113	2.26	2.26	52.9	70.6	-17.7	0.7	16
DDH 131 1160-1221	DDH 131 1168-1169	0.01	0.01	17.7	0.3	17.4	59.0	12
DDH 131 1160-1221	DDH 131 1207-1208	6.32	6.32	30.1	198	-168	0.2	14
DDH 131 1221-1316	DDH 131 1234-1235	3.50	3.27	10.1	109	-98.9	0.1	19
DDH 131 1221-1316	DDH 131 1302-1303	0.22	0.22	12.4	6.9	5.5	1.8	7
DDH 131 1316-1410	DDH 131 1346-1347	1.51	1.35	14.2	47.2	-33.0	0.3	19
DDH 131 1410-1503	DDH 131 1469-1470	0.60	0.60	51.4	18.8	32.6	2.7	9
DDH 132 1130-1180	DDH 132 1133-1113.5	10.8	10.8	38.4	338	-300	0.1	17
DDH 132 1130-1180	DDH 132 1139-1140	0.61	0.61	49.6	18.4	31.2	2.7	14
DDH 133 1050-1240	DDH 133 1224-1225	0.17	0.16	53.7	5.3	48.4	10.1	12
DDH 138 1770-1820	DDH 138 1797-1798	0.24	0.14	14.0	7.5	6.5	1.9	12
DDH 143 1070-1120	DDH 143 1110-1111	7.13	6.96	5.3	223	-218	0.02	16
DDH 149 1620-1670	DDH 149 1641-1642	0.09	0.09	49.9	2.8	47.1	17.8	6
DDH 154 1590-1650	DDH 154 1595-1596	0.32	0.32	66.2	10.0	56.2	6.6	11
DDH 159 1750-1900	DDH 159 1767-1768	0.31	0.31	107	9.7	97.3	11.0	11
DDH 160 2420-2450	DDH 160 2421-2422	1.14	1.14	33.4	35.6	-2.2	0.9	17
DDH 160 2420-2450	DDH 160 2434-2435	1.03	1.00	58.5	32.2	26.3	1.82	17
DDH 165 2240-2290	DDH 165 2289-2290	0.39	0.37	73.3	12.2	61.1	6.01	14

Appendix 1.3 Table 3 (Continued)

Main Interval	ABA/WRC Evaluated Interval	S %	S ² %	NP kg/tonne	AP kg/tonne	Net NP kg/tonne	$\frac{NP}{AP}$	WRC Value*
DDH 176 880-950	DDH 176 926-927	3.73	3.65	57.7	117	-59.3	0.49	17
DDH 242 605-635	DDH 242 615-616	2.62	2.62	31.9	81.9	-50.0	0.39	12
DDH 269 865-940	DDH 269 896-897	0.79	0.79	13.0	24.1	-11.1	0.54	16
DDH 270 2070-2165	DDH 270 2082-2083	0.05	0.04	10.6	1.6	9.0	6.63	12
DDH 271 2195-2250	DDH 271 2209-2210	0.16	0.16	44.3	5.0	39.3	8.86	14

*Refer to Table 3.5-20 of the May 22, 1995, Crandon Project EIR for interpretation of WRC values.

Appendix 1.3 Table 4

Crandon Formation (Ore) Summary of the 1994 ABA Determinations and WRC Values for the Initial Investigation

Main Interval	ABA/WRC Evaluated Interval	S %	S ² %	NP kg/tonne	AP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	WRC Value*
DDH 21 1753-1756	DDH 21 1754-1755	5.43	5.37	178	170	8.0	1.0	9
DDH 23 1492-1496	DDH 23 1492.5-1495.5	33.3	33.3	30.9	1,010	-979	0.03	25
DDH 35 2374-2376	DDH 35 2375-2375.5	29.7	29.7	144	956	-812	0.2	25
DDH 73 1580-1580	DDH 73 1581.5-1582	5.10	5.10	48.5	157	-108	0.3	17
DDH 128 2311-2313	DDH 128 2312-2312.5	11.2	10.4	7.2	350	-343	0.02	30
DDH 133 1297-1299	DDH 133 1297.5-1298	5.99	5.69	36.8	187	-150	0.2	18
DDH 143 1127-1130	DDH 143 1128.5-1129	7.18	7.18	18.3	224	-206	0.1	27
DDH 159 1916-1919	DDH 159 1917-1918	34.1	33.9	68.4	1,030	-962	0.1	32
DDH 248 909-912	DDH 248 910-911	4.75	4.49	3.7	148	-144	0.03	19
DDH 249 1995-1998	DDH 249 1996.5-1997	15.3	15.3	5.3	478	-473	0.01	27
DDH 251 1141-1143	DDH 251 1142-1142.5	8.30	8.19	15.0	259	-244	0.1	22

*Refer to Table 3.5-20 of the May 22, 1995, Crandon Project EIR for interpretation of WRC values.

Appendix 1.4

Chemex 1995 ABA Data and Lakefield Research 1995 ABA Data



Chemex Labs, Inc.

Analytical Chemists * Geochemists * Registered Assayers

994 Glendale Ave., Unit 3, Sparks
Nevada, U.S.A. 89431
PHONE: 702-356-5395 FAX: 702-355-0179

To: CRANDON MINING COMPANY

7 H BROWN ST.
RHINELANDER, WISCONSIN
54501-1457

Project:
Comments: ATTN: KEN BLACK

Page Number : 1
Total Pages : 1
Certificate Date: 02-OCT-98
Invoice No. : 19528949
P.O. Number :
Account : MZX

CERTIFICATE OF ANALYSIS A9528949

SAMPLE	PREP CODE		PASTE pH	S % * Sulfate	S % *** Sulfide	S % Total	CO2 % Inorg	Mod. Ma Acid **	Mod Neu Potent.	Net Neu Poten**	Ratio NP/MPA
CMC-CT	268	220	6.3	0.29	28.44	28.4	1.0	889	21	-868	1.00
CMC-FT	268	220	6.3	0.05	30.04	31.1	1.3	939	26	-913	1.00

FILE MAIN EMJ
 Sub WS
 Sub DA
 Keywords _____

NOTE: * HYDROCHLORIC ACID SOLUBLE SULFATE
 NOTE: ** UNITS = KILOGRAMS CaCO3 EQUIVALENT PER METRIC TONNE (Kg/MT)
 NOTE: *** NITRIC ACID SOLUBLE SULFIDE

CERTIFICATION: Hart Bickler

FILE NO. W37
CH
 Keywords ABA

LAKEFIELD RESEARCH

A Division of Falconbridge Limited

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 Rhinelander, WI, 54501-3161 - U.S.A.

Attn : K. W. Collison
 Fax : (715)365-1457

Lakefield, September 7, 1995

Date Rec. : September 1, 1995
 LR. Ref. : SEP9002.R95
 Reference : PO#95-0017
 Project : LR

CERTIFICATE OF ANALYSIS

No.	Sample ID	Constant	N HCL added HCL	NaOH added mL	HCL (mL) consumed	NP *	MPA *	CNNP *	NP/MPA *	S %	S= %	Paste pH units	
1	Analysis Date	05.09.95	02.09.95	02.09.95	05.09.95	05.09.95	05.09.95	05.09.95	05.09.95	03.09.95	03.09.95	30995	
2	Analysis Time	16:32	09:12	09:12	16:32	12:35	12:35	15:22	16:31	16:31	12:45	15:29	700
7	DDH 44 538-540	1.000	0.4980	40	39.90	0.1	1	< 0.3	1	3.3	< 0.01	< 0.01	8.48
9	DDH 44 548-550	1.000	0.4980	40	39.80	0.2	3	< 0.3	3	10.0	< 0.01	< 0.01	8.52
11	DDH 44 557-559	1.000	0.4980	40	39.90	0.1	1	< 0.3	1	3.3	< 0.01	< 0.01	8.69
13	DDH 44 566-568	1.000	0.4980	40	39.7	0.3	4	< 0.3	4	13	< 0.01	< 0.01	8.75
15	DDH 44 575-577	1.000	0.4980	40	39.80	0.2	3	< 0.3	3	10.0	< 0.01	< 0.01	8.85
19	DDH 92 313-315	1.000	0.4980	40	39.75	0.3	4	2.8	1	1.4	0.09	0.06	8.38
21	DDH 92 322-324	1.000	0.4980	40	39.90	0.1	1	0.3	1	3.3	0.01	< 0.01	8.81
23	DDH 92 332-334	1.000	0.4980	40	39.80	0.2	3	0.3	3	10.0	0.01	< 0.01	8.36
25	DDH-23 1041-1043	1.000	0.4980	40	38.70	1.3	16	1.6	14	10	0.05	0.05	8.45
27	DDH-23 1050-1052	1.000	0.4980	40	37.60	2.4	30	7.5	23	4.0	0.24	0.24	8.65
33	DDH-23 1059-1061	1.000	0.4980	40	38.05	2.0	25	0.9	24	28	0.03	0.02	8.58
35	DDH-23 1068-1070	1.000	0.4980	40	39.05	1.0	12	0.3	12	40	0.01	< 0.01	8.71
37	DDH-23 1077-1079	1.000	0.4980	40	39.20	0.8	10	1.9	8	5.3	0.06	0.04	8.80
39	DDH-44 754-756	1.000	0.4980	40	39.60	0.4	5	0.6	4	8.3	0.02	< 0.01	8.38
41	DDH-44 764-766	1.000	0.4980	40	39.55	0.5	6	0.3	6	20	0.01	< 0.01	7.76
45	DDH-44 774-776	1.000	0.4980	40	39.85	0.2	3	0.3	3	10.0	0.01	< 0.01	8.24
47	DDH-160 1975-1977	1.000	0.4980	40	39.30	0.7	9	0.3	9	30	0.01	< 0.01	9.03

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No.	Sample ID	Constant	N HCL added HCL	NaOH added mL	HCL (mL) consumed	NP *	MPA *	CNNP *	NP/MPA *	S %	S= %	Paste pH units
49	DDH-160 1985-1987	1.000	0.4980	40	38.60	17	0.6	16	28	0.02	0.01	9.09
51	DDH-160 1994-1996	1.000	0.4980	40	37.60	30	0.3	30	100	0.01	0.01	9.19
53	DDH-172 1504-1506	1.000	0.4980	40	39.65	5	< 0.3	5	17	< 0.01	< 0.01	9.09
59	DDH-172 1513-1515	1.000	0.4980	40	39.35	9	< 0.3	9	30	< 0.01	< 0.01	9.18
61	DDH-172 1522-1524	1.000	0.4980	40	38.05	25	< 0.3	25	83	< 0.01	< 0.01	9.13
63	DDH-46 2028-2030	1.000	0.4980	40	36.95	39	< 0.3	39	130	< 0.01	< 0.01	9.20
65	DDH-46 2037-2039	1.000	0.4980	40	36.00	50	< 0.3	50	167	< 0.01	< 0.01	9.34
67	DDH-46 2046-2048	1.000	0.4980	40	36.95	39	1.9	37	21	0.06	0.03	9.24
69	DDH-46 2055-2057	0.9901	0.4980	80	67.75	161	0.6	160	268	0.02	< 0.01	8.72
73	73-DDH 1372-1374	0.9950	0.4980	40	37.60	32	2.5	30	13	0.08	0.08	9.16
75	73-DDH 1381-1383	0.9950	0.4980	40	38.45	21	< 0.3	21	70	< 0.01	< 0.01	9.24
77	73-DDH 1390-1392	0.9901	0.4980	80	69.80	136	0.9	135	151	0.03	0.02	9.00
79	DDH-131 1163-1165	1.000	0.4980	40	38.70	16	< 0.3	16	53	< 0.01	< 0.01	9.23
81	DDH-131 1171-1173	1.008	0.4980	40	38.95	9	5.9	3	1.5	0.19	0.14	8.91
87	DDH-131 1180-1182	1.008	0.4980	40	34.90	60	5.3	55	11	0.17	0.14	8.62
89	DDH-16 2079-2099	1.008	0.4980	40	32.30	92	0.3	92	307	0.01	< 0.01	8.90
91	DDH-16 3007-3009	1.008	0.4980	40	35.00	59	0.9	58	66	0.03	0.03	8.89
93	DDH-16 3017-3019	0.9950	0.4980	40	36.75	42	0.3	42	140	0.01	0.01	8.88
95	DDH 45 2067-2069	0.9950	0.4980	40	34.30	73	1.9	71	38	0.06	0.06	8.79
99	DDH 45 2077-2079	0.9950	0.4980	40	38.75	17	1.6	15	11	0.05	0.05	9.08
101	DDH 45 2086-2088	0.9950	0.4980	40	37.80	30	0.9	29	33	0.03	0.03	8.74
103	DDH 45 2098-2100	0.9950	0.4980	40	37.85	29	1.3	28	22	0.04	0.03	8.69
105	DDH-68 1880-1882	0.9950	0.4980	40	37.7	31	0.3	31	103	0.01	0.01	8.83
107	DDH-68 1889-1891	1.000	0.4980	40	37.90	26	< 0.3	26	87	< 0.01	< 0.01	8.85
113	DDH-68 1898-1900	0.9986	0.4980	40	36.30	47	0.6	46	78	0.02	< 0.01	9.25
115	DDH-176 993-995	0.9986	0.4980	40	38.20	24	2.8	21	8.6	0.09	0.07	8.25
117	DDH-176 1002-1004	1.005	0.4980	40	39.80	0	7.5	-7	0	0.24	0.16	7.16
119	DDH-176 1010-1012	1.005	0.4980	40	39.80	0	10.6	-10	0	0.34	0.25	7.07
121	DDH-176 1019-1021	0.9950	0.4980	40	39.85	5	4.7	0	1.1	0.15	0.09	8.52
125	DDH-9 SL 362-385	0.9950	0.4980	40	39.80	5	< 0.3	5	17	< 0.01	< 0.01	8.69

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No.	Sample ID	Constant	N HCL added HCL	ml	NaOH added mL	HCL (mL) consumed	NP *	MPA *	CNNP *	NP/MPA *	S %	S= %	Paste pH units
127	DDH-23 SL 523-552	0.9950	0.4980	40	38.50	1.7	21	0.3	21	70	0.01	< 0.01	7.77
129	DDH-44 SL 160-192	0.9988	0.4980	80	79.50	0.6	7	0.6	6	12	0.02	< 0.01	8.69
131	DDH-44 SL 536-575	0.9950	0.4980	40	39.90	0.3	4	< 0.3	4	13	< 0.01	< 0.01	8.60
133	DDH-91 SL 247-274	0.9950	0.4980	40	39.90	0.3	4	0.3	4	13	0.01	< 0.01	8.46
139	DDH-91 SL 397-447	1.000	0.4980	40	39.10	0.9	11	10.6	0	1.0	0.34	0.20	8.93
141	DDH-92 SL 311-338	1.000	0.4980	40	39.40	0.6	7	1.3	6	5.4	0.04	0.03	8.32
143	DDH-144 SL 662-688	1.000	0.4980	40	39.70	0.3	4	1.3	3	3.1	0.04	< 0.01	8.20
145	DDH-9 RL 592-642	1.000	0.4980	40	39.30	0.7	9	3.4	6	2.6	0.11	0.08	8.11
147	DDH-15 RL 2079-2111	0.9986	0.4980	40	38.40	1.7	21	< 0.3	21	70	< 0.01	< 0.01	8.81
151	DDH-16 RL 2344-2376	1.008	0.4980	40	35.50	4.2	52	< 0.3	52	173	< 0.01	< 0.01	8.09
153	DDH-21 RL 932-985	0.9950	0.4980	40	39.40	0.8	10	< 0.3	10	33	< 0.01	< 0.01	8.37
155	DDH-21 RL 1216-1272	1.000	0.4980	40	36.40	3.6	45	1.9	43	24	0.06	0.02	8.42
157	DDH-23 RL 1042-1082	0.9950	0.4980	40	38.80	1.4	17	2.2	15	7.7	0.07	0.07	8.19
159	DDH-23 RL 1177-1230	1.008	0.4980	40	39.30	0.4	5	< 0.3	5	17	< 0.01	< 0.01	8.59
165	DDH-24 RL 1126-1161	1.008	0.4980	40	38.75	0.9	11	0.9	10	12	0.03	0.03	8.25
167	DDH-44 RL 667-694	1.008	0.4980	40	39.45	0.2	3	< 0.3	3	10.0	< 0.01	< 0.01	8.88
169	DDH-44 RL 752-779	0.9950	0.4980	40	39.60	0.6	7	< 0.3	7	23	< 0.01	< 0.01	8.49
171	DDH-46 RL 1823-1859	0.9988	0.4980	80	76.40	3.7	46	< 0.3	46	153	< 0.01	< 0.01	9.40
173	DDH-91 RL 583-621	1.008	0.4980	40	39.35	0.3	4	2.2	2	1.8	0.07	0.07	8.25
177	DDH-160 RL 1783-1808	1.008	0.4980	40	36.95	2.8	35	1.3	34	27	0.04	< 0.01	8.80
179	DDH-160 RL 1971-1997	0.9986	0.4980	40	37.25	2.8	35	0.6	34	58	0.02	< 0.01	9.02
181	DDH-163 RL 1721-1747	1.008	0.4980	40	37.15	2.6	32	< 0.3	32	107	< 0.01	< 0.01	9.25
183	DDH-163 RL 1804-1829	0.9950	0.4980	40	35.80	4.4	55	4.1	51	13	0.13	0.07	9.36
185	DDH-172 RL 1298-1315	0.9969	0.4980	80	78.90	1.3	16	0.9	15	18	0.03	< 0.01	8.81
191	DDH-172 RL 1500-1526	1.008	0.4980	40	39.30	0.4	5	< 0.3	5	17	< 0.01	< 0.01	9.32
193	DDH-16 UML 2378-2406	0.9950	0.4980	40	34.70	5.5	68	< 0.3	68	227	< 0.01	< 0.01	8.92
195	DDH-44 UML 955-980	1.028	0.4980	40	39.40	-0.5	-6	< 0.3	-6	-20	< 0.01	< 0.01	8.70
197	DDH-46 UML 1944-1984	0.9986	0.4980	40	32.60	7.4	92	3.8	88	24	0.12	0.10	9.55
199	DDH-46 UML 2026-2060	0.9986	0.4980	40	34.45	5.6	70	0.3	70	233	0.01	< 0.01	8.77
203	DDH-73 UML 1370-1395	0.9986	0.4980	40	29.15	10.9	136	1.9	134	72	0.06	0.06	8.90

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No.	Sample ID	Constant	N HCL added HCL	NaOH added mL	HCL (mL) consumed	NP *	MPA *	CNNP *	NP/MPA *	S %	S= Paste %	pH units	
205	DDH-92 UML 564-573	0.9986	0.4980	40	39.25	0.8	10	< 0.3	10	33	< 0.01	< 0.01	8.71
207	DDH-92 UML 575-589	0.9986	0.4980	40	38.70	1.4	17	< 0.3	17	57	< 0.01	< 0.01	8.41
209	DDH-131 UML 1161-1185	1.005	0.4980	40	37.80	2.0	25	0.9	24	28	0.03	0.03	8.54
211	DDH-131 UML 1161-1186	0.9986	0.4980	40	35.95	4.1	51	0.9	50	57	0.03	< 0.01	8.82
213	DDH-140 UML 2841-2868	0.9988	0.4980	80	79.80	0.3	4	1.9	2	2.1	0.06	< 0.01	8.83
219	DDH-149 UML 1442-1477	1.005	0.4980	40	38.60	1.2	15	< 0.3	15	50	< 0.01	< 0.01	8.93
221	DDH-154 UML 1444-1470	0.9986	0.4980	40	29.95	10.1	126	12.2	114	10	0.39	0.20	9.00
223	DDH-160 UML 2220-2245	0.9986	0.4980	40	36.70	3.4	42	2.5	40	17	0.08	0.08	9.25
225	DDH-163 UML 2371-2396	0.9950	0.4980	40	34.40	5.8	72	2.2	70	33	0.07	0.06	9.40
227	DDH-163 UML 2560-2585	0.9950	0.4980	40	37.70	2.5	31	0.6	30	52	0.02	0.02	9.05
231	DDH-6 LML 865-900	1.005	0.4980	40	39.20	0.6	7	142.2	-135	0.1	4.55	3.79	8.00
233	DDH-9 LML 802-861	1.000	0.4980	40	37.20	2.8	35	147.2	-112	0.2	4.71	4.22	7.84
235	DDH-15 LML 2475-2515	1.028	0.4980	40	34.55	4.5	56	6.3	50	8.9	0.20	0.16	9.08
237	DDH-16 LML 2995-3026	1.028	0.4980	40	34.20	4.8	60	10.6	49	5.7	0.34	0.33	8.87
239	DDH-21 LML 1627-1657	1.000	0.4980	40	38.60	1.4	17	1.3	16	13	0.04	0.03	8.99
245	DDH-42 LML 2234-2271	1.028	0.4980	40	34.40	4.6	57	5.0	52	11	0.16	0.16	8.72
247	DDH-45 LML 2065-2100	1.028	0.4980	40	37.30	1.7	21	0.9	20	23	0.03	0.03	8.63
249	DDH-46 LML 2238-2273	0.9986	0.4980	40	34.30	5.7	71	3.1	68	23	0.10	0.07	8.67
251	DDH-68 LML 1878-1903	1.005	0.4980	40	36.80	3.0	37	0.3	37	123	0.01	< 0.01	8.65
253	DDH-85 LML 964-1004	1.028	0.4980	40	35.00	4.0	50	37.5	13	1.3	1.20	0.93	8.49
257	DDH-139 LML 2933-2960	1.005	0.4980	40	34.40	5.4	67	0.3	67	223	0.01	< 0.01	8.66
259	DDH-154 LML 1500-1526	0.9986	0.4980	40	37.75	2.3	29	0.9	28	32	0.03	0.02	8.88
261	DDH-159 LML 1813-1838	1.008	0.4980	40	35.30	4.4	55	5.3	50	10	0.17	0.12	8.67
263	DDH-163 LML 2850-2921B	0.9950	0.4980	40	30.80	9.4	117	27.5	90	4.3	0.88	0.88	9.02
265	DDH-165 LML 2227-2250	1.028	0.4980	40	37.60	1.3	16	0.6	15	27	0.02	0.02	8.74
271	DDH-176 LML 986-1021	1.000	0.4980	40	39.70	0.3	4	< 0.3	4	13	< 0.01	< 0.01	7.49
273	DDH-270 LML 2047-2073	0.9950	0.4980	40	39.25	0.9	11	< 0.3	11	37	< 0.01	< 0.01	8.22
275	CMC-FT	1.0000	0.4980	40	37.25	2.8	35	946.9	-911	< 1	30.3	24.0	6.61
277	CMC-CT	1.0000	0.4980	40	37.75	2.3	29	925.0	-896	< 1	29.6	28.2	5.59

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No.	Sample ID	Constant	N HCL added HCL mL	NaOH added mL	HCL (mL) consumed	NP *	MPA *	CNNP *	NP/MPA *	S %	S= Paste pH % units
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Constant (C) = (mL acid in blank) / (mL base in blank)
mL acid consumed = (mL acid added) - (mL base added x C)

- *NP(Neutralization Potential)
= (mL acid consumed) x (25) x (N of acid)
- *MPA(Maximum Potential Acidity)
= % Sulphur x 31.25
- *CNNP(Common Net Neutralization Potential)
= NP-MPA

*Results expresses as tonnes CaCO3 eq/1000 tonnes material



Roch Marion

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The analytical results reported herein refer to the samples as received. Reproduction of this analytical report in full or in part is prohibited without prior written approval.

REFERENCES AND METHODOLOGIES

Sulphur (Sulphide)

$$\% \text{ Sulphate S} = \frac{\text{weight of BaSO}_4 \times 0.1374 \times 100}{\text{sample weight (g)}}$$

The factor for converting BaSO₄ to S is 0.1374

$$\% \text{ Sulphide S} = \% \text{ S in residue (step 5)} \times \frac{\text{weight of residue (g)}}{\text{weight of sample (g)}}$$

References:

1. Hildebrand, W.F., G.E.F. Lundell, H.A. Bright and J.I. Hoffman, Applied Inorganic Analysis, 1953, 2nd Edition, John Wiley and Sons Inc., New York, pp. 711-722
2. Kolthoff, I.M., and E.B. Sandell, Textbook of Quantitative Inorganic Analysis, 1948, Revised Edition, The MacMillan Company, New York, pp 329-343
3. Furman, N.H., Scott's Standard Methods of Chemical Analysis, 1962, 6th Edition, Van Nostrand Company Inc., New York, Volume 1, pp. 1003-1011, 1037
4. Ingles, J.C., Manual of Analytical Methods for the Uranium Concentrating Plant, April, 1958, Dept. of Energy, Mines and Resources, Mines Branch, Ottawa, Mines Branch Monograph 866, Method No. S-1, Pt.III
5. LECO Instruction Manual, CS 244-784-000, 1986, Leco Corporation

Acid-Base Accounting and Paste pH

6. Sobek, A.A., W.A. Schullere, J.R. Freeman, and R.M. Smith, Field and Laboratory Methods Applicable to Overburden and Minesoils, 1978, U.S. Environmental Protection Agency. Report No. EPA 600/2-78-054

At the request of Crandon Mining Company, the acid neutralization potential test in the above mentioned reference was modified to reflect the recommendations presented in:

7. Brogton, L.M., R.W. Chambers and A. Robertson. 1992. Minerock Guidelines: Design and Control of Drainage Water Quality. Saskatchewan Environment and Public Safety Report No. 93301. Prince Albert, Saskatchewan.

Appendix 1.5

Skunk Lake Formation 1995 ABA Determinations

Appendix 1.5 Table 1

ABA Determinations of the Randomly Selected Skunk Lake Formation Cores, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of the Skunk Lake Master Composite

Skunk Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 9 362-385	<0.01	<0.01	<0.05	5	1	0.3	0.3	4.7	17	17	3.3	8.69
DDH 23 523-552	0.01	<0.01	0.18	21	4	0.3	0.3	20.7	70	70	13	7.77
DDH 44 160-192	0.02	<0.01	<0.05	7	1	0.6	0.3	6.4	12	23	3.3	8.69
DDH 44 536-575	<0.01	<0.01	<0.05	4	1	0.3	0.3	3.7	13	13	3.3	8.60
DDH 91 247-274	0.01	<0.01	<0.05	4	1	0.3	0.3	3.7	13	13	3.3	8.46
DDH 91 397-447	0.34	0.20	<0.05	11	1	10.6	6.3	0.4	1.0	1.8	0.2	8.93
DDH 92 311-338	0.04	0.03	<0.05	7	1	1.3	0.9	5.7	5.4	7.8	1.1	8.32
DDH 144 662-688	0.04	<0.01	<0.05	4	1	1.3	0.3	2.7	3.1	13	3.3	8.20
Range	<0.01-0.34	<0.01-0.20	<0.05-0.18	4-21	1-4	0.3-10.6	0.3-6.3	0.4-20.7	1.0-70	1.8-70	0.2-13	7.77-8.93
X (n = 8)	0.06	0.04	0.07	8	1	2	1	6.0	17	20	3.8	8.5
σ	0.11	0.07	0.05	6	1	4	2	6.2	22	21	3.9	0.4
Master Composite	0.14	0.13	NA	0	NC	4.4	4.1	-4.4	0	0	NC	8.7

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

NA = not analyzed

NC = not calculated

Appendix 1.5 Table 2

Determination of ABA Variability Within the Randomly Selected Skunk Lake Formation Core DDH 44: 536-575, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of DDH 44: 536-575

Skunk Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 44 538-540	<0.01	<0.01	<0.05	1	1	0.3	0.3	0.7	3.3	3.3	3.3	8.48
DDH 44 548-550	<0.01	<0.01	<0.05	3	1	0.3	0.3	2.7	10	10	3.3	8.52
DDH 44 557-559	<0.01	<0.01	<0.05	1	1	0.3	0.3	0.7	3.3	3.3	3.3	8.69
DDH 44 566-568	<0.01	<0.01	<0.05	4	1	0.3	0.3	3.7	13	13	3.3	8.75
DDH 44 575-577	<0.01	<0.01	<0.05	3	1	0.3	0.3	2.7	10	10	3.3	8.85
Range				1-4				0.7-3.7	3.3-13	3.3-13		8.48-8.85
X (n = 5)	<0.01	<0.01	<0.05	2.4	1	0.3	0.3	2.1	8	8	3.3	8.7
σ				1.3				1.3	4	4		0.2
DDH 44 536-575	<0.01	<0.01	<0.05	4	1	0.3	0.3	3.7	13	13	3.3	8.6

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Appendix 1.5 Table 3

Determination of ABA Variability Within the Randomly Selected Skunk Lake Formation Core DDH 92: 311-338, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of DDH 92: 311-338

Skunk Lake Core	S %	S ₂ %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 92 313-315	0.09	0.06	0.07	4	2	2.8	1.9	1.2	1.4	2.1	1	8.38
DDH 92 322-324	0.01	<0.01	0.15	1	3	0.3	0.3	0.7	3.3	3.3	10	8.81
DDH 92 332-334	0.01	<0.01	0.18	3	4	0.3	0.3	2.7	10	10	13	8.36
Range	0.01-0.09	<0.01-0.06	0.07-0.18	1-4	2-4	0.3-2.8	0.3-1.9	0.7-2.7	1.4-10	2.1-10	1-13	8.36-8.81
X (n = 3)	0.04	0.03	0.13	3	3	1.1	0.8	1.5	4.9	5.1	8	8.5
σ	0.05	0.03	0.06	2	1	1.4	0.9	1.0	4.5	4.3	6	0.2
DDH 92 311-338	0.04	0.03	<0.05	7	1	1.3	0.9	5.7	5.4	7.8	1.1	8.3

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Appendix 1.6

Rice Lake Formation 1995 ABA Determinations

Appendix 1.6 Table 1

ABA Determinations of the Randomly Selected Rice Lake Formation Cores, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of the Rice Lake Master Composite

Rice Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 92 592-642	0.11	0.08	<0.05	9	1	3.4	2.5	5.6	2.6	3.6	0.4	8.11
DDH 15 2079-2111	<0.01	<0.01	0.22	21	5	0.3	0.3	20.7	70	70	17	8.81
DDH 16 2344-2376	<0.01	<0.01	2.64	52	60	0.3	0.3	51.7	173	173	200	8.09
DDH 21 932-985	<0.01	<0.01	0.22	10	5	0.3	0.3	9.7	33	33	17	8.37
DDH 21 1216-1272	0.06	0.02	0.73	45	17	1.9	0.6	43.1	24	75	28	8.42
DDH 23 1042-1082	0.07	0.07	0.15	17	3	2.2	2.2	14.8	7.7	7.7	1.4	8.19
DDH 23 1177-1230	<0.01	<0.01	<0.05	5	1	0.3	0.3	4.7	17	17	3.3	8.59
DDH 24 1126-1161	0.03	0.03	0.11	11	3	0.9	0.9	10.1	12	12	3.3	8.25
DDH 44 667-694	<0.01	<0.01	<0.05	3	1	0.3	0.3	2.7	10	10	3.3	8.88
DDH 44 752-779	<0.01	<0.01	<0.05	7	1	0.3	0.3	6.7	23	23	3.3	8.49
DDH 46 1823-1859	<0.01	<0.01	1.69	46	38	0.3	0.3	45.7	153	153	127	9.40
DDH 91 583-621	0.07	0.07	<0.05	4	1	2.2	2.2	1.8	1.8	1.8	0.4	8.25

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Appendix 1.6 Table 1 (Continued)

Rice Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 160 1783-1808	0.04	<0.01	0.77	35	18	1.3	0.3	33.7	27	117	60	8.80
DDH 160 1971-1997	0.02	<0.01	0.55	35	13	0.6	0.3	34.4	58	117	43	9.02
DDH 163 1721-1747	<0.01	<0.01	0.77	32	18	0.3	0.3	31.7	107	107	60	9.25
DDH 163 1804-1829	0.13	0.07	2.72	55	62	4.1	2.2	50.9	13	25	28	9.36
DDH 172 1298-1315	0.03	<0.01	0.18	16	4	0.9	0.3	15.1	18	53	13	8.81
DDH 172 1500-1526	<0.01	<0.01	<0.05	5	1	0.3	0.3	4.7	17	17	3.3	9.32
Range	<0.01- 0.13	<0.01- 0.08	<0.05- 2.72	3-55	1-62	0.3-4.1	0.3-2.5	1.8-51.7	1.8-173	1.8-173	0.4-200	8.09-9.40
X (n = 18)	0.04	0.03	0.61	23	14	1.1	0.8	22	43	56	34	8.7
σ	0.04	0.03	0.86	18	20	1.2	0.8	18	51	55	52	0.4
Master Composite	0.05	0.05	NA	30	NC	1.6	1.6	28.4	19	19	NC	9.1

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

NA = not analyzed

NC = not calculated

Appendix 1.6 Table 2

Determination of ABA Variability Within the Randomly Selected Rice Lake Formation Core DDH 23: 1042-1082, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of DDH 23: 1042-1082

Rice Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 23 1041-1043	0.05	0.05	0.15	16	3	1.6	1.6	14.4	10	10	1.9	8.45
DDH 23 1050-1052	0.24	0.24	0.40	30	9	7.5	7.5	22.5	4.0	4.0	1.2	8.65
DDH 23 1059-1061	0.03	0.02	0.40	25	9	0.9	0.6	24.1	28	42	15	8.58
DDH 23 1068-1070	0.01	<0.01	0.18	12	4	0.3	0.3	11.7	40	40	13	8.71
DDH 23 1077-1079	0.06	0.04	<0.05	10	1	1.9	1.2	8.1	5.3	8.3	0.8	8.80
Range	0.01-0.24	<0.01-0.24	<0.05-0.40	10-30	1-9	0.3-7.5	0.3-7.5	8.1-24.1	4.0-40	4.0-42	0.8-15	8.45-8.80
X (n = 5)	0.08	0.07	0.24	19	5	2.4	2.2	16	17	21	6.4	8.6
σ	0.09	0.1	0.16	8.6	4	2.9	3.0	6.9	16	18	7.0	0.1
DDH 23 1042-1082	0.07	0.07	0.15	17	3	2.2	2.2	14.8	7.7	7.7	1.4	8.2

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Appendix 1.6 Table 3

Determination of ABA Variability Within the Randomly Selected Rice Lake Formation Core DDH 44: 752-779, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of DDH 44: 752-779

Rice Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 44 754-756	0.02	<0.01	0.11	5	3	0.6	0.3	4.4	8.3	17	10	8.38
DDH 44 764-766	0.01	<0.01	0.07	6	2	0.3	0.3	5.7	20	20	6.7	7.76
DDH 44 774-776	0.01	<0.01	0.11	3	3	0.3	0.3	2.7	10	10	10	8.24
Range	0.01-0.02		0.07-0.11	3-6	2-3	0.3-0.6		2.7-5.7	8.3-20	10-20	6.7-10	7.76-8.38
X (n = 3)	0.01	<0.01	0.10	5	3	0.4	0.3	4.3	13	16	8.9	8.1
σ	0.01		0.02	2	1	0.2		1.5	6.3	5.1	1.9	0.3
DDH 44 752-779	<0.01	<0.01	<0.05	7	1	0.3	0.3	6.7	23	23	3.3	8.5

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Appendix 1.6 Table 4

Determination of ABA Variability Within the Randomly Selected Rice Lake Formation Core DDH 160: 1971-1997, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of DDH 160: 1971-1997

Rice Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 160 1975-1977	0.01	<0.01	0.15	9	3	0.3	0.3	8.7	30	30	10	9.03
DDH 160 1985-1987	0.02	0.01	0.07	17	2	0.6	0.3	16.4	28	57	6.7	9.09
DDH 160 1994-1996	0.01	0.01	0.33	30	8	0.3	0.3	29.7	100	100	27	9.19
Range	0.01-0.02	<0.01-0.01	0.07-0.33	9-30	2-8	0.3-0.6		8.7-29.7	28-100	30-100	6.7-27	9.03-9.19
X (n = 3)	0.01	0.01	0.18	19	4	0.4	0.3	18	53	62	15	9.1
σ	0.01	0.01	0.13	11	3	0.2		11	41	35	11	0.1
DDH 160 1971-1997	0.02	<0.01	0.55	35	13	0.6	0.3	34.4	58	117	43	9.0

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Appendix 1.6 Table 5

Determination of ABA Variability Within the Randomly Selected Rice Lake Formation Core DDH 172: 1500-1526, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of DDH 172: 1500-1526

Rice Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 172 1504-1506	<0.01	<0.01	<0.05	5	1	0.3	0.3	4.7	17	17	3.3	9.09
DDH 172 1513-1515	<0.01	<0.01	<0.05	9	1	0.3	0.3	8.7	30	30	3.3	9.18
DDH 172 1522-1524	<0.01	<0.01	0.26	25	1	0.3	0.3	24.7	83	83	3.3	9.13
Range			<0.05-0.26	5-25				4.7-24.7	17-83	17-83		9.09-9.18
X (n = 3)	<0.01	<0.01	0.12	13	1	0.3	0.3	13	43	43	3.3	9.1
σ			0.12	11				11	35	35		0.1
DDH 172 1500-1526	<0.01	<0.01	<0.05	5	1	0.3	0.3	4.7	17	17	3.3	9.3

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Appendix 1.7

Upper Mole Lake Formation 1995 ABA Determinations

Appendix 1.7 Table 1

ABA Determinations of the Randomly Selected Upper Mole Lake Formation Cores, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of the Upper Mole Lake Master Composite

Upper Mole Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 16 2378-2406	<0.01	<0.01	1.14	68	26	0.3	0.3	67.7	227	227	87	8.92
DDH 44 955-980	<0.01	<0.01	<0.05	-6	1	0.3	0.3	-6.3	-20	-20	3.3	8.70
DDH 46 1944-1984	0.12	0.10	1.32	92	30	3.8	3.1	88.2	24	30	9.7	9.55
DDH 46 2026-2060	0.01	<0.01	3.78	70	86	0.3	0.3	69.7	233	233	287	8.77
DDH 73 1370-1395	0.06	0.06	2.57	136	58	1.9	1.9	134.1	72	72	30	8.90
DDH 92 564-589	<0.01 ^a	<0.01 ^a	0.08 ^a	14 ^a	2 ^a	0.3 ^a	0.3 ^a	13.7 ^a	47 ^a	47 ^a	6.7 ^a	8.56 ^a
DDH 131 1161-1185	0.03 ^b	0.02 ^b	1.10 ^c	38 ^b	25 ^c	0.9 ^b	0.6 ^b	37.1 ^b	42 ^b	63 ^b	42 ^b	8.68 ^b
DDH 140 2841-2868	0.06	<0.01	2.61	4	59	1.9	0.3	2.1	2.1	13	197	8.83
DDH 149 1442-1477	<0.01	<0.01	0.22	15	5	0.3	0.3	14.7	50	50	17	8.93
DDH 154 1444-1470	0.39	0.20	5.03	126	114	12.2	6.3	113.8	10	20	18	9.00
DDH 160 2220-2245	0.08	0.08	0.81	42	18	2.5	2.5	39.5	17	17	7.2	9.25
DDH 163 2371-2396	0.07	0.06	2.17	72	49	2.2	1.9	69.8	33	38	26	9.40

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Appendix 1.7 Table 1 (Continued)

Upper Mole Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 163 2560-2585	0.02	0.02	0.33	31	8	0.6	0.6	30.4	52	52	13	9.05
Range	<0.01-0.39	<0.01-0.20	<0.05-5.03	-6 to 136	1-114	0.3-12.2	0.3-6.3	-6.3 to 134.1	-20 to 233	-20 to 233	3.3-287	8.56-9.55
X (n = 13)	0.07	0.05	1.63	54	37	2.1	1.4	52	61	65	57	9.0
σ	0.10	0.06	1.53	45	35	3.2	1.8	43	79	77	87	0.3
Master Composite	0.10	0.10	NA	48	NC	3.1	3.1	44.9	15	15	NC	9.1

^aAverage values for DDH 92:564-573 and DDH 92:575-589

^bAverage values for DDH 131:1161-1185 and DDH 131:1161-1186

^cValues for DDH 131:1161-1185

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

NA = not analyzed

NC = not calculated

Appendix 1.7 Table 2

Determination of ABA Variability Within the Randomly Selected Upper Mole Lake Formation Core DDH 46: 2026-2060, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of DDH 46: 2026-2060

Upper Mole Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 46 2028-2030	<0.01	<0.01	1.03	39	23	0.3	0.3	38.7	130	130	77	9.20
DDH 46 2037-2039	<0.01	<0.01	1.54	50	35	0.3	0.3	49.7	167	167	117	9.34
DDH 46 2046-2048	0.06	0.03	0.70	39	16	1.9	0.9	37.1	20	43	18	9.24
DDH 46 2055-2057	0.02	<0.01	6.31	161	144	0.6	0.3	160.4	268	537	480	8.72
Range	<0.01-0.06	<0.01-0.03	0.70-6.31	39-161	16-144	0.3-1.9	0.3-0.9	37.1- 160.4	20-268	43-537	18-480	8.72-9.34
X (n = 4)	0.02	0.02	2.40	72	54	0.8	0.4	71	146	219	173	9.1
σ	0.02	0.01	2.63	59	60	0.8	0.3	60	102	218	209	0.3
DDH 46 2026-2060	0.01	<0.01	3.78	70	86	0.3	0.3	69.7	233	233	287	8.8

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Compiled by: JET
Checked by: DJL

Appendix 1.7 Table 3

Determination of ABA Variability Within the Randomly Selected Upper Mole Lake Formation Core DDH 73: 1370-1395, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of DDH 73: 1370-1395

Upper Mole Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 73 1372-1374	0.08	0.08	1.03	32	23	2.5	2.5	29.5	13	13	9.2	9.16
DDH 73 1381-1383	<0.01	<0.01	0.51	21	12	0.3	0.3	20.7	70	70	40	9.24
DDH 73 1390-1392	0.03	0.02	5.40	136	123	0.9	0.6	135.1	151	227	205	9.00
Range	<0.01-0.08	<0.01-0.08	0.51-5.40	21-136	12-123	0.3-2.5	0.3-2.5	20.7-135.1	13-151	13-227	9.2-205	9.00-9.24
X (n = 3)	0.04	0.04	2.31	63	53	1.2	1.1	62	78	103	85	9.1
σ	0.04	0.04	2.69	63	61	1.1	1.2	64	69	111	105	0.1
DDH 73 1370-1395	0.06	0.06	2.57	136	58	1.9	1.9	134.1	72	72	30	8.9

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

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Appendix 1.7 Table 4

Determination of ABA Variability Within the Randomly Selected Upper Mole Lake Formation Core DDH 131: 1161-1185, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of DDH 131: 1161-1185

Upper Mole Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 131 1163-1165	<0.01	<0.01	0.22	16	5	0.3	0.3	15.7	53	53	17	9.23
DDH 131 1171-1173	0.19	0.14	0.11	9	3	5.9	4.4	3.1	1.5	2.0	0.68	8.91
DDH 131 1180-1182	0.17	0.14	2.13	60	48	5.3	4.4	54.7	11	14	11	8.62
Range	<0.01-0.19	<0.01-0.14	0.11-2.13	9-60	3-48	0.3-5.9	0.3-4.4	3.1-54.7	1.5-53	2.0-53	0.68-17	8.62-9.23
X (n = 3)	0.12	0.10	0.82	28	19	3.8	3.0	24	22	23	9.6	8.9
σ	0.10	0.08	1.14	28	25	3.1	2.4	27	27	27	8.2	0.3
DDH 131 1161-1185	0.03	0.02	1.10	38	25	0.9	0.6	37.1	42	63	42	8.7

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Appendix 1.8

Lower Mole Lake Formation 1995 ABA Determinations

Appendix 1.8 Table 1

ABA Determinations of the Randomly Selected Lower Mole Lake Formation Cores, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of the Lower Mole Lake Master Composite

Lower Mole Lake Core	S %	S ²⁻ %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 6 865-900	4.55	3.79	0.07	7	2	142.2	118.4	-135.2	0.05	0.06	0.02	8.00
DDH 9 802-861	4.71	4.22	0.48	35	11	147.2	131.9	-112.2	0.24	0.27	0.08	7.84
DDH 15 2475-2515	0.20	0.16	2.83	56	64	6.3	5.0	49.7	8.9	11	13	9.08
DDH 16 2995-3026	0.34	0.33	2.02	60	46	10.6	10.3	49.4	5.7	5.8	4.5	8.87
DDH 21 1627-1657	0.04	0.03	0.40	17	9	1.3	0.9	15.7	13	19	10	8.99
DDH 42 2234-2271	0.16	0.16	1.65	57	38	5.0	5.0	52.0	11	11	7.6	8.72
DDH 45 2065-2100	0.03	0.03	0.48	21	11	0.9	0.9	20.1	23	23	12	8.63
DDH 46 2238-2273	0.10	0.07	3.19	71	73	3.1	2.2	67.9	23	32	33	8.67
DDH 68 1878-1903	0.01	<0.01	1.54	37	35	0.3	0.3	36.7	123	123	117	8.65
DDH 85 964-1004	1.20	0.93	2.28	50	52	37.5	29.1	12.5	1.3	1.7	1.8	8.49
DDH 139 2933-2960	0.01	<0.01	1.87	67	43	0.3	0.3	66.7	223	223	143	8.66
DDH 154 1500-1526	0.03	0.02	0.40	29	9	0.9	0.6	28.1	32	48	15	8.88

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Appendix 1.8 Table 1 (Continued)

Lower Mole Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 159 1813-1838	0.17	0.12	2.42	55	55	5.3	3.7	49.7	10	15	15	8.67
DDH 163 2850-2921	0.88	0.88	<0.05	117	1	27.5	27.5	89.5	4.2	4.2	0.04	9.02
DDH 165 2227-2250	0.02	0.02	0.77	16	18	0.6	0.6	15.4	27	27	30	8.74
DDH 176 986-1021	<0.01	<0.01	0.18	4	4	0.3	0.3	3.7	13	13	13	7.49
DDH 270 2047-2073	<0.01	<0.01	3.27	11	74	0.3	0.3	10.7	37	37	247	8.22
Range	<0.01-4.71	<0.01-4.22	<0.05-3.27	4-117	1-74	0.3-147.2	0.3-131.9	-135.2 to 89.5	0.05-223	0.06-223	0.02-247	7.49-9.08
X (n = 17)	0.73	0.64	1.41	42	32	23	20	19	33	35	39	8.6
σ	1.50	1.30	1.13	29	26	47	41	59	57	56	67	0.4
Master Composite	0.34	0.27	NA	46	NC	11	8	35	4.2	5.8	NC	8.8

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

NA = not analyzed

NC = not calculated

Appendix 1.8 Table 2

Determination of ABA Variability Within the Randomly Selected Lower Mole Lake Formation Core DDH 16: 2995-3026, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of DDH 16: 2995-3026

Lower Mole Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	$\frac{NP}{AP}$	$\frac{NP}{SAP}$	$\frac{NP-CO_2}{SAP}$	Paste pH
DDH 16 2079-2099	0.01	<0.01	2.50	92	57	0.3	0.3	91.7	307	307	190	8.90
DDH 16 3007-3009	0.03	0.03	1.54	59	35	0.9	0.9	58.1	66	66	39	8.89
DDH 16 3017-3019	0.01	0.01	1.36	42	31	0.3	0.3	41.7	140	140	103	8.88
Range	0.01-0.03	<0.01-0.03	1.36-2.50	42-92	31-57	0.3-0.9	0.3-0.9	41.7-91.7	66-307	66-307	39-190	8.88-8.90
X (n = 3)	0.02	0.02	1.80	64	41	0.5	0.5	64	171	171	111	8.9
σ	0.01	0.01	0.61	25	14	0.3	0.3	25	123	123	76	0.01
DDH 16 2995-3026	0.34	0.33	2.02	60	46	10.6	10.3	49.4	5.7	5.8	4.5	8.9

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

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Appendix 1.8 Table 3

Determination of ABA Variability Within the Randomly Selected Lower Mole Lake Formation Core DDH 45: 065-2100, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of DDH 45: 2065-2100

Lower Mole Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 45 2067-2069	0.06	0.06	2.57	73	58	1.9	1.9	71.1	38	38	30	8.79
DDH 45 2077-2079	0.05	0.05	0.29	17	7	1.6	1.6	15.4	11	11	4.4	9.08
DDH 45 2086-2088	0.03	0.03	0.22	30	5	0.9	0.9	29.1	33	33	5.6	8.74
DDH 45 2098-2100	0.04	0.03	0.55	29	13	1.3	0.9	27.7	22	32	14	8.69
Range	0.03-0.06	0.03-0.06	0.22-2.57	17-73	5-58	0.9-1.9	0.9-1.9	15.4-71.1	11-38	11-38	4.4-30	8.69-9.08
X (n = 4)	0.04	0.04	0.91	37	21	1.4	1.3	36	26	28	14	8.8
σ	0.01	0.02	1.12	25	25	0.4	0.5	24	12	12	12	0.2
DDH 45 2065-2100	0.03	0.03	0.48	21	11	0.9	0.9	20.1	23	23	12	8.6

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Appendix 1.8 Table 4

Determination of ABA Variability Within the Randomly Selected Lower Mole Lake Formation Core DDH 68: 1878-1903, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of DDH 68: 1878-1903

Lower Mole Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 68 1880-1882	0.01	0.01	1.10	31	25	0.3	0.3	30.7	103	103	83	8.83
DDH 68 1889-1891	<0.01	<0.01	0.92	26	21	0.3	0.3	25.7	87	87	70	8.85
DDH 68 1898-1900	0.02	<0.01	3.19	47	73	0.6	0.3	46.4	78	157	243	9.25
Range	<0.01-0.02	<0.01-0.01	0.92-3.19	26-47	21-73	0.3-0.6		25.7-46.4	78-103	87-157	70-243	8.83-9.25
X (n = 3)	0.01	0.01	1.74	35	40	0.4	0.3	34	89	116	132	9.0
σ	0.01		1.26	11	29	0.2		11	13	37	96	0.2
DDH 68 1878-1903	0.01	<0.01	1.54	37	35	0.3	0.3	36.7	123	123	117	8.6

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

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Appendix 1.8 Table 5

Determination of ABA Variability Within the Randomly Selected Lower Mole Lake Formation Core DDH 176: 986-1021, Calculated Statistical Parameters, and a Comparison With the ABA Determinations of DDH 176: 986-1021

Lower Mole Lake Core	S %	S ² %	CO ₂ %	NP kg/tonne	NP-CO ₂ kg/tonne	AP kg/tonne	SAP kg/tonne	Net NP kg/tonne	<u>NP</u> AP	<u>NP</u> SAP	<u>NP-CO₂</u> SAP	Paste pH
DDH 176 993-995	0.09	0.07	<0.05	24	1	2.8	2.2	21.2	8.6	11	0.4	8.25
DDH 176 1002-1004	0.24	0.16	<0.05	0	1	7.5	5.0	-7.5	0	0	0.2	7.16
DDH 176 1010-1012	0.34	0.25	0.22	0	5	10.6	7.8	-10.6	0	0	0.6	7.07
DDH 176 1019-1021	0.15	0.09	0.11	5	3	4.7	2.8	0.3	1.1	1.8	1.1	8.52
Range	0.09-0.34	0.07-0.25	<0.05-0.22	0-24	1-5	2.8-10.6	2.2-7.8	-10.6 to 21.2	0-8.6	0-11	0.2-1.1	7.07-8.52
X (n = 4)	0.21	0.14	0.11	7.2	2	6.4	4.4	0.8	2.4	3.2	0.6	7.8
σ	0.11	0.08	0.08	11	2	3.4	2.5	14	4.1	5.3	0.4	0.7
DDH 176 986-1021	<0.01	<0.01	0.18	4	4	0.3	0.3	3.7	13	13	13	7.5

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Appendix 1.9

1994 Waste Rock Classification (WRC) Evaluations

Waste Rock Classification (WRC) Evaluations

DDH: 155 Main int.: 125-150 Eval. int.: 130-131

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 25%

(SL)

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	=	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	=	<u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	=	<u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	=	<u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	=	<u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	=	<u>4</u>
Weathering/slaking	<u>2</u>	X	<u>2</u>	=	<u>4</u>
			Total =		<u>12</u>

DDH: 155 Main int. 280-308 Eval. int. 305-306

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 15%

(SL)

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	=	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	=	<u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	=	<u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	=	<u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	=	<u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	=	<u>4</u>
Weathering/slaking	<u>2</u>	X	<u>2</u>	=	<u>4</u>
			Total =		<u>12</u>

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06/94

Waste Rock Classification (WRC) Evaluations

DDH: 155 Main int.: 335-350 Eval. int.: 349-350

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 40%

(SL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>10</u>

DDH: 155 Main int. 490-510 Eval. int. 492-493

Est. sulfide content in eval. int. Average

Est. % of main int. accounted for by eval. int. 50%

(SL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>10</u>

ASJ
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 155 Main int.: 615-635 Eval. int.: 627-628

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 25%

(SL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>10</u>

DDH: 155 Main int. 735-760 Eval. int. 756-757

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 20%

(SL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>10</u>

822
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 155 Main int.: 890-915 Eval. int.: 893-894

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 25%

(RL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>10</u>

DDH: 155 Main int. 1040-1060 Eval. int. 1053-1054

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 25%

(RL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>10</u>

JED
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 155 Main int.: 1185-1210 Eval. int.: 1194-1195

Est. sulfide content in eval. int. Average
 Est. % of main int. accounted for by eval. int. 50%

RL

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>10</u>

DDH: 155 Main int. 1340-1360 Eval. int. 1342-1343

Est. sulfide content in eval. int. Average
 Est. % of main int. accounted for by eval. int. 50%

RL

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>10</u>

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06/94

Waste Rock Classification (WRC) Evaluations

DDH: 155 Main int.: 1490-1510 Eval. int.: 1509-1510

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 40%

(RL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>10</u>

DDH: 155 Main int. 1640-1675 Eval. int. 1661-1662

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 15%

(RL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>20</u>

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06/94

Waste Rock Classification (WRC) Evaluations

DDH: 155 Main int.: 1790-1810 Eval. int.: 1808-1809

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 25%

(RL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>4</u>

DDH: 155 Main int. 1940-1960 Eval. int. 1962-1963

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 25%

(RL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>14</u>

JSD
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 155 Main int.: 2080-2105 Eval. int.: 2089-2090

Est. sulfide content in eval. int. Average
Est. % of main int. accounted for by eval. int. 60%

RL

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>10</u>

DDH: 155 Main int. 2240-2260 Eval. int. 2241-2242

Est. sulfide content in eval. int. Average
Est. % of main int. accounted for by eval. int. 60%

RL

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>3</u>	X	<u>-4</u>	= <u>-12</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>4</u>

82
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 155 Main int.: _____ Eval. int.: 1549-1550

Est. sulfide content in eval. int.

Est. % of main int. accounted for by eval. int.

(RL)

Requested by
WDNR

Factor	Relative Rating	WRC Weight	Potential
Sulfide type	1	X 6	= 6
Sulfide surface area exposed	3	X 5	= 15
Alkali type	3	X -4	= -12
Alkali surface area exposed	3	X -3	= -9
Grain size	2	X 2	= 4
Weathering/slaking	1	X 2	= 2
Total =			<u>6</u>

DDH: 155 Main int. _____ Eval. int. 1582-1583

Est. sulfide content in eval. int.

Est. % of main int. accounted for by eval. int.

(RL)

Requested by
WDNR

Factor	Relative Rating	WRC Weight	Potential
Sulfide type	1	X 6	= 6
Sulfide surface area exposed	3	X 5	= 15
Alkali type	3	X -4	= -12
Alkali surface area exposed	3	X -3	= -9
Grain size	2	X 2	= 4
Weathering/slaking	1	X 2	= 2
Total =			<u>6</u>

82
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 44 Main int.: 310-340 Eval. int.: 329-330

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 35%

(SL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>14</u>

DDH: 44 Main int. 530-560 Eval. int. 555-556

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 30%

(SL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	= <u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>12</u>

JSD
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 44 Main int.: 869-890 Eval. int.: 883-884

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 20%

ML

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	=	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	=	<u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	=	<u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	=	<u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	=	<u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	=	<u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	=	<u>2</u>
			Total =		<u>16</u>

DDH: 74 Main int. 330-360 Eval. int. 352-353

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 20%

SL

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	=	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	=	<u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	=	<u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	=	<u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	=	<u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	=	<u>4</u>
Weathering/slaking	<u>2</u>	X	<u>2</u>	=	<u>4</u>
			Total =		<u>14</u>

827
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 74 Main int.: 560-590 Eval. int.: 570-571

Est. sulfide content in eval. int. Average

Est. % of main int. accounted for by eval. int. 50%

RL

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	= <u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>9</u>

DDH: 242 Main int. 605-635 Eval. int. 615-616

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 10%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	= <u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>12</u>

027
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 98 Main int.: 525-560 Eval. int.: 556-557

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 25%

(SL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	= <u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>12</u>

DDH: 21 Main int. 1120-1150 Eval. int. 1122-1123

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 5%

(RL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>17</u>

852
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 21 Main int.: 1520-1550 Eval. int.: 1527-1528

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 20%

(ML)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	<u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	<u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	<u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	<u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	<u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	<u>2</u>
			Total =	<u>6</u>

DDH: 160 Main int. 2000-2030 Eval. int. 2020-2021

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 10%

(RL)

Alternate eval. int. suggested by WDR

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	<u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	<u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	<u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	<u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	<u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	<u>2</u>
			Total =	<u>16</u>

82)
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 160 Main int.: 2420-2450 Eval. int.: 2421-2422

Est. sulfide content in eval. int. Average

Est. % of main int. accounted for by eval. int. 85%

(ML)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>17</u>

DDH: 160 Main int. 2420-2450 Eval. int. 2434-2435

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 15%

(ML)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>17</u>

JR
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 6 Main int.: 740-780 Eval. int.: 775-776

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 20%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>14</u>

DDH: 133 Main int. 1050-1240 Eval. int. 1224-1225

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 30%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	= <u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>12</u>

J.S.J
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 138 Main int.: 1770-1820 Eval. int.: 1797-1798

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 5%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	= <u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>12</u>

DDH: 37 Main int. 2160-2200 Eval. int. 2184-2185

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 20%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>10</u>

JSD
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 85 Main int.: 800-840 Eval. int.: 836-837

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 35%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>14</u>

DDH: 269 Main int. 865-940 Eval. int. 896-897

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 20%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	= <u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	= <u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>16</u>

82
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 165 Main int.: 2240-2290 Eval. int.: 2289-2290

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 10%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>14</u>

DDH: 42 Main int. 2210-2250 Eval. int. 2235-2236

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 20%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	= <u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>12</u>

827
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 128 Main int.: 2100-2130 Eval. int.: 2112-2113

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 8%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	= <u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	= <u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>16</u>

DDH: 35 Main int. 2270-2350 Eval. int. 2315-2316

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 5%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	= <u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>12</u>

JSD
04/94

Waste Rock Classification (WRC) Evaluations

DDH: 68 Main int.: 1930-2020 Eval. int.: 1971-1972

Est. sulfide content in eval. int. Average
Est. % of main int. accounted for by eval. int. 60%

ML

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	<u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	<u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	<u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	<u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	<u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	<u>2</u>
			Total =	<u>14</u>

DDH: 271 Main int. 2195-2250 Eval. int. 2209-2210

Est. sulfide content in eval. int. Highest
Est. % of main int. accounted for by eval. int. 20%

ML

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	<u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	<u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	<u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	<u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	<u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	<u>2</u>
			Total =	<u>14</u>

JR
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 270 Main int.: 2070-2165 Eval. int.: 2082-2083

Est. sulfide content in eval. int. Average
Est. % of main int. accounted for by eval. int. 100%

ML

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	=	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	=	<u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	=	<u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	=	<u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	=	<u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	=	<u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	=	<u>2</u>
			Total =		<u>12</u>

DDH: 159 Main int. 1750-1900 Eval. int. 1767-1768

Est. sulfide content in eval. int. Highest
Est. % of main int. accounted for by eval. int. 25%

ML

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	=	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	=	<u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	=	<u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	=	<u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	=	<u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	=	<u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	=	<u>2</u>
			Total =		<u>11</u>

82
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 45 Main int.: 1730-1770 Eval. int.: 1767-1768

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 20%

(ML)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	= <u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>11</u>

DDH: 21 Main int. 1620-1670 Eval. int. 1647-1648

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 15%

(ML)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>14</u>

827
0494

Waste Rock Classification (WRC) Evaluations

DDH: 16 Main int.: 2300-2380 Eval. int.: 2325-2326

Est. sulfide content in eval. int. Average
 Est. % of main int. accounted for by eval. int. 60%

(RL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>10</u>

DDH: 176 Main int. 880-950 Eval. int. 926-927

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 10%

(ML)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>17</u>

JL
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 142 Main int.: 700-800 Eval. int.: 714-715

Est. sulfide content in eval. int. Average

Est. % of main int. accounted for by eval. int. 50%

SL

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>1</u>
			Total =	<u>10</u>

DDH: 142 Main int. 700-800 Eval. int. 791-793

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 50%

SL

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>5</u>	X	<u>5</u>	= <u>25</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>30</u>

82
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 144 Main int.: 660-750 Eval. int.: 722-723

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 10%

(SL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>3</u>	X	<u>-4</u>	= <u>-12</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>-4</u>

DDH: 149 Main int. 1100-1150 Eval. int. 1119-1120

Est. sulfide content in eval. int. Average
 Est. % of main int. accounted for by eval. int. 65%

(RL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>14</u>

JR
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 149 Main int.: 1620-1670 Eval. int.: 1641-1642

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 2%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	= <u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	= <u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>6</u>

DDH: 132 Main int. 1130-1180 Eval. int. 1139-1140

Est. sulfide content in eval. int. Average

Est. % of main int. accounted for by eval. int. 75%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>14</u>

fd
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 132 Main int.: 1130-1180 Eval. int.: 1133-1133.5

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. <1%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>17</u>

DDH: 23 Main int. 1500-1600 Eval. int. 1549-1550

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 20%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	= <u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	= <u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>16</u>

JED
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 23 Main int.: 930-1050 Eval. int.: 974-975

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 1-2%

RL

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>20</u>

DDH: 172 Main int. 1070-1100 Eval. int. 1093-1094

Est. sulfide content in eval. int. Average

Est. % of main int. accounted for by eval. int. 100%

RL

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	= <u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>19</u>

ESD
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 91 Main int.: 949-981 Eval. int.: 949-950

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 15%

(ML)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	<u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	<u>15</u>
Alkali type	<u>2</u>	X	<u>-4</u>	<u>-8</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	<u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	<u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	<u>2</u>
			Total =	<u>10</u>

DDH: 20 Main int. 700-750 Eval. int. 707-708

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 10%

(ML)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	<u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	<u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	<u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	<u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	<u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	<u>2</u>
			Total =	<u>14</u>

JED
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 73 Main int.: 1500-1600 Eval. int.: 1549-1550

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 4%

ML

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	=	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	=	<u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	=	<u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	=	<u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	=	<u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	=	<u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	=	<u>2</u>
			Total =		<u>16</u>

DDH: 140 Main int. 2300-2500 Eval. int. 2361-2369

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 5%

RL

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	=	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	=	<u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	=	<u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	=	<u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	=	<u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	=	<u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	=	<u>2</u>
			Total =		<u>22</u>

SD
02/94

Waste Rock Classification (WRC) Evaluations

DDH: 154 Main int.: 1590-1650 Eval. int.: 1595-1596

Est. sulfide content in eval. int. Highest
Est. % of main int. accounted for by eval. int. 10%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	= <u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>11</u>

DDH: 92 Main int. 700-780 Eval. int. 734-735

Est. sulfide content in eval. int. Highest
Est. % of main int. accounted for by eval. int. <1%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>14</u>

JED
06/04

Waste Rock Classification (WRC) Evaluations

DDH: 92 Main int.: 700-780 Eval. int.: 725-726

Est. sulfide content in eval. int. Average
Est. % of main int. accounted for by eval. int. 50%

ML

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	= <u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	= <u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>16</u>

DDH: 24 Main int. 940-1170 Eval. int. 1028-1029

Est. sulfide content in eval. int. Highest
Est. % of main int. accounted for by eval. int. <1%

RL

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	= <u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	= <u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>6</u>

ED
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 24 Main int.: 940-1170 Eval. int.: 1132-1133

Est. sulfide content in eval. int. Average
 Est. % of main int. accounted for by eval. int. 75%

RL

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>14</u>

DDH: 143 Main int. 700-770 Eval. int. 748-749

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 15%

RL

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>14</u>

82
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 143 Main int.: 1070-1120 Eval. int.: 1110-1111

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 2%

(ML)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	= <u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	= <u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>16</u>

DDH: 46 Main int. 1800-1980 Eval. int. 1834-1835

Est. sulfide content in eval. int. Average
 Est. % of main int. accounted for by eval. int. 60%

(RL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	= <u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>9</u>

57
02/94

Waste Rock Classification (WRC) Evaluations

DDH: 46 Main int.: 1800-2000⁺ Eval. int.: 2009-2010

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 1%

(ML)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	= <u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	= <u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>16</u>

DDH: 46 Main int. 2200-2320 Eval. int. 2295-2296

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 3%

(ML)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	= <u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>11</u>

723
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 9 Main int.: 139-190 Eval. int.: 139-140

Est. sulfide content in eval. int. Average

Est. % of main int. accounted for by eval. int. 50%

(SL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>14</u>

DDH: 9 Main int. 139-190 Eval. int. 159-160

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 15%

(SL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	= <u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	= <u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>16</u>

62
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 9 Main int.: 300-400 Eval. int.: 339-340

Est. sulfide content in eval. int. High
 Est. % of main int. accounted for by eval. int. 20%

(SL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	= <u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	= <u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>6</u>

DDH: 9 Main int. 300-400 Eval. int. 380-381

Est. sulfide content in eval. int. Average
 Est. % of main int. accounted for by eval. int. 80%

(SL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	= <u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>12</u>

CSJ
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 131 Main int.: 1160-1221 Eval. int.: 1207-1208

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 5%

ML

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	=	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	=	<u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	=	<u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	=	<u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	=	<u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	=	<u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	=	<u>2</u>
			Total =		<u>14</u>

DDH: 131 Main int. 1160-1221 Eval. int. 1168-1169

Est. sulfide content in eval. int. Average

Est. % of main int. accounted for by eval. int. 95%

ML

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	=	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	=	<u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	=	<u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	=	<u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	=	<u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	=	<u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	=	<u>2</u>
			Total =		<u>12</u>

82
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 131 Main int.: 1221-1316 Eval. int.: 1234-1235

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. 1%

(ML)

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	= <u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>19</u>

DDH: 131 Main int. 1221-1316 Eval. int. 1302-1303

Est. sulfide content in eval. int. Average
 Est. % of main int. accounted for by eval. int. 59%

(ML)

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
Total =				<u>7</u>

JSD
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 131 Main int.: 1316-1410 Eval. int.: 1346-1347

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 4%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	= <u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>19</u>

DDH: 131 Main int. 1410-1503 Eval. int. 1469-1470

Est. sulfide content in eval. int. Average

Est. % of main int. accounted for by eval. int. 100%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	= <u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>9</u>

J2
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 163 Main int.: 1750-1950 Eval. int.: 1782-1783

Est. sulfide content in eval. int. Average
 Est. % of main int. accounted for by eval. int. 100%

(RL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>7</u>

DDH: 163 Main int. 1750-1950 Eval. int. 1835-1836

Est. sulfide content in eval. int. Highest
 Est. % of main int. accounted for by eval. int. <1%

(RL)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>14</u>

82
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 163 Main int.: 1750-1950 Eval. int.: 1874-1875

Est. sulfide content in eval. int. Average (2nd sample)

Est. % of main int. accounted for by eval. int. 100%

RL

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	= <u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	= <u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>6</u>

DDH: 98 Main int. 1280-1330 Eval. int. 1304-1305

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 10%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	= <u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>4</u>	X	<u>-3</u>	= <u>-12</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>16</u>

JS?
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 23 Main int.: 1400-1460 Eval. int.: 1456-1457

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 20%

ML

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>2</u>	X	<u>5</u>	= <u>10</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>12</u>

DDH: 98 Main int. 820-850 Eval. int. 844-845

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 50%

RL

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>3</u>	X	<u>-3</u>	= <u>-9</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>14</u>

85)
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 21 Main int.: 1753-1756 Eval. int.: 1754-1755

Est. sulfide content in eval. int.

Est. % of main int. accounted for by eval. int.

(CR)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>3</u>	X	<u>-4</u>	= <u>-12</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>9</u>

DDH: 23 Main int. 1492-1496 Eval. int. 1492.5-1495.5

Est. sulfide content in eval. int.

Est. % of main int. accounted for by eval. int.

(CR)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	= <u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>25</u>

82
04/94

Waste Rock Classification (WRC) Evaluations

DDH: 35 Main int.: 2374-2376 Eval. int.: 2375-2375.5

Est. sulfide content in eval. int.

Est. % of main int. accounted for by eval. int.

CR

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	= <u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>25</u>

DDH: 73 Main int. 1580-1583 Eval. int. 1581.5-1582

Est. sulfide content in eval. int.

Est. % of main int. accounted for by eval. int.

CR

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>17</u>

DEJ
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 128 Main int.: 2311-2313 Eval. int.: 2312-2312.5

Est. sulfide content in eval. int.

Est. % of main int. accounted for by eval. int.

(CR)

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	=	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	=	<u>6</u>
Sulfide surface area exposed	<u>5</u>	X	<u>5</u>	=	<u>25</u>
Alkali type	<u>1</u>	X	<u>-4</u>	=	<u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	=	<u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	=	<u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	=	<u>2</u>
				Total =	<u>30</u>

DDH: 133 Main int. 1297-1299 Eval. int. 1297.5-1298

Est. sulfide content in eval. int.

Est. % of main int. accounted for by eval. int.

(CR)

<u>Factor</u>	<u>Relative Rating</u>		<u>WRC Weight</u>	=	<u>Potential</u>
Sulfide type	<u>1</u>	X	<u>6</u>	=	<u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	=	<u>20</u>
Alkali type	<u>2</u>	X	<u>-4</u>	=	<u>-8</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	=	<u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	=	<u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	=	<u>2</u>
				Total =	<u>18</u>

JE
06/24

Waste Rock Classification (WRC) Evaluations

DDH: 143 Main int.: 1127-1130 Eval. int.: 1128.5-1129

Est. sulfide content in eval. int.

Est. % of main int. accounted for by eval. int.

CR

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	= <u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>3</u>	X	<u>2</u>	= <u>6</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>27</u>

DDH: 159 Main int. 1916-1919 Eval. int. 1917-1918

Est. sulfide content in eval. int.

Est. % of main int. accounted for by eval. int.

CR

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>5</u>	X	<u>5</u>	= <u>25</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>3</u>	X	<u>2</u>	= <u>6</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>32</u>

52
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 248 Main int.: 909-912 Eval. int.: 910-911

Est. sulfide content in eval. int.

Est. % of main int. accounted for by eval. int.

(CR)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	= <u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>3</u>	X	<u>2</u>	= <u>6</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>19</u>

DDH: 249 Main int. 1995-1998 Eval. int. 1996.5-1997

Est. sulfide content in eval. int.

Est. % of main int. accounted for by eval. int.

(CR)

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	= <u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>3</u>	X	<u>2</u>	= <u>6</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>27</u>

JR
06/94

Waste Rock Classification (WRC) Evaluations

DDH: 251 Main int.: 1141-1143 Eval. int.: 1142-1142.5

Est. sulfide content in eval. int.

Est. % of main int. accounted for by eval. int.

CR

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>4</u>	X	<u>5</u>	= <u>20</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>2</u>	X	<u>-3</u>	= <u>-6</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>22</u>

DDH: 131 Main int. _____ Eval. int. 579-579.5

Est. sulfide content in eval. int.

Est. % of main int. accounted for by eval. int.

Misc. Sample

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	= <u>6</u>
Sulfide surface area exposed	<u>1</u>	X	<u>5</u>	= <u>5</u>
Alkali type	<u>1</u>	X	<u>-4</u>	= <u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	= <u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	= <u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	= <u>2</u>
			Total =	<u>10</u>

Waste Rock Classification (WRC) Evaluations

DDH: 155 Main int.: 1640-1675 Eval. int.: 1661-1662

Est. sulfide content in eval. int. Highest

Est. % of main int. accounted for by eval. int. 15

RL

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	<u>1</u>	X	<u>6</u>	<u>6</u>
Sulfide surface area exposed	<u>3</u>	X	<u>5</u>	<u>15</u>
Alkali type	<u>1</u>	X	<u>-4</u>	<u>-4</u>
Alkali surface area exposed	<u>1</u>	X	<u>-3</u>	<u>-3</u>
Grain size	<u>2</u>	X	<u>2</u>	<u>4</u>
Weathering/slaking	<u>1</u>	X	<u>2</u>	<u>2</u>
			Total =	<u>20</u>

DDH: _____ Main int. _____ Eval. int. _____

Est. sulfide content in eval. int. _____

Est. % of main int. accounted for by eval. int. _____

Factor	Relative Rating		WRC Weight	Potential
Sulfide type	_____	X	<u>6</u>	_____
Sulfide surface area exposed	_____	X	<u>5</u>	_____
Alkali type	_____	X	<u>-4</u>	_____
Alkali surface area exposed	_____	X	<u>-3</u>	_____
Grain size	_____	X	<u>2</u>	_____
Weathering/slaking	_____	X	<u>2</u>	_____
			Total =	_____

Appendix 2

1995 Bulk Chemical Composition Data

- Appendix 2.1** **Lakefield Research Bulk Chemical Composition of the ABA Samples**
- Appendix 2.2** **Skunk Lake Formation Bulk Chemical Composition Data**
- Appendix 2.3** **Rice Lake Formation Bulk Chemical Composition Data**
- Appendix 2.4** **Upper Mole Lake Formation Bulk Chemical Composition Data**
- Appendix 2.5** **Lower Mole Lake Formation Bulk Chemical Composition Data**

Appendix 2.1

Lakefield Research Bulk Chemical Composition of the ABA Samples

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Crandon Mining Company

7 N. Brown St., 3rd Flr.

Rhineland, WI, 54501-3161 - U.S.A.

Attn : K. W. Collison

Fax : (715)365-1457

Lakefield, September 8, 1995

Date Rec. : September 1, 1995

LR. Ref. : SEP9001.R95

Reference : PO#95-0017

Project : LR

CERTIFICATE OF ANALYSIS

No.	Sample ID	Al g/t	As g/t	Ba g/t	Be g/t	Ca g/t	Cd g/t	Co g/t	Cr g/t	Cu g/t	Fe g/t	Mg g/t	Mn g/t	Mo g/t
1	DDH 44 538-540	58600	< 50	383	< 0.5	956	4.0	19	24	37	33100	12400	381	< 5.0
2	DDH 44 548-550	58700	< 50	381	< 0.5	928	4.0	12	11	28	36300	13600	397	< 5.0
3	DDH 44 557-559	59300	< 50	361	< 0.5	1440	3.4	11	14	26	36400	18000	457	< 5.0
4	DDH 44 566-568	68200	< 50	433	< 0.5	685	3.4	8.0	< 2.0	8.5	34700	18100	472	< 5.0
5	DDH 44 575-577	65200	< 50	404	< 0.5	548	3.4	11	< 2.0	13	32900	18800	458	< 5.0
6	DDH 92 313-315	65000	66	458	< 0.5	854	4.0	16	14	1180	35300	17700	534	< 5.0
7	DDH 92 322-324	65000	< 50	462	< 0.5	828	3.4	8.1	< 2.0	31	33400	17200	513	< 5.0

No.	Sample ID	Na g/t	Ni g/t	P g/t	Pb g/t	Sb g/t	Se g/t	Te g/t	Zn g/t	K g/t	As g/t	Se g/t	Sb g/t	Hg g/t	CO2 %
1	DDH 44 538-540	1350	28	155	20	< 10	< 5.0	< 10	144	21100	43.6	< 5.0	< 5.0	< 0.3	< 0.05
2	DDH 44 548-550	1370	30	96	24	< 10	< 5.0	< 10	136	20400	21.0	< 5.0	< 5.0	< 0.3	< 0.05
3	DDH 44 557-559	1290	29	68	25	< 10	< 5.0	< 10	149	19600	8.3	< 5.0	< 5.0	< 0.3	< 0.05
4	DDH 44 566-568	1420	< 2.0	176	25	< 10	< 5.0	< 10	88	23800	6.0	< 5.0	< 5.0	< 0.3	< 0.05
5	DDH 44 575-577	1210	7.8	97	27	< 10	< 5.0	< 10	101	22600	13.5	< 5.0	< 5.0	< 0.3	< 0.05
6	DDH 92 313-315	1340	46	163	29	< 10	< 5.0	< 10	125	22000	65.6	< 5.0	< 5.0	< 0.3	0.07
7	DDH 92 322-324	1330	20	157	29	< 10	< 5.0	< 10	62	22800	5.9	< 5.0	< 5.0	< 0.3	0.15

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SEP9001.R95

No.	Sample ID	Al g/t	As g/t	Ba g/t	Be g/t	Ca g/t	Cd g/t	Co g/t	Cr g/t	Cu g/t	Fe g/t	Mg g/t	Mn g/t	Mo g/t
8	DDH 92 332-334	77900	< 50	368	< 0.5	578	11	16	58	174	77800	27500	888	< 5.0
9	DDH-23 1041-1043	99700	< 50	471	0.8	1510	14	39	8.2	849	104000	34000	2270	< 5.0
10	DDH-23 1050-1052	106000	< 50	533	0.7	2430	48	51	35	124	108000	34900	2500	< 5.0
11	DDH-23 1059-1061	98100	< 50	745	1.0	3360	15	40	2.1	191	92400	32500	2350	< 5.0
12	DDH-23 1068-1070	78700	< 50	392	< 0.5	2020	15	38	32	72	104000	42400	2260	< 5.0
13	DDH-23 1077-1079	57300	< 50	272	< 0.5	1660	9.4	24	2.1	553	65000	27800	1240	< 5.0
14	DDH-44 754-756	71200	< 50	482	< 0.5	1380	5.6	15	9.7	11	38100	21200	480	< 5.0
15	DDH-44 764-766	67100	< 50	252	0.7	1910	7.4	15	39	72	46100	20200	478	< 5.0
16	DDH-44 774-776	68700	< 50	540	0.7	1370	4.5	15	< 2.0	12	38100	10700	288	< 5.0
17	DDH-160 1975-1977	85000	< 50	358	0.8	1840	11	33	< 2.0	116	72900	58700	804	< 5.0
18	DDH-160 1985-1987	85800	< 50	468	< 0.5	3270	9.0	30	47	124	73800	53500	909	< 5.0
19	DDH-160 1994-1996	93500	< 50	434	0.7	5460	9.6	26	< 2.0	16	60200	40900	738	< 5.0

No.	Sample ID	Na g/t	Ni g/t	P g/t	Pb g/t	Sb g/t	Se g/t	Te g/t	Zn g/t	K g/t	As g/t	Se g/t	Sb g/t	Hg g/t	CO2 %
8	DDH 92 332-334	1210	10	137	32	< 10	< 5.0	< 10	129	20500	8.7	< 5.0	< 5.0	< 0.3	0.18
9	DDH-23 1041-1043	3170	25	230	46	< 10	< 5.0	< 10	425	31600	< 5.0	< 5.0	< 5.0	< 0.3	0.15
10	DDH-23 1050-1052	16900	44	205	48	< 10	< 5.0	< 10	7390	22000	38.8	< 5.0	< 5.0	0.5	0.40
11	DDH-23 1059-1061	8210	40	238	44	< 10	< 5.0	< 10	550	29900	12.3	< 5.0	< 5.0	< 0.3	0.40
12	DDH-23 1068-1070	904	19	616	33	< 10	< 5.0	< 10	280	10400	9.9	< 5.0	< 5.0	< 0.3	0.18
13	DDH-23 1077-1079	985	< 2.0	420	30	< 10	< 5.0	< 10	366	9840	5.2	< 5.0	< 5.0	< 0.3	< 0.05
14	DDH-44 754-756	1460	5.1	516	26	< 10	< 5.0	< 10	78	24700	9.4	< 5.0	< 5.0	< 0.3	0.11
15	DDH-44 764-766	1160	31	456	25	< 10	< 5.0	< 10	353	23200	11.0	< 5.0	< 5.0	< 0.3	0.07
16	DDH-44 774-776	2010	< 2.0	487	28	< 10	< 5.0	< 10	68	27300	33.4	< 5.0	< 5.0	< 0.3	0.11
17	DDH-160 1975-1977	1100	10	444	35	< 10	< 5.0	< 10	94	12400	< 5.0	< 5.0	< 5.0	< 0.3	0.15
18	DDH-160 1985-1987	1190	29	646	34	< 10	< 5.0	< 10	109	15100	< 5.0	< 5.0	< 5.0	< 0.3	0.07
19	DDH-160 1994-1996	21800	< 2.0	460	39	< 10	< 5.0	< 10	168	12300	6.5	< 5.0	< 5.0	< 0.3	0.33

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SEP9001.R95

No.	Sample ID	Al g/t	As g/t	Ba g/t	Be g/t	Ca g/t	Cd g/t	Co g/t	Cr g/t	Cu g/t	Fe g/t	Mg g/t	Mn g/t	Mo g/t
20	DDH-172 1504-1506	70000	< 50	469	< 0.5	1620	3.9	11	103	16	29500	26200	490	< 5.0
21	DDH-172 1513-1515	68900	< 50	509	< 0.5	2590	3.4	9.3	8.3	21	24800	25000	561	< 5.0
22	DDH-172 1522-1524	68700	< 50	529	< 0.5	4670	1.1	8.4	3.5	17	20100	19200	601	< 5.0
23	DDH-46 2028-2030	64400	< 50	207	< 0.5	10600	7.3	19	87	17	62700	41300	1450	67
24	DDH-46 2037-2039	69500	< 50	289	< 0.5	17400	5.7	14	< 2.0	49	42000	22800	1190	< 5.0
25	DDH-46 2046-2048	71100	< 50	396	< 0.5	10000	8.0	29	< 2.0	130	63900	33400	1090	< 5.0
26	DDH-46 2055-2057	81200	< 50	148	< 0.5	57700	10	41	8.2	126	79100	31100	1290	< 5.0
27	73-DDH 1372-1374	61300	< 50	450	< 0.5	7630	5.7	13	14	941	49400	16500	1430	< 5.0
28	73-DDH 1381-1383	67700	< 50	547	< 0.5	5050	6.8	13	2.5	28	47100	19000	964	< 5.0
29	73-DDH 1390-1392	64200	< 50	49	< 0.5	40700	8.4	27	< 2.0	66	58000	22400	1330	< 5.0
30	DDH-131 1163-1165	66300	< 50	545	< 0.5	4170	8.4	22	< 2.0	22	59300	22400	1050	< 5.0
31	DDH-131 1171-1173	94500	< 50	552	0.5	2610	13	35	34	11	95900	33500	1590	< 5.0

4

No.	Sample ID	Na g/t	Ni g/t	P g/t	Pb g/t	Sb g/t	Se g/t	Te g/t	Zn g/t	K g/t	As g/t	Se g/t	Sb g/t	Hg g/t	CO2 %
20	DDH-172 1504-1506	1590	50	524	25	< 10	< 5.0	< 10	85	19300	< 5.0	< 5.0	< 5.0	< 0.3	< 0.05
21	DDH-172 1513-1515	1500	14	464	29	< 10	< 5.0	< 10	87	22200	< 5.0	< 5.0	< 5.0	< 0.3	< 0.05
22	DDH-172 1522-1524	2900	13	436	25	< 10	< 5.0	< 10	71	23500	< 5.0	< 5.0	< 5.0	< 0.3	0.26
23	DDH-46 2028-2030	2360	24	762	31	< 10	< 5.0	< 10	110	9000	< 5.0	< 5.0	< 5.0	< 0.3	1.03
24	DDH-46 2037-2039	16900	< 2.0	820	27	< 10	< 5.0	< 10	68	12000	< 5.0	< 5.0	< 5.0	< 0.3	1.54
25	DDH-46 2046-2048	7940	54	623	27	< 10	< 5.0	< 10	90	12100	< 5.0	< 5.0	< 5.0	< 0.3	0.70
26	DDH-46 2055-2057	20300	66	795	35	< 10	< 5.0	< 10	92	5740	< 5.0	< 5.0	< 5.0	< 0.3	6.31
27	73-DDH 1372-1374	1910	30	608	27	< 10	< 5.0	< 10	74	18600	< 5.0	< 5.0	< 5.0	< 0.3	1.03
28	73-DDH 1381-1383	1700	18	650	24	< 10	< 5.0	< 10	72	20900	< 5.0	< 5.0	< 5.0	< 0.3	0.51
29	73-DDH 1390-1392	26900	28	342	25	< 10	< 5.0	< 10	86	2880	5.4	< 5.0	< 5.0	< 0.3	5.40
30	DDH-131 1163-1165	1480	2.8	789	24	< 10	< 5.0	< 10	119	18200	< 5.0	< 5.0	< 5.0	< 0.3	0.22
31	DDH-131 1171-1173	8650	70	504	37	< 10	< 5.0	< 10	172	20800	< 5.0	< 5.0	< 5.0	< 0.3	0.11

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No.	Sample ID	Al g/t	As g/t	Ba g/t	Be g/t	Ca g/t	Cd g/t	Co g/t	Cr g/t	Cu g/t	Fe g/t	Mg g/t	Mn g/t	Mo g/t
32	DDH-131 1180-1182	80600	< 50	444	0.5	12100	15	41	17	40	98600	42000	2140	< 5.0
33	DDH-16 2079-2099	77400	< 50	250	< 0.5	13900	11	31	22	8.5	79800	33600	1810	< 5.0
34	DDH-16 3007-3009	72500	< 50	209	< 0.5	10800	9.1	24	64	62	76200	28600	1680	< 5.0
35	DDH-16 3017-3019	73100	< 50	209	< 0.5	10600	8.9	21	27	47	66100	18300	1240	< 5.0
36	DDH 45 2067-2069	59400	< 50	160	< 0.5	14000	11	21	7.2	59	68200	21100	1970	< 5.0
37	DDH 45 2077-2079	62600	< 50	171	< 0.5	4910	12	25	4.3	308	80500	20900	1190	< 5.0
38	DDH 45 2086-2088	58000	< 50	127	< 0.5	4650	12	24	< 2.0	110	80300	19200	1140	< 5.0
39	DDH 45 2098-2100	57900	< 50	196	< 0.5	5860	13	26	< 2.0	58	81500	19600	1300	< 5.0
40	DDH-68 1880-1882	52900	< 50	171	< 0.5	6180	9.2	20	32	66	67400	17700	1280	< 5.0
41	DDH-68 1889-1891	61200	< 50	175	< 0.5	6910	10	19	< 2.0	9.8	66500	17800	1130	< 5.0
42	DDH-68 1898-1900	64000	< 50	220	< 0.5	5240	11	21	46	13	75500	19000	1160	< 5.0
43	DDH-176 993-995	61900	< 50	232	0.8	1660	9.0	16	27	13	45300	23900	220	< 5.0

No.	Sample ID	Na g/t	Ni g/t	P g/t	Pb g/t	Sb g/t	Se g/t	Te g/t	Zn g/t	K g/t	As g/t	Se g/t	Sb g/t	Hg g/t	CO2 %
32	DDH-131 1180-1182	1890	50	475	38	< 10	< 5.0	< 10	198	15700	7.2	< 5.0	< 5.0	< 0.3	2.13
33	DDH-16 2079-2099	9190	< 2.0	884	31	< 10	< 5.0	< 10	134	12000	< 5.0	< 5.0	< 5.0	< 0.3	2.50
34	DDH-16 3007-3009	11900	21	1100	32	< 10	< 5.0	< 10	151	9430	8.9	< 5.0	< 5.0	< 0.3	1.54
35	DDH-16 3017-3019	18000	20	1500	32	< 10	< 5.0	< 10	161	11600	5.0	< 5.0	< 5.0	< 0.3	1.36
36	DDH 45 2067-2069	12000	16	1040	29	< 10	< 5.0	< 10	349	8200	< 5.0	< 5.0	< 5.0	< 0.3	2.57
37	DDH 45 2077-2079	9570	12	1170	28	< 10	< 5.0	< 10	222	6720	< 5.0	< 5.0	< 5.0	< 0.3	0.29
38	DDH 45 2086-2088	8710	< 2.0	1040	23	< 10	< 5.0	< 10	285	5160	< 5.0	< 5.0	< 5.0	< 0.3	0.22
39	DDH 45 2098-2100	6970	< 2.0	1180	25	< 10	< 5.0	< 10	258	6190	5.8	< 5.0	< 5.0	< 0.3	0.55
40	DDH-68 1880-1882	8570	2.7	1040	23	< 10	< 5.0	< 10	138	5920	< 5.0	< 5.0	< 5.0	< 0.3	1.10
41	DDH-68 1889-1891	13900	< 2.0	1260	25	< 10	< 5.0	< 10	148	6600	5.9	< 5.0	< 5.0	< 0.3	0.92
42	DDH-68 1898-1900	9740	< 2.0	1340	29	< 10	< 5.0	< 10	180	11500	15.7	< 5.0	< 5.0	< 0.3	3.19
43	DDH-176 993-995	1550	4.3	755	37	< 10	< 5.0	< 10	1030	15100	8.3	< 5.0	< 5.0	< 0.3	< 0.05

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SEP9001.R95

No.	Sample ID	Al g/t	As g/t	Ba g/t	Be g/t	Ca g/t	Cd g/t	Co g/t	Cr g/t	Cu g/t	Fe g/t	Mg g/t	Mn g/t	Mo g/t
44	DDH-176 1002-1004	82200	< 50	442	1.3	544	4.0	7.4	23	73	23500	13300	74	< 5.0
45	DDH-176 1010-1012	62000	< 50	313	1.0	601	4.5	9.4	15	11	26500	10800	143	< 5.0
46	DDH-176 1019-1021	71100	< 50	219	0.7	2020	7.3	15	13	9.3	47000	24500	208	< 5.0
47	DDH-9 SL 362-385	64400	< 50	368	< 0.5	618	8.6	12	29	13	46000	21100	649	< 5.0
48	DDH-23 SL 523-552	59000	< 50	337	0.6	1910	7.6	13	< 2.0	11	44000	19000	787	< 5.0
49	DDH-44 SL 160-192	62300	< 50	373	0.5	366	6.3	8.0	42	353	39600	20400	394	< 5.0
50	DDH-44 SL 536-575	59300	< 50	388	0.6	618	6.4	15	48	27	31600	14300	374	< 5.0
51	DDH-91 SL 247-274	60300	< 50	253	0.5	482	12	18	3.1	2695	60900	20300	798	< 5.0
52	DDH-91 SL 397-447	67100	< 50	323	0.7	1350	9.9	15	< 2.0	131	59700	25500	928	< 5.0
53	DDH-92 SL 311-338	59100	< 50	382	0.6	535	6.3	13	18	458	38400	17300	526	< 5.0
54	DDH-144 SL 662-688	57300	< 50	243	< 0.5	565	9.2	17	9.5	351	59000	22600	1030	< 5.0
55	DDH-9 RL 592-642	71200	< 50	331	0.6	1680	9.2	19	3.4	35	54500	32200	679	< 5.0

No.	Sample ID	Na g/t	Ni g/t	P g/t	Pb g/t	Sb g/t	Se g/t	Te g/t	Zn g/t	K g/t	As g/t	Se g/t	Sb g/t	Hg g/t	CO2 %
44	DDH-176 1002-1004	2690	< 2.0	118	52	< 10	< 5.0	< 10	159	32600	15.3	< 5.0	< 5.0	< 0.3	< 0.05
45	DDH-176 1010-1012	2110	< 2.0	199	31	< 10	< 5.0	< 10	998	22900	5.3	< 5.0	< 5.0	< 0.3	0.22
46	DDH-176 1019-1021	2120	< 2.0	907	30	< 10	< 5.0	< 10	509	19500	19.0	< 5.0	< 5.0	< 0.3	0.11
47	DDH-9 SL 362-385	1530	13	145	26	< 10	< 5.0	< 10	137	19100	6.6	< 5.0	< 5.0	< 0.3	< 0.05
48	DDH-23 SL 523-552	1130	< 2.0	214	25	< 10	< 5.0	< 10	131	17700	< 5.0	< 5.0	< 5.0	< 0.3	0.18
49	DDH-44 SL 160-192	1200	12	100	23	< 10	< 5.0	< 10	152	20600	23.3	< 5.0	< 5.0	< 0.3	< 0.05
50	DDH-44 SL 536-575	1450	27	159	21	< 10	< 5.0	< 10	107	22200	11.5	< 5.0	< 5.0	< 0.3	< 0.05
51	DDH-91 SL 247-274	1100	6.0	78	22	< 10	< 5.0	< 10	230	15700	< 5.0	< 5.0	< 5.0	< 0.3	< 0.05
52	DDH-91 SL 397-447	1210	< 2.0	418	28	< 10	< 5.0	< 10	132	17200	12.3	< 5.0	< 5.0	< 0.3	< 0.05
53	DDH-92 SL 311-338	1270	6.8	137	26	< 10	< 5.0	< 10	75	20300	16.1	< 5.0	< 5.0	< 0.3	< 0.05
54	DDH-144 SL 662-688	1040	5.4	144	25	< 10	< 5.0	< 10	169	13900	7.8	< 5.0	< 5.0	< 0.3	< 0.05
55	DDH-9 RL 592-642	1220	4.0	632	29	< 10	< 5.0	< 10	185	18500	< 5.0	< 5.0	< 5.0	< 0.3	< 0.05

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No.	Sample ID	Al g/t	As g/t	Ba g/t	Be g/t	Ca g/t	Cd g/t	Co g/t	Cr g/t	Cu g/t	Fe g/t	Mg g/t	Mn g/t	Mo g/t
56	DDH-15 RL 2079-2111	75200	< 50	281	0.6	4620	9.8	23	28	24	54100	48100	1180	< 5.0
57	DDH-16 RL 2344-2376	75900	< 50	310	0.6	13900	15	30	11	14	94800	29200	1310	< 5.0
58	DDH-21 RL 932-985	68300	< 50	435	0.7	2070	6.8	13	12	28	41400	22800	779	< 5.0
59	DDH-21 RL 1216-1272	75300	< 50	211	0.8	4790	10	26	5.2	60	72900	53800	1120	< 5.0
60	DDH-23 RL 1042-1082	81200	< 50	466	0.7	2460	17	32	< 2.0	318	82700	32400	1880	< 5.0
61	DDH-23 RL 1177-1230	75200	< 50	208	0.5	1400	11	23	24	39	75700	46600	1230	< 5.0
62	DDH-24 RL 1126-1161	71800	< 50	626	0.5	2340	9.2	18	45	224	52700	16700	951	< 5.0
63	DDH-44 RL 667-694	65600	< 50	367	< 0.5	1210	7.4	12	< 2.0	6.2	51200	25700	640	< 5.0
64	DDH-44 RL 752-779	67300	< 50	391	< 0.5	1400	6.8	15	261	24	46300	21700	522	< 5.0
65	DDH-46 RL 1823-1859	68100	< 50	221	< 0.5	14700	5.7	15	108	9.1	38700	22100	1130	< 5.0
66	DDH-91 RL 583-621	79100	< 50	366	0.5	1950	11	16	116	3004	75200	26900	961	< 5.0
67	DDH-160 RL 1783-1808	75000	< 50	191	< 0.5	6230	16	39	525	55	102000	53800	1690	< 5.0

No.	Sample ID	Na g/t	Ni g/t	P g/t	Pb g/t	Sb g/t	Se g/t	Te g/t	Zn g/t	K g/t	As g/t	Se g/t	Sb g/t	Hg g/t	CO2 %
56	DDH-15 RL 2079-2111	7870	27	366	31	< 10	< 5.0	< 10	166	12700	< 5.0	< 5.0	< 5.0	< 0.3	0.22
57	DDH-16 RL 2344-2376	10300	< 2.0	672	28	< 10	< 5.0	< 10	76	9900	< 5.0	< 5.0	< 5.0	< 0.3	2.64
58	DDH-21 RL 932-985	1460	3.7	466	25	< 10	< 5.0	< 10	69	23400	< 5.0	< 5.0	< 5.0	< 0.3	0.22
59	DDH-21 RL 1216-1272	1060	< 2.0	677	33	< 10	< 5.0	< 10	102	11100	6.9	< 5.0	< 5.0	< 0.3	0.73
60	DDH-23 RL 1042-1082	5680	< 2.0	405	36	< 10	< 5.0	< 10	1340	20000	11.6	< 5.0	< 5.0	< 0.3	0.15
61	DDH-23 RL 1177-1230	1170	4.0	438	31	< 10	< 5.0	< 10	253	12000	< 5.0	< 5.0	< 5.0	< 0.3	< 0.05
62	DDH-24 RL 1126-1161	1460	13	508	30	< 10	< 5.0	< 10	161	25500	< 5.0	< 5.0	< 5.0	< 0.3	0.11
63	DDH-44 RL 667-694	1290	< 2.0	452	26	< 10	< 5.0	< 10	109	18500	< 5.0	< 5.0	< 5.0	< 0.3	< 0.05
64	DDH-44 RL 752-779	1470	< 2.0	467	24	< 10	< 5.0	< 10	124	22000	8.7	< 5.0	< 5.0	< 0.3	< 0.05
65	DDH-46 RL 1823-1859	21200	< 2.0	411	25	< 10	< 5.0	< 10	96	12300	< 5.0	< 5.0	< 5.0	< 0.3	1.69
66	DDH-91 RL 583-621	1250	< 2.0	656	34	< 10	< 5.0	< 10	142	18900	< 5.0	< 5.0	< 5.0	< 0.3	< 0.05
67	DDH-160 RL 1783-1808	940	< 2.0	693	32	< 10	< 5.0	< 10	112	6940	< 5.0	< 5.0	< 5.0	< 0.3	0.77

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No.	Sample ID	Al g/t	As g/t	Ba g/t	Be g/t	Ca g/t	Cd g/t	Co g/t	Cr g/t	Cu g/t	Fe g/t	Mg g/t	Mn g/t	Mo g/t
68	DDH-160 RL 1971-1997	81900	< 50	357	0.6	5500	9.1	28	184	45	63100	47600	866	< 5.0
69	DDH-163 RL 1721-1747	60900	< 50	391	< 0.5	10300	4.6	12	570	16	41000	18100	1160	< 5.0
70	DDH-163 RL 1804-1829	72800	< 50	359	< 0.5	16400	8.0	24	119	66	57000	25100	1960	< 5.0
71	DDH-172 RL 1298-1315	74800	< 50	224	< 0.5	2700	12	23	61	163	73800	49000	1770	< 5.0
72	DDH-172 RL 1500-1526	68700	< 50	513	0.5	2660	4.6	11	304	19	28200	24200	564	< 5.0
73	DDH-16 UML 2378-2406	68500	< 50	474	< 0.5	8460	10	28	164	20	81400	22300	1200	< 5.0
74	DDH-44 UML 955-980	71600	< 50	301	< 0.5	1460	10	20	129	16	69000	32500	771	< 5.0
75	DDH-46 UML 1944-1984	75900	< 50	422	0.5	15100	4.0	12	202	10	38400	10500	855	< 5.0
76	DDH-46 UML 2026-2060	69300	< 50	243	< 0.5	23300	6.9	22	88	44	58600	31200	1200	< 5.0
77	DDH-73 UML 1370-1395	65200	< 50	322	< 0.5	26800	6.9	19	123	404	51900	21400	1450	< 5.0
78	DDH-92 UML 564-573	90500	< 50	369	0.8	1090	9.7	19	33	8.3	78300	40000	1220	< 5.0
79	DDH-92 UML 575-589	47000	< 50	101	0.7	951	6.9	14	96	7.8	50800	23900	786	< 5.0

No.	Sample ID	Na g/t	Ni g/t	P g/t	Pb g/t	Sb g/t	Se g/t	Te g/t	Zn g/t	K g/t	As g/t	Se g/t	Sb g/t	Hg g/t	CO2 %
68	DDH-160 RL 1971-1997	12000	< 2.0	556	36	< 10	< 5.0	< 10	114	11600	< 5.0	< 5.0	< 5.0	< 0.3	0.55
69	DDH-163 RL 1721-1747	11700	< 2.0	447	25	< 10	< 5.0	< 10	108	15900	< 5.0	< 5.0	< 5.0	< 0.3	0.77
70	DDH-163 RL 1804-1829	19100	< 2.0	511	34	< 10	< 5.0	< 10	171	10300	< 5.0	< 5.0	< 5.0	< 0.3	2.72
71	DDH-172 RL 1298-1315	1030	< 2.0	565	31	< 10	< 5.0	< 10	505	12100	< 5.0	< 5.0	< 5.0	< 0.3	0.18
72	DDH-172 RL 1500-1526	1790	< 2.0	497	26	< 10	< 5.0	< 10	75	24300	< 5.0	< 5.0	< 5.0	< 0.3	< 0.05
73	DDH-16 UML 2378-2406	1640	< 2.0	634	28	< 10	< 5.0	< 10	92	14700	< 5.0	< 5.0	< 5.0	< 0.3	1.14
74	DDH-44 UML 955-980	1240	< 2.0	526	30	< 10	< 5.0	< 10	183	15200	< 5.0	< 5.0	< 5.0	< 0.3	< 0.05
75	DDH-46 UML 1944-1984	34700	< 2.0	472	29	< 10	< 5.0	< 10	90	10300	< 5.0	< 5.0	< 5.0	< 0.3	1.32
76	DDH-46 UML 2026-2060	12300	< 2.0	743	28	< 10	< 5.0	< 10	80	9940	< 5.0	< 5.0	< 5.0	< 0.3	3.78
77	DDH-73 UML 1370-1395	13300	< 2.0	524	26	< 10	< 5.0	< 10	82	14800	< 5.0	< 5.0	< 5.0	< 0.3	2.57
78	DDH-92 UML 564-573	1380	< 2.0	296	36	< 10	< 5.0	< 10	193	19300	< 5.0	< 5.0	< 5.0	< 0.3	< 0.05
79	DDH-92 UML 575-589	920	< 2.0	191	23	< 10	< 5.0	< 10	120	5110	5.7	< 5.0	< 5.0	< 0.3	0.11

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No.	Sample ID	Al g/t	As g/t	Ba g/t	Be g/t	Ca g/t	Cd g/t	Co g/t	Cr g/t	Cu g/t	Fe g/t	Mg g/t	Mn g/t	Mo g/t
80	DDH-131 UML 1161-1185	71000	< 50	408	0.9	7920	10	29	20	27	76200	32500	1430	< 5.0
81	DDH-140 UML 2841-2868	75100	< 50	370	0.6	18000	7.4	23	< 2.0	32	61700	18500	1090	< 5.0
82	DDH-149 UML 1442-1477	68200	< 50	113	0.6	2980	9.7	20	8.2	33	64600	61300	992	< 5.0
83	DDH-154 UML 1444-1470	68400	< 50	233	< 0.5	19200	8.0	22	< 2.0	105	56800	33200	1200	< 5.0
84	DDH-160 UML 2220-2245	70900	< 50	270	< 0.5	8790	6.9	16	6.7	589	55300	24500	679	< 5.0
85	DDH-163 UML 2371-2396	65500	< 50	146	< 0.5	23500	5.7	23	25	873	57400	18200	870	< 5.0
86	DDH-163 UML 2560-2585	56900	< 50	396	< 0.5	3240	6.3	21	< 2.0	70	59100	20800	746	< 5.0
87	DDH-6 LML 865-900	73400	< 50	196	0.6	2340	12	24	7.4	38	69200	50100	312	< 5.0
88	DDH-9 LML 802-861	45800	730	296	0.9	3120	10	8.0	< 2.0	88	52500	12500	135	< 5.0
89	DDH-15 LML 2475-2515	74000	< 50	249	2.4	13600	11	30	< 2.0	88	69400	27500	1200	< 5.0
90	DDH-16 LML 2995-3026	71100	< 50	152	< 0.5	12800	11	25	< 2.0	212	77600	29200	1410	< 5.0
91	DDH-21 LML 1627-1657	74700	< 50	249	< 0.5	4700	10	24	< 2.0	208	68000	44700	1120	< 5.0

No.	Sample ID	Na g/t	Ni g/t	P g/t	Pb g/t	Sb g/t	Se g/t	Te g/t	Zn g/t	K g/t	As g/t	Se g/t	Sb g/t	Hg g/t	CO2 %
80	DDH-131 UML 1161-1185	2190	19	538	29	< 10	< 5.0	< 10	155	13700	< 5.0	< 5.0	< 5.0	< 0.3	1.10
81	DDH-140 UML 2841-2868	24000	< 2.0	856	33	< 10	< 5.0	< 10	126	6170	< 5.0	< 5.0	< 5.0	< 0.3	2.61
82	DDH-149 UML 1442-1477	810	21	630	29	< 10	< 5.0	< 10	113	5030	< 5.0	< 5.0	< 5.0	< 0.3	0.22
83	DDH-154 UML 1444-1470	10800	3.8	507	57	< 10	< 5.0	< 10	177	12500	< 5.0	< 5.0	< 5.0	< 0.3	5.03
84	DDH-160 UML 2220-2245	14000	11	688	31	< 10	< 5.0	< 10	94	8910	< 5.0	< 5.0	< 5.0	< 0.3	0.81
85	DDH-163 UML 2371-2396	19800	29	657	25	< 10	< 5.0	< 10	74	3440	< 5.0	< 5.0	< 5.0	< 0.3	2.17
86	DDH-163 UML 2560-2585	950	8.1	516	27	< 10	< 5.0	< 10	121	10300	< 5.0	< 5.0	< 5.0	< 0.3	0.33
87	DDH-6 LML 865-900	1410	11	875	42	< 10	< 5.0	< 10	897	12500	34.3	< 5.0	< 5.0	0.4	0.07
88	DDH-9 LML 802-861	1060	< 2.0	114	303	25	< 5.0	< 10	2410	18900	729	< 5.0	23	1.8	0.48
89	DDH-15 LML 2475-2515	11600	< 2.0	605	39	< 10	< 5.0	< 10	196	11300	11.3	< 5.0	< 5.0	< 0.3	2.83
90	DDH-16 LML 2995-3026	11100	< 2.0	1050	28	< 10	< 5.0	< 10	193	8110	5.5	< 5.0	< 5.0	< 0.3	2.02
91	DDH-21 LML 1627-1657	1070	11	911	30	< 10	< 5.0	< 10	137	10900	< 5.0	< 5.0	< 5.0	< 0.3	0.40

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No.	Sample ID	Al g/t	As g/t	Ba g/t	Be g/t	Ca g/t	Cd g/t	Co g/t	Cr g/t	Cu g/t	Fe g/t	Mg g/t	Mn g/t	Mo g/t
92	DDH-42 LML 2234-2271	70000	< 50	217	< 0.5	16100	9.7	21	< 2.0	20	71300	25800	1370	< 5.0
93	DDH-45 LML 2065-2100	56000	< 50	136	< 0.5	6210	9.7	25	138	81	74900	19600	1220	< 5.0
94	DDH-46 LML 2238-2273	73500	< 50	295	< 0.5	20500	9.1	27	69	51	67300	19100	1020	< 5.0
95	DDH-68 LML 1878-1903	62300	< 50	178	< 0.5	7550	9.0	20	93	33	71000	19300	1160	< 5.0
96	DDH-85 LML 964-1004	69800	72	329	0.9	10700	6.3	15	73	18	43600	24700	552	< 5.0
97	DDH-139 LML 2933-2960	77300	< 50	233	< 0.5	16000	9.6	23	60	36	72400	35800	1400	< 5.0
98	DDH-154 LML 1500-1526	70300	< 50	192	1.8	4140	11	25	19	87	69200	43700	1210	< 5.0
99	DDH-159 LML 1813-1838	75900	< 50	374	1.4	10100	6.2	21	< 2.0	30	41900	13900	1080	< 5.0
100	DDH-163 LML 2850-2921B	78000	< 50	336	0.9	17900	6.8	22	< 2.0	57	45900	45200	1020	< 5.0
101	DDH-165 LML 2227-2250	71300	< 50	196	0.6	5990	14	30	62	21	86600	39800	1300	< 5.0
102	DDH-176 LML 986-1021	76200	< 50	295	1.6	1110	11	16	43	55	45200	21500	199	< 5.0
103	DDH-270 LML 2047-2073	79700	< 50	577	0.7	4310	3.9	15	14	11	25100	9860	309	< 5.0

No.	Sample ID	Na g/t	Ni g/t	P g/t	Pb g/t	Sb g/t	Se g/t	Te g/t	Zn g/t	K g/t	As g/t	Se g/t	Sb g/t	Hg g/t	CO2 %
92	DDH-42 LML 2234-2271	11500	< 2.0	1140	27	< 10	< 5.0	< 10	173	7810	11.2	< 5.0	< 5.0	< 0.3	1.65
93	DDH-45 LML 2065-2100	8900	25	993	27	< 10	< 5.0	< 10	248	5410	< 5.0	< 5.0	< 5.0	< 0.3	0.48
94	DDH-46 LML 2238-2273	17800	14	628	29	< 10	< 5.0	< 10	90	7870	< 5.0	< 5.0	< 5.0	< 0.3	3.19
95	DDH-68 LML 1878-1903	9830	< 2.0	1100	29	< 10	< 5.0	< 10	160	6630	6.5	< 5.0	< 5.0	< 0.3	1.54
96	DDH-85 LML 964-1004	3530	7.1	406	29	< 10	< 5.0	< 10	331	21600	72.1	< 5.0	< 5.0	< 0.3	2.28
97	DDH-139 LML 2933-2960	13800	9.6	1060	32	< 10	< 5.0	< 10	131	12000	< 5.0	< 5.0	< 5.0	< 0.3	1.87
98	DDH-154 LML 1500-1526	960	10	634	29	< 10	< 5.0	< 10	196	8830	< 5.0	< 5.0	< 5.0	< 0.3	0.40
99	DDH-159 LML 1813-1838	12000	< 2.0	632	30	< 10	< 5.0	< 10	103	16500	35.3	< 5.0	< 5.0	< 0.3	2.42
100	DDH-163 LML 2850-2921B	2540	4.6	353	32	< 10	< 5.0	< 10	160	19900	37.5	< 5.0	< 5.0	< 0.3	< 0.05
101	DDH-165 LML 2227-2250	1490	17	670	30	< 10	< 5.0	< 10	219	8000	5.1	< 5.0	< 5.0	< 0.3	0.77
102	DDH-176 LML 986-1021	2080	26	322	49	< 10	< 5.0	< 10	1610	21900	28.5	< 5.0	< 5.0	< 0.3	0.18
103	DDH-270 LML 2047-2073	2840	2.3	1510	27	< 10	< 5.0	< 10	69	25100	6.9	< 5.0	< 5.0	< 0.3	3.27

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119	CMC-FT	17200	3110	37	< 0.5	6600	52	86	< 2.0	523	274000	10500	518	< 5.0
121	CMC-CT	17900	3088	38	< 0.5	6620	51	83	< 2.0	489	267000	10800	523	< 5.0

No.	Sample ID	Na g/t	Ni g/t	P g/t	Pb g/t	Sb g/t	Se g/t	Te g/t	Zn g/t	K g/t	As g/t	Se g/t	Sb g/t	Hg g/t	CO2 %
119	CMC-FT	848	< 2.0	123	886	< 10	< 20	< 10	6210	4250	3000	18.9	23	2.7	1.76
121	CMC-CT	907	< 2.0	117	845	< 10	< 20	< 10	5450	4500	2680	52.4	25	2.3	1.58

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Roch Marion

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Appendix 2.2

Skunk Lake Formation Bulk Chemical Composition Data

Appendix 2.2 Table 1

Bulk Chemical Composition of the Randomly Selected Skunk Lake Formation Cores, Calculated Statistical Parameters, and a Comparison With the Composition of the Skunk Lake Master Composite

Skunk Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 9 362-385	70,800	7.3	405	<0.6	680	9.5	13	32	14	50,600	<0.3	21,000	23,200	714	<5.5	1,680	14	160	29	<5.5	<5.5	<11	151	<0.05
DDH 23 523-552	64,900	<5.5	371	0.6	2,100	8.4	14	<2.2	12	48,400	<0.3	19,500	20,900	866	<5.5	1,240	<2.2	235	28	<5.5	<5.5	<11	144	0.18
DDH 44 160-192	68,500	25.6	410	0.6	403	6.9	8.8	46	388	43,600	<0.3	22,700	22,400	433	<5.5	1,320	13	110	25	<5.5	<5.5	<11	167	<0.05
DDH 44 536-575	65,200	12.6	427	0.6	680	7.0	16	53	30	34,800	<0.3	24,400	15,700	411	<5.5	1,600	30	175	23	<5.5	<5.5	<11	118	<0.05
DDH 91 247-274	66,300	<5.5	278	0.6	530	13	20	3.4	2,960	67,000	<0.3	17,300	22,300	878	<5.5	1,210	6.6	86	24	<5.5	<5.5	<11	253	<0.05
DDH 91 397-447	73,800	13.5	355	0.7	1,480	11	16	<2.2	144	65,700	<0.3	18,900	28,000	1,020	<5.5	1,330	<2.2	460	31	<5.5	<5.5	<11	145	<0.05
DDH 92 311-338	65,000	17.7	420	0.6	588	6.9	14	20	504	42,200	<0.3	22,300	19,000	579	<5.5	1,400	7.5	151	29	<5.5	<5.5	<11	82	<0.05
DDH 144 662-688	63,000	8.6	267	<0.6	622	10	19	10	386	64,900	<0.3	15,300	24,900	1,130	<5.5	1,140	6.0	158	28	<5.5	<5.5	<11	186	<0.05
Range	63,000-73,800	<5.5-25.6	267-427	<0.6-0.7	403-2,100	6.9-13	8.8-20	<2.2-53	12-2,960	34,800-67,000	<0.3	15,300-24,400	15,700-28,000	411-1,130		1,140-1,680	<2.2-30	86-460	23-31				82-253	<0.05-0.18
X (n = 8)	67,200	12.0	367	0.6	885	9.0	15	21	555	52,200	<0.3	20,200	22,000	753	<5.5	1,360	10	192	27	<5.5	<5.5	<11	156	0.07
<i>s</i>	3,600	7.0	63	0.07	589	2.2	3.5	20	991	12,300		3,010	3,700	265		189	9.1	117	2.8				50	0.05
Master Composite	63,600	61	390	<1.0	1,100	5.0	21	7.0	860	46,000	<0.3	17,900	21,200	630	<20	1,100	6.0	NA	140	20	<3.0	<3.0	240	NA

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.
 NA = not analyzed

Compiled by: JET
 Checked by: DJL

Appendix 2.2 Table 2

Bulk Chemical Composition Variability Within the Randomly Selected Skunk Lake Formation Core DDH 44: 536-575, Calculated Statistical Parameters, and a Comparison With the Composition of DDH 44: 536-575

Skunk Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 44 538-540	64,500	48.0	421	<0.6	1,050	4.4	21	26	41	36,400	<0.3	23,200	13,600	419	<5.5	1,480	31	170	22	<5.5	<5.5	<11	158	<0.05
DDH 44 548-550	64,600	23.1	419	<0.6	1,020	4.4	13	12	31	39,900	<0.3	22,400	15,000	437	<5.5	1,510	33	106	26	<5.5	<5.5	<11	150	<0.05
DDH 44 557-559	65,200	9.1	397	<0.6	1,580	3.7	12	15	29	40,000	<0.3	21,600	19,800	503	<5.5	1,420	32	75	28	<5.5	<5.5	<11	164	<0.05
DDH 44 566-568	75,000	6.6	476	<0.6	754	3.7	8.8	<2.2	9.4	38,200	<0.3	26,200	19,900	519	<5.5	1,560	<2.2	194	28	<5.5	<5.5	<11	97	<0.05
DDH 44 575-577	71,700	14.8	444	<0.6	603	3.7	12	<2.2	14	36,200	<0.3	24,900	20,700	504	<5.5	1,330	8.6	107	30	<5.5	<5.5	<11	111	<0.05
Range	64,500-75,000	6.6-48.0	397-476		603-1,580	3.7-4.4	8.8-21	<2.2-26	9.4-41	36,200-40,000		21,600-26,200	13,600-20,700	419-519		1,330-1,560	<2.2-33	75-194	22-30				97-164	
X (n = 5)	68,200	20.3	431	<0.6	1,000	4.0	13	11	25	38,100	<0.3	23,700	17,800	476	<5.5	1,460	21	130	27	<5.5	<5.5	<11	136	<0.05
σ	4,850	16.7	30		373	0.4	4.6	9.9	13	1,830		1,870	3,250	45		89	15	50	3.0				30	
DDH 44 536-575	65,200	12.6	427	0.6	680	7.0	16	53	30	34,800	<0.3	24,400	15,700	411	<5.5	1,600	30	175	23	<5.5	<5.5	<11	118	<0.06

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Appendix 2.2 Table 3

Bulk Chemical Composition Variability Within the Randomly Selected Skunk Lake Formation Core DDH 92: 311-338, Calculated Statistical Parameters, and a Comparison With the Composition of DDH 92: 311-338

Skunk Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 92 313-315	71,500	72.1	504	<0.6	939	4.4	18	15	1,300	38,800	<0.3	24,200	19,500	587	<5.5	1,470	51	179	32	<5.5	<5.5	<11	138	0.07
DDH 92 322-324	71,500	6.5	508	<0.6	911	3.7	8.9	<2.2	34	36,700	<0.3	25,100	18,900	564	<5.5	1,460	22	173	32	<5.5	<5.5	<11	68	0.15
DDH 92 332-334	85,700	9.6	405	<0.6	636	12	18	64	191	85,600	<0.3	22,600	30,200	977	<5.5	1,330	11	151	35	<5.5	<5.5	<11	142	0.18
Range	71,500-85,700	6.5-72.1	405-508		636-939	3.7-12	8.9-18	<2.2-64	34-1,300	36,700-85,600		22,600-25,100	18,900-30,200	564-977		1,330-1,470	11-51	151-179	32-35				68-142	0.07-0.18
X (n = 3)	76,200	29.4	472	<0.6	829	6.7	15	27	508	53,700	<0.3	24,000	22,900	709	<5.5	1,420	28	168	33	<5.5	<5.5	<11	116	0.13
s	8,200	37.0	58		167	4.6	5.2	33	690	27,600		1,270	6,360	232		78	21	15	1.7				42	0.06
DDH 92 311-338	65,000	17.7	420	0.6	588	6.9	14	20	504	42,200	<0.3	22,300	19,000	579	<5.5	1,400	7.5	151	29	<5.5	<5.5	<11	82	<0.05

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Compiled by: JET
Checked by: DJL

Appendix 2.3

Rice Lake Formation Bulk Chemical Composition Data

Appendix 2.3 Table 1

Bulk Chemical Composition of the Randomly Selected Rice Lake Formation Cores, Calculated Statistical Parameters, and a Comparison With the Composition of the Rice Lake Master Composite

Rice Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 92 592-642	78,300	<5.5	364	0.7	1,850	10	21	3.7	38	60,000	<0.3	20,400	35,400	747	<5.5	1,340	4.4	695	32	<5.5	<5.5	<11	204	<0.05
DDH 15 2079-2111	82,700	<5.5	309	0.7	5,080	11	25	31	26	59,500	<0.3	14,000	52,900	1,300	<5.5	8,660	30	403	34	<5.5	<5.5	<11	183	0.22
DDH 16 2344-2376	83,500	<5.5	341	0.7	15,300	16	33	12	15	104,000	<0.3	10,900	32,100	1,440	<5.5	11,300	<2.2	739	31	<5.5	<5.5	<11	84	2.64
DDH 21 932-985	75,100	<5.5	478	0.8	2,280	7.5	14	13	31	45,500	<0.3	25,700	25,100	857	<5.5	1,610	4.1	513	28	<5.5	<5.5	<11	76	0.22
DDH 21 1216-1272	82,800	7.6	232	0.9	5,270	11	29	5.7	66	80,200	<0.3	12,200	59,200	1,230	<5.5	1,170	<2.2	745	36	<5.5	<5.5	<11	112	0.73
DDH 23 1042-1082	89,300	13	513	0.8	2,710	19	35	<2.2	350	91,000	<0.3	22,000	35,600	2,070	<5.5	6,250	<2.2	446	40	<5.5	<5.5	<11	1,470	0.15
DDH 23 1177-1230	82,700	<5.5	229	0.6	1,540	12	25	26	43	83,300	<0.3	13,200	51,300	1,350	<5.5	1,290	4.4	482	34	<5.5	<5.5	<11	278	<0.05
DDH 24 1126-1161	79,000	<5.5	689	0.6	2,570	10	20	50	246	58,000	<0.3	28,000	18,400	1,050	<5.5	1,610	14	559	33	<5.5	<5.5	<11	177	0.11
DDH 44 667-694	72,200	<5.5	404	<0.6	1,330	8.1	13	<2.2	6.8	56,300	<0.3	20,400	28,300	704	<5.5	1,420	<2.2	497	29	<5.5	<5.5	<11	120	<0.05
DDH 44 752-779	74,000	9.6	430	<0.6	1,540	7.5	16	287	26	50,900	<0.3	24,200	23,900	574	<5.5	1,620	<2.2	514	26	<5.5	<5.5	<11	136	<0.05
DDH 46 1823-1859	74,900	<5.5	243	<0.6	16,200	6.3	16	119	10	42,600	<0.3	13,500	24,300	1,240	<5.5	23,300	<2.2	452	28	<5.5	<5.5	<11	106	1.69
DDH 91 583-621	87,000	<5.5	403	0.6	2,140	12	18	128	3,300	82,700	<0.3	20,800	29,600	1,060	<5.5	1,380	<2.2	722	37	<5.5	<5.5	<11	156	<0.05
DDH 160 1783-1808	82,500	<5.5	210	<0.6	6,850	18	43	577	60	112,000	<0.3	7,630	59,200	1,860	<5.5	1,030	<2.2	762	35	<5.5	<5.5	<11	123	0.7

Appendix 2.3 Table 1 (Continued)

Rice Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 160 1971-1997	90,100	<5.5	393	0.7	6,050	10	31	202	50	69,400	<0.3	12,800	52,400	953	<5.5	13,200	<2.2	612	40	<5.5	<5.5	<11	125	0.55
DDH 163 1721-1747	67,000	<5.5	430	<0.6	11,300	5.1	13	627	18	45,100	<0.3	17,500	19,900	1,280	<5.5	12,900	<2.2	492	28	<5.5	<5.5	<11	119	0.77
DDH 163 1804-1829	80,100	<5.5	395	<0.6	18,000	8.8	26	131	73	62,700	<0.3	11,300	27,600	2,160	<5.5	21,000	<2.2	562	37	<5.5	<5.5	<11	188	2.72
DDH 172 1253-1315	82,300	<5.5	246	<0.6	2,970	13	25	67	179	81,200	<0.3	13,300	53,900	1,950	<5.5	1,130	<2.2	622	34	<5.5	<5.5	<11	555	0.18
DDH 172 1500-1526	75,600	<5.5	564	0.6	2,930	5.1	12	334	21	31,000	<0.3	26,700	26,600	620	<5.5	1,970	<2.2	547	29	<5.5	<5.5	<11	82	<0.05
Range	67,000- 90,100	<5.5- 13	210- 689	<0.6- 0.9	1,330- 18,000	5.1-19	12-43	<2.2- 627	6.8- 3,300	31,000- 112,000		7,630- 28,000	18,400- 59,200	574- 2,160		1,030- 23,300	<2.2- 30	403- 762	26-40				82- 1,470	<0.05- 2.72
X (n = 18)	80,000	6.3	381	0.7	5,880	11	23	145	253	67,500	<0.3	17,500	36,400	1,250	<5.5	6,230	4.8	576	33	<5.5	<5.5	<11	238	0.61
σ	6,050	2.0	128	0.1	5,490	4.0	8.8	193	766	22,100		6,180	14,200	493		7,240	6.9	114	4.2				326	0.86
Master Composite	68,000	<40	340	<1.0	7,700	7.0	19	11	210	62,100	<0.3	12,400	36,000	1,400	<20	5,100	15	NA	150	20	<3.0	<3.0	190	NA

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

NA = not analyzed

Compiled by: JET
Checked by: DJL

Appendix 2.3 Table 2

Bulk Chemical Composition Variability Within the Randomly Selected Rice Lake Formation Core DDH 23: 1042-1082, Calculated Statistical Parameters, and a Comparison With the Composition of DDH 23: 1042-1082

Rice Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Tc mg/kg	Zn mg/kg	CO ₂ %
DDH 23 1041-1043	110,000	<5.5	518	0.88	1,660	15	43	9.0	934	114,000	<0.3	34,800	37,400	2,500	<5.5	3,490	28	253	51	<5.5	<5.5	<11	468	0.15
DDH 23 1050-1052	117,000	43	586	0.77	2,670	53	56	38	136	119,000	0.5	24,200	38,400	2,750	<5.5	18,600	48	226	53	<5.5	<5.5	<11	8,130	0.40
DDH 23 1059-1061	108,000	14	820	1.1	3,700	16	44	2.3	210	102,000	<0.3	32,900	35,800	2,580	<5.5	9,030	44	262	48	<5.5	<5.5	<11	605	0.40
DDH 23 1068-1070	86,600	11	431	<0.6	2,220	16	42	35	79	114,000	<0.3	11,400	46,600	2,490	<5.5	994	21	678	36	<5.5	<5.5	<11	308	0.18
DDH 23 1077-1079	63,000	5.7	299	<0.65	1,830	10	26	2.3	608	71,500	<0.3	10,800	30,600	1,360	<5.5	1,080	<2.2	462	33	<5.5	<5.5	<11	403	<0.05
Range	63,000-117,000	<5.5-43	299-820	<0.6-1.1	1,660-3,700	10-53	26-56	2.3-38	79-934	71,500-119,000	<0.3-0.5	10,800-34,800	30,600-46,600	1,360-2,750		994-18,600	<2.2-48	226-678	33-53				308-8,130	<0.05-0.40
X (n = 5)	96,900	16	530	0.77	2,420	22	42	17	393	104,000	0.34	22,800	37,800	2,340	<5.5	6,640	29	376	44	<5.5	<5.5	<11	1,980	0.24
σ	22,100	16	194	0.23	816	18	11	18	366	19,300	0.09	11,400	5,780	555		7,440	18	193	9.1				3,440	0.16
DDH 23 1042-1082	89,300	13	513	0.8	2,710	19	35	<2.2	350	91,000	<0.3	22,000	35,600	2,070	<5.5	6,250	<2.2	446	40	<5.5	<5.5	<11	1,470	0.15

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

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Appendix 2.3 Table 3

Bulk Chemical Composition Variability Within the Randomly Selected Rice Lake Formation Core DDH 44: 752-779, Calculated Statistical Parameters, and a Comparison With the Composition of DDH 44: 752-779

Rice Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 44 754-756	78,300	10	530	<0.6	1,520	6.2	16	11	12	41,900	<0.3	27,200	23,300	528	<5.5	1,610	5.6	568	29	<5.5	<5.5	<11	86	0.11
DDH 44 764-766	73,800	12	277	0.8	2,100	8.1	16	43	79	50,700	<0.3	25,500	22,200	526	<5.5	1,280	34	502	28	<5.5	<5.5	<11	388	0.07
DDH 44 774-776	75,600	37	594	0.8	1,510	5.0	16	<2.2	13	41,900	<0.3	30,000	11,800	317	<5.5	2,210	<2.2	536	31	<5.5	<5.5	<11	75	0.11
Range	73,800-78,300	10-37	277-594	<0.6-0.8	1,510-2,100	5.0-8.1		<2.2-43	12-79	41,900-50,700		25,500-30,000	11,800-23,300	317-528		1,280-2,210	<2.2-34	502-568	28-31				75-388	0.07-0.11
X (n = 3)	75,900	20	467	0.7	1,710	6.4	16	19	35	44,800	<0.3	27,600	19,100	457	<5.5	1,700	14	535	29	<5.5	<5.5	<11	183	0.10
σ	2,260	15	167	0.1	338	1.6		21	38	5,080		2,270	6,340	121		471	17	33	1.5				178	0.02
DDH 44 752-779	74,000	9.6	430	<0.6	1,540	7.5	16	287	26	50,900	<0.3	24,200	23,900	574	<5.5	1,620	<2.2	514	26	<5.5	<5.5	<11	136	<0.05

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Appendix 2.3 Table 4

Bulk Chemical Composition Variability Within the Randomly Selected Rice Lake Formation Core DDH 160: 1971-1997, Calculated Statistical Parameters, and a Comparison With the Composition of DDH 160: 1971-1997

Rice Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 160 1975-1977	93,500	<5.5	394	0.9	2,020	12	36	<2.2	128	80,200	<0.3	13,600	64,600	884	<5.5	1,210	11	488	38	<5.5	<5.5	<11	103	0.15
DDH 160 1985-1987	94,400	<5.5	515	<0.6	3,600	9.9	33	52	136	81,200	<0.3	16,600	58,800	1,000	<5.5	1,310	32	711	37	<5.5	<5.5	<11	120	0.07
DDH 160 1994-1996	103,000	7.2	477	0.8	6,010	11	29	<2.2	18	66,200	<0.3	13,500	45,000	812	<5.5	24,000	<2.2	506	43	<5.5	<5.5	<11	185	0.33
Range	93,500-103,000	<5.5-7.2	394-515	<0.6-0.9	2,020-6,010	9.9-12	29-36	<2.2-52	18-136	66,200-81,200		13,500-16,600	45,000-64,600	812-1,000		1,210-24,000	<2.2-32	488-711	37-43				103-185	0.07-0.33
X (n = 3)	97,000	6.1	462	0.8	3,880	11	33	19	94	75,900	<0.3	14,600	56,100	899	<5.5	8,840	15	568	39	<5.5	<5.5	<11	136	0.18
<i>s</i>	5,240	1.0	62	0.2	2,010	1.1	3.5	29	66	8,390		1,760	10,100	95		13,100	15	124	3.2				43	0.13
DDH 160 1971-1997	90,100	<5.5	393	0.7	6,050	10	31	202	50	69,400	<0.3	12,800	52,400	953	<5.5	13,200	<2.2	612	40	<5.5	<5.5	<11	125	0.55

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Compiled by: JET
Checked by: DJL

Appendix 2.3 Table 5

Bulk Chemical Composition Variability Within the Randomly Selected Rice Lake Formation Core DDH 172: 1500-1526, Calculated Statistical Parameters, and a Comparison With the Composition of DDH 172: 1500-1526

Rice Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 172 1504-1506	77,000	<0.6	516	<0.6	1,780	4.3	12	113	18	32,400	<0.3	21,200	28,800	539	<5.5	1,750	55	576	28	<5.5	<5.5	<11	94	<0.05
DDH 172 1513-1515	75,800	<0.6	560	<0.6	2,850	3.7	10	9.1	23	27,300	<0.3	24,400	27,500	617	<5.5	1,650	15	510	32	<5.5	<5.5	<11	96	<0.05
DDH 172 1522-1524	75,600	<0.6	582	<0.6	5,140	1.2	9.2	3.8	19	22,100	<0.3	25,800	21,100	661	<5.5	3,190	14	480	28	<5.5	<5.5	<11	78	0.26
Range	75,600-77,000		516-582		1,780-5,140	1.2-4.3	9.2-12	3.8-113	18-23	22,100-32,400		21,200-25,800	21,100-28,800	539-661		1,650-3,190	14-55	480-576	28-32				78-96	<0.05-0.26
X (n = 3)	76,100	<0.6	553	<0.6	3,260	3.1	10	42	20	27,300	<0.3	23,800	25,800	606	<5.5	2,200	28	522	29	<5.5	<5.5	<11	89	0.12
σ	757		34		1,720	1.6	1.4	62	2.6	5,150		2,360	4,120	62		862	23	49	2.3				9.9	0.12
DDH 172 1500-1526	75,600	<5.5	564	<0.6	2,930	5.1	12	334	21	31,000	<0.3	26,700	26,600	624	<5.5	1,970	<2.2	547	29	<5.5	<5.5	<11	82	<0.05

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Appendix 2.4

Upper Mole Lake Formation Bulk Chemical Composition Data

Appendix 2.4 Table 1

Bulk Chemical Composition of the Randomly Selected Upper Mole Lake Formation Cores, Calculated Statistical Parameters, and a Comparison With the Composition of the Upper Mole Lake Master Composite

Upper Mole Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 16 2378-2406	75,400	<5.5	521	<0.6	9,310	11	31	180	22	89,500	<0.3	16,200	24,500	1,320	<5.5	1,800	<2.2	697	31	<5.5	<5.5	<11	101	1.14
DDH 44 955-980	78,800	<5.5	331	<0.6	1,610	11	22	142	18	75,900	<0.3	16,700	35,800	848	<5.5	1,360	<2.2	579	33	<5.5	<5.5	<11	201	<0.05
DDH 46 1944-1984	83,300	<5.5	464	0.6	16,600	4.4	13	222	11	42,200	<0.3	11,300	11,600	940	<5.5	38,200	<2.2	519	32	<5.5	<5.5	<11	99	1.32
DDH 46 2026-2060	76,200	<5.5	267	<0.6	25,600	7.6	24	97	48	64,500	<0.3	10,900	34,300	1,320	<5.5	13,500	<2.2	817	31	<5.5	<5.5	<11	88	3.78
DDH 73 1370-1395	71,700	<5.5	354	<0.6	29,500	7.6	21	135	444	57,100	<0.3	16,300	23,500	1,600	<5.5	14,600	<2.2	576	29	<5.5	<5.5	<11	90	2.57
DDH 92 564-589*	75,600	5.9	258	0.8	1,120	9.1	18	71	9.0	71,000	<0.3	13,400	35,200	1,100	<5.5	1,270	<2.2	268	32	<5.5	<5.5	<11	172	0.08
DDH 131 1161-1185	78,100	<5.5	449	1.0	8,710	11	32	22	30	83,800	<0.3	15,100	35,800	1,570	<5.5	2,410	21	592	32	<5.5	<5.5	<11	170	1.10
DDH 140 2841-2868	82,600	<5.5	407	0.7	19,800	8.1	25	<2.2	35	67,900	<0.3	6,790	20,400	1,200	<5.5	26,400	<2.2	942	36	<5.5	<5.5	<11	139	2.61
DDH 149 1442-1477	75,000	<5.5	124	0.7	3,280	11	22	9.0	36	71,100	<0.3	5,530	67,400	1,090	<5.5	891	23	693	32	<5.5	<5.5	<11	124	0.22
DDH 154 1444-1470	75,200	<5.5	256	<0.6	21,100	8.8	24	<2.2	116	62,500	<0.3	13,800	36,500	1,320	<5.5	11,900	4.2	558	63	<5.5	<5.5	<11	195	5.03
DDH 160 2220-2245	78,000	<5.5	297	<0.6	9,670	7.6	18	7.4	648	60,800	<0.3	9,800	27,000	747	<5.5	15,400	12	757	34	<5.5	<5.5	<11	103	0.81
DDH 163 2371-2396	72,000	<5.5	161	<0.6	25,800	6.3	25	28	960	63,100	<0.3	3,780	20,000	957	<5.5	21,800	32	723	28	<5.5	<5.5	<11	81	2.17
DDH 163 2560-2585	62,600	<5.5	436	<0.6	3,560	6.9	23	<2.2	77	65,000	<0.3	11,300	22,900	821	<5.5	1,040	8.9	568	30	<5.5	<5.5	<11	133	0.33

Appendix 2.4 Table 1 (Continued)

Upper Mole Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
Range	51,700-99,600	<5.5-6.3	111-521	<0.6-1.0	1,050-29,500	4.4-11	13-32	<2.2-222	8.6-960	42,200-89,500		3,780-21,200	11,600-67,400	747-1,600		891-38,200	<2.2-32	210-942	25-63				81-212	<0.05-5.03
X (n = 13)	75,700	5.5	333	0.7	13,500	8.5	23	71	189	67,300	<0.3	11,600	30,400	1,140	<5.5	11,600	9.0	638	34	<5.5	<5.5	<11	130	1.63
n	5,260	0.1	120	0.1	10,100	2.1	5.1	77	303	11,900		4,230	13,600	276		11,800	10	164	8.9				42	1.53
Master Composite	71,000	<40	360	<1.0	13,400	6.0	25	12	240	65,900	<0.3	11,400	26,400	480	<20	3,000	18	NA	160	20	<3	<3	180	NA

*Average values for DDH 92:564-573 and DDH 92:575-589.

Note: Detection limit values were used in calculations for measured values which were less than the detection limit

NA = not analyzed

Appendix 2.4 Table 2

Bulk Chemical Composition Variability Within the Randomly Selected Upper Mole Lake Formation Core DDH 46: 2026-2060, Calculated Statistical Parameters, and a Comparison With the Composition of DDH-46:-2026-2060

Upper Mole Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 46 2028-2030	70,800	<5.5	228	<0.6	11,700	8.0	21	96	19	69,000	<0.3	9,900	45,400	1,600	74	2,600	26	838	34	<5.5	<5.5	<11	121	1.03
DDH 46 2037-2039	76,400	<5.5	318	<0.6	19,100	6.3	15	<2.2	54	46,200	<0.3	13,200	25,100	1,310	<5.5	18,600	<2.2	902	30	<5.5	<5.5	<11	75	1.54
DDH 46 2046-2048	78,200	<5.5	436	<0.6	11,000	8.8	32	<2.2	143	70,300	<0.3	13,300	36,700	1,200	<5.5	8,730	59	685	30	<5.5	<5.5	<11	99	0.70
DDH 46 2055-2057	89,300	<5.5	163	<0.6	63,500	11	45	9.0	139	87,000	<0.3	6,310	34,200	1,420	<5.5	22,300	73	874	38	<5.5	<5.5	<11	101	6.31
26 Range	70,800-89,300		163-436		11,000-63,500	6.3-11	15-45	<2.2-96	19-143	46,200-87,000		6,310-13,300	25,100-45,400	1,200-1,600	<5.5-74	2,600-22,300	<2.2-73	685-902	30-38				75-121	0.70-6.31
X (n = 4)	78,700	<5.5	286	<0.6	26,300	8.5	28	27	89	68,100	<0.3	10,700	35,400	1,380	23	13,100	40	825	33	<5.5	<5.5	<11	99	2.40
σ	7,750		118		25,100	2.0	13	46	62	16,800		3,310	8,350	170	34	9,020	32	97	3.8				19	2.63
DDH 46 2026-2060	76,200	<5.5	267	<0.6	25,600	7.6	24	97	48	64,500	<0.3	10,900	34,300	1,320	<5.5	13,500	<2.2	817	31	<5.5	<5.5	<11	88	3.78

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Compiled by: JET
Checked by: DJL

Appendix 2.4 Table 3

Bulk Chemical Composition Variability Within the Randomly Selected Upper Mole Lake Formation Core DDH 73: 1370-1395, Calculated Statistical Parameters, and a Comparison With the Composition of DDH 73: 1370-1395

Upper Mole Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 73 1372-1374	67,400	<5.5	495	<0.6	8,390	6.3	14	15	1,040	54,300	<0.3	20,500	18,200	1,570	<5.5	2,100	33	669	30	<5.5	<5.5	<11	81	1.03
DDH 73 1381-1383	74,500	<5.5	602	<0.6	5,560	7.5	14	2.8	31	51,800	<0.3	23,000	20,900	1,060	<5.5	1,870	20	715	26	<5.5	<5.5	<11	79	0.51
DDH 73 1390-1392	70,600	5.9	54	<0.6	44,800	9.2	30	<2.2	73	63,800	<0.3	3,170	24,600	1,460	<5.5	29,600	31	376	28	<5.5	<5.5	<11	95	5.40
Range	67,400-74,500	<5.5-5.9	54-602		5,560-44,800	6.3-9.2	14-30	<2.2-15	31-1,040	51,800-63,800		3,170-23,000	18,200-24,600	1,060-1,570		1,870-29,600	20-33	376-715	26-30				79-95	0.51-5.40
X (n = 3)	70,800	5.6	384	<0.6	19,600	7.7	19	6.7	381	56,600	<0.3	15,600	21,200	1,360	<5.5	11,200	28	587	28	<5.5	<5.5	<11	85	2.31
σ	3,560	0.2	290		21,900	1.5	9.2	7.2	571	6,330		10,800	3,210	268		15,900	7.0	184	2.0				8.7	2.69
DDH 73 1370-1395	71,700	<5.5	354	<0.6	29,500	7.6	21	135	444	57,100	<0.3	16,300	23,500	1,600	<5.5	14,600	<2.2	576	29	<5.5	<5.5	<11	90	2.57

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Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Appendix 2.4 Table 4

Bulk Chemical Composition Variability Within the Randomly Selected Upper Mole Lake Formation Core DDH 131: 1161-1185, Calculated Statistical Parameters, and a Comparison With the Composition of DDH 131: 1161-1185

Upper Mole Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 131 1163-1165	72,900	<5.5	600	<0.6	4,590	9.2	24	<2.2	24	65,200	<0.3	20,000	24,600	1,160	<5.5	1,630	3.1	868	26	<5.5	<5.5	<11	131	0.22
DDH 131 1171-1173	104,000	<5.5	607	0.6	2,870	14	38	37	12	105,000	<0.3	22,900	36,800	1,750	<5.5	9,520	77	554	41	<5.5	<5.5	<11	189	0.11
DDH 131 1180-1182	88,700	7.9	488	0.6	13,300	16	45	19	44	108,000	<0.3	17,300	46,200	2,350	<5.5	2,080	55	522	42	<5.5	<5.5	<11	218	2.13
Range	72,900-104,000	<5.5-7.9	488-607	<0.6-0.6	2,870-13,300	9.2-16	24-45	<2.2-37	12-44	65,200-108,000	<0.3	17,300-22,900	24,600-46,200	1,160-2,350		1,630-9,520	3.1-77	522-868	26-42				131-218	0.11-2.13
X (n = 3)	88,500	6.3	565	0.6	6,920	13	36	19	27	92,700	<0.3	20,100	35,900	1,750	<5.5	4,410	45	648	36	<5.5	<5.5	<11	179	0.82
σ	15,600	1.4	67		5,590	3.5	11	17	16	23,900		2,800	10,800	595		4,430	38	191	9.0				44	1.14
DDH 131 1161-1185	78,100	<5.5	449	1.0	8,710	11	32	22	30	83,800	<0.3	15,100	35,800	1,570	<5.5	2,410	21	592	32	<5.5	<5.5	<11	170	1.10

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Appendix 2.5

Lower Mole Lake Formation Bulk Chemical Composition Data

Appendix 2.5 Table 1

Bulk Chemical Composition of the Randomly Selected Lower Mole Lake Formation Cores, Calculated Statistical Parameters, and a Comparison With the Composition of the Lower Mole Lake Master Composite

Lower Mole Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 6 865-900	80,700	37.7	216	0.7	2,570	13	26	8.1	42	76,100	0.44	13,800	55,100	343	<5.5	1,550	12	962	46	<5.5	<5.5	<11	987	0.07
DDH 9 802-861	50,400	802	326	1.0	3,430	11	8.8	<2.2	97	57,800	2.0	20,800	13,800	148	<5.5	1,170	<2.2	125	333	25	<5.5	<11	2,650	0.48
DDH 15 2475-2515	81,400	12.4	274	2.6	15,000	12	33	<2.2	97	76,300	<0.3	12,400	30,200	1,320	<5.5	12,800	<2.2	666	43	<5.5	<5.5	<11	216	2.83
DDH 16 2995-3026	78,200	6.0	167	<0.6	14,100	12	28	<2.2	233	85,400	<0.3	8,920	32,100	1,550	<5.5	12,200	<2.2	1,160	31	<5.5	<5.5	<11	212	2.02
DDH 21 1627-1657	82,200	<5.5	274	<0.6	5,170	11	26	<2.2	229	74,800	<0.3	12,000	49,200	1,230	<5.5	1,180	12	1,000	33	<5.5	<5.5	<11	151	0.40
DDH 42 2234-2271	77,000	12	239	<0.6	17,700	11	23	<2.2	22	78,400	<0.3	8,590	28,400	1,510	<5.5	12,600	<2.2	1,250	30	<5.5	<5.5	<11	190	1.65
DDH 45 2065-2100	61,600	<5.5	150	<0.6	6,830	11	28	152	89	82,400	<0.3	5,950	21,600	1,340	<5.5	9,790	28	1,090	30	<5.5	<5.5	<11	273	0.48
DDH 46 2238-2273	80,800	<5.5	324	<0.6	22,600	10	30	76	56	74,000	<0.3	8,660	21,000	1,120	<5.5	19,600	15	691	32	<5.5	<5.5	<11	99	3.19
DDH 68 1878-1903	68,500	7.2	196	<0.6	8,300	9.9	22	102	36	78,100	<0.3	7,290	21,200	1,280	<5.5	10,800	<2.2	1,210	32	<5.5	<5.5	<11	176	1.54
DDH 85 964-1004	76,800	79.3	362	1.0	11,800	6.9	16	80	20	48,000	<0.3	23,800	27,200	607	<5.5	3,880	7.8	447	32	<5.5	<5.5	<11	364	2.28
DDH 139 2933-2960	85,000	<5.5	256	<0.6	17,600	11	25	66	40	79,600	<0.3	13,200	39,400	1,540	<5.5	15,200	11	1,170	35	<5.5	<5.5	<11	144	1.87
DDH 154 1500-1526	77,300	<5.5	211	2.0	4,550	12	28	21	96	76,100	<0.3	9,710	48,100	1,330	<5.5	1,060	11	697	32	<5.5	<5.5	<11	216	0.40
DDH 159 1813-1838	83,500	39	411	1.5	11,100	6.8	23	<2.2	33	46,100	<0.3	18,200	15,300	1,190	<5.5	13,200	<2.2	695	33	<5.5	<5.5	<11	113	2.42

Appendix 2.5 Table 1 (Continued)

Lower Mole Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 163 2850-2921	85,800	41	370	1.0	19,700	7.5	24	<2.2	63	50,500	<0.3	21,900	49,700	1,120	<5.5	2,790	5.1	388	35	<5.5	<5.5	<11	176	<0.05
DDH 165 2227-2250	78,400	5.6	216	0.7	6,590	15	33	68	23	95,300	<0.3	8,800	43,800	1,430	<5.5	1,640	19	737	33	<5.5	<5.5	<11	241	0.77
DDH 176 986-1021	83,800	31	324	1.8	1,220	12	18	47	60	49,700	<0.3	24,100	23,600	219	<5.5	2,290	29	354	54	<5.5	<5.5	<11	1,770	0.18
DDH 270 2047-2073	87,700	7.6	635	0.8	4,740	4.3	16	15	12	27,600	<0.3	27,600	10,800	340	<5.5	3,120	2.5	1,660	30	<5.5	<5.5	<11	76	3.27
Range	50,400-87,700	<5.5-802	150-635	<0.6-2.6	1,220-22,600	4.3-15	8.8-33	<2.2-152	12-233	27,600-95,300	<0.3-2.0	5,950-27,600	10,800-55,100	148-1,550		1,060-19,600	<2.2-29	125-1,660	30-333	<5.5-25			76-2,650	<0.05-3.27
X (n = 17)	77,600	65	291	1.0	10,200	10	24	38	73	68,000	0.41	14,500	31,200	1,040	<5.5	7,340	9.7	841	53	6.6	<5.5	<11	474	1.41
σ	9,460	191	116	0.6	6,600	2.6	6.4	45	66	17,900	0.41	6,860	13,900	494		6,140	8.8	395	73	4.7			702	1.13
Master Composite	68,300	61	290	<1.0	9,900	8.0	28	9.0	330	70,400	<0.3	11,900	28,700	1,300	<20	7,300	10	NA	180	30	<3	<3	360	NA

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.
 NA = not analyzed

Compiled by: JET
 Checked by: DJL

Appendix 2.5 Table 2

Bulk Chemical Composition Variability Within the Randomly Selected Lower Mole Lake Formation Core DDH 16: 2995-3026, Calculated Statistical Parameters, and a Comparison With the Composition of DDH 16: 2995-3026

Lower Mole Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 16 2079-2099	85,100	<5.5	275	<0.6	15,300	12	34	24	9.4	87,800	<0.3	13,200	37,000	1,990	<5.5	10,100	<2.2	972	34	<5.5	<5.5	<11	147	2.50
DDH 16 3007-3009	79,800	9.8	230	<0.6	11,900	10	26	70	68	83,800	<0.3	10,400	31,500	1,850	<5.5	13,100	23	1,210	35	<5.5	<5.5	<11	166	1.54
DDH 16 3017-3019	80,400	5.5	230	<0.6	11,700	9.8	23	30	52	72,700	<0.3	12,800	20,100	1,360	<5.5	19,800	22	1,650	35	<5.5	<5.5	<11	177	1.36
Range	79,800-85,100	<5.5-9.8	230-275		11,700-15,300	9.8-12	23-34	24-70	9.4-68	72,700-87,800		10,400-13,200	20,100-37,000	1,360-1,990		10,100-19,800	<2.2-23	972-1,650	34-35				147-177	1.36-2.50
\bar{X} (n = 3)	81,800	6.9	245	<0.6	13,000	11	28	41	43	81,400	<0.3	12,100	29,500	1,730	<5.5	14,300	16	1,280	35	<5.5	<5.5	<11	163	1.80
σ	2,900	2.5	26		2,020	1.2	5.7	25	30	7,820		1,510	8,620	331		4,970	12	344	0.6				15	0.61
DDH 16 2995-3026	78,200	<5.5	167	<0.6	14,100	12	28	<2.2	233	85,400	<0.3	8,920	32,100	1,550	<5.5	12,200	<2.2	1,160	31	<5.5	<5.5	<11	212	2.02

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Compiled by: JET
Checked by: DJL

Appendix 2.5 Table 3

Bulk Chemical Composition Variability Within the Randomly Selected Lower Mole Lake Formation Core DDH 45: 2065-2100, Calculated Statistical Parameters, and a Comparison With the Composition of DDH 45: 2065-2100

Lower Mole Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 45 2067-2069	65,300	<5.5	176	<0.6	15,400	12	23	7.9	65	75,000	<0.3	9,020	23,200	2,170	<5.5	13,200	18	1,140	32	<5.5	<5.5	<11	384	2.57
DDH 45 2077-2079	68,900	<5.5	188	<0.6	5,400	13	28	4.7	339	88,600	<0.3	7,390	23,000	1,310	<5.5	10,500	13	1,290	31	<5.5	<5.5	<11	244	0.29
DDH 45 2086-2088	63,800	<5.5	140	<0.6	5,120	13	26	<2.2	121	88,300	<0.3	5,680	21,100	1,250	<5.5	9,580	<2.2	1,140	25	<5.5	<5.5	<11	314	0.22
DDH 45 2098-2100	63,700	6.4	216	<0.6	6,450	14	29	<2.2	64	89,600	<0.3	6,810	21,600	1,430	<5.5	7,670	<2.2	1,300	28	<5.5	<5.5	<11	284	0.55
3 Range	63,700- 68,900	<5.5- 6.4	140- 216		5,120- 15,400	12-14	23-29	<2.2- 7.9	64-339	75,000- 89,600		5,680- 9,020	21,100- 23,200	1,250- 2,170		7,670- 13,200	<2.2- 18	1,140- 1,300	25-32				244-384	0.22- 2.57
X (n = 4)	65,400	5.7	180	<0.6	8,090	13	26	4.2	147	85,400	<0.3	7,220	22,200	1,540	<5.5	10,200	8.8	1,220	29	<5.5	<5.5	<11	306	0.91
σ	2,430	0.4	31		4,900	1	3	2.7	130	6,940		1,390	1,030	427		2,300	7.9	90	3.2				59	1.12
DDH 45 2065-2100	61,600	<5.5	150	<0.6	6,830	11	28	152	89	82,400	<0.3	5,950	21,600	1,340	<5.5	9,790	28	1,090	30	<5.5	<5.5	<11	273	0.48

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Compiled by: JET
Checked by: DJL

Appendix 2.5 Table 4

Bulk Chemical Composition Variability Within the Randomly Selected Lower Mole Lake Formation Core DDH 68: 1878-1903, Calculated Statistical Parameters, and a Comparison With the Composition of DDH 68: 1878-1903

Lower Mole Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 68 1880-1882	58,200	<5.5	188	<0.6	6,800	10	22	35	73	74,100	<0.3	6,510	19,500	1,410	<5.5	9,430	3.0	1,140	25	<5.5	<5.5	<11	152	1.10
DDH 68 1889-1891	67,300	6.5	192	<0.6	7,600	11	21	<2.2	11	73,200	<0.3	7,260	19,600	1,240	<5.5	15,300	<2.2	1,390	28	<5.5	<5.5	<11	163	0.92
DDH 68 1898-1900	70,400	17	242	<0.6	5,760	12	23	51	14	83,000	<0.3	12,600	20,900	1,280	<5.5	10,700	<2.2	1,470	32	<5.5	<5.5	<11	198	3.19
Range	58,200-70,400	<5.5-17	188-242		5,760-7,600	10-12	21-23	<2.2-51	11-73	73,200-83,000		6,510-12,600	19,500-20,900	1,240-1,410		9,430-15,300	<2.2-3.0	1,140-1,470	25-32				152-198	0.92-3.19
\bar{X} (n = 3)	65,300	9.7	207	<0.6	6,720	11	22	29	33	76,800	<0.3	8,790	20,000	1,310	<5.5	11,800	2.5	1,330	28	<5.5	<5.5	<11	171	1.74
σ	6,340	6.4	30		923	1	1	25	35	5,420		3,320	781	89		3,090	0.5	172	4				24	1.26
DDH 68 1878-1903	68,500	7.2	196	<0.6	8,300	9.9	22	102	36	78,100	<0.3	7,290	21,200	1,280	<5.5	10,800	<2.2	1,210	32	<5.5	<5.5	<11	176	1.54

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Compiled by: JET
Checked by: DJL

Appendix 2.5 Table 5

Bulk Chemical Composition Variability Within the Randomly Selected Lower Mole Lake Formation Core DDH 176: 986-1021, Calculated Statistical Parameters, and a Comparison With the Composition of DDH 176: 986-1021

Lower Mole Lake Core	Al mg/kg	As mg/kg	Ba mg/kg	Be mg/kg	Ca mg/kg	Cd mg/kg	Co mg/kg	Cr mg/kg	Cu mg/kg	Fe mg/kg	Hg mg/kg	K mg/kg	Mg mg/kg	Mn mg/kg	Mo mg/kg	Na mg/kg	Ni mg/kg	P mg/kg	Pb mg/kg	Sb mg/kg	Se mg/kg	Te mg/kg	Zn mg/kg	CO ₂ %
DDH 176 993-995	68,100	9.1	255	0.88	1,830	9.9	18	30	14	49,800	<0.3	16,600	26,300	242	<5.5	1,700	4.7	830	41	<5.5	<5.5	<11	1,130	<0.05
DDH 176 1002-1004	90,400	17	486	1.4	598	4.4	8.1	25	80	25,800	<0.3	35,900	14,600	81	<5.5	2,960	<2.2	130	57	<5.5	<5.5	<11	175	<0.05
DDH 176 1010-1012	68,200	5.8	344	1.1	661	5.0	10	16	12	29,200	<0.3	25,200	11,900	157	<5.5	2,320	<2.2	219	34	<5.5	<5.5	<11	1,100	0.22
DDH 176 1019-1021	78,200	21	241	0.77	2,220	8.0	16	14	10	51,700	<0.3	21,400	27,000	229	<5.5	2,330	<2.2	998	33	<5.5	<5.5	<11	560	0.11
Range	68,100-90,400	5.8-21	241-486	0.77-1.4	598-2,220	4.4-9.9	8.1-18	14-30	10-80	25,800-51,700		16,600-35,900	11,900-27,000	81-242		1,700-2,960	<2.2-4.7	130-998	33-57				175-1,130	<0.05-0.22
X (n = 4)	76,200	13	332	1.0	1,330	6.8	13	21	29	39,100	<0.3	24,800	20,000	177	<5.5	2,330	2.8	544	41	<5.5	<5.5	<11	741	0.11
σ	10,600	7.0	113	0.3	822	2.6	4.7	7.5	34	13,500		8,210	7,820	74		514	1.2	434	11				459	0.08
DDH 176 986-1021	83,800	31	324	1.8	1,220	12	18	47	60	49,700	<0.3	24,100	23,600	219	<5.5	2,290	29	354	54	<5.5	<5.5	<11	1,770	0.18

Note: Detection limit values were used in calculations for measured values which were less than the detection limit.

Appendix 3

Waste Characterization Kinetic Test Laboratory Data

- Appendix 3.1 Physical Dimensions and Test Conditions of the Composites Used in the Kinetic Tests**
- Appendix 3.2 Parameters Measured Weekly in the Leachate from the Waste Rock Composites**
- Appendix 3.3 Parameters Measured Weekly in the Leachate from the Tailings Composites**

Appendix 3.1

Physical Dimensions and Test Conditions of the Composites Used in the Kinetic Tests

Physical Dimensions and Test Conditions of the Composites Used in the Kinetic Tests

1 Waste Rock Composites

- A. The Rice Lake and Upper Mole Lake Master Composites were each placed and are being leached in a modified large scale humidity cell formed from a 30-gallon polyethylene tank with a conical base which has a spigot at the lowest part of the base. A layer of lead-free fiberglass covers the base of each tank. The composites drain freely.
- B. The six other waste rock composites were each placed and are being leached in a modified large scale humidity cell formed from a 30-gallon polyethylene cylindrical tank which has a spigot in the sidewall of the tank at the base. The base of each composite is supported by a porous plexiglass plate covered with lead-free fiberglass above the upper level of the spigot such that the composites drain freely.
- C. The weight and physical dimensions of each composite are listed below:

Composite	Weight (kg)	Tank Diameter (cm)	Composite Height Above Plate/Base (cm)
Skunk Lake Master	84.55	45.7	35.6
Rice Lake Master	126.59	45.7	48.3
Upper Mole Lake Master	133.18	45.7	50.8
Lower Mole Lake Master	77.73	45.7	30.5
Skunk Lake High Sulfur	73.64	45.7	26.7
Rice Lake High Sulfur	81.14	45.7	27.9
Upper Mole Lake High Sulfur	78.18	45.7	29.2
Lower Mole Lake High Sulfur	74.32	45.7	26.7

- D. Each leaching cycle is one week in length. During the first day of a cycle, approximately twice the average weekly precipitation for the Crandon area is applied to the composite in the form of a single storm event. The storm precipitation is applied to the top of the entire composite. During the remaining six days of a cycle, approximately twice the average weekly precipitation for the

Crandon area is applied in 12 equal amounts at about noon and midnight of each day. The day 2-7 precipitation is applied to the top of the composite in the form of a mist. The diameter of the area receiving mist precipitation is about one half the diameter of the 30-gallon tank. The area receiving the mist is reversed 180 degrees every week. All leaching has been conducted with deionized (DI) water which has been used to simulate rainfall.

- E. Humidified air is pumped into the base of each tank for two 4-hour periods each day between 4-8 AM and 4-8 PM. The humidified air is applied through two ports which are opposite each other and at right angles to the axis of spray application.

2 TMA Tailings

- A. Each of the four TMA tailings composites were placed and are being leached in a modified large scale humidity cell formed from part of a 30-gallon polyethylene cylindrical tank which has a spigot in the sidewall of the tank at the tank base. The base of each composite is supported by a porous plexiglass plate covered with lead-free fiberglass above the level of the spigot such that the composite drains freely when leaching under alternating W/D conditions was desired. Successive ½- to ¾-inch thick layers of coarse and fine, precleaned silica sand separate the tailings composites from the fiberglass layer to minimize the physical loss of the tailings materials during leachate sample collection.
- B. The upper surface of each of the composites was dimpled to increase the surface area exposed to oxidation, and to promote drainage of the leaching fluids through the central portion of the materials when leaching under alternating W/D conditions.
- C. The weight and physical dimensions of each composite are listed below:

Composite	Weight (kg)	Tank Diameter (cm)	Composite Height Above Base (cm)	Dimple Depth (cm)
Fine Tails ^a	18.2	45.7	8.8	5.0
Whole Tails ^a	22.7	45.7	8.8	7.6
Whole Tails ^b	30.1	45.7	12.7	7.6
Lime Amended Whole Tails ^b	34.8	45.7	15.2	10.1

^a = leached under saturated, followed by alternating W/D, conditions

^b = leached under alternating W/D conditions

- D. Each leaching cycle is one week in length. During the sixth day of each alternating W/D cycle, four times the average weekly Crandon area precipitation is applied to the top of each composite. Due to the high moisture retention

capacity of these composites, all of the DI water used for the W/D leaching is applied at one time to enhance surface oxidation between applications. Saturated leaching occurred under ponded conditions in which the composites were saturated with, and covered by, process water.

- E. The composites were allowed to oxidize naturally between cycles. The spigot beneath the plexiglass plate is left open at all times to permit some oxidation of the materials from the base.

3 Backfill Tailings

- A. Each of the four backfill tailings composites were placed and are being leached in a large scale humidity cell formed from a 5-gallon polyethylene tank which has a spigot in the sidewall of the tank at the tank base. The base of each composite is supported by a layered system similar to that used in the TMA tailings humidity cells.
- B. The cemented tailings composites consist primarily of gravel size fragments of cemented tailings. The cemented samples were formed in standard plastic cement molds and cured for 14 days, after which the samples were broken and the resulting fragments were used to charge the appropriate tanks.
- C. The weight and physical dimensions of each composite are listed below:

Composite	Weight (kg)	Tank Diameter (cm)	Composite Height Above Plate (cm)
Coarse Tails	8.12	27.9	13.2
Cemented Coarse Tails	25.5	27.9	63.6
Whole Tails	7.08	27.9	11.4
Cemented Whole Tails	25.3	27.9	63.6

- D. Each leaching cycle is one week in length. The first two leaching cycles consisted of two, widely spaced W/D leachings. The composites were leached with 4.8 L of process water during each of the W/D cycles. Following the collection of the second W/D leachate sample, the composites were saturated with, and continuously covered by groundwater collected from a well at the Crandon site. As seen in Table 2 of Appendices 4.14, 4.15, 4.16, and 4.17, the amount of leachate extracted per saturated leaching cycle was much less than that collected during the W/D leachings. Site groundwater has been added to each composite after the collection of a sample in order to maintain a continuously saturated condition.

Appendix 3.2

Parameters Measured Weekly in the Leachate from the Waste Rock Composites

Appendix 3.2 Table 1

Parameters Measured Weekly in the Leachate Collected from the Waste Rock Composites

Skunk Lake Master Composite

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μ S/cm)*	pH (su)	Alkalinity (total, mg/L)
102594	5,725	20	316	6.23	44
110294	5,470	20	294	6.25	33
110994	4,055	20	240	5.65	33
111694	4,930	19	192	6.94	30
112194	4,460	18	186	6.01	34
112894	5,560	21	128	6.08	27
120594	4,250	22	121	6.51	29
121294	4,930	21	126	6.00	30
121994	4,320	19	126	7.73	31
122794	4,460	17	131	7.68	28
010395	4,970	16	131	7.62	31
010995	3,740	21	108	7.26	26
011795	4,290	22	112	7.30	26
012395	4,200	22	123	7.60	24
013095	4,580	22	123	7.54	26
020695	500	19	136	7.07	23
021395	8,160	20	147	8.30(?)	23
022095	4,700	20	132	7.07	26
022795	4,100	19	131	7.37	29
030695	4,780	20	141	7.51	24
031395	3,610	23	113	7.11	200(?)
032095	4,550	20	124	6.96	20
032795	4,420	18	134	6.75	18
040495	5,080	20	129	6.84	16
041095	4,960	20	138	6.93	20
041795	4,080	22	151	6.74	16
042495	3,940	23	130	6.64	14

Appendix 3.2 Table 1 (Continued)

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity ($\mu\text{S/cm}$)*	pH (su)	Alkalinity (total, mg/L)
050195	4,060	21	123	6.72	24
050895	3,580	22	120	6.71	17
051595	4,400	22	120	6.91	20
052295	3,950	23	116	7.12	16
053095	4,840	23	113	6.92	18
060595	4,320	23	114	6.65	18
061295	4,600	22	96	6.96	22
061995	5,740	23	107	7.54	14
062695	3,980	23	103	7.53	14
070395	4,280	22	106	7.34	NA
071095	5,260	23	110	7.35	NA
071795	0				
072495	7,110	23	114	7.07	NA
073195	3,320	23	117	7.24	NA
080795	4,900	23	120	7.13	NA
081495	3,560	23	112	7.21	NA
082195	4,460	23	114	7.16	NA
083095	5,440	23	111	7.11	NA
090595	4,120	23	118	7.13	12
091195	3,840	21	126	7.17	12
091895	3,620	21	117	7.03	13
092595	4,980	21	113	6.74	13
100295	4,160	21	104	6.47	14
100995	4,280	21	102	6.43	14
101695	4,180	22	97	6.37	
102395	3,810	21	98	6.37	
103095	4,770	21	101	6.53	
110695	4,240	21	96	6.34	

* Conductivity values corrected for temperature.

NA = not analyzed.

Appendix 3.2 Table 2

Parameters Measured Weekly in the Leachate Collected from the Waste Rock Composites

Rice Lake Master Composite

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μ S/cm)*	pH (su)	Alkalinity (total, mg/L)
102594	6,490	20	345	7.00	130
110294	4,785	20	315	7.36	110
110994	3,760	20	251	5.67	100
111694	7,160	19	288	7.54	110
112194	3,400	18	238	7.00	91
112894	2,710	21	215	7.42	91
120594	2,480	22	214	7.78	92
121294	6,650	19	169	7.26	71
121994	5,400	19	195	8.13	80
122794	3,880	17	243	8.07	93
010395	3,900	16	233	8.31	87
010995	3,340	21	209	8.17	89
011795	3,400	22	202	8.22	83
012395	3,820	22	210	8.27	52
013095	4,030	22	206	8.37	51
020695	500	19	210	8.23	82
021395	7,480	19	217	8.19	86
022095	4,460	21	199	8.18	83
022795	4,320	19	202	8.39	82
030695	4,880	19	204	8.16	81
031395	3,820	23	174	8.17	78
032095	4,660	20	183	8.10	76
032795	4,600	18	202	8.12	78
040495	5,740	21	181	8.07	75
041095	5,160	19	204	8.14	73
041795	3,770	22	167	8.15	73
042495	4,400	23	166	8.13	39(?)

Appendix 3.2 Table 2 (Continued)

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity ($\mu\text{S}/\text{cm}$)*	pH (su)	Alkalinity (total, mg/L)
050195	4,380	21	170	8.11	80
050895	4,960	22	168	8.08	71
051595	5,100	22	164	8.05	74
052295	3,220	23	150	7.98	68
053095	3,780	24	157	7.94	68
060595	3,720	23	165	7.93	70
061295	4,700	22	153	8.10	70
061995	5,470	23	162	8.29	70
062695	5,100	23	156	8.23	70
070395	4,820	22	158	8.21	NA
071095	5,150	23	154	8.16	NA
071795	0				
072495	7,180	24	162	8.03	NA
073195	4,480	24	158	8.06	NA
080795	4,780	23	154	8.06	NA
081495	4,960	23	152	8.10	NA
082195	4,750	23	154	8.07	NA
083095	5,620	23	157	8.05	NA
090595	4,360	23	154	8.20	65
091195	4,780	21	158	8.00	60
091895	4,360	21	155	7.85	65
092595	4,340	21	156	7.71	43
100295	3,860	21	156	7.61	64
100995	3,940	21	157	7.41	66
101695	3,880	22	151	7.36	
102395	3,820	21	153	7.40	
103095	3,840	21	160	7.53	
110695	3,660	21	157	7.37	

* Conductivity values corrected for temperature.

NA = not analyzed.

Appendix 3.2 Table 3

Parameters Measured Weekly in the Leachate Collected from the Waste Rock Composites

Upper Mole Lake Master Composite

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
102594	6,700	20	380	7.01	120
110294	4,915	20	358	7.21	120
110994	4,550	20	301	6.11	110
111694	2,490	19	339	7.62	110
112194	3,760	18	322	7.22	100
112894	7,950	21	217	7.58	87
120594	3,360	22	246	7.82	100
121294	4,700	20	256	7.77	97
122094	4,340	17	256	7.69	93
122794	4,080	17	268	8.15	96
010395	4,650	16	266	8.29	94
010995	3,730	21	224	8.34	91
011795	4,020	22	228	8.35	90
012395	3,780	22	233	8.34	88
013095	5,040	22	296	7.69(?)	71
020695	500	19	291	8.05	68
021395	7,990	19	264	8.12	79
022095	4,460	21	220	8.34	88
022795	3,960	19	222	8.45	86
030695	3,960	19	228	8.41	84
031395	3,590	23	203	8.26	82
032095	4,390	20	215	8.22	78
032795	3,750	18	235	8.32	80
040495	3,240	21	212	8.25	78
041095	4,080	19	276	8.01	67
041795	5,100	22	211	8.28	78
042495	4,300	23	191	8.27	77

Appendix 3.2 Table 3 (Continued)

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity ($\mu\text{S}/\text{cm}$)*	pH (su)	Alkalinity (total, mg/L)
050195	4,120	22	193	8.29	84
050895	3,940	21	197	8.11	75
051595	3,540	22	192	8.21	76
052295	4,900	23	190	8.19	79
053095	5,740	23	180	8.09	76
060595	4,320	24	177	7.54	75
061295	4,700	22	168	8.19	74
061995	5,180	23	176	8.35	82
062695	4,120	24	171	8.29	73
070395	4,600	22	181	8.26	NA
071095	4,860	23	174	8.19	NA
071795	0				
072495	7,230	24	182	8.09	NA
073195	4,080	25	175	8.18	NA
080795	4,670	23	172	8.15	NA
081495	4,450	23	172	8.26	NA
082195	4,700	23	170	8.16	NA
083095	5,100	24	173	8.19	NA
090595	3,960	24	176	8.28	70
091195	3,900	21	184	8.19	67
091895	4,340	22	176	8.05	69
092595	4,800	21	182	7.89	68
100295	5,160	21	176	7.77	71
100995	4,730	21	172	7.62	70
101695	4,700	22	167	7.65	
102395	4,600	22	168	7.55	
103095	5,020	20	183	7.73	
110695	4,800	21	175	7.53	

* Conductivity values corrected for temperature.

NA = not analyzed.

Appendix 3.2 Table 4

Parameters Measured Weekly in the Leachate Collected from the Waste Rock Composites

Lower Mole Lake Master Composite

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μ S/cm)*	pH (su)	Alkalinity (total, mg/L)
102594	5,690	20	595	7.21	120
110294	4,655	20	431	6.67	91
110994	4,700	20	342	6.10	89
111694	4,780	19	294	7.41	75
112194	4,360	18	286	6.82	76
112894	5,300	21	227	7.50	75
120594	3,795	22	206	7.57	76
121294	4,840	20	224	7.70	77
122094	3,730	17	323	7.93	79
122794	4,320	17	230	7.98	83
010395	4,840	17	226	8.09	81
010995	3,880	23	191	8.27	75
011795	3,950	22	195	8.31	71
012395	4,100	22	197	8.29	73
013095	5,290	22	199	8.35	76
020695	500	19	214	8.29	70
021395	8,500	19	213	8.17	72
022095	5,580	20	194	8.28	73
022795	3,940	19	196	8.36	73
030695	5,460	19	198	8.34	72
031395	4,530	22	180	8.20	76
032095	4,510	20	188	8.14	68
032795	4,540	18	206	8.26	71
040495	4,620	21	188	8.20	66
041095	5,490	19	204	8.17	64
041795	4,140	22	217	8.15	62
042495	4,720	22	188	8.19	63

Appendix 3.2 Table 4 (Continued)

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity ($\mu\text{S/cm}$)*	pH (su)	Alkalinity (total, mg/L)
050195	5,000	21	180	8.24	74
050895	4,540	21	177	8.10	62
051595	5,040	22	175	8.11	64
052295	3,580	23	167	8.19	64
053095	5,100	24	167	8.06	62
060595	3,790	25	164	7.79	61
061295	4,280	22	149	8.09	60
061995	4,300	26	175	8.26	60
062695	4,160	23	166	8.18	62
070395	3,680	23	167	8.11	NA
071095	4,860	24	167	8.11	NA
071795	0				
072495	7,750	23	172	7.86	NA
073195	4,060	24	175	8.05	NA
080795	4,180	24	166	8.01	NA
081495	4,800	23	168	8.05	NA
082195	4,480	23	168	8.01	NA
083095	4,840	24	164	7.99	NA
090595	4,040	24	172	8.13	55
091195	4,220	22	179	8.03	58
091895	3,690	22	192	7.95	52
092595	4,420	21	170	7.85	52
100295	4,440	21	166	7.69	56
100995	4,280	21	165	7.53	53
101695	3,740	22	159	7.50	
102395	4,160	21	163	7.46	
103095	4,280	21	170	7.63	
110695	4,600	21	163	7.40	

* Conductivity values corrected for temperature.
 NA = not analyzed.

Appendix 3.2 Table 5

Parameters Measured Weekly in the Leachate Collected from the Waste Rock Composites

Skunk Lake High Sulfur Composite

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μ S/cm)*	pH (su)	Alkalinity (total, mg/L)
102494	5,875	20	1,010	6.23	34
110194	5,660	20	829	6.42	24
110994	2,860	20	679	5.39	20
111594	5,420	19	617	5.84	16
112194	3,900	18	546	6.09	17
112894	6,040	20	407	5.89	15
120694	4,750	16	425	5.88	16
121394	5,200	20	390	5.89	19
122094	4,500	17	403	7.37	20
122794	4,860	17	425	7.84	18
010395	5,170	17	419	7.77	19
010995	3,700	22	353	6.68	19
011795	5,140	22	361	7.77	21
012395	5,220	22	379	7.15	21
013095	4,740	21	365	7.10	20
020695	500	19	387	7.98	20
021395	9,050	20	412	7.85	20
022095	5,060	21	401	7.74	19
022795	4,100	19	404	7.73	17
030695	5,060	19	420	7.73	18
031395	4,100	24	377	7.08	16
032095	4,850	20	420	7.45	15
032795	4,310	19	451	7.59	12
040495	3,760	21	431	7.51	13
041095	5,030	18	479	7.65	14
041795	4,040	22	427	7.53	13
042495	4,700	24	416	6.76	12

Appendix 3.2 Table 5 (Continued)

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity ($\mu\text{S}/\text{cm}$)*	pH (su)	Alkalinity (total, mg/L)
050195	4,380	22	433	6.72	21
050895	4,690	20	470	7.42	11
051595	4,600	22	447	7.53	14
052295	4,230	24	432	7.49	10
053195	4,840	23	474	6.44	11
060595	4,110	23	481	6.55	12
061295	4,700	22	427	7.33	11
061995	5,240	24	410	7.50	13
062695	4,160	24	423	7.41	12
070395	5,000	24	443	7.35	13
071095	5,140	25	433	7.35	14
071795	0				
072495	7,690	24	444	7.22	18
073195	4,560	25	470	7.38	14
080795	4,900	23	459	7.32	17
081495	4,710	23	442	7.39	12
082195	4,880	23	436	7.36	12
083095	5,630	25	411	7.33	13
090595	4,700	24	431	7.47	13
091195	4,240	22	443	7.37	<5(?)
091895	4,570	22	418	7.43	14
092595	5,080	21	428	7.15	12
100395	4,500	22	399	6.57	13
100995	4,980	22	419	6.88	12
101695	4,710	22	412	6.91	
102395	4,790	21	437	6.92	
103095	4,290	21	433	7.02	
110695	4,960	21	444	6.80	

* Conductivity values corrected for temperature.
 NA = not analyzed.

Appendix 3.2 Table 6

Parameters Measured Weekly in the Leachate Collected from the Waste Rock Composites

Rice Lake High Sulfur Composite

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μS/cm)*	pH (su)	Alkalinity or Acidity (total, mg/L)
102494	5,565	20	1,400	6.30	<5 ¹
110194	3,470	20	640	6.88	<5 ¹
110994	7,120	20	1,010	4.75	44 ²
111594	2,820	19	906	4.13	54 ²
112194	2,960	18	917	4.02	61 ²
112894	7,330	20	704	4.05	50 ²
120694	4,040	16	670	3.95	56 ²
121394	4,400	20	716	3.94	78 ²
122094	4,380	18	752	3.85	86 ²
122794	4,140	17	779	3.80	110 ²
010395	4,300	17	779	3.75	100 ²
010995	3,820	22	675	3.73	110 ²
011795	4,420	22	717	3.71	130 ²
012395	3,860	22	765	3.58	150 ²
013095	4,780	21	796	3.44	170 ²
020695	500	19	832	3.41	180 ²
021395	7,800	19	856	3.37	94 ² (?)
022095	4,380	21	823	3.30	190 ²
022795	4,100	19	840	3.23	190 ²
030695	5,260	19	876	3.21	200 ²
031395	4,200	23	800	3.03	190 ²
032095	4,020	21	914	2.95	220 ²
032795	5,240	19	1,060	2.97	250 ²
040495	4,160	21	1,090	2.90	260 ²
041095	5,250	18	1,410	2.77	320 ²
041795	3,840	22	1,340	2.73	330 ²
042495	5,080	23	1,480	2.70	400 ²

Appendix 3.2 Table 6 (Continued)

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μS/cm)*	pH (su)	Alkalinity or Acidity (total, mg/L)
050195	4,480	21	1,620	2.65	430 ²
050895	4,620	20	1,750	2.65	450 ²
051595	4,100	22	1,660	2.69	480 ²
052295	4,730	23	1,700	2.68	490 ²
053195	4,900	23	1,740	2.75	520 ²
060595	4,350	23	1,790	2.88	530 ²
061295	4,740	23	1,690	2.65	500 ²
061995	5,160	23	1,560	2.62	440 ²
062695	4,660	23	1,630	2.64	450 ²
070395	4,740	23	1,700	2.61	NA
071095	4,960	24	1,680	2.60	NA
071795	0				
072495	7,720	23	1,880	2.67	NA
073195	4,140	23	1,960	2.63	NA
080795	4,190	23	1,930	2.69	NA
081495	5,010	23	2,020	2.66	NA
082195	4,260	23	2,140	2.68	NA
083095	5,850	24	2,310	2.66	NA
090595	4,320	24	2,360	2.50	860 ²
091195	3,860	21	2,570	2.53	870 ²
091895	4,960	22	2,430	2.00	840 ²
092595	4,390	21	2,440	2.49	810 ²
100395	5,070	22	2,330	2.57	770 ²
100995	4,640	21	2,460	2.58	800 ²
101695	4,640	22	2,340	2.64	
102395	4,420	22	2,420	2.63	
103095	4,460	21	2,420	2.58	
110695	4,800	21	2,470	2.57	

* Conductivity values corrected for temperature.

NA = not analyzed.

x¹ = Alkalinity value.

x² = Acidity value.

Appendix 3.2 Table 7

Parameters Measured Weekly in the Leachate Collected from the Waste Rock Composites

Upper Mole Lake High Sulfur Composite

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μ S/cm)*	pH (su)	Alkalinity or Acidity (total, mg/L)
102494	6,475	20	1,630	6.79	23 ¹
110194	2,435	20	1,480	7.08	11 ¹
110994	4,934	20	1,280	5.38	9 ¹
111694	2,360	21	1,260	5.69	<5 ¹
112194	3,050	19	1,260	5.31	<5 ¹
112894	5,120	20	1,020	5.12	<5 ¹
120694	4,930	16	948	4.96	<5 ¹
121394	6,000	20	711	4.90	<5 ¹
122094	5,500	18	650	4.67	10 ²
122794	5,680	18	646	4.52	19 ²
010395	3,740	17	659	4.41	18 ²
010995	3,700	22	665	4.23	30 ²
011795	4,040	22	767	4.17	30 ²
012395	4,860	22	815	4.13	32 ²
013095	5,640	21	747	4.10	10 ²
020695	500	19	764	4.07	36 ²
021395	8,160	19	768	4.14	130 ² (?)
022095	3,480	20	829	4.00	30 ²
022795	3,630	19	905	4.03	36 ²
030695	4,100	18	957	4.00	34 ²
031395	3,410	22	862	3.85	35 ²
032095	4,300	20	962	3.79	48 ²
032795	4,680	19	1,000	3.93	62 ²
040495	4,680	21	878	3.94	41 ²
041095	5,030	18	945	3.85	47 ²
041795	4,700	22	819	3.88	40 ²
042495	4,860	23	835	3.85	60 ²

Appendix 3.2 Table 7 (Continued)

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity ($\mu\text{S}/\text{cm}$)*	pH (su)	Alkalinity or Acidity (total, mg/L)
050195	3,400	21	872	3.81	61 ²
050895	4,380	20	1,000	3.69	67 ²
051595	3,040	21	988	3.73	56 ²
052295	3,020	23	989	3.67	81 ²
053195	3,800	23	1,040	3.75	78 ²
060595	3,360	24	1,120	3.81	78 ²
061295	5,280	23	1,070	3.66	88 ²
061995	5,480	23	913	3.63	54 ²
062695	4,160	23	840	3.58	62 ²
070395	4,230	23	914	3.48	NA
071095	5,400	24	926	3.40	NA
071795	0				
072495	9,350	24	1,170	3.05	NA
073195	4,040	23	1,410	2.88	NA
080795	5,440	23	1,540	2.87	NA
081495	5,820	23	1,580	2.92	NA
082195	5,380	23	1,600	2.94	NA
083095	5,380	24	1,600	2.94	NA
090695	5,010	24	1,680	3.02	280 ²
091195	4,480	21	1,860	2.87	310 ²
091895	4,190	22	1,880	2.38	340 ²
092595	4,640	21	2,020	2.76	380 ²
100395	4,400	22	2,040	2.78	430 ²
100995	3,830	21	2,200	2.77	500 ²
101695	4,590	22	2,280	2.81	
102395	3,800	21	2,400	2.81	
103095	3,870	22	2,430	2.74	
110695	4,500	22	2,450	2.71	

* Conductivity values corrected for temperature.
 NA = not analyzed.

x¹ = Alkalinity value.
 x² = Acidity value.

Appendix 3.2 Table 8

Parameters Measured Weekly in the Leachate Collected from the Waste Rock Composites

Lower Mole Lake High Sulfur Composite

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μ S/cm)*	pH (su)	Acidity (total, mg/L)
102494	5,100	20	2,870	3.91	830
110194	7,185	20	4,910	3.71	1,100
110994	3,440	20	3,070	4.04	430
111694	6,120	21	3,110	3.84	280
112194	3,820	19	2,520	3.92	80
112894	4,860	20	2,220	4.06	93
120694	3,580	16	2,360	4.00	82
121294	6,660	18	2,060	4.20	60
122094	4,600	18	1,600	4.24	38
122794	3,000	18	1,750	4.15	68
010395	4,560	17	2,050	4.02	50
010995	4,580	22	1,910	3.96	54
011795	3,740	22	1,950	3.92	70
012395	3,820	22	2,070	3.89	78
013095	4,140	21	2,160	3.85	82
020695	500	19	2,240	3.86	78
021395	8,590	19	2,290	3.89	110
022095	5,760	20	2,040	3.89	92
022795	4,890	19	1,980	3.87	95
030695	5,100	18	2,000	3.85	86
031395	5,040	23	1,770	3.71	88
032095	5,140	20	1,850	3.66	92
032795	4,380	18	1,940	3.78	110
040495	4,160	21	1,820	3.79	110
041095	4,150	18	2,030	3.71	110
041795	3,320	21	1,830	3.73	120
042495	5,050	23	1,890	3.69	160

Appendix 3.2 Table 8 (Continued)

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μS/cm)*	pH (su)	Acidity (total, mg/L)
050195	4,860	21	1,960	3.68	140
050895	5,460	20	1,970	3.64	170
051595	5,320	21	1,740	3.65	130
052295	5,020	23	1,630	3.70	150
053195	6,240	24	1,590	3.73	140
060595	4,530	23	1,610	3.89	130
061295	4,690	23	1,590	3.66	140
061995	4,630	25	1,500	3.67	120
062695	4,340	25	1,520	3.67	140
070395	4,360	23	1,680	3.62	NA
071095	4,460	25	1,630	3.61	NA
071795	0				
072495	5,620	23	1,850	3.48	NA
073195	3,600	23	1,970	3.39	NA
080795	4,180	23	1,970	3.25	NA
081495	3,590	23	1,960	3.39	NA
082195	3,780	23	2,030	3.28	NA
083095	4,800	24	2,180	3.21	NA
090695	3,900	24	2,240	3.19	280
091195	4,040	21	2,410	3.01	300
091895	4,350	21	2,370	2.57	300
092595	4,500	21	2,410	2.91	350
100395	4,490	22	2,290	2.92	340
100995	4,870	21	2,390	2.89	370
101695	4,640	22	2,330	2.98	
102395	4,920	21	2,450	2.92	
103095	4,880	21	2,410	2.93	
110695	4,790	21	2,430	2.84	

* Conductivity values corrected for temperature.

NA = not analyzed.

Appendix 3.3

Parameters Measured Weekly in the Leachate from the Tailings Composites

Appendix 3.3 Table 1

Parameters Measured Weekly in the Leachate Collected from the Tailings Composites

Fine Tailings Composite Leached Under Saturated, Followed by Alternating W/D, Conditions

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μ S/cm)*	pH (su)	Alkalinity /Acidity (total, mg/L)
121494 ^a	4,500	16	1,830	6.87	37 ¹
011895 ^a	4,500	21	1,920	7.52	52 ¹
022195 ^b	5,200	18	2,040	7.29	26 ¹
022895 ^b	4,420	16	1,480	7.20	20 ¹
030795 ^b	3,360	20	1,450	7.51	20 ¹
031495 ^b	5,050	19	939	4.77	5 ²
032195 ^b	3,320	21	1,340	6.31	<5 ¹
032895 ^b	3,780	20	1,350	5.90	<5 ¹
040495 ^b	3,720	19	1,240	6.03	<5 ¹
041195 ^b	7,610	22	1,350	5.03	<5 ¹
041895 ^b	3,450	20	1,090	4.25	27 ²
042595 ^b	3,380	22	1,140	4.08	33 ²
050295 ^b	3,600	21	1,220	4.09	27 ²
051095 ^b	3,900	21	1,070	4.02	30 ²
051795 ^b	3,900	22	1,070	4.04	22 ²
052395 ^b	3,600	23	1,060	4.03	35 ²
053195 ^b	3,780	24	1,040	3.97	47 ²
060695 ^b	3,840	22	1,030	3.98	23 ²
061295 ^b	5,100	22	814	5.74(?)	<5 ¹ (?)
062095 ^b	4,240	25	896	4.07	21 ²
062795 ^b	2,980	23	929	4.01	20 ²
070595 ^b	4,580	23	1,100	4.12	28 ²
071195 ^b	2,900	24	922	4.40	19 ²
071795 ^b	0				
072595 ^b	4,960	23	1,080	3.95	12 ²
080195 ^b	2,220	23	796	3.45	15 ²
080895 ^b	3,590	23	1,080	3.69	15 ²

Appendix 3.3 Table 1 (Continued)

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μS/cm)*	pH (su)	Alkalinity /Acidity (total, mg/L)
081595 ^b	4,140	22	1,110	3.94	<10 ²
082295 ^b	3,350	23	1,060	4.59	<10 ²
083195 ^b	4,280	24	938	5.65	<5 ¹
090695 ^b	4,360	26	952	6.86	8 ¹
091295 ^b	2,710	23	952	6.84	12 ¹
091995 ^b	4,540	21	923	6.82	12 ¹
092695 ^b	2,820	21	933	6.92	15 ¹
100395 ^b	4,820	22	793	6.80	35 ¹
101095 ^b	2,980	21	813	6.87	18 ¹
101795 ^b	2,980	24	747	6.88	
102495 ^b	4,300	23	688	6.70	
103195 ^b	3,100	21	717	6.79	
110795 ^b	3,480	22	606	6.77	

* Conductivity values corrected for temperature.

NA = not analyzed.

Date^a = composite leached under saturated conditions.

Date^b = composite leached under alternating wet and dry (W/D) conditions.

x¹ = Alkalinity value.

x² = Acidity value.

Appendix 3.3 Table 2

Parameters Measured Weekly in the Leachate Collected from the Tailings Composites

Whole Tailings Composite Leached Under Saturated, Followed by Alternating W/D, Conditions

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μ S/cm)*	pH (su)	Alkalinity (total, mg/L)
121494 ^a	3,400	16	3,120	6.77	86
011895 ^a	4,500	21	3,070	7.20	79
022195 ^b	4,320	19	3,310	7.42	40
022895 ^b	4,200	16	2,490	7.50	62
030795 ^b	3,380	20	1,820	7.68	59
031495 ^b	4,700	21	1,440	7.40	51
032195 ^b	3,520	21	1,280	7.46	50
032895 ^b	3,520	20	1,170	7.41	46
040495 ^b	3,440	19	1,280	7.53	48
041195 ^b	7,380	22	1,420	7.13	32
041895 ^b	3,410	21	1,040	7.15	38
042595 ^b	3,470	22	1,040	7.26	45
050295 ^b	3,540	21	1,400	7.43	54
051095 ^b	3,580	21	1,500	7.40	47
051795 ^b	3,810	22	1,290	7.39	51
052395 ^b	3,580	24	1,120	7.39	57
053195 ^b	3,620	23	1,110	7.37	56
060695 ^b	3,800	23	974	7.53	53
061295 ^b	4,480	23	909	7.09	49
062095 ^b	3,800	24	905	7.47	46
062795 ^b	3,780	24	900	7.61	56
070595 ^b	3,660	23	888	7.67	50
071195 ^b	3,800	25	826	7.61	53
071795 ^b	0				
072595 ^b	3,600	23	771	7.62	49
080195 ^b	2,940	23	876	7.15	52
080895 ^b	3,940	23	850	6.93	51

Appendix 3.3 Table 2 (Continued)

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity ($\mu\text{S/cm}$)*	pH (su)	Alkalinity (total, mg/L)
081595 ^b	3,920	23	858	7.31	50
082295 ^b	3,870	23	777	7.40	49
083195 ^b	3,760	24	800	7.39	50
090695 ^b	3,880	25	754	7.62	48
091295 ^b	3,810	23	698	7.56	44
091995 ^b	3,740	22	678	7.28	41
092695 ^b	3,760	22	639	7.15	40
100395 ^b	3,760	22	649	7.04	42
101095 ^b	3,750	22	636	7.21	43
101795 ^b	3,320	23	649	7.10	
102495 ^b	3,340	23	565	6.85	
103195 ^b	3,360	21	636	6.91	
110795 ^b	3,520	22	556	6.90	

* Conductivity values corrected for temperature.

NA = not analyzed.

Date^a = composite leached under saturated conditions.

Date^b = composite leached under alternating wet and dry (W/D) conditions.

Appendix 3.3 Table 3

Parameters Measured Weekly in the Leachate Collected from the Tailings Composites

Whole Tailings Composite Leached Under Alternating W/D Conditions

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity ($\mu\text{S}/\text{cm}$)*	pH (su)	Alkalinity (total, mg/L)
102594	2,120	20	1,860	7.59	1000
110294	4,510	20	1,400	6.50	380
110994	4,570	20	936	5.50	200
111694	4,020	19	921	6.15	22
112294	4,750	16	1,160	5.88	30
112994	5,220	17	1,680	5.96	46
120694	4,620	16	2,310	7.25	75
121394	5,570	19	2,510	7.11	82
122194	4,460	17	3,150	7.62	51
122894	4,720	18	2,980	7.55	100
010495	4,700	20	2,600	7.29	92
011095	4,330	23	2,260	6.82	79
011795	3,640	22	2,230	7.21	71
012495	2,960	22	2,000	7.15	34
013195	3,060	18	2,070	6.96	26
020895	3,400	20	1,790	6.68	31
021595	5,120	20	1,600	7.04	20
022195	3,780	20	1,370	7.14	29
022895	3,460	17	1,280	6.48	20
030795	3,240	20	1,320	6.37	17
031495	3,520	20	1,060	6.53	12
032195	3,540	20	1,090	6.33	17
032895	3,500	20	1,090	6.32	16
040495	3,600	19	1,540	6.44	24
041195	3,430	22	1,720	6.56	35
041895	3,120	21	1,380	6.39	20
042595	3,200	22	1,260	6.23	11

Appendix 3.3 Table 3 (Continued)

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
050295	3,290	21	1,360	6.22	10
051095	3,200	21	1,380	6.21	9
051795	3,640	22	1,390	6.41	16
052395	3,480	23	1,470	6.64	29
053195	3,420	23	1,260	6.22	15
060695	3,960	23	1,400	6.96	28
061295	3,850	23	1,440	6.16	33
062095	4,060	24	1,390	6.80	34
062795	4,020	23	1,380	6.97	37
070595	3,820	22	1,360	7.12	39
071195	3,820	24	1,180	7.00	32
071795	0				
072595	3,800	23	1,220	7.41	28
080195	3,210	23	1,390	6.41	8
080895	4,010	22	1,420	6.35	20
081595	4,040	22	1,350	6.60	27
082295	4,020	23	1,200	6.61	25
083195	3,660	24	1,160	6.58	25
090695	3,900	25	1,060	6.85	21
091295	3,760	22	1,080	6.75	21
091995	3,660	21	1,080	6.44	17
092695	3,720	21	1,010	6.33	21
100395	3,530	22	1,010	6.29	19
101095	3,650	22	976	6.44	22
101795	3,500	24	946	6.49	
102495	3,360	22	979	6.21	
103195	3,380	21	1,040	5.85	
110795	3,340	21	979	5.96	

* Conductivity values corrected for temperature.

NA = not analyzed.

Note: Surface configuration of the composite was changed from flat to bowl shaped on 012395.

Appendix 3.3 Table 4

Parameters Measured Weekly in the Leachate Collected from the Tailings Composites

Lime Amended Whole Tailings Composite Leached Under Alternating W/D Conditions

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μ S/cm)*	pH (su)	Alkalinity (total, mg/L)
102594	3,010	20	800	11.61	17
110294	4,080	20	2,160	11.23	18
110994	4,360	20	1,250	11.17	23
111694	4,450	20	1,170	10.97	190
112294	4,870	16	896	10.88	200
112994	4,560	17	998	10.82	172
120694	4,120	16	1,000	10.72	146
121294	7,630	20	1,010	10.55	510
122194	4,300	17	633	9.15	36
122894	4,710	18	727	10.24	78
010495	4,620	20	817	10.24	52
011095	4,160	23	886	10.85	73
011795	2,920	21	756	10.29	39
012495	1,000	22	1,380	10.99	150
013195	400	19	770	8.33	47
020895	2,520	20	980	8.81	24
021595	1,350	20	961	8.34	NA
022195	2,460	20	1,120	9.18	500(?)
022895	1,880	17	1,150	8.17	NA
030795	1,840	22	1,140	7.77	NA
031495	2,150	20	1,130	7.43	NA
032195	2,520	21	1,260	7.95	NA
032895	2,500	20	1,230	7.66	NA
040495	2,580	19	907	7.23	NA
041195	2,360	22	918	7.35	NA
041895	2,150	21	955	7.24	NA
042595	2,490	22	947	7.27	NA

Appendix 3.3 Table 4 (Continued)

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity ($\mu\text{S}/\text{cm}$)*	pH (su)	Alkalinity (total, mg/L)
050295	2,520	21	965	7.26	NA
051095	2,600	21	976	7.00	NA
051795	3,000	21	1,030	6.55	NA
052395	2,840	23	1,140	6.84	NA
053195	2,750	23	1,010	7.22	NA
060695	3,550	22	1,030	7.40	NA
061295	3,360	23	937	7.63	NA
062095	3,220	24	922	7.53	NA
062795	3,450	23	963	7.55	NA
070595	3,350	23	965	7.48	NA
071195	3,290	23	888	7.73	NA
071795	0				
072595	3,510	23	872	7.42	NA
080195	2,160	23	812	7.08	NA
080895	3,620	23	927	6.98	NA
081595	3,740	22	968	7.36	NA
082295	3,380	23	898	7.46	NA
083195	3,160	24	867	7.43	NA
090695	3,580	25	847	7.72	NA
091295	3,460	22	884	7.53	22
091995	3,230	21	911	7.18	25
092695	3,450	23	852	7.23	20
100395	3,120	23	897	7.26	89
101095	3,090	22	928	7.29	33
101795	3,050	24	871	7.29	
102495	2,820	23	856	6.92	
103195	2,720	21	943	7.02	
110795	2,640	22	879	6.92	

* Conductivity values corrected for temperature.

NA = not analyzed.

Note: Surface configuration of the composite was changed from flat to bowl shaped on 012395.

Appendix 3.3 Table 5

Parameters Measured Weekly in the Leachate Collected from the Tailings Composites

Backfill Coarse Tailings Composite Leached Under Alternating W/D, Followed by Saturated, Conditions

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μ S/cm)*	pH (su)	Alkalinity (total, mg/L)
101194 ^b	4,500	18	3,830	6.32	
121494 ^b	0				
122194 ^a	4,400	18	2,610	6.04	70
122894 ^a	4,500	18	2,430	6.47	24
010395 ^a	400	17	2,750	6.97	44
011195 ^a	4,500	23	773	6.60	71
011795 ^a	2,750	22	829	6.64	86
012395 ^a	500	22	916	6.65	87
013095 ^a	500	21	876	6.69	96
020895 ^a	4,500	20	617	7.22	110
021595 ^a	500	22	815	6.77	72
022195 ^a	500	21	688	7.04	90
022895 ^a	500	18	848	7.02	100
030795 ^a	500	21	764	7.00	110
031395 ^a	500	23	697	7.00	110
032195 ^a	500	21	704	7.00	120
032895 ^a	500	21	681	7.13	110
040495 ^a	4,500	20	708	7.03	120
041195 ^a	500	23	678	7.12	80
041895 ^a	500	21	737	7.42	96
042595 ^a	500	23	704	7.47	110
050195 ^a	500	21	724	7.35	110
050895 ^a	500	20	736	7.20	110
051595 ^a	500	23	665	7.13	110
052295 ^a	500	24	642	7.25	110
053195 ^a	500	24	639	7.22	110
060695 ^a	500	23	655	7.37	100

Appendix 3.3 Table 5 (Continued)

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
061295 ^a	500	23	655	7.00	100
062095 ^a	500	24	660	7.17	97
062695 ^a	500	23	684	7.09	100
070395 ^a	500	23	693	7.22	NA
071195 ^a	250	24	686	7.25	NA
071795 ^a	0				
072595 ^a	2,000	24	694	6.87	90
073195 ^a	250	25	688	6.98	NA
080795 ^a	250	23	724	6.77	NA
081495 ^a	250	24	720	7.22	NA
082195 ^a	250	24	673	7.02	NA
083095 ^a	250	24	726	6.90	NA
090695 ^a	2,000	25	715	7.13	81
091195 ^a	2,000	22	744	6.92	66
091895 ^a	2,000	22	683	7.20	66
092595 ^a	2,000	21	633	7.00	62
100395 ^a	2,000	22	572	6.95	64
101095 ^a	2,000	23	517	6.93	66
101795 ^a	2,000	24	478	7.02	
102395 ^a	2,000	21	485	7.07	
103095 ^a	2,000	21	458	7.05	
110695 ^a	2,000	20	472	6.91	

* Conductivity values corrected for temperature.

NA = not analyzed.

Date^a = composite leached under saturated conditions.

Date^b = composite leached under alternating wet and dry (W/D) conditions.

Appendix 3.3 Table 6

Parameters Measured Weekly in the Leachate Collected from the Tailings Composites

Backfill Cemented Coarse Tailings Composite Leached Under Alternating W/D, Followed by Saturated, Conditions

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity ($\mu\text{S}/\text{cm}$)*	pH (su)	Alkalinity (total, mg/L)
101194 ^b	4,500	18	6,830	12.08	
121494 ^b	4,500	16	4,210	11.37	350
122094 ^a	4,500	18	4,330	11.95	510
122794 ^a	4,500	18	3,970	9.98	550
010395 ^a	400	17	3,860	10.44	470
011195 ^a	4,500	23	3,290	11.97	560
011795 ^a	2,750	22	3,190	12.12	NA
012395 ^a	500	22	3,110	12.14	530
013095 ^a	500	21	3,110	12.37	520
020895 ^a	4,500	21	3,140	12.08	520
021595 ^a	500	20	3,100	12.17	510
022195 ^a	500	21	2,990	12.18	500
022895 ^a	500	18	3,180	12.36	500
030795 ^a	500	21	2,910	12.23	500
031395 ^a	500	23	2,710	12.24	500
032195 ^a	500	21	2,810	12.17	480
032895 ^a	500	21	2,790	12.15	480
040495 ^a	4,500	20	2,810	12.00	440
041195 ^a	500	22	2,710	12.03	470
041895 ^a	500	21	2,690	12.01	470
042595 ^a	500	23	2,540	11.49	450
050195 ^a	500	20	2,670	11.17	420
050895 ^a	500	20	2,630	11.06	400
051595 ^a	500	24	2,300	11.14	42(?)
052295 ^a	500	24	2,310	11.16	410
053195 ^a	500	24	2,250	11.11	390
060695 ^a	500	22	2,380	11.31	380

Appendix 3.3 Table 6 (Continued)

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity ($\mu\text{S/cm}$)*	pH (su)	Alkalinity (total, mg/L)
061295 ^a	500	23	2,220	11.87	370
062095 ^a	500	24	2,220	11.90	370
062695 ^a	500	24	2,190	11.87	340
070395 ^a	500	24	2,160	11.80	NA
071195 ^a	250	25	2,060	11.73	NA
071795 ^a	0				
072595 ^a	2,000	24	2,110	11.49	320
073195 ^a	250	24	2,120	11.05	NA
080795 ^a	250	24	2,050	10.82	NA
081495 ^a	250	23	2,100	11.78	NA
082195 ^a	250	24	2,040	11.30	NA
083095 ^a	250	25	1,970	11.29	NA
090695 ^a	2,000	26	1,920	11.41	300
091195 ^a	2,000	22	2,130	11.28	300
091895 ^a	2,000	21	2,190	11.78	310
092595 ^a	2,000	21	2,150	11.16	300
100395 ^a	2,000	21	2,110	11.28	300
101095 ^a	2,000	22	2,050	11.53	300
101795 ^a	2,000	24	1,920	11.17	
102395 ^a	2,000	21	2,050	11.09	
103095 ^a	2,000	22	1,980	11.00	
110695 ^a	2,000	20	2,070	11.23	

* Conductivity values corrected for temperature.

NA = not analyzed.

Date^a = composite leached under saturated conditions.

Date^b = composite leached under alternating wet and dry (W/D) conditions.

Appendix 3.3 Table 7

Parameters Measured Weekly in the Leachate Collected from the Tailings Composites

Backfill Whole Tailings Composite Leached Under Alternating W/D, Followed by Saturated, Conditions

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity ($\mu\text{S}/\text{cm}$)*	pH (su)	Alkalinity (total, mg/L)
101194 ^b	4,500	18	2,530	7.24	
121494 ^b	0				
122194 ^a	4,400	18	1,990	6.97	74
122894 ^a	4,500	18	1,380	7.18	76
010395 ^a	400	17	2,030	6.50	34
011195 ^a	4,500	23	566	6.89	82
011795 ^a	2,750	22	631	7.21	66
012395 ^a	500	22	838	6.64	75
013095 ^a	500	21	1,030	6.58	78
020895 ^a	4,500	19	1,090	6.99	90
021595 ^a	500	22	997	6.66	59
022195 ^a	500	20	793	6.91	71
022895 ^a	500	18	947	6.88	79
030795 ^a	500	21	877	6.91	88
031395 ^a	500	23	805	6.91	94
032195 ^a	500	22	811	6.92	97
032895 ^a	500	21	818	7.01	92
040495 ^a	4,500	20	824	7.03	96
041195 ^a	500	23	809	6.76	60
041895 ^a	500	21	932	7.02	67
042595 ^a	500	23	874	6.42	71
050195 ^a	500	20	983	6.82	69
050895 ^a	500	20	1,050	6.70	64
051595 ^a	500	23	972	6.62	72
052295 ^a	500	24	720(?)	6.95	63
053195 ^a	500	24	823	6.75	73
060695 ^a	500	23	830	7.00	89

Appendix 3.3 Table 7 (Continued)

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μS/cm)*	pH (su)	Alkalinity (total, mg/L)
061295 ^a	500	23	792	6.63	76
062095 ^a	500	25	797	6.88	76
062695 ^a	500	23	849	6.67	69
070395 ^a	500	23	902	6.61	NA
071195 ^a	250	24	965	6.65	NA
071795 ^a	0				
072595 ^a	2,000	23	970	6.62	63
073195 ^a	250	24	985	6.38	NA
080795 ^a	250	24	1,080	6.36	NA
081495 ^a	250	24	1,050	6.62	NA
082195 ^a	250	25	1,100	6.64	NA
083095 ^a	250	24	1,160	6.50	NA
090695 ^a	2,000	25	775	7.15	49
091195 ^a	2,000	21	834	6.71	51
091895 ^a	2,000	22	762	6.70	59
092595 ^a	2,000	21	696	6.69	60
100395 ^a	2,000	23	619	6.66	74
101095 ^a	2,000	21	609	6.75	64
101795 ^a	2,000	24	520	6.85	
102395 ^a	2,000	21	502	6.92	
103095 ^a	2,000	21	490	6.92	
110695 ^a	2,000	20	522	6.75	

* Conductivity values corrected for temperature.

NA = not analyzed.

Date^a = composite leached under saturated conditions.

Date^b = composite leached under alternating wet and dry (W/D) conditions.

Appendix 3.3 Table 8

Parameters Measured Weekly in the Leachate Collected from the Tailings Composites

Backfill Cemented Whole Tailings Composite Leached Under Alternating W/D, Followed by Saturated, Conditions

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μ S/cm)*	pH (su)	Alkalinity /Acidity (total, mg/L)
101194 ^b	4,500	18	5,940	8.88	
121494 ^b	4,500	16	5,090	6.92	<5 ¹
122094 ^a	4,500	18	4,420	6.22	<5 ¹
122894 ^a	4,500	18	3,850	6.59	<5 ¹
010395 ^a	400	17	3,960	3.95(?)	41 ² (?)
011195 ^a	4,500	23	3,130	7.30	17 ¹
011795 ^a	2,000	22	3,190	6.53	8 ¹
012395 ^a	500	22	3,140	6.63	12 ¹
013095 ^a	500	21	3,200	6.52	10 ¹
020895 ^a	4,500	21	2,970	9.09(?)	22 ¹
021595 ^a	500	22	2,890	7.77	24 ¹
022195 ^a	500	21	2,940	7.81	19 ¹
022895 ^a	500	18	3,150	7.59	17 ¹
030795 ^a	500	21	2,890	7.73	13 ¹
031395 ^a	500	23	2,720	7.69	13 ¹
032195 ^a	500	21	2,840	7.60	<5 ¹
032895 ^a	500	21	2,810	7.57	<5 ¹
040495 ^a	4,500	20	2,860	7.40	<5 ¹
041195 ^a	500	23	2,570	9.10	32 ¹
041895 ^a	500	21	2,660	9.02	37 ¹
042595 ^a	500	23	2,540	9.00	22 ¹
050195 ^a	500	20	2,690	8.74	20 ¹
050895 ^a	500	20	2,690	8.17	32 ¹
051595 ^a	500	23	2,490	8.02	14 ¹
052295 ^a	500	24	2,420	8.11	21 ¹
053195 ^a	500	24	2,400	8.01	17 ¹
060695 ^a	500	22	2,510	8.21	10 ¹

Appendix 3.3 Table 8 (Continued)

Date	Leachate Collected (mL)	Temperature (°C)	Conductivity (μS/cm)*	pH (su)	Alkalinity /Acidity (total, mg/L)
061295 ^a	500	23	2,430	7.56	13 ¹
062095 ^a	500	24	2,370	7.82	19 ¹
062695 ^a	500	24	2,360	7.70	16 ¹
070395 ^a	500	24	2,350	7.67	<5 ¹ (?)
071195 ^a	500	24	2,340	7.55	13 ¹
071795 ^a	0				
072595 ^a	2,000	24	2,340	8.07	14 ¹
073195 ^a	500	24	2,340	8.60	17 ¹
080795 ^a	500	24	2,330	8.38	16 ¹
081495 ^a	500	23	2,370	8.60	15 ¹
082195 ^a	500	24	2,330	8.45	14 ¹
083095 ^a	500	24	2,310	8.15	5 ¹
090695 ^a	2,000	25	2,260	8.62	16 ¹
091195 ^a	2,000	22	2,420	8.83	18 ¹
091895 ^a	2,000	22	2,410	9.42	23 ¹
092595 ^a	2,000	21	2,450	9.36	20 ¹
100395 ^a	2,000	22	2,390	9.32	21 ¹
101095 ^a	2,000	22	2,380	9.51	32 ¹
101795 ^a	2,000	24	2,280	8.88	
102395 ^a	2,000	21	2,430	9.53	
103095 ^a	2,000	21	2,430	9.50	
110695 ^a	2,000	20	2,480	9.36	

* Conductivity values corrected for temperature.

NA = not analyzed.

Date^a = composite leached under saturated conditions.

Date^b = composite leached under alternating wet and dry (W/D) conditions.

x¹ = Alkalinity value.

x² = Acidity value.

Appendix 4

Waste Characterization Kinetic Test Calculations

(Note: See Appendix 1.1 for an explanation of the ABA terms used in this appendix.)

- Appendix 4.1** Explanation of Waste Characterization Data Sheets and Calculations
- Appendix 4.2** Skunk Lake Waste Rock Master Composite
- Appendix 4.3** Rice Lake Waste Rock Master Composite
- Appendix 4.4** Upper Mole Lake Waste Rock Master Composite
- Appendix 4.5** Lower Mole Lake Waste Rock Master Composite
- Appendix 4.6** Skunk Lake High-Sulfur Waste Rock Composite
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- Appendix 4.10** Fine Tailings - Leached Under Saturated Conditions, Followed by Wet/Dry Cycles
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- Appendix 4.12** Whole Tailings - Leached Under Alternating Wet/Dry Cycles
- Appendix 4.13** Lime Amended Whole Tailings - Leached Under Alternating Wet/Dry Conditions
- Appendix 4.14** Backfill Coarse Tailings - Leached Under Wet/Dry Cycles Followed by Saturated Conditions
- Appendix 4.15** Backfill Cemented Coarse Tailings - Leached Under Wet/Dry Cycles Followed by Saturated Conditions
- Appendix 4.16** Backfill Whole Tailings - Leached Under Wet/Dry Cycles Followed by Saturated Conditions
- Appendix 4.17** Backfill Cemented Whole Tailings - Leached Under Wet/Dry Cycles Followed by Saturated Conditions

Appendix 4.1

Explanation of Waste Characterization Data Sheets and Calculations

Explanation of Waste Characterization Data Sheets and Calculations

The test data and calculated results for each waste characterization test on waste rock or tailings are presented in seven consecutive Tables (1 to 7) as follows. Explanations of each table and calculations follow.

Table 1. **Sample characterization** - includes tailings or waste rock bulk chemical (head) analysis (calculated from Lakefield Research and Chemex data); acid base accounting results (Lakefield Research data); the sample mass used in the test; and, if applicable, the analysis of process water or groundwater used as the leach solution in specific stages of some tests.

The bulk chemical (head) analysis values are expressed as milligrams of metal per kilogram of test sample, converted from percentages reported for the analyses carried out by Lakefield Research as detailed in Tables 1 and 2 in Appendix 3.5-32 of the EIR.

Table 2. **Parameters measured weekly**, or some other period, include volume of leachate collected, pH, conductivity, alkalinity/acidity, and sulfate. Cumulative sulfate leached is included in this table.

Actual measured sulfate analyses are shown in bold typeface. Since sulfate analyses were not performed on every leachate sample obtained weekly, intermediate values are calculated by linear interpolation.

Cumulative sulfate(mg/kg) is calculated by determining the milligrams of sulfate leached per kilogram of test sample at a specific cycle (the mass flux) and the value obtained is added to the cumulative total for the previous cycle. For example, for a test waste rock sample of mass = 8.0 kg:

At cycle 1, volume of leachate = 4.5 L (measured), sulfate analysis = 800 mg/L (by analysis)

At cycle 2, volume of leachate = 4.3 L (measured), sulfate analysis = 600 mg/L (by analysis)

$$\text{then, mass flux of sulfate at cycle 1} = \frac{4.5 \text{ L} * 800 \text{ mg/L}}{8 \text{ kg}} = 450.0 \text{ mg/kg of SO}_4$$

$$\text{and, mass flux of sulfate at cycle 2} = \frac{4.3 \text{ L} * 600 \text{ mg/L}}{8 \text{ kg}} = 322.5 \text{ mg/kg of SO}_4$$

$$\text{therefore, cumulative mass flux at cycle 2} = 450.0 + 322.5 = 772.5 \text{ mg/kg SO}_4$$

Table 3. **Leachate analysis** - provides the analyses of metals in leachates for each leach cycle (Pace Laboratories data)

As with the sulfate analyses given in Table 2, metal analyses are not performed on all leachate samples. Intermediate values are calculated by linear interpolation.

Table 4. **Cumulative mass flux** - provides the calculated cumulative values of the mass of each metal leached from the test sample in units of milligrams metals leached per kilogram

of sample.

Cumulative mass flux (mg/kg) values for metals leached are, in the general case, calculated by the same methodology as shown above for sulfate, using the values given in Table 3. All cumulative mass flux values for tests on waste rock are calculated in this way.

For tests on tailings in which process water or groundwater were used as the leach solution, a correction is made for the contribution of that metal in the leach solution for each metal analysis in the leachate shown in Table 3 before the cumulative mass flux value is calculated. For example, for a test tailings sample of mass = 12 kg,

Volume of leachate collected at cycle 6 = 4.1 L

Analysis of leachate for copper at cycle 6 = 3.5 mg/L

Analysis of process water for copper = 0.30 mg/L

Therefore, the corrected (or net) values of copper in the leachate = 3.5 - 0.30 = 3.2 mg/L

and, the mass flux of copper at cycle 6 = $\frac{4.1 \text{ L} * 3.2 \text{ mg/L}}{12 \text{ kg}} = 1.093 \text{ mg/kg}$

The cumulative mass flux of copper at cycle 6 = the value at cycle 5 + 1.093 mg/kg

Table 5. **Cumulative metal extractions** - provides calculated values of the percentage of each metals leached from the test sample on a cumulative basis.

Cumulative metal extractions (%) are determined by expressing the cumulative mass flux values given in Table 4 for each metal at each cycle as a percentage of the value in the original bulk composition (head) of the sample as provided in Table 1. For example, the cumulative mass flux of zinc at cycle 17 for a test on a tailings sample = 45.75 mg/kg.

From Table 1, the bulk chemical (head) analysis of zinc = 4400 mg/kg

Therefore, the cumulative extraction of zinc at cycle 17 = $\frac{45.75 \text{ mg/kg}}{4400 \text{ mg/kg}} * 100\% = 1.04\%$

Table 6. **Metal extraction rates** - provides calculated values of the rate of metal extraction at each cycle, calculated as a 5-cycle (usually 5 weeks) moving average.

Metal extraction rates are calculated as 5-cycle moving averages by determining, from Table 4, the total mass flux of each metal over successive 5-cycle periods and then dividing the flux value by the corresponding time interval. Values of rate are expressed in units of milligrams of metal per kilogram of test sample per week. For example, the cumulative mass fluxes of calcium for a test on a waste rock sample are as follows:

At cycle 24 (215 days), the cumulative mass flux of calcium = 1376.3 mg/kg

At cycle 29 (250 days), the cumulative mass flux of calcium = 1434.5 mg/kg

Therefore, the calcium extraction rate at cycle 29 for the period cycle 24 to 29 is given by:

$$\text{Rate} = \frac{(1434.5 \text{ mg/kg} - 1376.3 \text{ mg/kg})}{(250 \text{ days} - 215 \text{ days})} * \frac{7 \text{ days}}{\text{week}} = 11.64 \text{ mg Ca/kg/week}$$

Table 7. Oxidation and neutralization results - provides calculated values to assess the extent and rate of both sulfide oxidation and the depletion of neutralization, including cumulative sulfate flux, sulfur depletion, sulfate production rate, the moles of SO₄, Ca and Mg extracted, the [Ca + Mg]/[SO₄] molar ratio, cumulative neutralization potential (NP) depletion, NP depletion rate, and NP consumed.

Cumulative sulfate flux (mg/kg) values are carried forward from Table 2, calculated as previously described.

Sulfur depletion (%) values are determined by converting the cumulative mass flux values for sulfate at each cycle to cumulative mass flux values of sulfur and expressing them as a percentage of the value in the original (head) sample, converted from the value in percent in Table 1 to mg/kg. For example, for a test on a tailings sample:

Cumulative mass flux of sulfate at cycle 31 = 1850 mg/kg

Thus, cumulative mass flux of sulfur = 1850 mg/kg SO₄ * $\frac{32 \text{ (mol weight of sulfur)}}{96 \text{ (mol weight of sulfate)}}$ = 616.7 mg/kg S

From Table 1, the bulk chemical (head) analysis of sulfur = 21.3% = $\frac{21.3}{100}$ * 1,000,000 = 213,000 mg/kg

Therefore, the cumulative extraction of sulfur at cycle 31 = $\frac{616.7 \text{ mg/kg}}{213,000 \text{ mg/kg}}$ * 100% = 0.29%

Sulfate Production Rate (mg/kg/week) values are calculated as 5-cycle moving averages by determining the cumulative mass flux of sulfate over successive 5-cycle periods and then dividing the flux value by the corresponding time interval. Values of rate are expressed in units of milligrams of sulfate per kilogram of test sample per week. An example of the methodology of this calculation is shown above for metal extraction rates (Table 6).

Moles extracted of sulfate, calcium and magnesium are calculated for the purpose of determining the ratio of moles of calcium plus magnesium to moles of sulfate. The moles extracted at a specific cycle are calculated by dividing the sulfate, calcium and magnesium leachate analyses for the same cycle (from Table 3) by the corresponding molecular weights. For example,

At cycle 23, the leachate analysis gave sulfate, calcium, and magnesium values of 240, 110, and 8 mg/L, respectively.

Converting to moles: sulfate = $\frac{240 \text{ mg/L}}{96}$ = 2.50 mmoles,

calcium = $\frac{110}{40}$ = 2.75 mmoles,

and magnesium = $\frac{8}{24.3}$ = 0.33 mmoles

The *mole ratio [Ca + Mg] / [SO₄]* is calculated at each cycle from the values of the moles extracted of sulfate, calcium and magnesium as calculated above. For

the above example:

$$\text{At cycle 23, } \frac{[\text{Ca} + \text{Mg}]}{[\text{SO}_4]} = \frac{[2.75 + 0.33]}{2.50} = 1.23$$

The appearance of sulfate in solution can be assumed to result from the oxidation of sulfide and the calculated sulfate production rate at any cycle indicative of the rate of oxidation at that time based on a 5-cycle average. In practice, samples usually contain some sulfate, such as products of oxidation or mineral phases such as gypsum, at the start of testing, which are leached in the early cycles of the test. However, if the amount of already-soluble sulfate is not excessive, and the tests are run with sufficiently high volumes of leachate to prevent or minimize sulfate precipitation, it can be assumed that sulfate production rates after the early cycles are a measure of oxidation rates.

Acidity produced during oxidation is neutralized by acid consuming minerals resulting in the appearance in solution of cations from those minerals. Since the carbonate minerals such as calcite and dolomite are dominant in neutralization reactions, especially in neutral pH conditions, the values of calcium and magnesium in solution are indicative of the dissolution of the neutralizing minerals. Other cations such as potassium, sodium, aluminum also appear in solution, resulting from some reaction of leachate with silicate minerals. However, these can usually be ignored, especially for solutions with pH in the neutral range. Therefore, the value of the molar ratio $[\text{Ca} + \text{Mg}]/[\text{SO}_4]$ provides an indication of the relative rates of oxidation and the depletion of neutralizing minerals. It should be noted that depletion of neutralization minerals occurs in the absence of acid producing conditions and which is therefore included in the value of the ratio.

Cumulative neutralization potential (NP) depletion (mg/kg) is calculated by multiplying the cumulative sulfate flux at a specific cycle by the molar ratio $[\text{Ca} + \text{Mg}]/[\text{SO}_4]$ at that cycle. The value obtained is then converted from mg/kg SO_4 to mg/kg CaCO_3 . For example:

At cycle 14, the cumulative sulfate flux (Table 7) = 130.4 mg/kg
At the same cycle, the ratio $[\text{Ca} + \text{Mg}]/[\text{SO}_4] = 1.45$

$$\text{Therefore, the cumulative NP depletion} = 130.4 * 1.45 * \frac{100.1 \text{ (mol. wt. CaCO}_3\text{)}}{96 \text{ (mol. wt. of SO}_4\text{)}} = 197.2 \text{ mg/kg}$$

NP depletion rate (mg/kg/week) is calculated as a 5-cycle moving average from the cumulative NP depletion in the same manner as described above for the sulfate production rate.

NP consumed (%) is calculated by expressing cumulative NP depletion values as a percentage of the NP values given in Table 1, converted from kg/tonne to units of mg/tonne. For example, for a test on a waste rock sample:

Cumulative NP depletion at cycle 22 = 357 mg/kg

From Table 1, sample NP = 15.5 kg/tonne = 15.5 kg/tonne * 1000 g/kg (or mg/kg) = 15,500 mg/kg

Therefore, the cumulative NP depletion at cycle 22 = $\frac{357 \text{ mg/kg}}{15,500 \text{ mg/kg}} * 100\% = 2.3\%$

Appendix 4.2

Skunk Lake Waste Rock Master Composite

Appendix 4.2 Table 1

Sample Characterization Skunk Lake Waste Rock Master Composite

Metals Analysis		Waste Rock (ppm)
Aluminum	Al	63600
Antimony	Sb	20
Arsenic	As	61
Barium	Ba	390
Beryllium	Be	<1
Bismuth	Bi	<50
Cadmium	Cd	5.0
Calcium	Ca	1100
Carbon	C	800
Chromium	Cr	7.0
Cobalt	Co	21
Copper	Cu	860
Gallium	Ga	14
Iron	Fe	46000
Lead	Pb	140
Lithium	Li	NA
Magnesium	Mg	21200
Manganese	Mn	630
Mercury	Hg	<0.3
Molybdenum	Mo	<20
Nickel	Ni	6
Phosphorus	P	NA
Potassium	K	17900
Selenium	Se	<3
Silicon	Si	311000
Silver	Ag	<0.01
Sodium	Na	1100
Strontium	Sr	NA
Thallium	Tl	<10
Tin	Sn	<10
Titanium	Ti	560
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	240
Sulfur	S	100

ABA Results	
Paste pH	8.7
S (Total) (%)	0.14
SO4 (%)	NA
S (sulfide) (%)	0.13
AP (kg CaCO3/tonne)	4.1
NP (kg CaCO3/tonne)	1.0
CO2 (%)	NA
CO3 NP (kg CaCO3/tonne)	NA
Net NP (kg CaCO3/tonne)	-3.1
NP/AP	0.24

Note: NA = not analyzed

Sample Mass (kg)	84.55
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Appendix 4.2 Table 2

Parameters Measured Weekly
Skunk Lake Waste Rock Master Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
25-Oct	1	0	5.725	6.2	316	44		83	6
2-Nov	2	8	5.470	6.3	294	33		77	11
9-Nov	3	15	4.055	5.7	240	33		66	14
16-Nov	4	22	4.930	6.9	192	30		55	17
21-Nov	5	27	4.460	6.0	186	34		44	19
28-Nov	6	34	5.560	6.1	128	27		39	22
5-Dec	7	41	4.250	6.5	121	29		33	24
12-Dec	8	48	4.930	6.0	126	30		28	25
19-Dec	9	55	4.320	7.7	126	31		23	26
27-Dec	10	63	4.460	7.7	131	28		24	28
3-Jan	11	70	4.970	7.6	131	31		25	29
9-Jan	12	76	3.740	7.3	108	26		27	30
17-Jan	13	84	4.290	7.3	112	26		28	32
23-Jan	14	90	4.200	7.6	123	24		29	33
30-Jan	15	97	4.580	7.5	123	26		30	35
6-Feb	16	104	0.500	7.1	126	23		32	35
13-Feb	17	111	8.160	8.3	147	23		33	38
20-Feb	18	118	4.700	7.1	132	26		33	40
27-Feb	19	125	4.100	7.4	131	29		32	41
6-Mar	20	132	4.780	7.5	141	24		32	43
13-Mar	21	139	3.610	7.1	113			32	45
20-Mar	22	146	4.550	7.0	124	20		31	46
27-Mar	23	153	4.420	6.8	134	18		31	48
4-Apr	24	161	5.080	6.8	129	16		30	50
10-Apr	25	167	4.960	6.9	138	20		30	52
17-Apr	26	174	4.080	6.7	151	16		30	53
24-Apr	27	181	3.940	6.6	130	14		29	54
1-May	28	188	4.060	6.7	123	24		29	56
8-May	29	195	3.580	6.7	120	17		29	57
15-May	30	202	4.400	6.9	120	20		28	58
22-May	31	209	3.950	7.1	116	16		28	60
30-May	32	217	4.840	6.9	113	18		27	61
5-Jun	33	223	4.320	6.7	114	18		27	63
12-Jun	34	230	4.600	7.0	96	22			
19-Jun	35	237	5.740	7.5	107	14			
26-Jun	36	244	3.980	7.5	103	14			
3-Jul	37	251	4.280	7.3	106				
10-Jul	38	258	5.260	7.4	110				
17-Jul	39	265	0.000						
24-Jul	40	272	7.110	7.1	114				
31-Jul	41	279	3.320	7.2	117				
7-Aug	42	286	4.900	7.1	120				
14-Aug	43	293	3.560	7.2	112				
21-Aug	44	300	4.460	7.2	114				
30-Aug	45	309	5.440	7.1	111				
5-Sep	46	315	4.120	7.1	118	12			
11-Sep	47	321	3.840	7.2	126	12			
18-Sep	48	328	3.620	7.0	117	13			
25-Sep	49	335	4.980	6.7	113	13			
2-Oct	50	342	4.160	6.5	104	14			
9-Oct	51	349	4.280	6.4	102	14			
16-Oct	52	356	4.180	6.4	97				
23-Oct	53	363	3.810	6.4	98				
30-Oct	54	370	4.770	6.5	101				
6-Nov	55	377	4.240	6.3	96				

* Measured values of sulfate shown in bold.

Appendix 4.2 Table 3

Leachate Analysis
Skunk Lake Waste Rock Master Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L)*													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn	
1	0	4.200	0.013	0.016	20.0	< 0.005	0.290	6.8	14.0	0.51	13.00	0.0300	11.00	0.110	
2	8	12.000	0.018	0.035	19.0	0.017	0.560	20.0	19.0	0.63	10.90	0.0320	8.10	0.200	
3	15	8.310	0.016	0.026	16.3	0.013	0.392	13.9	15.1	0.49	10.33	0.0280	6.43	0.145	
4	22	4.620	0.013	0.018	13.7	0.009	0.225	7.7	11.2	0.35	9.77	0.0240	4.77	0.089	
5	27	0.930	0.011	0.009	11.0	< 0.005	0.057	1.6	7.3	0.21	9.20	0.0200	3.10	0.034	
6	34	1.098	0.009	0.009	10.4	0.005	0.063	1.8	6.9	0.20	8.75	0.0163	2.68	0.036	
7	41	1.265	0.006	0.010	9.8	0.005	0.069	2.0	6.5	0.20	8.30	0.0125	2.25	0.038	
8	48	1.433	0.004	0.010	9.1	0.005	0.074	2.1	6.0	0.19	7.85	0.0088	1.83	0.039	
9	55	1.600	0.002	0.010	8.5	0.005	0.080	2.3	5.6	0.18	7.40	0.0050	1.40	0.041	
10	63	1.409	0.003	0.009	8.6	0.005	0.073	2.0	5.5	0.18	7.06	0.0051	1.36	0.041	
11	70	1.217	0.004	0.009	8.7	0.005	0.066	1.7	5.5	0.18	6.73	0.0053	1.33	0.041	
12	76	1.026	0.005	0.008	8.8	0.005	0.058	1.5	5.4	0.18	6.39	0.0054	1.29	0.041	
13	84	0.834	0.006	0.008	8.9	0.005	0.051	1.2	5.3	0.18	6.05	0.0055	1.25	0.041	
14	90	0.643	0.007	0.007	8.9	0.005	0.044	0.9	5.2	0.17	5.71	0.0056	1.21	0.040	
15	97	0.451	0.008	0.006	9.0	0.005	0.037	0.6	5.2	0.17	5.38	0.0058	1.18	0.040	
16	104	0.260	0.009	0.006	9.1	0.005	0.029	0.4	5.1	0.17	5.04	0.0059	1.14	0.040	
17	111	0.068	0.010	< 0.005	9.2	< 0.005	0.022	0.1	5.0	0.17	4.70	0.0060	1.10	0.040	
18	118	0.070	0.010	0.005	9.2	0.022	0.11	5.0	0.17	4.57	0.0063	1.09	0.040		
19	125	0.071	0.010	0.005	9.2	0.022	0.11	5.1	0.16	4.44	0.0066	1.08	0.041		
20	132	0.073	0.010	0.005	9.3	0.023	0.12	5.1	0.16	4.31	0.0069	1.06	0.041		
21	139	0.074	0.010	0.005	9.3	0.023	0.13	5.1	0.15	4.18	0.0073	1.05	0.042		
22	146	0.076	0.010	0.005	9.3	0.023	0.14	5.1	0.15	4.04	0.0076	1.04	0.042		
23	153	0.077	0.010	0.005	9.3	0.023	0.15	5.2	0.14	3.91	0.0079	1.03	0.042		
24	161	0.079	0.010	0.005	9.3	0.023	0.16	5.2	0.14	3.78	0.0082	1.01	0.043		
25	167	0.080	0.010	0.005	9.3	0.024	0.16	5.2	0.14	3.65	0.0085	1.00	0.043		
26	174	0.082	0.010	0.005	9.4	0.024	0.17	5.2	0.13	3.52	0.0088	0.99	0.043		
27	181	0.083	0.010	0.005	9.4	0.024	0.18	5.3	0.13	3.39	0.0091	0.98	0.044		
28	188	0.085	0.010	0.005	9.4	0.024	0.19	5.3	0.12	3.26	0.0094	0.96	0.044		
29	195	0.086	0.010	0.005	9.4	0.024	0.20	5.3	0.12	3.13	0.0098	0.95	0.045		
30	202	0.088	0.010	0.005	9.4	0.024	0.21	5.3	0.11	2.99	0.0101	0.94	0.045		
31	209	0.089	0.010	0.005	9.5	0.025	0.21	5.4	0.11	2.86	0.0104	0.93	0.045		
32	217	0.091	0.010	0.005	9.5	0.025	0.22	5.4	0.10	2.73	0.0107	0.91	0.046		
33	223	0.092	0.01	< 0.005	9.5	0.025	0.23	5.4	0.10	2.60	0.0110	0.90	0.046		

* Measured values shown in bold.

Appendix 4.2 Table 4

**Cumulative Mass Flux
Skunk Lake Waste Rock Master Composite**

Test: **Leached under wet/dry alternating cycles**
 Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.28	0.001	0.001	1.4	0.000	0.020	0.46	0.9	0.035	0.9	0.002	0.7	0.01
2	8	1.06	0.002	0.003	2.6	0.001	0.06	1.75	2.2	0.075	1.6	0.004	1.3	0.02
3	15	1.46	0.003	0.005	3.4	0.002	0.07	2.42	2.9	0.099	2.1	0.005	1.6	0.03
4	22	1.73	0.004	0.006	4.2	0.003	0.09	2.87	3.6	0.119	2.7	0.007	1.9	0.03
5	27	1.78	0.004	0.006	4.7	0.003	0.09	2.95	3.9	0.130	3.1	0.008	2.0	0.03
6	34	1.85	0.005	0.007	5.4	0.003	0.09	3.07	4.4	0.144	3.7	0.009	2.2	0.04
7	41	1.91	0.005	0.007	5.9	0.003	0.10	3.17	4.7	0.153	4.1	0.010	2.3	0.04
8	48	2.00	0.005	0.008	6.4	0.004	0.10	3.29	5.1	0.164	4.6	0.010	2.4	0.04
9	55	2.08	0.005	0.008	6.9	0.004	0.11	3.41	5.4	0.174	5.0	0.010	2.5	0.04
10	63	2.15	0.005	0.009	7.3	0.004	0.11	3.52	5.6	0.183	5.3	0.011	2.6	0.05
11	70	2.22	0.006	0.009	7.8	0.005	0.11	3.62	6.0	0.193	5.7	0.011	2.6	0.05
12	76	2.27	0.006	0.010	8.2	0.005	0.12	3.69	6.2	0.201	6.0	0.011	2.7	0.05
13	84	2.31	0.006	0.010	8.7	0.005	0.12	3.75	6.5	0.210	6.3	0.011	2.8	0.05
14	90	2.34	0.007	0.010	9.1	0.005	0.12	3.79	6.7	0.219	6.6	0.012	2.8	0.05
15	97	2.37	0.007	0.011	9.6	0.006	0.12	3.83	7.0	0.228	6.9	0.012	2.9	0.06
16	104	2.37	0.007	0.011	9.7	0.006	0.12	3.83	7.0	0.229	6.9	0.012	2.9	0.06
17	111	2.38	0.008	0.011	10.6	0.006	0.13	3.84	7.5	0.245	7.4	0.013	3.0	0.06
18	118	2.38	0.009	0.012	11.1		0.13	3.84	7.8	0.255	7.6	0.013	3.1	0.06
19	125	2.38	0.009	0.012	11.5		0.13	3.85	8.0	0.262	7.8	0.013	3.1	0.06
20	132	2.39	0.010	0.012	12.0		0.13	3.86	8.3	0.271	8.1	0.014	3.2	0.07
21	139	2.39	0.010	0.012	12.4		0.13	3.86	8.6	0.278	8.3	0.014	3.2	0.07
22	146	2.40	0.011	0.013	12.9		0.13	3.87	8.8	0.286	8.5	0.014	3.3	0.07
23	153	2.40	0.011	0.013	13.4		0.13	3.88	9.1	0.293	8.7	0.015	3.3	0.07
24	161	2.40	0.012	0.013	14.0		0.13	3.89	9.4	0.302	8.9	0.015	3.4	0.07
25	167	2.41	0.012	0.013	14.5		0.14	3.90	9.7	0.310	9.1	0.016	3.4	0.08
26	174	2.41	0.013	0.014	15.0		0.14	3.91	10.0	0.316	9.3	0.016	3.5	0.08
27	181	2.42	0.013	0.014	15.4		0.14	3.91	10.2	0.322	9.5	0.017	3.5	0.08
28	188	2.42	0.014	0.014	15.9		0.14	3.92	10.5	0.328	9.6	0.017	3.6	0.08
29	195	2.42	0.014	0.014	16.3		0.14	3.93	10.7	0.333	9.8	0.018	3.6	0.09
30	202	2.43	0.015	0.015	16.8		0.14	3.94	11.0	0.339	9.9	0.018	3.7	0.09
31	209	2.43	0.015	0.015	17.2		0.14	3.95	11.2	0.344	10.0	0.019	3.7	0.09
32	217	2.44	0.016	0.015	17.7		0.14	3.96	11.5	0.350	10.2	0.019	3.8	0.09
33	223	2.44	0.016	0.015	18.2		0.15	3.98	11.8	0.355	10.3	0.020	3.8	0.10

Appendix 4.2 Table 5

**Cumulative Metal Extractions
Skunk Lake Waste Rock Master Composite**

Test: **Leached under wet/dry alternating cycles**
 Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.0004	0.0014	0.0003	0.12	0.005	0.0023	0.001	0.004	0.005	0.005	0.07	0.07	0.003
2	8	0.0017	0.0034	0.001	0.23	0.021	0.006	0.004	0.010	0.012	0.009	0.14	0.12	0.008
3	15	0.002	0.005	0.001	0.31	0.029	0.009	0.005	0.014	0.016	0.012	0.18	0.14	0.011
4	22	0.003	0.006	0.001	0.38	0.037	0.010	0.006	0.017	0.019	0.015	0.23	0.17	0.014
5	27	0.003	0.007	0.002	0.43	0.041	0.011	0.006	0.019	0.021	0.018	0.26	0.18	0.014
6	34	0.003	0.008	0.002	0.49	0.045	0.011	0.007	0.021	0.023	0.021	0.30	0.20	0.015
7	41	0.003	0.008	0.002	0.54	0.049	0.011	0.007	0.022	0.024	0.023	0.32	0.21	0.016
8	48	0.003	0.009	0.002	0.59	0.053	0.012	0.007	0.024	0.026	0.026	0.34	0.22	0.017
9	55	0.003	0.009	0.002	0.63	0.057	0.012	0.007	0.025	0.028	0.028	0.35	0.23	0.018
10	63	0.003	0.009	0.002	0.67	0.061	0.013	0.008	0.027	0.029	0.030	0.35	0.23	0.019
11	70	0.003	0.009	0.002	0.71	0.065	0.013	0.008	0.028	0.031	0.032	0.36	0.24	0.020
12	76	0.004	0.010	0.002	0.75	0.068	0.014	0.008	0.029	0.032	0.034	0.37	0.24	0.021
13	84	0.004	0.010	0.003	0.79	0.072	0.014	0.008	0.031	0.033	0.035	0.38	0.25	0.021
14	90	0.004	0.011	0.003	0.83	0.075	0.014	0.008	0.032	0.035	0.037	0.39	0.26	0.022
15	97	0.004	0.011	0.003	0.87	0.079	0.014	0.008	0.033	0.036	0.039	0.40	0.26	0.023
16	104	0.004	0.012	0.003	0.88	0.079	0.014	0.008	0.033	0.036	0.039	0.40	0.26	0.023
17	111	0.004	0.013	0.003	0.96	0.086	0.015	0.008	0.035	0.039	0.041	0.42	0.27	0.025
18	118	0.004	0.014	0.003	1.01		0.015	0.008	0.037	0.040	0.043	0.43	0.28	0.026
19	125	0.004	0.015	0.003	1.05		0.015	0.008	0.038	0.042	0.044	0.44	0.28	0.027
20	132	0.004	0.016	0.003	1.09		0.015	0.008	0.039	0.043	0.045	0.46	0.29	0.028
21	139	0.004	0.016	0.003	1.13		0.015	0.008	0.040	0.044	0.046	0.47	0.29	0.028
22	146	0.004	0.017	0.003	1.18		0.015	0.008	0.042	0.045	0.047	0.48	0.30	0.029
23	153	0.004	0.018	0.003	1.22		0.015	0.008	0.043	0.047	0.049	0.50	0.30	0.030
24	161	0.004	0.019	0.003	1.27		0.016	0.008	0.044	0.048	0.050	0.51	0.31	0.031
25	167	0.004	0.020	0.003	1.32		0.016	0.008	0.046	0.049	0.051	0.53	0.31	0.032
26	174	0.004	0.021	0.003	1.36		0.016	0.008	0.047	0.050	0.052	0.54	0.32	0.033
27	181	0.004	0.022	0.004	1.40		0.016	0.009	0.048	0.051	0.053	0.56	0.32	0.034
28	188	0.004	0.022	0.004	1.44		0.016	0.009	0.049	0.052	0.054	0.57	0.33	0.035
29	195	0.004	0.023	0.004	1.48		0.016	0.009	0.050	0.053	0.054	0.59	0.33	0.036
30	202	0.004	0.024	0.004	1.52		0.016	0.009	0.052	0.054	0.055	0.60	0.33	0.037
31	209	0.004	0.025	0.004	1.56		0.017	0.009	0.053	0.055	0.056	0.62	0.34	0.038
32	217	0.004	0.026	0.004	1.61		0.017	0.009	0.054	0.055	0.057	0.64	0.34	0.039
33	223	0.004	0.027	0.004	1.66		0.017	0.009	0.056	0.056	0.058	0.66	0.35	0.040

Appendix 4.2 Table 6

**Metal Extraction Rates
Skunk Lake Waste Rock Master Composite**

Test: **Leached under wet/dry alternating cycles**
 Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0													
2	8	0.679	0.0010	0.002	1.08	0.0010	0.032	1.13	1.08	0.036	0.62	0.0018	0.46	0.011
3	15	0.548	0.0009	0.002	0.94	0.0008	0.026	0.91	0.91	0.030	0.56	0.0016	0.39	0.009
4	22	0.460	0.0009	0.001	0.89	0.0007	0.022	0.77	0.83	0.027	0.56	0.0015	0.35	0.008
5	27	0.387	0.0008	0.001	0.88	0.0007	0.018	0.65	0.78	0.025	0.58	0.0015	0.33	0.007
6	34	0.322	0.0008	0.001	0.84	0.0006	0.015	0.54	0.71	0.022	0.58	0.0014	0.30	0.006
7	41	0.181	0.0006	0.001	0.71	0.0004	0.009	0.30	0.54	0.017	0.54	0.0012	0.22	0.004
8	48	0.114	0.0005	0.001	0.65	0.0004	0.006	0.19	0.46	0.014	0.53	0.0010	0.18	0.003
9	55	0.074	0.0004	0.001	0.58	0.0003	0.004	0.11	0.38	0.012	0.49	0.0007	0.13	0.002
10	63	0.073	0.0003	0.001	0.50	0.0003	0.004	0.11	0.33	0.010	0.43	0.0005	0.10	0.002
11	70	0.073	0.0002	0.000	0.47	0.0003	0.004	0.11	0.31	0.010	0.39	0.0004	0.09	0.002
12	76	0.071	0.0002	0.000	0.46	0.0003	0.004	0.10	0.30	0.010	0.38	0.0003	0.08	0.002
13	84	0.061	0.0002	0.000	0.43	0.0003	0.003	0.09	0.27	0.009	0.34	0.0003	0.07	0.002
14	90	0.053	0.0002	0.000	0.45	0.0003	0.003	0.08	0.28	0.009	0.33	0.0003	0.07	0.002
15	97	0.044	0.0003	0.000	0.47	0.0003	0.003	0.06	0.28	0.009	0.32	0.0003	0.07	0.002
16	104	0.030	0.0003	0.000	0.38	0.0002	0.002	0.04	0.22	0.007	0.25	0.0002	0.05	0.002
17	111	0.021	0.0004	0.000	0.46	0.0003	0.002	0.03	0.26	0.009	0.27	0.0003	0.06	0.002
18	118	0.014	0.0005	0.000	0.49		0.002	0.02	0.27	0.009	0.27	0.0003	0.06	0.002
19	125	0.008	0.0005	0.000	0.48		0.001	0.01	0.26	0.009	0.25	0.0003	0.06	0.002
20	132	0.004	0.0005	0.000	0.49		0.001	0.006	0.26	0.009	0.24	0.0003	0.06	0.002
21	139	0.004	0.0006	0.000	0.55		0.001	0.007	0.30	0.010	0.27	0.0004	0.06	0.002
22	146	0.004	0.0005	0.0003	0.48		0.001	0.006	0.26	0.008	0.22	0.0004	0.05	0.002
23	153	0.004	0.0005	0.0003	0.47		0.001	0.007	0.26	0.008	0.21	0.0004	0.05	0.002
24	161	0.004	0.0005	0.0003	0.48		0.001	0.007	0.26	0.008	0.21	0.0004	0.05	0.002
25	167	0.004	0.0005	0.0003	0.50		0.001	0.008	0.28	0.008	0.21	0.0004	0.05	0.002
26	174	0.004	0.0005	0.0003	0.51		0.001	0.008	0.28	0.008	0.21	0.0004	0.06	0.002
27	181	0.004	0.0005	0.0003	0.50		0.001	0.009	0.28	0.007	0.19	0.0005	0.05	0.002
28	188	0.004	0.0005	0.0003	0.49		0.001	0.009	0.27	0.007	0.19	0.0005	0.05	0.002
29	195	0.004	0.0005	0.0003	0.47		0.001	0.009	0.26	0.006	0.17	0.0005	0.05	0.002
30	202	0.004	0.0005	0.0002	0.45		0.001	0.009	0.25	0.006	0.15	0.0004	0.05	0.002
31	209	0.004	0.0005	0.0002	0.44		0.001	0.009	0.25	0.006	0.15	0.0005	0.04	0.002
32	217	0.004	0.0005	0.0002	0.45		0.001	0.010	0.26	0.005	0.14	0.0005	0.04	0.002
33	223	0.004	0.0005	0.0002	0.47		0.001	0.011	0.27	0.005	0.14	0.0005	0.05	0.002

Appendix 4.2 Table 7

Oxidation and Neutralization Results
Skunk Lake Waste Rock Master Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO [Ca + Mg] [SO4]	NEUTRALIZATION		
		Cumulative Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)		Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1	0	6	0.13		0.059	0.034	0.039	1.24	7		0.7
2	8	11	0.25	4.4	0.052	0.031	0.051	1.57	15	7.1	1.5
3	15	14	0.33	3.8	0.033	0.020	0.030	1.50	20	6.1	2.0
4	22	17	0.40	3.6	0.033	0.020	0.027	1.40	25	5.6	2.5
5	27	19	0.46	3.5	0.024	0.015	0.016	1.26	28	5.4	2.8
6	34	22	0.52	3.3	0.026	0.017	0.019	1.35	32	5.0	3.2
7	41	24	0.56	2.7	0.017	0.012	0.013	1.47	34	4.0	3.4
8	48	25	0.60	2.4	0.017	0.013	0.014	1.63	37	3.5	3.7
9	55	26	0.63	2.0	0.012	0.011	0.012	1.87	39	3.0	3.9
10	63	28	0.66	1.6	0.013	0.011	0.012	1.77	42	2.6	4.2
11	70	29	0.69	1.4	0.015	0.013	0.013	1.68	44	2.4	4.4
12	76	30	0.72	1.3	0.012	0.010	0.010	1.59	46	2.4	4.6
13	84	32	0.75	1.3	0.015	0.011	0.011	1.51	48	2.2	4.8
14	90	33	0.79	1.4	0.015	0.011	0.011	1.44	51	2.3	5.1
15	97	35	0.83	1.5	0.017	0.012	0.011	1.38	53	2.3	5.3
16	104	35	0.83	1.2	0.002	0.001	0.001	1.32	53	1.8	5.3
17	111	38	0.91	1.6	0.033	0.022	0.020	1.27	57	2.2	5.7
18	118	40	0.95	1.7	0.019	0.013	0.011	1.29	60	2.4	6.0
19	125	41	0.99	1.7	0.016	0.011	0.010	1.31	62	2.3	6.2
20	132	43	1.03	1.7	0.019	0.013	0.012	1.33	64	2.3	6.4
21	139	45	1.06	1.9	0.014	0.010	0.009	1.35	66	2.6	6.6
22	146	46	1.10	1.6	0.017	0.013	0.011	1.37	69	2.3	6.9
23	153	48	1.14	1.6	0.017	0.012	0.011	1.39	71	2.2	7.1
24	161	50	1.18	1.6	0.019	0.014	0.013	1.41	74	2.3	7.4
25	167	52	1.23	1.6	0.018	0.014	0.013	1.43	76	2.4	7.6
26	174	53	1.26	1.7	0.015	0.011	0.010	1.46	78	2.4	7.8
27	181	54	1.29	1.6	0.014	0.011	0.010	1.48	81	2.4	8.1
28	188	56	1.33	1.6	0.014	0.011	0.010	1.50	83	2.3	8.3
29	195	57	1.35	1.5	0.013	0.010	0.009	1.53	85	2.3	8.5
30	202	58	1.39	1.4	0.015	0.012	0.011	1.55	87	2.1	8.7
31	209	60	1.42	1.3	0.014	0.011	0.010	1.58	89	2.1	8.9
32	217	61	1.46	1.3	0.016	0.014	0.013	1.61	92	2.2	9.2
33	223	63	1.49	1.4	0.014	0.012	0.011	1.63	94	2.3	9.4

* Rates of sulfate production and NP depletion are 5-week moving averages

Appendix 4.3

Rice Lake Waste Rock Master Composite

Appendix 4.3 Table 1

Sample Characterization Rice Lake Waste Rock Master Composite

Metals Analysis		Waste Rock (ppm)
Aluminum	Al	68000
Antimony	Sb	20
Arsenic	As	<40
Barium	Ba	340
Beryllium	Be	<1
Bismuth	Bi	<50
Cadmium	Cd	7
Calcium	Ca	7700
Carbon	C	3300
Chromium	Cr	11
Cobalt	Co	19
Copper	Cu	210
Gallium	Ga	14
Iron	Fe	62100
Lead	Pb	150
Lithium	Li	NA
Magnesium	Mg	36000
Manganese	Mn	1400
Mercury	Hg	<0.3
Molybdenum	Mo	<20
Nickel	Ni	15
Phosphorus	P	NA
Potassium	K	12400
Selenium	Se	<3
Silicon	Si	285000
Silver	Ag	<0.01
Sodium	Na	5100
Strontium	Sr	NA
Thallium	Tl	<10
Tin	Sn	<10
Titanium	Ti	380
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	190
Sulfur	S	<100

ABA Results	
Paste pH	9.1
S (Total) (%)	0.05
SO4 (%)	NA
S (sulfide) (%)	0.05
AP (kg CaCO3/tonne)	1.6
NP (kg CaCO3/tonne)	1.6
CO2 (%)	NA
CO3 NP (kg CaCO3/tonne)	NA
Net NP (kg CaCO3/tonne)	0.0
NP/AP	1.0

Note: NA = not analyzed

Sample Mass (kg)	126.59
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Appendix 4.3 Table 2

Parameters Measured Weekly
Rice Lake Waste Rock Master Composite

Test: **Leached under wet/dry alternating cycles**

Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
25-Oct	1	0	6.490	7.0	345	130		44	2
2-Nov	2	8	4.785	7.4	315	110		35	4
9-Nov	3	15	3.760	5.7	251	100		30	4
16-Nov	4	22	7.160	7.5	288	110		24	6
21-Nov	5	27	3.400	7.0	238	91		19	6
28-Nov	6	34	2.710	7.4	215	91		17	7
5-Dec	7	41	2.480	7.8	214	92		16	7
12-Dec	8	48	6.650	7.3	169	71		14	8
19-Dec	9	55	5.400	8.1	195	80		23	9
27-Dec	10	63	3.880	8.1	243	93		22	9
3-Jan	11	70	3.900	8.3	233	87		21	10
9-Jan	12	76	3.340	8.2	209	89		20	11
17-Jan	13	84	3.400	8.2	202	83		19	11
23-Jan	14	90	3.820	8.3	210	52		18	12
30-Jan	15	97	4.030	8.4	206	51		17	12
6-Feb	16	104	0.500	8.2	210	82		16	12
13-Feb	17	111	7.480	8.2	217	86		15	13
20-Feb	18	118	4.460	8.2	199	83		15	14
27-Feb	19	125	4.320	8.4	202	82		15	14
6-Mar	20	132	4.880	8.2	204	81		14	15
13-Mar	21	139	3.820	8.2	174	78		14	15
20-Mar	22	146	4.660	8.1	183	76.0		14	16
27-Mar	23	153	4.600	8.1	202	78		14	16
4-Apr	24	161	5.740	8.1	181	75		13	17
10-Apr	25	167	5.160	8.1	204	73		13	17
17-Apr	26	174	3.770	8.2	167	73		13	18
24-Apr	27	181	4.400	8.1	166	39		13	18
1-May	28	188	4.380	8.1	170	80		12	18
8-May	29	195	4.960	8.1	168	71		12	19
15-May	30	202	5.100	8.1	164	74		12	19
22-May	31	209	3.220	8.0	159	68		12	20
30-May	32	217	3.780	7.9	157	68		11	20
5-Jun	33	223	3.720	7.9	165	70		11	20
12-Jun	34	230	4.700	8.1	153	70			
19-Jun	35	237	5.470	8.3	162	70			
26-Jun	36	244	5.100	8.2	156	70			
3-Jul	37	251	4.820	8.2	158				
10-Jul	38	258	5.150	8.2	154				
17-Jul	39	265	0.000						
24-Jul	40	272	7.180	8.0	162				
31-Jul	41	279	4.480	8.1	158				
7-Aug	42	286	4.780	8.1	154				
14-Aug	43	293	4.960	8.1	152				
21-Aug	44	300	4.750	8.1	154				
30-Aug	45	309	5.620	8.1	157				
5-Sep	46	315	4.360	8.2	154	65			
11-Sep	47	321	4.780	8.0	158	60			
18-Sep	48	328	4.360	7.9	155	65			
25-Sep	49	335	4.340	7.7	156	43			
2-Oct	50	342	3.860	7.6	156	64			
9-Oct	51	349	3.940	7.4	157	66			
16-Oct	52	356	3.880	7.4	151				
23-Oct	53	363	3.820	7.4	153				
30-Oct	54	370	3.840	7.5	160				
6-Nov	55	377	3.660	7.4	157				

* Measured values of sulfate shown in bold

Appendix 4.3 Table 3

Leachate Analysis
Rice Lake Waste Rock Master Composite

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L)*															
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Nickel Ni	Potassium K	Sodium Na	Titanium Ti	Zinc Zn
1	0	76.0	0.049	0.120	20.0	0.054	0.850	110.0	0.065	66.0	2.300	0.030	0.030	18.1	43.0	0.110	0.570
2	8	42.0	0.033	0.078	14.0	0.043	0.520	60.0	0.058	40.0	1.200	0.028	0.028	17.4	30.0	0.083	0.340
3	15	32.3	0.031	0.063	14.0	0.030	0.410	46.7	0.052	33.7	0.940	0.025	0.025	14.90	23.3	0.072	0.270
4	22	22.7	0.028	0.048	14.0	0.018	0.300	33.3	0.046	27.3	0.680	0.023	0.023	12.40	16.7	0.061	0.200
5	27	13.0	0.026	0.033	14.0	< 0.005	0.190	20.0	< 0.040	21.0	0.420	< 0.020	< 0.020	9.90	10.0	< 0.050	0.130
6	34	11.0	0.028	0.036	15.7	0.005	0.303	17.0	0.040	18.3	0.467	0.020	0.020	8.87	8.53	0.050	0.180
7	41	9.0	0.031	0.040	17.3	0.005	0.417	14.0	0.040	15.7	0.513	0.020	0.020	7.83	7.07	0.050	0.230
8	48	7.0	0.033	0.043	19.0	< 0.005	0.530	11.0	< 0.040	13.0	0.560	< 0.020	< 0.020	6.80	5.90	< 0.050	0.280
9	55	19.0	0.022	0.037	16.0	0.013	0.230	27.0	< 0.040	23.0	0.620	< 0.020	< 0.020	9.70	5.00	< 0.050	0.180
10	63	16.7	0.023	0.034	16.0	0.012	0.213	23.8		21.3	0.556			9.29	4.83		0.147
11	70	14.5	0.023	0.031	16.0	0.011	0.197	20.6		19.6	0.493			8.88	4.65		0.134
12	76	12.2	0.024	0.028	16.0	0.010	0.180	17.4		17.9	0.429			8.46	4.48		0.121
13	84	10.0	0.024	0.026	16.0	0.009	0.163	14.2		16.3	0.365			8.05	4.30		0.109
14	90	7.7	0.025	0.023	16.0	0.008	0.146	11.0		14.6	0.301			7.64	4.13		0.096
15	97	5.5	0.025	0.020	16.0	0.007	0.130	7.8		12.9	0.238			7.23	3.95		0.083
16	104	3.2	0.026	0.017	16.0	0.006	0.113	4.6		11.2	0.174			6.81	3.78		0.070
17	111	1.0	0.026	0.014	16.0	< 0.005	0.096	1.4		9.5	0.110			6.40	3.60		0.057
18	118	0.9	0.027	0.014	16.1		0.091	1.32		9.4	0.106			6.16	3.43		0.056
19	125	0.9	0.027	0.013	16.3		0.085	1.24		9.3	0.102			5.93	3.26		0.056
20	132	0.8	0.028	0.013	16.4		0.080	1.16		9.2	0.098			5.69	3.09		0.055
21	139	0.8	0.028	0.013	16.5		0.074	1.08		9.1	0.095			5.45	2.93		0.054
22	146	0.7	0.029	0.012	16.6		0.069	1.00		9.0	0.091			5.21	2.76		0.054
23	153	0.7	0.029	0.012	16.8		0.063	0.92		8.9	0.087			4.98	2.59		0.053
24	161	0.6	0.030	0.011	16.9		0.058	0.84		8.8	0.083			4.74	2.42		0.052
25	167	0.6	0.031	0.011	17.0		0.053	0.77		8.8	0.079			4.50	2.25		0.052
26	174	0.5	0.031	0.011	17.1		0.047	0.69		8.7	0.075			4.26	2.08		0.051
27	181	0.5	0.032	0.010	17.3		0.042	0.61		8.6	0.071			4.03	1.91		0.050
28	188	0.4	0.032	0.010	17.4		0.036	0.53		8.5	0.067			3.79	1.74		0.049
29	195	0.4	0.033	0.010	17.5		0.031	0.45		8.4	0.064			3.55	1.58		0.049
30	202	0.3	0.033	0.009	17.6		0.025	0.37		8.3	0.060			3.31	1.41		0.048
31	209	0.3	0.034	0.009	17.8		0.020	0.29		8.2	0.056			3.08	1.24		0.047
32	217	0.2	0.034	0.008	17.9		0.014	0.21		8.1	0.052			2.84	1.07		0.047
33	223	0.2	0.035	0.008	18.0		0.009	0.13		8.0	0.048			2.60	0.90		0.046

* Measured values shown in bold

Appendix 4.3 Table 4

Cumulative Mass Flux
Rice Lake Waste Rock Master Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)															
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Nickel Ni	Potassium K	Sodium Na	Titanium Ti	Zinc Zn
1	0	3.90	0.003	0.006	1.0	0.003	0.044	5.64	0.003	3.4	0.118	0.002	0.002	1.0	2.2	0.006	0.029
2	8	5.48	0.004	0.009	1.6	0.004	0.06	7.91	0.006	4.9	0.163	0.003	0.003	1.6	3.3	0.009	0.042
3	15	6.44	0.005	0.011	2.0	0.005	0.08	9.29	0.007	5.9	0.191	0.003	0.003	2.1	4.0	0.011	0.050
4	22	7.73	0.006	0.014	2.8	0.006	0.09	11.18	0.010	7.4	0.230	0.005	0.005	2.8	5.0	0.014	0.061
5	27	8.08	0.007	0.015	3.1	0.006	0.10	11.72	0.011	8.0	0.241	0.005	0.005	3.0	5.2	0.016	0.065
6	34	8.31	0.008	0.015	3.5	0.007	0.10	12.08	0.012	8.4	0.251	0.006	0.006	3.2	5.4	0.017	0.069
7	41	8.49	0.008	0.016	3.8	0.007	0.11	12.35	0.012	8.7	0.261	0.006	0.006	3.4	5.6	0.018	0.073
8	48	8.86	0.010	0.018	4.8	0.007	0.14	12.93	0.014	9.4	0.290	0.007	0.007	3.7	5.9	0.020	0.088
9	55	9.67	0.011	0.020	5.5	0.007	0.15	14.08	0.016	10.4	0.317	0.008	0.008	4.2	6.1	0.023	0.095
10	63	10.18	0.012	0.021	6.0	0.008	0.16	14.81		11.0	0.334			4.4	6.2		0.099
11	70	10.63	0.012	0.022	6.5	0.008	0.16	15.45		11.6	0.349			4.7	6.4		0.103
12	76	10.95	0.013	0.023	6.9	0.008	0.17	15.91		12.1	0.360			4.9	6.5		0.107
13	84	11.22	0.014	0.023	7.3	0.009	0.17	16.29		12.5	0.370			5.2	6.6		0.110
14	90	11.45	0.014	0.024	7.8	0.009	0.18	16.62		13.0	0.379			5.4	6.7		0.112
15	97	11.63	0.015	0.025	8.3	0.009	0.18	16.87		13.4	0.387			5.6	6.8		0.115
16	104	11.64	0.015	0.025	8.4	0.009	0.18	16.89		13.4	0.388			5.6	6.9		0.115
17	111	11.70	0.017	0.026	9.3	0.009	0.19	16.97		14.0	0.394			6.0	7.1		0.119
18	118	11.73	0.018	0.026	9.9		0.19	17.02		14.3	0.398			6.2	7.2		0.121
19	125	11.76	0.019	0.027	10.5		0.19	17.06		14.6	0.401			6.4	7.3		0.123
20	132	11.79	0.020	0.027	11.1		0.20	17.10		15.0	0.405			6.7	7.4		0.125
21	139	11.82	0.020	0.027	11.6		0.20	17.14		15.3	0.408			6.8	7.5		0.126
22	146	11.84	0.022	0.028	12.2		0.20	17.17		15.6	0.411			7.0	7.6		0.128
23	153	11.87	0.023	0.028	12.8		0.20	17.21		15.9	0.414			7.2	7.7		0.130
24	161	11.90	0.024	0.029	13.6		0.21	17.24		16.3	0.418			7.4	7.8		0.133
25	167	11.92	0.025	0.029	14.3		0.21	17.28		16.7	0.421			7.6	7.9		0.135
26	174	11.94	0.026	0.030	14.8		0.21	17.30		16.9	0.424			7.7	8.0		0.136
27	181	11.95	0.027	0.030	15.4		0.21	17.32		17.2	0.426			7.9	8.0		0.138
28	188	11.97	0.028	0.030	16.0		0.21	17.34		17.5	0.428			8.0	8.1		0.140
29	195	11.98	0.030	0.031	16.7		0.21	17.35		17.9	0.431			8.1	8.2		0.142
30	202	12.00	0.031	0.031	17.4		0.21	17.37		18.2	0.433			8.3	8.2		0.144
31	209	12.00	0.032	0.031	17.8		0.21	17.38		18.4	0.435			8.3	8.2		0.145
32	217	12.01	0.033	0.031	18.4		0.21	17.38		18.6	0.436			8.4	8.3		0.146
33	223	12.02	0.034	0.032	18.9		0.21	17.39		18.9	0.438			8.5	8.3		0.147

Appendix 4.3 Table 5

Cumulative Metal Extractions
Rice Lake Waste Rock Master Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)															
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Nickel Ni	Potassium K	Sodium Na	Titanium Ti	Zinc Zn
1	0	0.0057	0.0063	0.0018	0.01	0.025	0.0208	0.009	0.002	0.009	0.008	0.01	0.01	0.008	0.04	0.0015	0.015
2	8	0.0081	0.0094	0.003	0.02	0.040	0.030	0.013	0.004	0.014	0.012	0.01	0.02	0.013	0.07	0.0023	0.022
3	15	0.009	0.012	0.003	0.03	0.048	0.036	0.015	0.005	0.016	0.014	0.02	0.02	0.017	0.08	0.0029	0.026
4	22	0.011	0.016	0.004	0.04	0.057	0.044	0.018	0.006	0.021	0.016	0.02	0.03	0.022	0.10	0.0038	0.032
5	27	0.012	0.017	0.004	0.04	0.058	0.046	0.019	0.007	0.022	0.017	0.03	0.03	0.025	0.10	0.0041	0.034
6	34	0.012	0.019	0.005	0.05	0.059	0.050	0.019	0.008	0.023	0.018	0.03	0.04	0.026	0.11	0.0044	0.036
7	41	0.012	0.020	0.005	0.05	0.060	0.053	0.020	0.008	0.024	0.019	0.03	0.04	0.027	0.11	0.0047	0.039
8	48	0.013	0.025	0.005	0.06	0.063	0.067	0.021	0.010	0.026	0.021	0.04	0.05	0.030	0.11	0.0054	0.046
9	55	0.014	0.027	0.006	0.07	0.068	0.071	0.023	0.011	0.029	0.023	0.04	0.05	0.034	0.12	0.0059	0.050
10	63	0.015	0.029	0.006	0.08	0.071	0.074	0.024		0.031	0.024			0.036	0.12		0.052
11	70	0.016	0.031	0.006	0.08	0.074	0.077	0.025		0.032	0.025			0.038	0.12		0.054
12	76	0.016	0.032	0.007	0.09	0.077	0.080	0.026		0.034	0.026			0.040	0.13		0.056
13	84	0.016	0.034	0.007	0.10	0.079	0.082	0.026		0.035	0.026			0.042	0.13		0.058
14	90	0.017	0.036	0.007	0.10	0.081	0.084	0.027		0.036	0.027			0.043	0.13		0.059
15	97	0.017	0.038	0.007	0.11	0.083	0.086	0.027		0.037	0.028			0.045	0.13		0.061
16	104	0.017	0.038	0.007	0.11	0.083	0.086	0.027		0.037	0.028			0.046	0.13		0.061
17	111	0.017	0.042	0.008	0.12	0.086	0.089	0.027		0.039	0.028			0.049	0.14		0.062
18	118	0.017	0.044	0.008	0.13		0.090	0.027		0.040	0.028			0.050	0.14		0.064
19	125	0.017	0.046	0.008	0.14		0.092	0.027		0.041	0.029			0.052	0.14		0.065
20	132	0.017	0.049	0.008	0.14		0.093	0.028		0.042	0.029			0.054	0.15		0.066
21	139	0.017	0.051	0.008	0.15		0.094	0.028		0.042	0.029			0.055	0.15		0.067
22	146	0.017	0.054	0.008	0.16		0.095	0.028		0.043	0.029			0.057	0.15		0.068
23	153	0.017	0.056	0.008	0.17		0.096	0.028		0.044	0.030			0.058	0.15		0.069
24	161	0.017	0.060	0.008	0.18		0.098	0.028		0.045	0.030			0.060	0.15		0.070
25	167	0.018	0.063	0.009	0.19		0.099	0.028		0.046	0.030			0.061	0.16		0.071
26	174	0.018	0.065	0.009	0.19		0.099	0.028		0.047	0.030			0.062	0.16		0.072
27	181	0.018	0.068	0.009	0.20		0.100	0.028		0.048	0.030			0.063	0.16		0.073
28	188	0.018	0.071	0.009	0.21		0.101	0.028		0.049	0.031			0.064	0.16		0.074
29	195	0.018	0.074	0.009	0.22		0.101	0.028		0.050	0.031			0.066	0.16		0.075
30	202	0.018	0.077	0.009	0.23		0.102	0.028		0.051	0.031			0.067	0.16		0.076
31	209	0.018	0.080	0.009	0.23		0.102	0.028		0.051	0.031			0.067	0.16		0.076
32	217	0.018	0.082	0.009	0.24		0.102	0.028		0.052	0.031			0.068	0.16		0.077
33	223	0.018	0.085	0.009	0.25		0.102	0.028		0.052	0.031			0.069	0.16		0.078

Appendix 4.3 Table 6

Metal Extraction Rates
Rice Lake Waste Rock Master Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/yrk) - 5 Cycle Moving Average															
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Nickel Ni	Potassium K	Sodium Na	Titanium Ti	Zinc Zn
1	0																
2	8	1.389	0.0011	0.003	0.46	0.0014	0.017	1.98	0.002	1.32	0.040	0.0009	0.001	0.58	0.99	0.003	0.011
3	15	1.189	0.0010	0.002	0.44	0.0012	0.015	1.71	0.002	1.17	0.034	0.0008	0.001	0.51	0.85	0.002	0.010
4	22	1.219	0.0012	0.002	0.55	0.0011	0.016	1.76	0.002	1.29	0.036	0.0010	0.001	0.57	0.88	0.003	0.010
5	27	1.083	0.0012	0.002	0.55	0.0009	0.014	1.58	0.002	1.20	0.032	0.0009	0.001	0.54	0.79	0.003	0.009
6	34	0.909	0.0010	0.002	0.50	0.0008	0.012	1.33	0.002	1.03	0.027	0.0008	0.001	0.46	0.66	0.002	0.008
7	41	0.637	0.0009	0.001	0.48	0.0005	0.010	0.94	0.001	0.81	0.021	0.0007	0.001	0.37	0.47	0.002	0.007
8	48	0.511	0.0011	0.002	0.60	0.0003	0.014	0.77	0.002	0.74	0.021	0.0008	0.001	0.35	0.39	0.002	0.008
9	55	0.411	0.0010	0.001	0.58	0.0002	0.012	0.62	0.001	0.62	0.018	0.0007	0.001	0.29	0.23	0.002	0.007
10	63	0.409	0.0009	0.001	0.55	0.0003	0.011	0.60		0.59	0.018			0.27	0.19		0.007
11	70	0.450	0.0009	0.001	0.58	0.0003	0.011	0.65		0.63	0.019			0.29	0.18		0.007
12	76	0.492	0.0009	0.001	0.62	0.0004	0.011	0.71		0.68	0.020			0.31	0.18		0.007
13	84	0.459	0.0007	0.001	0.49	0.0003	0.006	0.65		0.61	0.016			0.27	0.14		0.004
14	90	0.357	0.0007	0.001	0.46	0.0003	0.005	0.51		0.52	0.012			0.25	0.13		0.004
15	97	0.298	0.0007	0.001	0.48	0.0003	0.005	0.42		0.49	0.011			0.24	0.13		0.003
16	104	0.209	0.0006	0.001	0.39	0.0002	0.004	0.30		0.37	0.008			0.19	0.10		0.002
17	111	0.150	0.0008	0.001	0.49	0.0002	0.004	0.21		0.38	0.007			0.22	0.12		0.002
18	118	0.106	0.0008	0.001	0.53		0.004	0.15		0.37	0.006			0.22	0.12		0.002
19	125	0.062	0.0009	0.000	0.53		0.003	0.09		0.33	0.004			0.21	0.12		0.002
20	132	0.033	0.0009	0.000	0.55		0.003	0.047		0.32	0.004			0.21	0.12		0.002
21	139	0.036	0.0011	0.001	0.64		0.003	0.050		0.37	0.004			0.24	0.13		0.002
22	146	0.029	0.0010	0.000	0.57		0.003	0.041		0.32	0.003			0.20	0.11		0.002
23	153	0.028	0.0010	0.000	0.58		0.003	0.038		0.32	0.003			0.19	0.10		0.002
24	161	0.027	0.0011	0.000	0.61		0.002	0.036		0.33	0.003			0.19	0.10		0.002
25	167	0.026	0.0011	0.000	0.64		0.002	0.035		0.34	0.003			0.19	0.10		0.002
26	174	0.024	0.0011	0.000	0.64		0.002	0.032		0.33	0.003			0.18	0.09		0.002
27	181	0.022	0.0011	0.000	0.64		0.002	0.029		0.33	0.003			0.17	0.08		0.002
28	188	0.020	0.0011	0.000	0.63		0.002	0.026		0.32	0.003			0.16	0.08		0.002
29	195	0.018	0.0012	0.000	0.64		0.002	0.022		0.32	0.003			0.15	0.07		0.002
30	202	0.015	0.0012	0.000	0.62		0.001	0.018		0.30	0.002			0.13	0.06		0.002
31	209	0.013	0.0011	0.000	0.61		0.001	0.016		0.29	0.002			0.12	0.06		0.002
32	217	0.011	0.0011	0.000	0.58		0.001	0.012		0.27	0.002			0.11	0.05		0.002
33	223	0.010	0.0011	0.000	0.58		0.001	0.010		0.27	0.002			0.10	0.04		0.002

Appendix 4.3 Table 7

Oxidation and Neutralization Results
Rice Lake Waste Rock Master Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO [Ca + Mg] [SO4]	NEUTRALIZATION		
		Cumulative Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)		Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1	0	2	0.15		0.023	0.026	0.139	7.02	16		1.0
2	8	4	0.24	1.16	0.014	0.013	0.062	5.47	24	6.60	1.5
3	15	4	0.30	1.03	0.009	0.010	0.041	5.62	29	5.93	1.8
4	22	6	0.39	1.14	0.014	0.020	0.064	5.82	38	6.70	2.3
5	27	6	0.42	1.06	0.005	0.009	0.023	6.13	41	6.30	2.5
6	34	7	0.45	0.92	0.004	0.008	0.016	6.35	43	5.51	2.7
7	41	7	0.47	0.73	0.003	0.008	0.013	6.61	45	4.52	2.8
8	48	8	0.52	0.70	0.008	0.025	0.028	6.93	51	4.56	3.2
9	55	9	0.58	0.61	0.010	0.017	0.040	5.69	56	4.00	3.5
10	63	9	0.63	0.59	0.007	0.012	0.027	5.64	60	3.80	3.8
11	70	10	0.67	0.64	0.007	0.012	0.025	5.58	64	4.04	4.0
12	76	11	0.70	0.71	0.005	0.011	0.019	5.51	67	4.34	4.2
13	84	11	0.74	0.64	0.005	0.011	0.018	5.44	70	3.74	4.4
14	90	12	0.77	0.58	0.006	0.012	0.018	5.36	73	3.30	4.6
15	97	12	0.81	0.57	0.006	0.013	0.017	5.27	76	3.21	4.7
16	104	12	0.81	0.45	0.001	0.002	0.002	5.17	76	2.51	4.8
17	111	13	0.87	0.51	0.009	0.024	0.023	5.06	81	2.77	5.1
18	118	14	0.91	0.52	0.005	0.014	0.014	5.14	84	2.84	5.2
19	125	14	0.94	0.50	0.005	0.014	0.013	5.23	86	2.69	5.4
20	132	15	0.98	0.50	0.006	0.016	0.015	5.31	89	2.71	5.6
21	139	15	1.01	0.57	0.004	0.012	0.011	5.40	92	3.11	5.7
22	146	16	1.04	0.50	0.005	0.015	0.014	5.50	95	2.76	5.9
23	153	16	1.07	0.49	0.005	0.015	0.013	5.59	98	2.77	6.1
24	161	17	1.11	0.50	0.006	0.019	0.017	5.69	101	2.87	6.3
25	167	17	1.15	0.51	0.006	0.017	0.015	5.80	104	2.98	6.5
26	174	18	1.17	0.50	0.004	0.013	0.011	5.91	107	2.97	6.7
27	181	18	1.20	0.49	0.005	0.015	0.012	6.02	109	2.94	6.8
28	188	18	1.23	0.47	0.004	0.015	0.012	6.14	112	2.91	7.0
29	195	19	1.26	0.46	0.005	0.017	0.014	6.26	115	2.89	7.2
30	202	19	1.29	0.44	0.005	0.018	0.014	6.38	118	2.80	7.4
31	209	20	1.31	0.42	0.003	0.011	0.009	6.52	120	2.73	7.5
32	217	20	1.33	0.39	0.003	0.013	0.010	6.66	123	2.57	7.7
33	223	20	1.36	0.38	0.003	0.013	0.010	6.80	125	2.56	7.8

* Rates of sulfate production and NP depletion are 5-week moving averages

Appendix 4.4

Upper Mole Lake Waste Rock Master Composite

Appendix 4.4 Table 1

Sample Characterization Upper Mole Lake Waste Rock Master Composite

Metals Analysis		Waste Rock (ppm)
Aluminum	Al	71000
Antimony	Sb	30
Arsenic	As	<40
Barium	Ba	360
Beryllium	Be	<1
Bismuth	Bi	<50
Cadmium	Cd	6
Calcium	Ca	13400
Carbon	C	5300
Chromium	Cr	12
Cobalt	Co	25
Copper	Cu	240
Gallium	Ga	15
Iron	Fe	65900
Lead	Pb	260
Lithium	Li	NA
Magnesium	Mg	32100
Manganese	Mn	1300
Mercury	Hg	<0.3
Molybdenum	Mo	<20
Nickel	Ni	10
Phosphorus	P	NA
Potassium	K	11400
Selenium	Se	<3
Silicon	Si	285000
Silver	Ag	<0.01
Sodium	Na	6900
Strontium	Sr	NA
Thallium	Tl	<10
Tin	Sn	60
Titanium	Ti	690
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	190
Sulfur	S	400

ABA Results	
Paste pH	8.0
S (Total) (%)	0.10
SO4 (%)	NA
S (sulfide) (%)	0.10
AP (kg CaCO3/tonne)	3.1
NP (kg CaCO3/tonne)	48.0
CO2 (%)	NA
CO3 NP (kg CaCO3/tonne)	NA
Net NP (kg CaCO3/tonne)	44.9
NP/AP	15.5

Note: NA = not analyzed

Sample Mass (kg)	133.18
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Appendix 4.4 Table 2

Parameters Measured Weekly
Upper Mole Lake Waste Rock Master Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (µS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
25-Oct	1	0	6.700	7.0	380	120		48	2.4
2-Nov	2	8	4.915	7.2	358	120		45	4.1
9-Nov	3	15	4.550	6.1	301	110		43	5.6
16-Nov	4	22	2.490	7.6	339	110		42	6.3
21-Nov	5	27	3.760	7.2	322	100		40	7.5
28-Nov	6	34	7.950	7.6	217	87		35	9.6
5-Dec	7	41	3.360	7.8	246	100		31	10.3
12-Dec	8	48	4.700	7.8	256	97		26	11.2
19-Dec	9	55	4.340	7.7	256	93		21	11.9
27-Dec	10	63	4.080	8.2	268	96		24	12.7
3-Jan	11	70	4.650	8.3	266	94		26	13.6
9-Jan	12	76	3.730	8.3	224	91		29	14.4
17-Jan	13	84	4.020	8.4	228	90		31	15.3
23-Jan	14	90	3.780	8.3	233	88		34	16.2
30-Jan	15	97	5.040	7.7	296	71		36	17.6
6-Feb	16	104	0.500	8.1	291	68		39	17.8
13-Feb	17	111	7.990	8.1	264	79		41	20.2
20-Feb	18	118	4.460	8.3	220	88		39	21.5
27-Feb	19	125	3.960	8.5	222	86		37	22.6
6-Mar	20	132	3.960	8.4	228	84		36	23.7
13-Mar	21	139	3.590	8.3	203	82		34	24.6
20-Mar	22	146	4.390	8.2	215	78		32	25.7
27-Mar	23	153	3.750	8.3	235	80		30	26.5
4-Apr	24	161	3.240	8.3	212	78		28	27.2
10-Apr	25	167	4.080	8.0	276	67		27	28.0
17-Apr	26	174	5.100	8.3	211	78		25	28.9
24-Apr	27	181	4.300	8.3	191	77		23	29.7
1-May	28	188	4.120	8.3	193	84		21	30.3
8-May	29	195	3.940	8.1	197	75		19	30.9
15-May	30	202	3.540	8.2	192	76		17	31.4
22-May	31	209	4.900	8.2	190	79		16	31.9
30-May	32	217	5.740	8.1	180	76		14	32.5
5-Jun	33	223	4.320	7.5	177	75		12	32.9
12-Jun	34	230	4.700	8.2	168	74			
19-Jun	35	237	5.180	8.4	176	82			
26-Jun	36	244	4.120	8.3	171	73			
3-Jul	37	251	4.600	8.3	181				
10-Jul	38	258	4.860	8.1	174				
17-Jul	39	265	0.000						
24-Jul	40	272	7.230	8.1	182				
31-Jul	41	279	4.080	8.2	175				
7-Aug	42	286	4.670	8.2	172				
14-Aug	43	293	4.450	8.3	172				
21-Aug	44	300	4.700	8.2	170				
30-Aug	45	309	5.100	8.2	173				
5-Sep	46	315	3.960	8.3	176	70			
11-Sep	47	321	3.900	8.2	184	67			
18-Sep	48	328	4.340	8.1	176	69			
25-Sep	49	335	4.800	7.9	182	68			
2-Oct	50	342	5.160	7.8	176	71			
9-Oct	51	349	4.730	7.6	172	70			
16-Oct	52	356	4.700	7.7	167				
23-Oct	53	363	4.600	7.6	168				
30-Oct	54	370	5.020	7.7	183				
6-Nov	55	377	4.800	7.5	175				

* Measured values of sulfate shown in bold

Appendix 4.4 Table 3

Leachate Analysis
Upper Mole Lake Waste Rock Master Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *														
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn	
1	0	20.0	0.022	0.045	13.0	0.015	0.220	30.0	20.0	0.510	0.054	12.90	0.009	49.00	0.190	
2	8	14.0	0.220	0.029	12.0	0.012	0.170	20.0	17.0	0.340	<	0.050	16.20	0.012	36.00	0.140
3	15	10.3	0.151	0.024	13.3	0.010	0.126	14.8	15.7	0.260	0.046	14.70	0.011	30.00	0.108	
4	22	6.5	0.081	0.020	14.7	0.007	0.081	9.53	14.3	0.180	0.043	13.20	0.009	24.00	0.075	
5	27	2.8	0.012	0.015	16.0	<	0.005	0.037	4.30	13.0	0.100	0.039	11.70	0.008	18.00	0.043
6	34	5.1	0.019	0.019	16.5	0.006	0.055	7.48	14.3	0.153	0.034	11.18	0.008	15.40	0.057	
7	41	7.4	0.026	0.023	17.0	0.007	0.074	10.65	15.5	0.205	0.030	10.65	0.008	12.80	0.071	
8	48	9.7	0.033	0.026	17.5	0.007	0.092	13.83	16.8	0.258	0.025	10.13	0.008	10.20	0.085	
9	55	12.00	0.015	0.030	18.0	0.008	0.110	17.00	18.00	0.310	<	0.020	9.60	0.008	7.60	0.099
10	63	10.7	0.015	0.029	18.4	0.008	0.105	15.20	17.3	0.299	0.021	9.26	0.008	7.19	0.282	
11	70	9.4	0.014	0.028	18.8	0.007	0.099	13.40	16.5	0.288	0.023	8.93	0.007	6.78	0.424	
12	76	8.1	0.014	0.026	19.1	0.007	0.094	11.60	15.8	0.276	0.024	8.59	0.007	6.36	0.587	
13	84	6.8	0.013	0.025	19.5	0.007	0.088	9.80	15.0	0.265	0.025	8.25	0.007	5.95	0.750	
14	90	5.5	0.013	0.024	19.9	0.006	0.083	8.00	14.3	0.254	0.026	7.91	0.006	5.54	0.912	
15	97	4.2	0.012	0.023	20.3	0.006	0.077	6.20	13.5	0.243	0.028	7.58	0.006	5.13	1.075	
16	104	2.9	0.012	0.021	20.6	0.005	0.072	4.40	12.8	0.231	0.029	7.24	0.005	4.71	1.237	
17	111	1.6	0.011	0.020	21.0	<	0.005	0.066	2.60	12.0	0.030	6.90	<	0.005	4.30	1.400
18	118	1.5	0.012	0.019	20.9	0.006	0.062	2.44	11.8	0.207	0.029	6.74	0.005	4.17	1.315	
19	125	1.4	0.012	0.018	20.8	0.006	0.059	2.29	11.6	0.194	0.029	6.57	0.006	4.04	1.230	
20	132	1.3	0.013	0.017	20.6	0.006	0.055	2.13	11.4	0.181	0.028	6.41	0.006	3.91	1.145	
21	139	1.2	0.013	0.017	20.5	0.006	0.051	1.97	11.2	0.169	0.028	6.25	0.006	3.78	1.060	
22	146	1.1	0.014	0.016	20.4	0.006	0.047	1.82	10.9	0.156	0.027	6.09	0.007	3.64	0.974	
23	153	1.1	0.014	0.015	20.3	0.006	0.044	1.66	10.7	0.143	0.026	5.93	0.007	3.51	0.889	
24	161	1.0	0.015	0.014	20.1	0.006	0.040	1.50	10.5	0.130	0.026	5.76	0.007	3.38	0.804	
25	167	0.9	0.016	0.013	20.0	0.006	0.036	1.35	10.3	0.117	0.025	5.60	0.008	3.25	0.719	
26	174	0.8	0.016	0.012	19.9	0.006	0.032	1.19	10.1	0.104	0.024	5.44	0.008	3.12	0.634	
27	181	0.7	0.017	0.011	19.8	0.006	0.029	1.03	9.9	0.091	0.024	5.28	0.008	2.99	0.549	
28	188	0.6	0.017	0.010	19.6	0.006	0.025	0.88	9.7	0.078	0.023	5.11	0.008	2.86	0.464	
29	195	0.5	0.018	0.010	19.5	0.006	0.021	0.72	9.5	0.066	0.023	4.95	0.009	2.73	0.379	
30	202	0.4	0.018	0.009	19.4	0.006	0.017	0.56	9.2	0.053	0.022	4.79	0.009	2.59	0.293	
31	209	0.3	0.019	0.008	19.3	0.006	0.014	0.41	9.0	0.040	0.021	4.63	0.009	2.46	0.208	
32	217	0.2	0.019	0.007	19.1	0.006	0.010	0.25	8.8	0.027	0.021	4.46	0.010	2.33	0.123	
33	223	0.1	0.020	0.006	19.0	0.006	0.006	0.09	8.6	0.014	<	0.020	4.30	0.010	2.20	0.038

* Measured values shown in bold

Appendix 4.4 Table 4

**Cumulative Mass Flux
Upper Mole Lake Waste Rock Master Composite**

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	1.01	0.001	0.002	0.7	0.001	0.011	1.51	1.01	0.026	0.003	0.6	0.000	2.5	0.01
2	8	1.52	0.009	0.003	1.1	0.001	0.017	2.25	1.63	0.038	0.005	1.2	0.001	3.8	0.01
3	15	1.87	0.014	0.004	1.6	0.002	0.022	2.75	2.17	0.047	0.006	1.7	0.001	4.8	0.02
4	22	2.00	0.016	0.005	1.8	0.002	0.023	2.93	2.44	0.050	0.007	2.0	0.001	5.3	0.02
5	27	2.07	0.016	0.005	2.3	0.002	0.024	3.05	2.80	0.053	0.008	2.3	0.002	5.8	0.02
6	34	2.38	0.017	0.006	3.3	0.002	0.027	3.50	3.65	0.062	0.010	3.0	0.002	6.7	0.02
7	41	2.57	0.018	0.007	3.7	0.002	0.029	3.77	4.05	0.068	0.011	3.3	0.002	7.0	0.03
8	48	2.91	0.019	0.008	4.3	0.003	0.033	4.25	4.64	0.077	0.012	3.6	0.003	7.4	0.03
9	55	3.30	0.020	0.009	4.9	0.003	0.036	4.81	5.22	0.087	0.012	3.9	0.003	7.6	0.03
10	63	3.63	0.020	0.009	5.5	0.003	0.039	5.27	5.75	0.096		4.2	0.003	7.8	0.04
11	70	3.96	0.021	0.010	6.1	0.003	0.043	5.74	6.33	0.106		4.5	0.003	8.1	0.06
12	76	4.18	0.021	0.011	6.6	0.004	0.045	6.07	6.77	0.114		4.8	0.004	8.3	0.07
13	84	4.39	0.021	0.012	7.2	0.004	0.048	6.36	7.22	0.122		5.0	0.004	8.4	0.09
14	90	4.5	0.022	0.013	7.8	0.004	0.050	6.59	7.63	0.129		5.2	0.004	8.6	0.12
15	97	4.7	0.022	0.013	8.6	0.004	0.053	6.82	8.14	0.138		5.5	0.004	8.8	0.16
16	104	4.7	0.022	0.013	8.6	0.004	0.054	6.84	8.18	0.139		5.6	0.004	8.8	0.17
17	111	4.8	0.023	0.015	9.9	0.004	0.058	7.00	8.90	0.152		6.0	0.004	9.1	0.25
18	118	4.9	0.023	0.015	10.6		0.060	7.08	9.30	0.159		6.2	0.005	9.2	0.29
19	125	4.9	0.024	0.016	11.2		0.061	7.15	9.64	0.165		6.4	0.005	9.3	0.33
20	132	4.9	0.024	0.016	11.8		0.063	7.21	9.98	0.170		6.6	0.005	9.4	0.36
21	139	5.0	0.024	0.017	12.4		0.064	7.26	10.28	0.175		6.7	0.005	9.5	0.39
22	146	5.0	0.025	0.017	13.1		0.066	7.32	10.64	0.180		7.0	0.005	9.7	0.42
23	153	5.0	0.025	0.018	13.6		0.067	7.37	10.94	0.184		7.1	0.006	9.8	0.45
24	161	5.1	0.026	0.018	14.1		0.068	7.41	11.20	0.187		7.3	0.006	9.8	0.47
25	167	5.1	0.026	0.018	14.7		0.069	7.45	11.52	0.191		7.4	0.006	9.9	0.49
26	174	5.1	0.027	0.019	15.5		0.071	7.49	11.90	0.195		7.6	0.006	10.1	0.52
27	181	5.1	0.027	0.019	16.1		0.071	7.53	12.22	0.198		7.8	0.007	10.2	0.53
28	188	5.2	0.028	0.020	16.7		0.072	7.55	12.52	0.200		8.0	0.007	10.2	0.55
29	195	5.2	0.028	0.020	17.3		0.073	7.57	12.80	0.202		8.1	0.007	10.3	0.56
30	202	5.2	0.029	0.020	17.8		0.073	7.59	13.05	0.203		8.2	0.007	10.4	0.57
31	209	5.2	0.029	0.020	18.5		0.074	7.60	13.38	0.205		8.4	0.008	10.5	0.57
32	217	5.2	0.030	0.021	19.4		0.074	7.62	13.76	0.206		8.6	0.008	10.6	0.58
33	223	5.2	0.031	0.021	20.0		0.074	7.62	14.04	0.206		8.7	0.008	10.7	0.58

Appendix 4.4 Table 5

**Cumulative Metal Extractions
Upper Mole Lake Waste Rock Master Composite**

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.001	0.003	0.0006	0.00	0.006	0.005	0.002	0.00	0.002	0.014	0.006	0.02	0.04	0.005
2	8	0.002	0.023	0.001	0.01	0.010	0.007	0.003	0.01	0.003	0.023	0.011	0.03	0.05	0.008
3	15	0.003	0.036	0.001	0.01	0.013	0.009	0.004	0.01	0.004	0.031	0.015	0.04	0.07	0.010
4	22	0.003	0.040	0.001	0.01	0.014	0.010	0.004	0.01	0.004	0.035	0.018	0.05	0.08	0.010
5	27	0.003	0.041	0.001	0.02	0.015	0.010	0.005	0.01	0.004	0.040	0.020	0.06	0.08	0.011
6	34	0.003	0.043	0.002	0.02	0.018	0.011	0.005	0.01	0.005	0.050	0.026	0.07	0.10	0.013
7	41	0.004	0.045	0.002	0.03	0.019	0.012	0.006	0.01	0.005	0.054	0.029	0.08	0.10	0.014
8	48	0.004	0.048	0.002	0.03	0.021	0.014	0.006	0.01	0.006	0.059	0.032	0.09	0.11	0.015
9	55	0.005	0.049	0.002	0.04	0.024	0.015	0.007	0.02	0.007	0.062	0.034	0.10	0.11	0.017
10	63	0.005	0.050	0.003	0.04	0.026	0.016	0.008	0.02	0.007		0.037	0.10	0.11	0.021
11	70	0.006	0.052	0.003	0.05	0.028	0.018	0.009	0.02	0.008		0.040	0.11	0.12	0.029
12	76	0.006	0.052	0.003	0.05	0.029	0.019	0.009	0.02	0.009		0.042	0.12	0.12	0.038
13	84	0.006	0.053	0.003	0.05	0.031	0.020	0.010	0.02	0.009		0.044	0.13	0.12	0.050
14	90	0.006	0.054	0.003	0.06	0.032	0.021	0.010	0.02	0.010		0.046	0.13	0.12	0.063
15	97	0.007	0.055	0.004	0.06	0.034	0.022	0.010	0.03	0.011		0.048	0.14	0.13	0.085
16	104	0.007	0.056	0.004	0.06	0.034	0.022	0.010	0.03	0.011		0.049	0.14	0.13	0.087
17	111	0.007	0.057	0.004	0.07	0.037	0.024	0.011	0.03	0.012		0.052	0.15	0.13	0.131
18	118	0.007	0.058	0.004	0.08		0.025	0.011	0.03	0.012		0.054	0.15	0.13	0.155
19	125	0.007	0.059	0.004	0.08		0.026	0.011	0.03	0.013		0.056	0.16	0.14	0.174
20	132	0.007	0.060	0.005	0.09		0.026	0.011	0.03	0.013		0.058	0.17	0.14	0.192
21	139	0.007	0.061	0.005	0.09		0.027	0.011	0.03	0.013		0.059	0.17	0.14	0.207
22	146	0.007	0.062	0.005	0.10		0.027	0.011	0.03	0.014		0.061	0.18	0.14	0.224
23	153	0.007	0.063	0.005	0.10		0.028	0.011	0.03	0.014		0.062	0.19	0.14	0.237
24	161	0.007	0.064	0.005	0.11		0.028	0.011	0.03	0.014		0.064	0.19	0.14	0.247
25	167	0.007	0.065	0.005	0.11		0.029	0.011	0.04	0.015		0.065	0.20	0.14	0.259
26	174	0.007	0.067	0.005	0.12		0.029	0.011	0.04	0.015		0.067	0.21	0.15	0.271
27	181	0.007	0.068	0.005	0.12		0.030	0.011	0.04	0.015		0.068	0.22	0.15	0.281
28	188	0.007	0.069	0.005	0.12		0.030	0.011	0.04	0.015		0.070	0.23	0.15	0.288
29	195	0.007	0.071	0.006	0.13		0.030	0.011	0.04	0.016		0.071	0.24	0.15	0.294
30	202	0.007	0.072	0.006	0.13		0.031	0.012	0.04	0.016		0.072	0.24	0.15	0.298
31	209	0.007	0.074	0.006	0.14		0.031	0.012	0.04	0.016		0.074	0.25	0.15	0.302
32	217	0.007	0.076	0.006	0.14		0.031	0.012	0.04	0.016		0.075	0.27	0.15	0.305
33	223	0.007	0.077	0.006	0.15		0.031	0.012	0.04	0.016		0.077	0.28	0.15	0.306

Appendix 4.4 Table 6

Metal Extraction Rates
Upper Mole Lake Waste Rock Master Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kgwk) - 5 Cycle Moving Average													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0														
2	8	0.45	0.0071	0.001	0.39	0.0004	0.005	0.65	0.55	0.011	0.0016	0.52	0.0004	1.16	0.005
3	15	0.40	0.0062	0.001	0.42	0.0004	0.005	0.58	0.54	0.010	0.0016	0.51	0.0004	1.10	0.004
4	22	0.31	0.0047	0.001	0.37	0.0003	0.004	0.45	0.46	0.008	0.0013	0.43	0.0003	0.89	0.003
5	27	0.28	0.0039	0.001	0.42	0.0003	0.003	0.40	0.47	0.007	0.0014	0.43	0.0003	0.86	0.003
6	34	0.28	0.0033	0.001	0.54	0.0003	0.003	0.41	0.55	0.008	0.0015	0.48	0.0003	0.87	0.003
7	41	0.22	0.0019	0.001	0.55	0.0002	0.003	0.32	0.51	0.006	0.0013	0.43	0.0003	0.68	0.002
8	48	0.22	0.0010	0.001	0.58	0.0002	0.002	0.32	0.52	0.006	0.0012	0.40	0.0003	0.54	0.002
9	55	0.28	0.0008	0.001	0.65	0.0002	0.003	0.40	0.59	0.008	0.0011	0.41	0.0003	0.50	0.003
10	63	0.30	0.0008	0.001	0.62	0.0002	0.003	0.43	0.57	0.008		0.37	0.0003	0.40	0.004
11	70	0.31	0.0006	0.001	0.55	0.0002	0.003	0.44	0.52	0.008		0.30	0.0002	0.27	0.006
12	76	0.32	0.0006	0.001	0.59	0.0002	0.003	0.46	0.54	0.009		0.30	0.0002	0.25	0.009
13	84	0.29	0.0004	0.001	0.57	0.0002	0.003	0.41	0.50	0.009		0.27	0.0002	0.21	0.013
14	90	0.25	0.0004	0.001	0.58	0.0002	0.003	0.36	0.48	0.008		0.26	0.0002	0.19	0.018
15	97	0.22	0.0004	0.001	0.64	0.0002	0.003	0.32	0.49	0.009		0.27	0.0002	0.19	0.025
16	104	0.16	0.0003	0.001	0.52	0.0002	0.002	0.23	0.38	0.007		0.21	0.0002	0.15	0.023
17	111	0.13	0.0004	0.001	0.65	0.0002	0.002	0.19	0.43	0.008		0.24	0.0002	0.16	0.036
18	118	0.10	0.0004	0.001	0.69		0.002	0.15	0.43	0.008		0.24	0.0002	0.16	0.041
19	125	0.07	0.0004	0.001	0.68		0.002	0.11	0.40	0.007		0.23	0.0002	0.15	0.042
20	132	0.05	0.0004	0.001	0.65		0.002	0.08	0.37	0.006		0.21	0.0002	0.13	0.041
21	139	0.05	0.0004	0.001	0.75		0.002	0.08	0.42	0.007		0.24	0.0002	0.15	0.045
22	146	0.04	0.0004	0.001	0.63		0.002	0.07	0.35	0.006		0.20	0.0002	0.12	0.035
23	153	0.04	0.0004	0.000	0.60		0.002	0.06	0.33	0.005		0.18	0.0002	0.11	0.031
24	161	0.03	0.0004	0.000	0.56		0.001	0.05	0.30	0.004		0.17	0.0002	0.10	0.027
25	167	0.03	0.0004	0.000	0.58		0.001	0.05	0.31	0.004		0.17	0.0002	0.10	0.025
26	174	0.03	0.0005	0.000	0.62		0.001	0.05	0.32	0.004		0.18	0.0002	0.10	0.025
27	181	0.03	0.0005	0.000	0.61		0.001	0.04	0.32	0.004		0.17	0.0002	0.10	0.022
28	188	0.02	0.0005	0.000	0.62		0.001	0.04	0.32	0.003		0.17	0.0002	0.10	0.020
29	195	0.02	0.0006	0.000	0.66		0.001	0.03	0.33	0.003		0.18	0.0003	0.10	0.018
30	202	0.02	0.0005	0.000	0.62		0.001	0.03	0.31	0.003		0.16	0.0003	0.09	0.015
31	209	0.02	0.0006	0.000	0.61		0.001	0.02	0.29	0.002		0.15	0.0003	0.08	0.012
32	217	0.01	0.0006	0.000	0.63		0.001	0.02	0.30	0.002		0.15	0.0003	0.08	0.009
33	223	0.01	0.0006	0.000	0.65		0.000	0.01	0.30	0.001		0.16	0.0003	0.08	0.007

Appendix 4.4 Table 7

**Oxidation and Neutralization Results
Upper Mole Lake Waste Rock Master Composite**

Test: Leached under wet/dry alternating cycles

Water Sample: Bottom seepage

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO [Ca + Mg] [SO ₄]	NEUTRALIZATION		
		Cumulative Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)		Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1	0	2	0.08		0.025	0.016	0.041	2.30	6		0.01
2	8	4	0.14	1.45	0.017	0.011	0.026	2.13	9	3.23	0.02
3	15	6	0.19	1.47	0.015	0.011	0.022	2.17	13	3.28	0.03
4	22	6	0.21	1.25	0.008	0.007	0.011	2.20	15	2.81	0.03
5	27	7	0.25	1.31	0.012	0.011	0.015	2.24	17	2.97	0.04
6	34	10	0.32	1.47	0.022	0.025	0.035	2.72	23	3.59	0.05
7	41	10	0.34	1.33	0.008	0.011	0.016	3.35	26	3.48	0.05
8	48	11	0.37	1.21	0.009	0.015	0.024	4.20	30	3.62	0.06
9	55	12	0.40	1.19	0.007	0.015	0.024	5.44	34	4.06	0.07
10	63	13	0.42	1.01	0.007	0.014	0.022	4.78	37	3.91	0.08
11	70	14	0.45	0.78	0.009	0.016	0.024	4.24	41	3.52	0.09
12	76	14	0.48	0.80	0.008	0.013	0.018	3.79	44	3.72	0.09
13	84	15	0.51	0.79	0.010	0.015	0.019	3.42	48	3.49	0.10
14	90	16	0.54	0.86	0.010	0.014	0.017	3.10	51	3.43	0.11
15	97	18	0.59	1.02	0.014	0.019	0.021	2.83	55	3.62	0.11
16	104	18	0.59	0.86	0.002	0.002	0.002	2.59	55	2.88	0.12
17	111	20	0.67	1.17	0.026	0.031	0.030	2.39	61	3.39	0.13
18	118	22	0.72	1.28	0.014	0.017	0.016	2.47	65	3.49	0.13
19	125	23	0.75	1.28	0.012	0.015	0.014	2.56	68	3.37	0.14
20	132	24	0.79	1.22	0.011	0.015	0.014	2.65	71	3.15	0.15
21	139	25	0.82	1.37	0.009	0.014	0.012	2.76	73	3.60	0.15
22	146	26	0.86	1.09	0.011	0.017	0.015	2.88	76	3.01	0.16
23	153	27	0.88	1.00	0.009	0.014	0.012	3.02	79	2.87	0.16
24	161	27	0.91	0.89	0.007	0.012	0.011	3.17	81	2.65	0.17
25	167	28	0.93	0.86	0.008	0.015	0.013	3.35	84	2.71	0.18
26	174	29	0.96	0.87	0.010	0.019	0.016	3.55	88	2.89	0.18
27	181	30	0.99	0.81	0.008	0.016	0.013	3.78	91	2.83	0.19
28	188	30	1.01	0.77	0.007	0.015	0.012	4.05	93	2.85	0.19
29	195	31	1.03	0.77	0.006	0.014	0.012	4.37	96	3.00	0.20
30	202	31	1.05	0.67	0.005	0.013	0.010	4.76	98	2.81	0.20
31	209	32	1.06	0.60	0.006	0.018	0.014	5.24	101	2.74	0.21
32	217	33	1.08	0.56	0.006	0.021	0.016	5.84	105	2.80	0.22
33	223	33	1.10	0.52	0.004	0.015	0.011	6.63	108	2.87	0.22

* Rates of sulfate production and NP depletion are 5-week moving averages

Appendix 4.5

Lower Mole Lake Waste Rock Master Composite

Appendix 4.5 Table 1

Sample Characterization Lower Mole Lake Waste Rock Master Composite

Metals Analysis		Waste Rock (ppm)
Aluminum	Al	68300
Antimony	Sb	30
Arsenic	As	61
Barium	Ba	290
Beryllium	Be	<1
Bismuth	Bi	<50
Cadmium	Cd	8
Calcium	Ca	9900
Carbon	C	4400
Chromium	Cr	9
Cobalt	Co	28
Copper	Cu	330
Gallium	Ga	13
Iron	Fe	70400
Lead	Pb	180
Lithium	Li	NA
Magnesium	Mg	28700
Manganese	Mn	1300
Mercury	Hg	<0.3
Molybdenum	Mo	<20
Nickel	Ni	10
Phosphorus	P	NA
Potassium	K	11900
Selenium	Se	<3
Silicon	Si	273000
Silver	Ag	0.045
Sodium	Na	7300
Strontium	Sr	NA
Thallium	Tl	<10
Tin	Sn	<10
Titanium	Ti	620
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	360
Sulfur	S	2200

ABA Results	
Paste pH	8.8
S (Total) (%)	0.34
SO4 (%)	NA
S (sulfide) (%)	0.27
AP (kg CaCO3/tonne)	8.4
NP (kg CaCO3/tonne)	46.0
CO2 (%)	NA
CO3 NP (kg CaCO3/tonne)	NA
Net NP (kg CaCO3/tonne)	37.6
NP/AP	5.5

Note: NA = not analyzed

Sample Mass (kg)	77.73
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Parameters Measured Weekly
Lower Mole Lake Waste Rock Master Composite

Test: **Leached under wet/dry alternating cycles**Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
25-Oct	1	0	5 690	7.2	595	120		115	8
2-Nov	2	8	4 655	6.7	431	91		81	13
9-Nov	3	15	4 700	6.1	342	89		69	17
16-Nov	4	22	4 780	7.4	294	75		58	21
21-Nov	5	27	4 360	6.8	286	76		46	24
28-Nov	6	34	5 300	7.5	227	75		41	26
5-Dec	7	41	3 795	7.6	206	76		36	28
12-Dec	8	48	4 840	7.7	224	77		30	30
19-Dec	9	55	3 730	7.9	323	79		25	31
27-Dec	10	63	4 320	8.0	23	83		25	33
3-Jan	11	70	4 840	8.1	226	81		25	34
9-Jan	12	76	3 880	8.3	191	75		25	35
17-Jan	13	84	3 950	8.3	195	71		25	37
23-Jan	14	90	4 100	8.3	197	73		25	38
30-Jan	15	97	5 290	8.4	199	76		25	40
6-Feb	16	104	0 500	8.3	214	70		25	40
13-Feb	17	111	8 500	8.2	213	72		25	43
20-Feb	18	118	5 580	8.3	194	73		25	44
27-Feb	19	125	3 940	8.4	196	73		24	46
6-Mar	20	132	5 460	8.3	198	72		24	47
13-Mar	21	139	4 530	8.2	180	76		23	49
20-Mar	22	146	4 510	8.1	188	68		23	50
27-Mar	23	153	4 540	8.3	206	71		22	51
4-Apr	24	161	4 620	8.2	188	66		22	53
10-Apr	25	167	5 490	8.2	204	64		22	54
17-Apr	26	174	4 140	8.2	217	62		21	55
24-Apr	27	181	4 720	8.2	188	63		21	56
1-May	28	188	5 000	8.2	180	74		20	58
8-May	29	195	4 540	8.1	177	62		20	59
15-May	30	202	5 040	8.1	175	64		19	60
22-May	31	209	3 580	8.2	167	64		19	61
30-May	32	217	5 100	8.1	167	62		18	62
5-Jun	33	223	3 790	7.8	164	61		18	63
12-Jun	34	230	4 280	8.1	149	60			
19-Jun	35	237	4 300	8.3	175	60			
26-Jun	36	244	4 160	8.2	166	62			
3-Jul	37	251	3 680	8.1	167				
10-Jul	38	258	4 860	8.1	167				
17-Jul	39	265	0 000						
24-Jul	40	272	7 750	7.9	172				
31-Jul	41	279	4 060	8.1	175				
7-Aug	42	286	4 180	8.0	166				
14-Aug	43	293	4 800	8.1	168				
21-Aug	44	300	4 480	8.0	168				
30-Aug	45	309	4 840	8.0	164				
5-Sep	46	315	4 040	8.1	172	55			
11-Sep	47	321	4 220	8.0	179	58			
18-Sep	48	328	3 690	8.0	192	52			
25-Sep	49	335	4 420	7.9	170	52			
2-Oct	50	342	4 440	7.7	166	56			
9-Oct	51	349	4 280	7.5	165	53			
16-Oct	52	356	3 740	7.5	159				
23-Oct	53	363	4 160	7.5	163				
30-Oct	54	370	4 280	7.6	170				
6-Nov	55	377	4 600	7.4	163				

* Measured values of sulfate shown in bold

Appendix 4.5 Table 3

Leachate Analysis
Lower Mole Lake Waste Rock Master Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	4.90	0.110	0.017	26.0	0.110	7.9	20.0	0.240	0.0003	0.034	16.6	0.011	57.0	0.140
2	8	12.0	0.095	0.022	21.0	2.000	20.0	21.0	0.400	< 0.0002	0.024	13.40	0.009	36.0	0.200
3	15	8.53	0.075	0.018	19.3	1.346	14.27	18.0	0.307	0.0002	0.023	12.00	0.008	27.7	0.148
4	22	5.07	0.055	0.013	17.7	0.691	8.53	15.0	0.213	0.0002	0.021	10.60	0.007	19.3	0.097
5	27	1.60	0.035	0.009	16.0	0.037	2.8	12.0	0.120	< 0.0002	< 0.020	9.20	0.006	11.0	0.045
6	34	1.75	0.034	0.009	16.3	0.038	2.95	11.5	0.125	0.0003	0.020	8.65	0.006	9.38	0.050
7	41	1.90	0.034	0.009	16.5	0.040	3.10	11.0	0.130	0.0004	0.020	8.10	0.006	7.75	0.055
8	48	2.05	0.033	0.008	16.8	0.041	3.25	10.5	0.135	0.0004	0.020	7.55	0.005	6.13	0.060
9	55	2.20	0.028	0.008	17.0	0.042	3.4	10.0	0.140	0.0005	< 0.020	7.00	< 0.005	4.50	0.065
10	63	2.08	0.028	0.008	17.1	0.039	3.16	9.8	0.140	0.0005	0.020	6.75	0.005	4.26	0.065
11	70	1.95	0.027	0.008	17.3	0.037	2.93	9.7	0.140	0.0004	0.020	6.50	0.005	4.03	0.065
12	76	1.83	0.027	0.008	17.4	0.034	2.69	9.5	0.140	0.0004	0.020	6.25	0.005	3.79	0.064
13	84	1.70	0.026	0.008	17.5	0.032	2.45	9.3	0.140	0.0004	0.020	6.00	0.005	3.55	0.064
14	90	1.58	0.026	0.007	17.6	0.029	2.21	9.1	0.140	0.0003	0.020	5.75	0.005	3.31	0.064
15	97	1.45	0.025	0.007	17.8	0.026	1.98	9.0	0.140	0.0003	0.020	5.50	0.005	3.08	0.064
16	104	1.33	0.025	0.007	17.9	0.024	1.74	8.8	0.140	0.0002	0.020	5.25	0.005	2.84	0.063
17	111	1.20	0.024	0.007	18.0	0.021	1.50	8.6	0.140	< 0.0002	< 0.020	5.00	< 0.005	2.60	0.063
18	118	1.14	0.024	0.007	18.2	0.020	1.42	8.5	0.133	0.0002	0.020	4.83	0.005	2.53	0.060
19	125	1.07	0.025	0.007	18.4	0.020	1.34	8.4	0.126	0.0002	0.020	4.65	0.005	2.46	0.058
20	132	1.01	0.025	0.007	18.6	0.019	1.25	8.2	0.120	0.0002	0.020	4.48	0.005	2.39	0.055
21	139	0.95	0.025	0.007	18.8	0.019	1.17	8.1	0.113	0.0002	0.020	4.30	0.005	2.33	0.052
22	146	0.88	0.026	0.006	18.9	0.018	1.09	8.0	0.106	0.0002	0.020	4.13	0.005	2.26	0.050
23	153	0.82	0.026	0.006	19.1	0.017	1.01	7.9	0.099	0.0002	0.020	3.95	0.005	2.19	0.047
24	161	0.76	0.026	0.006	19.3	0.017	0.93	7.7	0.092	0.0002	0.020	3.78	0.005	2.12	0.044
25	167	0.70	0.027	0.006	19.5	0.016	0.85	7.6	0.086	0.0002	0.020	3.60	0.005	2.05	0.042
26	174	0.63	0.027	0.006	19.7	0.015	0.76	7.5	0.079	0.0002	0.020	3.43	0.005	1.98	0.039
27	181	0.57	0.027	0.006	19.9	0.015	0.68	7.4	0.072	0.0002	0.020	3.25	0.005	1.91	0.036
28	188	0.51	0.027	0.006	20.1	0.014	0.60	7.2	0.065	0.0002	0.020	3.08	0.005	1.84	0.033
29	195	0.44	0.028	0.006	20.3	0.014	0.52	7.1	0.058	0.0002	0.020	2.90	0.005	1.78	0.031
30	202	0.38	0.028	0.005	20.4	0.013	0.44	7.0	0.051	0.0002	0.020	2.73	0.005	1.71	0.028
31	209	0.32	0.028	0.005	20.6	0.012	0.35	6.9	0.045	0.0002	0.020	2.55	0.005	1.64	0.025
32	217	0.25	0.029	0.005	20.8	0.012	0.27	6.7	0.038	0.0002	0.020	2.38	0.005	1.57	0.023
33	223	0.19	0.029	0.005	21.0	0.011	0.19	6.6	0.031	< 0.0002	0.020	2.20	< 0.005	1.50	< 0.020

* Measured values shown in bold

Appendix 4.5 Table 4

**Cumulative Mass Flux
Lower Mole Lake Waste Rock Master Composite**

Test: **Leached under wet/dry alternating cycles**
 Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.36	0.008	0.001	1.9	0.008	0.58	1.5	0.018	0.0000	0.002	1.2	0.001	4.2	0.01
2	8	1.08	0.014	0.003	3.2	0.128	1.78	2.7	0.042	0.0000	0.004	2.0	0.001	6.3	0.02
3	15	1.59	0.018	0.004	4.3	0.209	2.64	3.8	0.060	0.0000	0.005	2.7	0.002	8.0	0.03
4	22	1.90	0.022	0.004	5.4	0.252	3.16	4.7	0.073	0.0001	0.007	3.4	0.002	9.2	0.04
5	27	1.99	0.024	0.005	6.3	0.254	3.32	5.4	0.080	0.0001	0.008	3.9	0.003	9.8	0.04
6	34	2.11	0.026	0.006	7.4	0.256	3.52	6.2	0.088	0.0001	0.009	4.5	0.003	10.4	0.04
7	41	2.21	0.028	0.006	8.2	0.258	3.67	6.7	0.095	0.0001	0.010	4.9	0.003	10.8	0.05
8	48	2.33	0.030	0.006	9.3	0.261	3.88	7.4	0.103	0.0001	0.011	5.4	0.004	11.2	0.05
9	55	2.44	0.031	0.007	10.1	0.263	4.04	7.9	0.110	0.0002	0.012	5.7	0.004	11.4	0.05
10	63	2.56	0.033	0.007	11.0	0.265	4.21	8.4	0.118	0.0002	0.013	6.1	0.004	11.7	0.06
11	70	2.68	0.034	0.008	12.1	0.267	4.40	9.0	0.126	0.0002	0.015	6.5	0.004	11.9	0.06
12	76	2.77	0.036	0.008	13.0	0.269	4.53	9.5	0.133	0.0002	0.016	6.8	0.005	12.1	0.06
13	84	2.85	0.037	0.009	13.9	0.271	4.66	10.0	0.141	0.0002	0.017	7.1	0.005	12.3	0.07
14	90	2.94	0.038	0.009	14.8	0.272	4.77	10.4	0.148	0.0003	0.018	7.4	0.005	12.5	0.07
15	97	3.04	0.040	0.009	16.0	0.274	4.91	11.0	0.157	0.0003	0.019	7.8	0.006	12.7	0.07
16	104	3.04	0.040	0.009	16.1	0.274	4.92	11.1	0.158	0.0003	0.019	7.8	0.006	12.7	0.07
17	111	3.18	0.043	0.010	18.1	0.276	5.08	12.0	0.174	0.0003		8.4	0.006	13.0	0.08
18	118	3.26	0.044	0.011	19.4	0.278	5.18	12.6	0.183	0.0003		8.7	0.006	13.1	0.09
19	125	3.31	0.046	0.011	20.3	0.279	5.25	13.1	0.190	0.0003		8.9	0.007	13.3	0.09
20	132	3.38	0.047	0.012	21.6	0.280	5.34	13.6	0.198	0.0003		9.3	0.007	13.4	0.09
21	139	3.44	0.049	0.012	22.7	0.281	5.41	14.1	0.205	0.0004		9.5	0.007	13.6	0.10
22	146	3.49	0.050	0.012	23.8	0.282	5.47	14.6	0.211	0.0004		9.7	0.008	13.7	0.10
23	153	3.54	0.052	0.013	24.9	0.283	5.53	15.0	0.217	0.0004		10.0	0.008	13.8	0.10
24	161	3.58	0.053	0.013	26.1	0.284	5.58	15.5	0.222	0.0004		10.2	0.008	14.0	0.10
25	167	3.63	0.055	0.013	27.5	0.285	5.64	16.0	0.228	0.0004		10.5	0.009	14.1	0.11
26	174	3.66	0.057	0.014	28.5	0.286	5.68	16.4	0.232	0.0004		10.6	0.009	14.2	0.11
27	181	3.70	0.058	0.014	29.7	0.287	5.73	16.9	0.237	0.0004		10.8	0.009	14.3	0.11
28	188	3.73	0.060	0.014	31.0	0.288	5.76	17.3	0.241	0.0004		11.0	0.009	14.4	0.11
29	195	3.76	0.062	0.015	32.2	0.289	5.80	17.8	0.244	0.0005		11.2	0.010	14.5	0.12
30	202	3.78	0.064	0.015	33.5	0.290	5.82	18.2	0.248	0.0005		11.4	0.010	14.7	0.12
31	209	3.80	0.065	0.015	34.5	0.290	5.84	18.5	0.250	0.0005		11.5	0.010	14.7	0.12
32	217	3.81	0.067	0.016	35.8	0.291	5.86	19.0	0.252	0.0005		11.6	0.011	14.8	0.12
33	223	3.82	0.068	0.016	36.9	0.292	5.87	19.3	0.254	0.0005		11.8	0.011	14.9	0.12

Appendix 4.5 Table 5

**Cumulative Metal Extractions
Lower Mole Lake Waste Rock Master Composite**

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.001	0.013	0.0004	0.02	0.002	0.001	0.01	0.001	0.01	0.012	0.010	0.03	0.06	0.003
2	8	0.002	0.023	0.001	0.03	0.039	0.003	0.01	0.003	0.01	0.020	0.017	0.04	0.09	0.006
3	15	0.002	0.030	0.001	0.04	0.063	0.004	0.01	0.005	0.02	0.026	0.023	0.06	0.11	0.009
4	22	0.003	0.036	0.002	0.05	0.076	0.004	0.02	0.006	0.02	0.033	0.029	0.08	0.13	0.010
5	27	0.003	0.039	0.002	0.06	0.077	0.005	0.02	0.006	0.02	0.039	0.033	0.09	0.13	0.011
6	34	0.003	0.043	0.002	0.07	0.078	0.005	0.02	0.007	0.03	0.045	0.038	0.10	0.14	0.012
7	41	0.003	0.045	0.002	0.08	0.078	0.005	0.02	0.007	0.04	0.050	0.041	0.11	0.15	0.013
8	48	0.003	0.049	0.002	0.09	0.079	0.006	0.03	0.008	0.04	0.057	0.045	0.12	0.15	0.014
9	55	0.004	0.051	0.002	0.10	0.080	0.006	0.03	0.008	0.05	0.061	0.048	0.13	0.16	0.015
10	63	0.004	0.053	0.003	0.11	0.080	0.006	0.03	0.009	0.06	0.067	0.051	0.14	0.16	0.016
11	70	0.004	0.056	0.003	0.12	0.081	0.006	0.03	0.010	0.07	0.073	0.054	0.15	0.16	0.017
12	76	0.004	0.058	0.003	0.13	0.082	0.006	0.03	0.010	0.08	0.078	0.057	0.16	0.17	0.018
13	84	0.004	0.060	0.003	0.14	0.082	0.007	0.03	0.011	0.08	0.083	0.060	0.16	0.17	0.019
14	90	0.004	0.063	0.003	0.15	0.082	0.007	0.04	0.011	0.09	0.089	0.062	0.17	0.17	0.019
15	97	0.004	0.065	0.003	0.16	0.083	0.007	0.04	0.012	0.09	0.095	0.065	0.18	0.17	0.021
16	104	0.004	0.066	0.003	0.16	0.083	0.007	0.04	0.012	0.09	0.096	0.066	0.19	0.17	0.021
17	111	0.005	0.070	0.004	0.18	0.084	0.007	0.04	0.013	0.10		0.070	0.20	0.18	0.023
18	118	0.005	0.073	0.004	0.20	0.084	0.007	0.04	0.014	0.11		0.073	0.22	0.18	0.024
19	125	0.005	0.075	0.004	0.21	0.085	0.007	0.05	0.015	0.11		0.075	0.22	0.18	0.025
20	132	0.005	0.078	0.004	0.22	0.085	0.008	0.05	0.015	0.11		0.078	0.24	0.18	0.026
21	139	0.005	0.080	0.004	0.23	0.085	0.008	0.05	0.016	0.12		0.080	0.25	0.19	0.027
22	146	0.005	0.083	0.004	0.24	0.086	0.008	0.05	0.016	0.12		0.082	0.25	0.19	0.027
23	153	0.005	0.085	0.004	0.25	0.086	0.008	0.05	0.017	0.13		0.084	0.26	0.19	0.028
24	161	0.005	0.088	0.004	0.26	0.086	0.008	0.05	0.017	0.13		0.086	0.27	0.19	0.029
25	167	0.005	0.091	0.005	0.28	0.087	0.008	0.06	0.018	0.13		0.088	0.29	0.19	0.030
26	174	0.005	0.093	0.005	0.29	0.087	0.008	0.06	0.018	0.14		0.089	0.30	0.19	0.030
27	181	0.005	0.096	0.005	0.30	0.087	0.008	0.06	0.018	0.14		0.091	0.31	0.20	0.031
28	188	0.005	0.099	0.005	0.31	0.087	0.008	0.06	0.019	0.15		0.093	0.32	0.20	0.032
29	195	0.006	0.101	0.005	0.33	0.088	0.008	0.06	0.019	0.15		0.094	0.33	0.20	0.032
30	202	0.006	0.104	0.005	0.34	0.088	0.008	0.06	0.019	0.15		0.096	0.34	0.20	0.033
31	209	0.006	0.106	0.005	0.35	0.088	0.008	0.06	0.019	0.16		0.097	0.34	0.20	0.033
32	217	0.006	0.110	0.005	0.36	0.088	0.008	0.07	0.019	0.16		0.098	0.36	0.20	0.033
33	223	0.006	0.112	0.006	0.37	0.088	0.008	0.07	0.020	0.17		0.099	0.36	0.20	0.034

Appendix 4.5 Table 6

**Metal Extraction Rates
Lower Mole Lake Waste Rock Master Composite**

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average													
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0														
2	8	0.63	0.0050	0.0012	1.10	0.105	1.05	1.10	0.021	<0.0001	0.0013	0.70	0.0005	1.89	0.010
3	15	0.58	0.0048	0.0011	1.13	0.094	0.96	1.09	0.020	<0.0001	0.0013	0.71	0.0005	1.79	0.010
4	22	0.49	0.0043	0.0010	1.12	0.078	0.82	1.04	0.018	<0.0001	0.0013	0.69	0.0005	1.60	0.009
5	27	0.42	0.0040	0.0010	1.14	0.064	0.71	1.02	0.016	<0.0001	0.0014	0.70	0.0005	1.46	0.008
6	34	0.36	0.0037	0.0009	1.14	0.051	0.61	0.97	0.015	<0.0001	0.0014	0.68	0.0004	1.29	0.007
7	41	0.24	0.0029	0.0007	1.07	0.028	0.40	0.85	0.011	<0.0001	0.0013	0.61	0.0004	0.95	0.005
8	48	0.16	0.0024	0.0006	1.05	0.011	0.26	0.76	0.009	<0.0001	0.0013	0.56	0.0004	0.68	0.004
9	55	0.11	0.0020	0.0005	0.99	0.002	0.19	0.66	0.008	<0.0001	0.0012	0.49	0.0003	0.47	0.003
10	63	0.11	0.0017	0.0005	0.92	0.002	0.17	0.58	0.007	<0.0001	0.0011	0.42	0.0003	0.36	0.003
11	70	0.11	0.0016	0.0004	0.91	0.002	0.17	0.55	0.007	<0.0001	0.0011	0.39	0.0003	0.28	0.003
12	76	0.11	0.0016	0.0004	0.95	0.002	0.17	0.55	0.008	<0.0001	0.0011	0.38	0.0003	0.25	0.004
13	84	0.10	0.0014	0.0004	0.89	0.002	0.15	0.50	0.007	<0.0001	0.0010	0.34	0.0003	0.21	0.003
14	90	0.10	0.0014	0.0004	0.94	0.002	0.15	0.51	0.008	<0.0001	0.0011	0.34	0.0003	0.21	0.003
15	97	0.10	0.0015	0.0004	1.02	0.002	0.14	0.54	0.008	<0.0001	0.0012	0.35	0.0003	0.21	0.004
16	104	0.08	0.0012	0.0003	0.83	0.001	0.11	0.43	0.007	<0.0001	0.0009	0.27	0.0002	0.16	0.003
17	111	0.08	0.0014	0.0004	1.02	0.001	0.11	0.51	0.008	<0.0001		0.31	0.0003	0.17	0.004
18	118	0.08	0.0016	0.0005	1.14	0.001	0.11	0.55	0.009	<0.0001		0.33	0.0003	0.18	0.004
19	125	0.07	0.0015	0.0004	1.11	0.001	0.10	0.53	0.008	<0.0001		0.31	0.0003	0.16	0.004
20	132	0.07	0.0015	0.0004	1.12	0.001	0.09	0.52	0.008	<0.0001		0.30	0.0003	0.16	0.004
21	139	0.08	0.0018	0.0005	1.32	0.001	0.10	0.60	0.009	<0.0001		0.34	0.0004	0.18	0.004
22	146	0.06	0.0015	0.0004	1.15	0.001	0.08	0.51	0.007	<0.0001		0.28	0.0003	0.15	0.003
23	153	0.06	0.0015	0.0004	1.11	0.001	0.07	0.48	0.007	<0.0001		0.25	0.0003	0.14	0.003
24	161	0.05	0.0015	0.0004	1.12	0.001	0.06	0.47	0.006	<0.0001		0.24	0.0003	0.13	0.003
25	167	0.05	0.0016	0.0004	1.17	0.001	0.06	0.48	0.006	<0.0001		0.24	0.0003	0.13	0.003
26	174	0.05	0.0016	0.0004	1.16	0.001	0.06	0.46	0.006	<0.0001		0.23	0.0003	0.13	0.003
27	181	0.04	0.0016	0.0004	1.18	0.001	0.05	0.46	0.005	<0.0001		0.22	0.0003	0.12	0.003
28	188	0.04	0.0017	0.0004	1.21	0.001	0.05	0.46	0.005	<0.0001		0.21	0.0003	0.12	0.002
29	195	0.04	0.0017	0.0004	1.26	0.001	0.04	0.47	0.005	<0.0001		0.21	0.0003	0.12	0.002
30	202	0.03	0.0017	0.0003	1.21	0.001	0.04	0.44	0.004	<0.0001		0.18	0.0003	0.11	0.002
31	209	0.03	0.0016	0.0003	1.19	0.001	0.03	0.42	0.003	<0.0001		0.17	0.0003	0.10	0.002
32	217	0.02	0.0016	0.0003	1.19	0.001	0.03	0.41	0.003	<0.0001		0.16	0.0003	0.10	0.002
33	223	0.02	0.0016	0.0003	1.17	0.001	0.02	0.39	0.003	<0.0001		0.15	0.0003	0.09	0.001

Appendix 4.5 Table 7

Oxidation and Neutralization Results
Lower Mole Lake Waste Rock Master Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO [Ca + Mg] [SO ₄]	NEUTRALIZATION		
		Cumulative Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)		Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1	0	8	0.08		0.088	0.048	0.060	1.23	11		0.02
2	8	13	0.13	4.24	0.051	0.031	0.052	1.65	19	7.28	0.04
3	15	17	0.17	4.22	0.044	0.029	0.045	1.69	27	7.34	0.06
4	22	21	0.21	4.01	0.037	0.027	0.038	1.76	33	7.07	0.07
5	27	24	0.23	3.93	0.027	0.022	0.028	1.87	38	7.06	0.08
6	34	26	0.26	3.70	0.029	0.028	0.032	2.07	44	6.84	0.10
7	41	28	0.28	3.15	0.018	0.020	0.022	2.34	48	6.18	0.10
8	48	30	0.29	2.66	0.020	0.026	0.027	2.70	54	5.74	0.12
9	55	31	0.31	2.16	0.012	0.020	0.020	3.21	58	5.21	0.13
10	63	33	0.32	1.75	0.014	0.024	0.022	3.20	62	4.70	0.14
11	70	34	0.33	1.51	0.016	0.027	0.025	3.18	67	4.53	0.15
12	76	35	0.35	1.46	0.013	0.022	0.019	3.17	71	4.64	0.16
13	84	37	0.36	1.30	0.013	0.022	0.019	3.15	76	4.29	0.16
14	90	38	0.37	1.36	0.014	0.023	0.020	3.13	80	4.47	0.17
15	97	40	0.39	1.46	0.018	0.030	0.025	3.12	85	4.79	0.19
16	104	40	0.39	1.17	0.002	0.003	0.002	3.10	86	3.84	0.19
17	111	43	0.42	1.44	0.028	0.049	0.039	3.09	95	4.66	0.21
18	118	44	0.43	1.58	0.018	0.033	0.025	3.14	101	5.13	0.22
19	125	46	0.45	1.52	0.013	0.023	0.017	3.20	105	4.94	0.23
20	132	47	0.46	1.51	0.017	0.033	0.024	3.25	110	4.96	0.24
21	139	49	0.48	1.75	0.014	0.027	0.019	3.31	115	5.79	0.25
22	146	50	0.49	1.47	0.014	0.027	0.019	3.37	120	4.96	0.26
23	153	51	0.50	1.37	0.014	0.028	0.019	3.44	124	4.74	0.27
24	161	53	0.51	1.35	0.014	0.029	0.019	3.50	129	4.74	0.28
25	167	54	0.53	1.36	0.016	0.034	0.022	3.57	135	4.88	0.29
26	174	55	0.54	1.31	0.012	0.026	0.016	3.65	139	4.80	0.30
27	181	56	0.55	1.30	0.013	0.030	0.018	3.72	144	4.84	0.31
28	188	58	0.57	1.30	0.014	0.032	0.019	3.80	149	4.93	0.32
29	195	59	0.58	1.31	0.012	0.030	0.017	3.88	154	5.06	0.33
30	202	60	0.59	1.22	0.013	0.033	0.019	3.97	159	4.82	0.35
31	209	61	0.60	1.17	0.009	0.024	0.013	4.06	162	4.70	0.35
32	217	62	0.61	1.12	0.013	0.034	0.018	4.15	168	4.64	0.36
33	223	63	0.62	1.07	0.009	0.026	0.013	4.25	172	4.52	0.37

* Rates of sulfate production and NP depletion are 5-week moving averages

Appendix 4.6

Skunk Lake High-Sulfur Waste Rock Composite

Appendix 4.6 Table 1

Sample Characterization Skunk Lake High-Sulfur Waste Rock Composite

Metals Analysis		Waste Rock (ppm)
Aluminum	Al	64300
Antimony	Sb	20
Arsenic	As	61
Barium	Ba	230
Beryllium	Be	<1
Bismuth	Bi	<50
Cadmium	Cd	9
Calcium	Ca	3800
Carbon	C	2400
Chromium	Cr	9
Cobalt	Co	13
Copper	Cu	160
Gallium	Ga	13
Iron	Fe	54900
Lead	Pb	160
Lithium	Li	NA
Magnesium	Mg	29800
Manganese	Mn	710
Mercury	Hg	0.7
Molybdenum	Mo	<20
Nickel	Ni	<5
Phosphorus	P	NA
Potassium	K	18000
Selenium	Se	4
Silicon	Si	303000
Silver	Ag	<0.01
Sodium	Na	1200
Strontium	Sr	NA
Thallium	Tl	<10
Tin	Sn	<10
Titanium	Ti	460
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	1300
Sulfur	S	39300

ABA Results	
Paste pH	8.7
S (Total) (%)	3.95
SO4 (%)	NA
S (sulfide) (%)	3.57
AP (kg CaCO3/tonne)	111.6
NP (kg CaCO3/tonne)	11.5
CO2 (%)	NA
CO3 NP (kg CaCO3/tonne)	NA
Net NP (kg CaCO3/tonne)	-100.1
NP/AP	0.10

Note: NA = not analyzed

Sample Mass (kg)	73.64
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Appendix 4.6 Table 2

Parameters Measured Weekly
Skunk Lake High-Sulfur Waste Rock Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
25-Oct	1	0	5.875	6.2	1010	34		516	41
2-Nov	2	8	5.660	6.4	829	24		381	70
9-Nov	3	15	2.860	5.4	679	20		318	83
16-Nov	4	22	5.420	5.8	617	16		254	101
21-Nov	5	27	3.900	6.1	546	17		212	113
28-Nov	6	34	6.040	5.9	407	15		178	127
5-Dec	7	41	4.750	5.9	425	16		143	136
12-Dec	8	48	5.200	5.9	390	19		109	144
19-Dec	9	55	4.500	7.4	403	20		74	149
27-Dec	10	63	4.860	7.8	425	18		85	154
3-Jan	11	70	5.170	7.8	419	19		96	161
9-Jan	12	76	3.700	6.7	353	19		106	166
17-Jan	13	84	5.140	7.8	361	21		117	174
23-Jan	14	90	5.220	7.2	379	21		128	184
30-Jan	15	97	4.740	7.1	365	20		139	192
6-Feb	16	104	0.500	8.0	387	20		149	193
13-Feb	17	111	9.050	7.9	412	20		160	213
20-Feb	18	118	5.060	7.7	401	19		163	224
27-Feb	19	125	4.100	7.7	404	17		166	234
6-Mar	20	132	5.060	7.7	420	18		169	245
13-Mar	21	139	4.100	7.1	377	16		173	255
20-Mar	22	146	4.850	7.5	420	15		176	266
27-Mar	23	153	4.310	7.6	451	12		179	277
4-Apr	24	161	3.760	7.5	431	13		182	286
10-Apr	25	167	5.030	7.7	479	14		185	299
17-Apr	26	174	4.040	7.5	427	13		188	309
24-Apr	27	181	4.700	6.8	416	12		191	321
1-May	28	188	4.380	7.7	433	21		194	333
8-May	29	195	4.690	7.4	470	11		198	345
15-May	30	202	4.600	7.5	447	14		201	358
22-May	31	209	4.230	7.5	432	10		204	370
30-May	32	217	4.840	6.4	474	11		207	383
5-Jun	33	223	4.110	6.6	481	12		210	395
12-Jun	34	230	4.700	7.3	427	11			
19-Jun	35	237	5.240	7.5	410	13			
26-Jun	36	244	4.160	7.4	423	12			
3-Jul	37	251	5.000	7.4	443	13			
10-Jul	38	258	5.140	7.4	433	14			
17-Jul	39	265	0.000						
24-Jul	40	272	7.690	7.2	444	18			
31-Jul	41	279	4.560	7.4	470	14			
7-Aug	42	286	4.900	7.3	459	17			
14-Aug	43	293	4.710	7.4	442	12			
21-Aug	44	300	4.880	7.4	436	12			
30-Aug	45	309	5.630	7.3	411	13			
5-Sep	46	315	4.700	7.5	431	13			
11-Sep	47	321	4.240	7.4	443	<5(?)			
18-Sep	48	328	4.570	7.4	418	14			
25-Sep	49	335	5.080	7.2	428	12			
3-Oct	50	343	4.500	6.6	399	13			
9-Oct	51	349	4.980	6.9	419	12			
16-Oct	52	356	4.710	6.9	412				
23-Oct	53	363	4.790	6.9	437				
30-Oct	54	370	4.290	7.0	433				
6-Nov	55	377	4.960	6.8	444				

* Measured values of sulfate shown in bold

Appendix 4.6 Table 3

Leachate Analysis
Skunk Lake High-Sulfur Waste Rock Composite

Test: **Leached under wet/dry alternating cycles**Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	6.10	0.012	0.027	82.0	0.042	0.160	6.70	79.0	2.10	28.6	0.025	14.0	0.58
2	8	4.20	0.010	0.018	65.0	0.017	0.100	4.50	58.0	1.60	19.0	0.018	6.30	0.32
3	15	3.50	0.008	0.014	56.5	0.014	0.086	3.90	48.0	1.35	13.9	0.019	4.60	0.29
4	22	2.80	0.006	0.009	48.0	< 0.010	0.072	3.30	38.0	1.10	8.80	0.020	2.90	0.25
5	27	1.20	< 0.005	0.010	42.0	< 0.010	0.034	1.40	31.0	0.93	7.30	0.016	2.00	0.16
6	34	1.05	0.005	0.009	39.0	0.010	0.030	1.20	28.0	0.87	6.68	0.014	1.73	0.15
7	41	0.90	0.005	0.008	36.0	0.010	0.025	1.00	25.0	0.82	6.05	0.011	1.45	0.14
8	48	0.75	0.005	0.007	33.0	0.010	0.021	0.79	22.0	0.76	5.43	0.009	1.18	0.13
9	55	0.60	< 0.005	0.006	30.0	< 0.010	0.016	0.59	19.0	0.70	4.80	< 0.006	0.9	0.12
10	63	0.58	0.005	0.006	30.5		0.017	0.57	19.0	0.71	4.59	0.007	0.88	0.14
11	70	0.57	0.005	0.006	31.0		0.017	0.56	19.0	0.72	4.38	0.008	0.86	0.15
12	76	0.55	0.005	0.006	31.5		0.018	0.54	19.0	0.73	4.16	0.009	0.84	0.17
13	84	0.54	0.005	0.007	32.0		0.019	0.53	19.0	0.74	3.95	0.010	0.82	0.19
14	90	0.52	0.005	0.007	32.5		0.019	0.51	19.0	0.75	3.74	0.010	0.80	0.20
15	97	0.50	0.005	0.007	33.0		0.020	0.49	19.0	0.76	3.53	0.011	0.78	0.22
16	104	0.49	0.005	0.007	33.5		0.020	0.48	19.0	0.77	3.31	0.012	0.76	0.23
17	111	0.47	< 0.005	0.007	34.0		0.021	0.46	19.0	0.78	3.10	0.013	0.74	0.25
18	118	0.446	0.005	0.007	34.9		0.020	0.44	19.6	0.76	3.02	0.013	0.73	0.29
19	125	0.423	0.005	0.007	35.8		0.020	0.41	20.3	0.74	2.94	0.013	0.73	0.34
20	132	0.399	0.005	0.007	36.6		0.019	0.39	20.9	0.72	2.86	0.013	0.72	0.38
21	139	0.376	0.005	0.007	37.5		0.019	0.36	21.5	0.70	2.78	0.014	0.71	0.43
22	146	0.352	0.005	0.007	38.4		0.018	0.34	22.1	0.68	2.69	0.014	0.71	0.47
23	153	0.328	0.005	0.007	39.3		0.018	0.32	22.8	0.66	2.61	0.014	0.70	0.51
24	161	0.305	0.005	0.007	40.1		0.017	0.29	23.4	0.64	2.53	0.014	0.69	0.56
25	167	0.281	0.005	0.007	41.0		0.017	0.27	24.0	0.63	2.45	0.014	0.69	0.60
26	174	0.257	0.005	0.007	41.9		0.016	0.24	24.6	0.61	2.37	0.014	0.68	0.64
27	181	0.234	0.005	0.007	42.8		0.015	0.22	25.3	0.59	2.29	0.014	0.67	0.69
28	188	0.210	0.005	0.007	43.6		0.015	0.20	25.9	0.57	2.21	0.014	0.66	0.73
29	195	0.187	0.005	0.007	44.5		0.014	0.17	26.5	0.55	2.13	0.015	0.66	0.78
30	202	0.163	0.005	0.007	45.4		0.014	0.15	27.1	0.53	2.04	0.015	0.65	0.82
31	209	0.139	0.005	0.007	46.3		0.013	0.12	27.8	0.51	1.96	0.015	0.64	0.86
32	217	0.116	0.005	0.007	47.1		0.013	0.10	28.4	0.49	1.88	0.015	0.64	0.91
33	223	0.092	< 0.005	0.007	48.0		0.012	0.08	29.0	0.47	1.80	0.015	0.63	0.95

* Measured values shown in bold

Appendix 4.6 Table 4

**Cumulative Mass Flux
Skunk Lake High-Sulfur Waste Rock Composite**

Test: **Leached under wet/dry alternating cycles**
 Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.49	0.001	0.002	6.5	0.003	0.013	0.53	6.3	0.17	2.3	0.002	1.1	0.05
2	8	0.81	0.002	0.004	11.5	0.005	0.020	0.88	10.8	0.29	3.7	0.003	1.6	0.07
3	15	0.95	0.002	0.004	13.7	0.005	0.024	1.03	12.6	0.34	4.3	0.004	1.8	0.08
4	22	1.15	0.002	0.005	17.3	0.006	0.029	1.27	15.4	0.42	4.9	0.006	2.0	0.10
5	27	1.22	0.003	0.005	19.5	0.006	0.031	1.35	17.1	0.47	5.3	0.006	2.1	0.11
6	34	1.30	0.003	0.006	22.7	0.007	0.033	1.45	19.4	0.54	5.9	0.008	2.2	0.12
7	41	1.36	0.003	0.007	25.0	0.008	0.035	1.51	21.0	0.60	6.3	0.008	2.3	0.13
8	48	1.41	0.004	0.007	27.3	0.009	0.036	1.57	22.5	0.65	6.6	0.009	2.4	0.14
9	55	1.45	0.004	0.007	29.2	0.009	0.037	1.60	23.7	0.69	6.9	0.009	2.5	0.15
10	63	1.49	0.004	0.008	31.2		0.038	1.64	24.9	0.74	7.2	0.010	2.5	0.16
11	70	1.53	0.005	0.008	33.4		0.040	1.68	26.3	0.79	7.5	0.010	2.6	0.17
12	76	1.55	0.005	0.009	34.9		0.041	1.71	27.2	0.83	7.7	0.011	2.6	0.17
13	84	1.59	0.005	0.009	37.2		0.042	1.74	28.6	0.88	8.0	0.011	2.7	0.19
14	90	1.63	0.006	0.009	39.5		0.043	1.78	29.9	0.93	8.3	0.012	2.7	0.20
15	97	1.66	0.006	0.010	41.6		0.044	1.81	31.1	0.98	8.5	0.013	2.8	0.22
16	104	1.66	0.006	0.010	41.8		0.045	1.82	31.3	0.99	8.5	0.013	2.8	0.22
17	111	1.72	0.007	0.011	46.0		0.047	1.87	33.6	1.08	8.9	0.014	2.9	0.25
18	118	1.75	0.007	0.011	48.4		0.049	1.90	34.9	1.13	9.1	0.015	2.9	0.27
19	125	1.78	0.007	0.012	50.4		0.050	1.92	36.1	1.18	9.3	0.016	3.0	0.29
20	132	1.80	0.008	0.012	52.9		0.051	1.95	37.5	1.23	9.5	0.017	3.0	0.31
21	139	1.82	0.008	0.013	55.0		0.052	1.97	38.7	1.26	9.6	0.018	3.1	0.34
22	146	1.85	0.008	0.013	57.5		0.053	1.99	40.2	1.31	9.8	0.019	3.1	0.37
23	153	1.87	0.009	0.013	59.8		0.054	2.01	41.5	1.35	10.0	0.019	3.2	0.40
24	161	1.88	0.009	0.014	61.9		0.055	2.03	42.7	1.38	10.1	0.020	3.2	0.43
25	167	1.90	0.009	0.014	64.7		0.056	2.05	44.3	1.42	10.3	0.021	3.2	0.47
26	174	1.92	0.009	0.015	67.0		0.057	2.06	45.7	1.46	10.4	0.022	3.3	0.50
27	181	1.93	0.010	0.015	69.7		0.058	2.07	47.3	1.49	10.5	0.023	3.3	0.55
28	188	1.94	0.010	0.015	72.3		0.059	2.08	48.8	1.53	10.7	0.024	3.4	0.59
29	195	1.96	0.010	0.016	75.1		0.060	2.10	50.5	1.56	10.8	0.025	3.4	0.64
30	202	1.97	0.011	0.016	78.0		0.061	2.11	52.2	1.60	10.9	0.026	3.4	0.69
31	209	1.97	0.011	0.017	80.6		0.062	2.11	53.8	1.63	11.1	0.026	3.5	0.74
32	217	1.98	0.011	0.017	83.7		0.062	2.12	55.7	1.66	11.2	0.027	3.5	0.80
33	223	1.99	0.012	0.018	86.4		0.063	2.12	57.3	1.68	11.3	0.028	3.6	0.85

Appendix 4.6 Table 5

**Cumulative Metal Extractions
Skunk Lake High-Sulfur Waste Rock Composite**

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.0008	0.0016	0.0009	0.2	0.026	0.0080	0.001	0.02	0.024	0.013	0.05	0.09	0.004
2	8	0.0013	0.0028	0.002	0.3	0.036	0.013	0.002	0.04	0.041	0.021	0.08	0.13	0.005
3	15	0.001	0.003	0.002	0.4	0.040	0.015	0.002	0.04	0.048	0.024	0.10	0.15	0.006
4	22	0.002	0.004	0.002	0.5	0.046	0.018	0.002	0.05	0.060	0.027	0.14	0.17	0.008
5	27	0.002	0.004	0.002	0.5	0.050	0.019	0.002	0.06	0.067	0.030	0.16	0.17	0.008
6	34	0.002	0.005	0.003	0.6	0.056	0.021	0.003	0.06	0.077	0.033	0.19	0.19	0.009
7	41	0.002	0.006	0.003	0.7	0.061	0.022	0.003	0.07	0.084	0.035	0.21	0.19	0.010
8	48	0.002	0.006	0.003	0.7	0.066	0.023	0.003	0.08	0.092	0.037	0.22	0.20	0.011
9	55	0.002	0.007	0.003	0.8	0.071	0.023	0.003	0.08	0.098	0.039	0.23	0.21	0.011
10	63	0.002	0.007	0.003	0.8		0.024	0.003	0.08	0.104	0.040	0.24	0.21	0.012
11	70	0.002	0.008	0.004	0.9		0.025	0.003	0.09	0.111	0.042	0.26	0.22	0.013
12	76	0.002	0.008	0.004	0.9		0.025	0.003	0.09	0.117	0.043	0.27	0.22	0.013
13	84	0.002	0.009	0.004	1.0		0.026	0.003	0.10	0.124	0.045	0.28	0.22	0.014
14	90	0.003	0.009	0.004	1.0		0.027	0.003	0.10	0.131	0.046	0.30	0.23	0.016
15	97	0.003	0.010	0.004	1.1		0.028	0.003	0.10	0.138	0.047	0.32	0.23	0.017
16	104	0.003	0.010	0.004	1.1		0.028	0.003	0.10	0.139	0.047	0.32	0.23	0.017
17	111	0.003	0.011	0.005	1.2		0.029	0.003	0.11	0.152	0.050	0.36	0.24	0.019
18	118	0.003	0.012	0.005	1.3		0.030	0.003	0.12	0.160	0.051	0.38	0.25	0.021
19	125	0.003	0.012	0.005	1.3		0.031	0.004	0.12	0.166	0.052	0.40	0.25	0.022
20	132	0.003	0.013	0.005	1.4		0.032	0.004	0.13	0.173	0.053	0.43	0.25	0.024
21	139	0.003	0.013	0.005	1.4		0.033	0.004	0.13	0.178	0.054	0.44	0.26	0.026
22	146	0.003	0.014	0.006	1.5		0.033	0.004	0.13	0.184	0.055	0.47	0.26	0.028
23	153	0.003	0.014	0.006	1.6		0.034	0.004	0.14	0.190	0.055	0.49	0.26	0.031
24	161	0.003	0.015	0.006	1.6		0.034	0.004	0.14	0.195	0.056	0.50	0.27	0.033
25	167	0.003	0.015	0.006	1.7		0.035	0.004	0.15	0.201	0.057	0.53	0.27	0.036
26	174	0.003	0.016	0.006	1.8		0.036	0.004	0.15	0.205	0.058	0.55	0.27	0.039
27	181	0.003	0.016	0.007	1.8		0.036	0.004	0.16	0.211	0.059	0.57	0.28	0.042
28	188	0.003	0.017	0.007	1.9		0.037	0.004	0.16	0.215	0.059	0.59	0.28	0.045
29	195	0.003	0.017	0.007	2.0		0.037	0.004	0.17	0.220	0.060	0.61	0.28	0.049
30	202	0.003	0.018	0.007	2.1		0.038	0.004	0.18	0.225	0.061	0.64	0.29	0.053
31	209	0.003	0.018	0.007	2.1		0.038	0.004	0.18	0.229	0.061	0.66	0.29	0.057
32	217	0.003	0.019	0.007	2.2		0.039	0.004	0.19	0.233	0.062	0.68	0.29	0.062
33	223	0.003	0.019	0.008	2.3		0.039	0.004	0.19	0.237	0.063	0.70	0.30	0.066

Appendix 4.6 Table 6

**Metal Extraction Rates
Skunk Lake High-Sulfur Waste Rock Composite**

Test: **Leached under wet/dry alternating cycles**
 Water Sample: **Bottom seepage**

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0													
2	8	0.282	0.0007	0.001	4.37	0.001	0.007	0.30	3.90	0.108	1.28	0.0012	0.42	0.022
3	15	0.214	0.0005	0.001	3.36	0.001	0.005	0.23	2.95	0.082	0.93	0.0010	0.31	0.017
4	22	0.212	0.0005	0.001	3.41	0.001	0.005	0.24	2.90	0.082	0.84	0.0011	0.28	0.017
5	27	0.189	0.0005	0.001	3.36	0.001	0.005	0.21	2.79	0.079	0.79	0.0012	0.25	0.016
6	34	0.168	0.0005	0.001	3.32	0.001	0.004	0.19	2.69	0.078	0.74	0.0011	0.23	0.015
7	41	0.117	0.0004	0.001	2.86	0.001	0.003	0.13	2.17	0.065	0.53	0.0010	0.16	0.013
8	48	0.099	0.0004	0.001	2.89	0.001	0.003	0.11	2.10	0.065	0.50	0.0010	0.14	0.012
9	55	0.063	0.0004	0.001	2.53	0.001	0.002	0.07	1.75	0.057	0.42	0.0008	0.10	0.010
10	63	0.053	0.0003	0.000	2.27		0.001	0.06	1.53	0.052	0.37	0.0006	0.08	0.009
11	70	0.044	0.0003	0.000	2.08		0.001	0.05	1.34	0.048	0.33	0.0005	0.07	0.009
12	76	0.039	0.0003	0.000	1.99		0.001	0.04	1.25	0.046	0.30	0.0005	0.06	0.009
13	84	0.035	0.0003	0.000	1.91		0.001	0.03	1.17	0.044	0.27	0.0005	0.05	0.009
14	90	0.036	0.0003	0.000	2.06		0.001	0.04	1.24	0.048	0.27	0.0006	0.05	0.011
15	97	0.036	0.0003	0.000	2.15		0.001	0.04	1.27	0.050	0.26	0.0006	0.05	0.012
16	104	0.028	0.0003	0.000	1.74		0.001	0.03	1.03	0.040	0.21	0.0005	0.04	0.011
17	111	0.034	0.0003	0.000	2.21		0.001	0.03	1.27	0.051	0.23	0.0008	0.05	0.015
18	118	0.033	0.0003	0.000	2.31		0.001	0.03	1.31	0.053	0.23	0.0008	0.05	0.017
19	125	0.030	0.0003	0.000	2.18		0.001	0.03	1.23	0.049	0.20	0.0008	0.05	0.017
20	132	0.029	0.0003	0.000	2.26		0.001	0.028	1.27	0.049	0.19	0.0008	0.05	0.019
21	139	0.032	0.0004	0.001	2.63		0.001	0.031	1.49	0.056	0.22	0.0010	0.05	0.024
22	146	0.025	0.0003	0.000	2.30		0.001	0.024	1.31	0.045	0.18	0.0008	0.05	0.024
23	153	0.023	0.0003	0.000	2.28		0.001	0.022	1.31	0.043	0.17	0.0008	0.04	0.026
24	161	0.021	0.0003	0.000	2.23		0.001	0.020	1.29	0.040	0.16	0.0008	0.04	0.027
25	167	0.020	0.0003	0.000	2.35		0.001	0.019	1.36	0.040	0.16	0.0008	0.04	0.031
26	174	0.018	0.0003	0.000	2.39		0.001	0.018	1.39	0.039	0.15	0.0008	0.04	0.033
27	181	0.017	0.0003	0.000	2.43		0.001	0.016	1.43	0.037	0.15	0.0008	0.04	0.036
28	188	0.015	0.0003	0.000	2.49		0.001	0.014	1.47	0.036	0.14	0.0008	0.04	0.038
29	195	0.015	0.0003	0.000	2.73		0.001	0.014	1.61	0.037	0.15	0.0009	0.04	0.044
30	202	0.013	0.0003	0.000	2.66		0.001	0.012	1.58	0.034	0.13	0.0009	0.04	0.045
31	209	0.011	0.0003	0.000	2.73		0.001	0.011	1.63	0.034	0.13	0.0009	0.04	0.047
32	217	0.010	0.0003	0.000	2.73		0.001	0.009	1.63	0.032	0.12	0.0009	0.04	0.049
33	223	0.009	0.0003	0.000	2.82		0.001	0.008	1.69	0.031	0.12	0.0009	0.04	0.053

Appendix 4.6 Table 7

Oxidation and Neutralization Results
Skunk Lake High-Sulfur Waste Rock Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO [Ca + Mg] [SO ₄]	NEUTRALIZATION		
		Cumulative Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wh)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)		Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wh) *	NP Consumed (%)
1	0	41	0.03		0.429	0.164	0.259	0.99	42		0.4
2	8	70	0.06	25.6	0.305	0.125	0.183	1.01	73	27.0	0.6
3	15	83	0.07	19.4	0.128	0.055	0.077	1.02	86	20.5	0.8
4	22	101	0.09	19.2	0.195	0.088	0.115	1.04	107	20.5	0.9
5	27	113	0.10	18.5	0.117	0.056	0.068	1.05	119	19.9	1.0
6	34	127	0.11	17.7	0.152	0.080	0.095	1.15	136	19.4	1.2
7	41	136	0.12	14.0	0.096	0.058	0.066	1.29	149	16.1	1.3
8	48	144	0.12	13.0	0.080	0.058	0.064	1.53	161	15.9	1.4
9	55	149	0.13	10.0	0.047	0.046	0.048	1.99	170	13.5	1.5
10	63	154	0.13	8.1	0.058	0.050	0.052	1.75	181	12.0	1.6
11	70	161	0.14	6.6	0.070	0.054	0.055	1.57	192	10.7	1.7
12	76	166	0.14	6.0	0.056	0.040	0.039	1.42	199	10.1	1.7
13	84	174	0.15	5.9	0.085	0.056	0.055	1.30	210	9.6	1.8
14	90	184	0.15	7.0	0.094	0.058	0.055	1.20	222	10.3	1.9
15	97	192	0.16	7.9	0.093	0.053	0.050	1.11	232	10.6	2.0
16	104	193	0.16	6.7	0.011	0.006	0.005	1.04	233	8.6	2.0
17	111	213	0.18	9.4	0.205	0.104	0.096	0.98	253	10.8	2.2
18	118	224	0.19	10.3	0.117	0.060	0.055	0.99	265	11.2	2.3
19	125	234	0.20	10.0	0.096	0.050	0.046	1.00	274	10.5	2.4
20	132	245	0.21	10.6	0.121	0.063	0.059	1.01	287	10.9	2.5
21	139	255	0.22	12.3	0.100	0.052	0.049	1.01	297	12.7	2.6
22	146	266	0.22	10.7	0.120	0.063	0.060	1.02	309	11.2	2.7
23	153	277	0.23	10.5	0.109	0.057	0.055	1.03	320	11.1	2.8
24	161	286	0.24	10.2	0.097	0.051	0.049	1.04	330	10.9	2.9
25	167	299	0.25	10.7	0.132	0.070	0.067	1.04	344	11.5	3.0
26	174	309	0.26	10.9	0.108	0.057	0.056	1.05	355	11.7	3.1
27	181	321	0.27	11.0	0.127	0.068	0.066	1.06	369	12.0	3.2
28	188	333	0.28	11.2	0.120	0.065	0.063	1.06	382	12.3	3.3
29	195	345	0.29	12.2	0.131	0.071	0.069	1.07	396	13.5	3.4
30	202	358	0.30	11.8	0.131	0.071	0.070	1.08	410	13.1	3.6
31	209	370	0.31	12.1	0.122	0.066	0.066	1.08	423	13.5	3.7
32	217	383	0.32	12.1	0.142	0.077	0.077	1.09	438	13.5	3.8
33	223	395	0.33	12.4	0.122	0.067	0.067	1.09	452	14.0	3.9

* Rates of sulfate production and NP depletion are 5-week moving averages

Appendix 4.7

Rice Lake High-Sulfur Waste Rock Composite

Appendix 4.7 Table 1

Sample Characterization Rice Lake High-Sulfur Waste Rock Composite

Metals Analysis		Waste Rock (ppm)
Aluminum	Al	65600
Antimony	Sb	20
Arsenic	As	61
Barium	Ba	270
Beryllium	Be	<1
Bismuth	Bi	<50
Cadmium	Cd	7
Calcium	Ca	1700
Carbon	C	500
Chromium	Cr	10
Cobalt	Co	16
Copper	Cu	490
Gallium	Ga	13
Iron	Fe	56100
Lead	Pb	220
Lithium	Li	NA
Magnesium	Mg	22500
Manganese	Mn	390
Mercury	Hg	<0.3
Molybdenum	Mo	<20
Nickel	Ni	<5
Phosphorus	P	NA
Potassium	K	16300
Selenium	Se	5
Silicon	Si	313000
Silver	Ag	<0.01
Sodium	Na	2800
Strontium	Sr	NA
Thallium	Tl	<10
Tin	Sn	20
Titanium	Ti	440
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	200
Sulfur	S	33300

ABA Results	
Paste pH	8.0
S (Total) (%)	3.26
SO4 (%)	NA
S (sulfide) (%)	3.20
AP (kg CaCO3/tonne)	100.0
NP (kg CaCO3/tonne)	0.5
CO2 (%)	NA
CO3 NP (kg CaCO3/tonne)	NA
Net NP (kg CaCO3/tonne)	-99.5
NP/AP	0.01

Note: NA = not analyzed

Sample Mass (kg)	81.14
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Appendix 4.7 Table 2

Parameters Measured Weekly
Rice Lake High-Sulfur Waste Rock Composite

Test: Leached under wet/dry alternating cycles

Water Sample: Bottom seepage

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
25-Oct	1	0	5.565	6.3	1400	<5		743	51
2-Nov	2	8	3.470	6.9	640	<5		602	77
9-Nov	3	15	7.120	4.8	1010		44	525	123
16-Nov	4	22	2.820	4.1	906		54	448	138
21-Nov	5	27	2.960	4.0	917		61	448	155
28-Nov	6	34	7.330	4.1	704		50	422	193
5-Dec	7	41	4.040	4.0	670		56	396	213
12-Dec	8	48	4.400	3.9	716		78	370	233
19-Dec	9	55	4.380	3.9	752		86	344	251
27-Dec	10	63	4.140	3.8	779		110	347	269
3-Jan	11	70	4.300	3.8	779		100	351	287
9-Jan	12	76	3.820	3.7	675		110	354	304
17-Jan	13	84	4.420	3.7	717		130	357	324
23-Jan	14	90	3.860	3.6	765		150	360	341
30-Jan	15	97	4.780	3.4	796		170	364	362
6-Feb	16	104	0.500	3.4	832		180	367	364
13-Feb	17	111	7.800	3.4	856		94	370	400
20-Feb	18	118	4.380	3.3	832		190	393	421
27-Feb	19	125	4.100	3.2	840		190	416	442
6-Mar	20	132	5.260	3.2	876		200	439	471
13-Mar	21	139	4.200	3.0	800		190	463	495
20-Mar	22	146	4.020	3.0	914		220	486	519
27-Mar	23	153	5.240	3.0	1060		250	509	552
4-Apr	24	161	4.160	2.9	1090		260	532	579
10-Apr	25	167	5.250	2.8	1410		300	555	615
17-Apr	26	174	3.840	2.7	1340		330	578	642
24-Apr	27	181	5.080	2.7	1480		400	601	680
1-May	28	188	4.480	2.7	1620		430	624	714
8-May	29	195	4.620	2.7	1750		450	648	751
15-May	30	202	4.100	2.7	1660		480	671	785
22-May	31	209	4.730	2.7	1700		490	694	825
30-May	32	217	4.900	2.8	1740		520	717	869
5-Jun	33	223	4.350	2.9	1790		530	740	908
12-Jun	34	230	4.740	2.7	1680		500		
19-Jun	35	237	5.160	2.6	1560		440		
26-Jun	36	244	4.660	2.6	1630		450		
3-Jul	37	251	4.740	2.6	1700				
10-Jul	38	258	4.960	2.6	1680				
17-Jul	39	265	0.000						
24-Jul	40	272	7.720	2.7	1880				
31-Jul	41	279	4.140	2.6	1960				
7-Aug	42	286	4.190	2.7	1930				
14-Aug	43	293	5.010	2.7	2020				
21-Aug	44	300	4.260	2.7	2140				
30-Aug	45	309	5.850	2.7	2310				
5-Sep	46	315	4.320	2.5	2360		860		
11-Sep	47	321	3.860	2.5	2570		870		
18-Sep	48	328	4.960	2.0	2430		840		
25-Sep	49	335	4.390	2.5	2440		810		
3-Oct	50	343	5.070	2.6	2330		770		
9-Oct	51	349	4.640	2.6	2460		800		
16-Oct	52	356	4.640	2.6	2340				
23-Oct	53	363	4.420	2.6	2420				
30-Oct	54	370	4.460	2.6	2420				
6-Nov	55	377	4.800	2.6	2470				

* Measured values of sulfate shown in bold

Appendix 4.7 Table 3

Leachate Analysis
Rice Lake High-Sulfur Waste Rock Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L)*													
		Aluminum Al	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	4.2	0.047	80	0.49	2.70	5.5	0.040	100.0	2.80	0.023	37.6	0.044	46	2.50
2	8	3.9	0.043	71	0.47	2.90	4.4	0.150	90.0	3.10	0.027	33.7	0.032	27	2.50
3	15	5.2	0.039	60	0.45	3.30	4.4	0.108	73.0	3.05	0.028	26.9	0.030	17.2	2.85
4	22	6.4	0.035	48	0.43	3.70	4.4	0.065	56.0	3.00	0.029	20.1	0.027	7.4	3.20
5	27	6.0	0.039	48	0.47	4.60	2.2	< 0.040	55.0	3.00	0.043	18.3	0.024	5.6	4.00
6	34	6.6	0.039	45	0.47	5.25	2.5	0.040	50.5	2.85	0.04	16.1	0.024	4.8	4.40
7	41	7.2	0.038	43	0.48	5.90	2.9	0.040	46.0	2.70	0.04	13.9	0.023	3.9	4.80
8	48	7.8	0.038	40	0.48	6.55	3.2	0.040	41.5	2.55	0.04	11.7	0.023	3.1	5.20
9	55	8.4	0.037	37	0.48	7.20	3.5	< 0.040	37.0	2.40	0.039	9.5	0.022	2.2	5.60
10	63	9.6	0.036	36	0.47	7.55	4.2		35.8	2.30		9.0	0.022	2.1	5.50
11	70	10.8	0.035	34	0.45	7.90	5.0		34.5	2.20		8.6	0.023	2.0	5.40
12	76	12.0	0.034	33	0.44	8.25	5.7		33.3	2.10		8.1	0.023	1.9	5.30
13	84	13.2	0.034	31	0.43	8.60	6.5		32.0	2.00		7.7	0.023	1.9	5.20
14	90	14.4	0.033	30	0.41	8.95	7.2		30.8	1.90		7.2	0.023	1.8	5.10
15	97	15.6	0.032	28	0.40	9.30	7.9		29.5	1.80		6.7	0.024	1.7	5.00
16	104	16.8	0.031	27	0.38	9.65	8.7		28.3	1.70		6.3	0.024	1.6	4.90
17	111	18.0	0.030	25	0.37	10.0	9.4		27.0	1.60		5.8	0.024	1.5	4.80
18	118	20.6	0.029	26	0.37	9.91	10.1		28.1	1.61		5.6	0.024	1.5	4.94
19	125	23.3	0.029	26	0.37	9.83	10.7		29.3	1.63		5.3	0.024	1.5	5.09
20	132	25.9	0.028	27	0.37	9.74	11.4		30.4	1.64		5.1	0.023	1.4	5.23
21	139	28.5	0.027	27	0.37	9.65	12.1		31.5	1.65		4.8	0.023	1.4	5.38
22	146	31.1	0.026	28	0.37	9.56	12.7		32.6	1.66		4.6	0.023	1.4	5.52
23	153	33.8	0.026	28	0.37	9.48	13.4		33.8	1.68		4.3	0.023	1.4	5.66
24	161	36.4	0.025	29	0.37	9.39	14.0		34.9	1.69		4.1	0.022	1.4	5.81
25	167	39.0	0.024	29	0.37	9.30	14.7		36.0	1.70		3.9	0.022	1.4	5.95
26	174	41.6	0.023	30	0.36	9.21	15.4		37.1	1.71		3.6	0.022	1.3	6.09
27	181	44.3	0.023	30	0.36	9.13	16.0		38.3	1.73		3.4	0.022	1.3	6.24
28	188	46.9	0.022	31	0.36	9.04	16.7		39.4	1.74		3.1	0.021	1.3	6.38
29	195	49.5	0.021	31	0.36	8.95	17.4		40.5	1.75		2.9	0.021	1.3	6.53
30	202	52.1	0.020	32	0.36	8.86	18.0		41.6	1.76		2.6	0.021	1.3	6.67
31	209	54.8	0.020	32	0.36	8.78	18.7		42.8	1.78		2.4	0.021	1.2	6.81
32	217	57.4	0.019	33	0.36	8.69	19.3		43.9	1.79		2.1	0.020	1.2	6.96
33	223	60.0	0.018	33	0.36	8.60	20.0		45.0	1.80		1.9	0.020	1.2	7.10

* Measured values shown in bold

Appendix 4.7 Table 4

Cumulative Mass Flux
Rice Lake High-Sulfur Waste Rock Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)													
		Aluminum Al	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.29	0.003	5.5	0.03	0.185	0.38	0.003	6.9	0.19	0.00	2.6	0.003	3.2	0.17
2	8	0.45	0.005	8.5	0.05	0.31	0.57	0.009	10.7	0.32	0.00	4.0	0.004	4.3	0.28
3	15	0.91	0.008	13.7	0.09	0.60	0.95	0.019	17.1	0.59	0.01	6.4	0.007	5.8	0.53
4	22	1.13	0.010	15.4	0.11	0.73	1.10	0.021	19.1	0.70	0.01	7.1	0.008	6.1	0.64
5	27	1.35	0.011	17.2	0.13	0.90	1.18	0.022	21.1	0.81	0.01	7.7	0.009	6.3	0.79
6	34	1.94	0.015	21.3	0.17	1.37	1.41	0.026	25.6	1.06	0.01	9.2	0.011	6.7	1.18
7	41	2.30	0.016	23.4	0.19	1.66	1.55	0.028	27.9	1.20	0.01	9.9	0.012	6.9	1.42
8	48	2.73	0.019	25.5	0.22	2.02	1.73	0.030	30.2	1.34	0.02	10.5	0.013	7.1	1.70
9	55	3.18	0.021	27.5	0.24	2.41	1.92	0.032	32.2	1.47	0.02	11.0	0.014	7.2	2.01
10	63	3.67	0.022	29.3	0.27	2.79	2.13		34.0	1.58		11.5	0.016	7.3	2.29
11	70	4.24	0.024	31.1	0.29	3.21	2.40		35.8	1.70		12.0	0.017	7.4	2.57
12	76	4.81	0.026	32.7	0.31	3.60	2.66		37.4	1.80		12.3	0.018	7.5	2.82
13	84	5.53	0.028	34.4	0.34	4.07	3.02		39.1	1.91		12.8	0.019	7.6	3.11
14	90	6.2	0.029	35.8	0.35	4.49	3.36		40.6	2.00		13.1	0.020	7.7	3.35
15	97	7.1	0.031	37.4	0.38	5.04	3.82		42.3	2.10		13.5	0.022	7.8	3.64
16	104	7.2	0.031	37.6	0.38	5.10	3.88		42.5	2.11		13.5	0.022	7.8	3.67
17	111	9.0	0.034	40.0	0.42	6.06	4.78		45.1	2.27		14.1	0.024	7.9	4.13
18	118	10.1	0.036	41.3	0.44	6.60	5.32		46.6	2.36		14.4	0.025	8.0	4.40
19	125	11.3	0.037	42.7	0.45	7.09	5.87		48.1	2.44		14.7	0.027	8.1	4.66
20	132	12.9	0.039	44.4	0.48	7.73	6.61		50.1	2.54		15.0	0.028	8.2	5.00
21	139	14.4	0.040	45.8	0.50	8.22	7.23		51.7	2.63		15.2	0.029	8.3	5.28
22	146	15.9	0.042	47.1	0.52	8.70	7.86		53.3	2.71		15.5	0.030	8.3	5.55
23	153	18.1	0.043	48.9	0.54	9.31	8.72		55.5	2.82		15.7	0.032	8.4	5.92
24	161	20.0	0.045	50.4	0.56	9.79	9.44		57.3	2.91		16.0	0.033	8.5	6.21
25	167	22.5	0.046	52.3	0.58	10.39	10.39		59.6	3.02		16.2	0.034	8.6	6.60
26	174	24.5	0.047	53.7	0.60	10.83	11.12		61.4	3.10		16.4	0.035	8.6	6.89
27	181	27.3	0.049	55.6	0.62	11.40	12.12		63.8	3.20		16.6	0.037	8.7	7.28
28	188	29.8	0.050	57.2	0.64	11.90	13.04		65.9	3.30		16.8	0.038	8.8	7.63
29	195	32.7	0.051	59.0	0.66	12.41	14.03		68.2	3.40		16.9	0.039	8.9	8.00
30	202	35.3	0.052	60.6	0.68	12.86	14.94		70.3	3.49		17.1	0.040	8.9	8.34
31	209	38.5	0.053	62.5	0.70	13.37	16.03		72.8	3.59		17.2	0.041	9.0	8.73
32	217	42.0	0.054	64.4	0.72	13.89	17.20		75.5	3.70		17.3	0.043	9.1	9.15
33	223	45.2	0.055	66.2	0.74	14.35	18.27		77.9	3.80		17.4	0.044	9.1	9.54

Appendix 4.7 Table 5

Cumulative Metal Extractions
Rice Lake High-Sulfur Waste Rock Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)													
		Aluminum Al	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.0004	0.0012	0.3	0.21	0.04	0.001	0.001	0.03	0.05	0.03	0.016	0.06	0.11	0.09
2	8	0.0007	0.002	0.5	0.34	0.06	0.001	0.004	0.05	0.08	0.05	0.025	0.09	0.15	0.14
3	15	0.001	0.003	0.8	0.58	0.12	0.002	0.008	0.08	0.15	0.10	0.039	0.14	0.21	0.26
4	22	0.002	0.004	0.9	0.68	0.15	0.002	0.009	0.08	0.18	0.12	0.043	0.16	0.22	0.32
5	27	0.002	0.004	1.0	0.78	0.18	0.002	0.010	0.09	0.21	0.16	0.048	0.18	0.22	0.39
6	34	0.003	0.005	1.3	1.05	0.28	0.003	0.012	0.11	0.27	0.23	0.056	0.22	0.24	0.59
7	41	0.004	0.006	1.4	1.20	0.34	0.003	0.013	0.12	0.31	0.27	0.061	0.24	0.25	0.71
8	48	0.004	0.007	1.5	1.36	0.41	0.003	0.014	0.13	0.34	0.32	0.065	0.27	0.25	0.85
9	55	0.005	0.008	1.6	1.52	0.49	0.003	0.015	0.14	0.38	0.36	0.068	0.29	0.26	1.00
10	63	0.006	0.008	1.7	1.67	0.57	0.004		0.15	0.41		0.071	0.31	0.26	1.14
11	70	0.006	0.009	1.8	1.82	0.66	0.004		0.16	0.44		0.073	0.34	0.26	1.29
12	76	0.007	0.010	1.9	1.95	0.73	0.005		0.17	0.46		0.076	0.36	0.27	1.41
13	84	0.008	0.010	2.0	2.09	0.83	0.005		0.17	0.49		0.078	0.38	0.27	1.55
14	90	0.009	0.011	2.1	2.22	0.92	0.006		0.18	0.51		0.080	0.40	0.27	1.67
15	97	0.011	0.012	2.2	2.36	1.03	0.007		0.19	0.54		0.083	0.43	0.28	1.82
16	104	0.011	0.012	2.2	2.38	1.04	0.007		0.19	0.54		0.083	0.44	0.28	1.84
17	111	0.014	0.013	2.4	2.60	1.24	0.009		0.20	0.58		0.086	0.48	0.28	2.07
18	118	0.015	0.013	2.4	2.72	1.35	0.009		0.21	0.60		0.088	0.51	0.29	2.20
19	125	0.017	0.014	2.5	2.84	1.45	0.010		0.21	0.62		0.090	0.53	0.29	2.33
20	132	0.020	0.014	2.6	2.99	1.58	0.012		0.22	0.65		0.092	0.56	0.29	2.50
21	139	0.022	0.015	2.7	3.11	1.68	0.013		0.23	0.67		0.093	0.58	0.29	2.64
22	146	0.024	0.015	2.8	3.22	1.78	0.014		0.24	0.70		0.095	0.61	0.30	2.77
23	153	0.028	0.016	2.9	3.37	1.90	0.016		0.25	0.72		0.097	0.64	0.30	2.96
24	161	0.030	0.017	3.0	3.49	2.00	0.017		0.25	0.75		0.098	0.66	0.30	3.11
25	167	0.034	0.017	3.1	3.63	2.12	0.019		0.26	0.77		0.099	0.69	0.31	3.30
26	174	0.037	0.018	3.2	3.74	2.21	0.020		0.27	0.79		0.100	0.71	0.31	3.44
27	181	0.042	0.018	3.3	3.88	2.33	0.022		0.28	0.82		0.102	0.73	0.31	3.64
28	188	0.045	0.018	3.4	4.01	2.43	0.023		0.29	0.85		0.103	0.76	0.31	3.81
29	195	0.050	0.019	3.5	4.14	2.53	0.025		0.30	0.87		0.104	0.78	0.32	4.00
30	202	0.054	0.019	3.6	4.25	2.62	0.027		0.31	0.89		0.105	0.80	0.32	4.17
31	209	0.059	0.020	3.7	4.39	2.73	0.029		0.32	0.92		0.105	0.83	0.32	4.37
32	217	0.064	0.020	3.8	4.52	2.84	0.031		0.34	0.95		0.106	0.85	0.32	4.58
33	223	0.069	0.020	3.9	4.64	2.93	0.033		0.35	0.97		0.107	0.87	0.33	4.77

Appendix 4.7 Table 6

Metal Extraction Rates
Rice Lake High-Sulfur Waste Rock Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average													
		Aluminum Al	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0														
2	8	0.15	0.002	2.66	0.018	0.11	0.16	0.006	3.37	0.116	0.001	1.26	0.0012	1.01	0.09
3	15	0.29	0.002	3.85	0.028	0.19	0.27	0.007	4.79	0.187	0.002	1.77	0.0018	1.24	0.17
4	22	0.27	0.002	3.16	0.024	0.17	0.23	0.006	3.88	0.161	0.001	1.43	0.0016	0.93	0.15
5	27	0.27	0.002	3.03	0.024	0.18	0.21	0.005	3.68	0.159	0.002	1.34	0.0015	0.81	0.16
6	34	0.34	0.002	3.25	0.028	0.24	0.21	0.005	3.86	0.179	0.002	1.36	0.0016	0.73	0.21
7	41	0.39	0.002	3.15	0.029	0.29	0.21	0.004	3.65	0.185	0.002	1.25	0.0016	0.55	0.24
8	48	0.39	0.002	2.50	0.026	0.30	0.16	0.002	2.77	0.158	0.002	0.88	0.0013	0.27	0.25
9	55	0.43	0.002	2.57	0.029	0.36	0.17	0.002	2.78	0.163	0.002	0.84	0.0014	0.24	0.29
10	63	0.45	0.002	2.37	0.028	0.37	0.18		2.51	0.151		0.73	0.0013	0.20	0.29
11	70	0.45	0.002	1.92	0.024	0.36	0.19		1.98	0.124		0.54	0.0011	0.13	0.27
12	76	0.50	0.002	1.86	0.024	0.39	0.22		1.89	0.120		0.49	0.0012	0.12	0.28
13	84	0.54	0.002	1.72	0.023	0.40	0.25		1.74	0.111		0.43	0.0011	0.10	0.27
14	90	0.61	0.002	1.65	0.022	0.42	0.29		1.68	0.106		0.41	0.0012	0.10	0.27
15	97	0.71	0.002	1.66	0.023	0.46	0.35		1.72	0.107		0.41	0.0012	0.10	0.28
16	104	0.62	0.001	1.32	0.018	0.39	0.31		1.38	0.085		0.32	0.0010	0.08	0.23
17	111	0.83	0.002	1.46	0.021	0.49	0.42		1.54	0.094		0.35	0.0012	0.09	0.26
18	118	0.94	0.002	1.44	0.021	0.52	0.48		1.54	0.092		0.34	0.0013	0.09	0.27
19	125	1.01	0.002	1.38	0.020	0.52	0.50		1.50	0.088		0.31	0.0013	0.08	0.26
20	132	1.16	0.002	1.39	0.020	0.54	0.56		1.55	0.088		0.30	0.0013	0.08	0.27
21	139	1.43	0.002	1.64	0.023	0.62	0.67		1.84	0.103		0.34	0.0015	0.09	0.32
22	146	1.40	0.002	1.43	0.020	0.53	0.62		1.64	0.089		0.27	0.0013	0.08	0.28
23	153	1.61	0.002	1.52	0.021	0.54	0.68		1.77	0.093		0.27	0.0013	0.08	0.30
24	161	1.70	0.001	1.51	0.020	0.52	0.70		1.79	0.091		0.25	0.0012	0.08	0.30
25	167	1.92	0.001	1.58	0.021	0.53	0.76		1.91	0.094		0.24	0.0013	0.08	0.32
26	174	2.02	0.001	1.58	0.020	0.52	0.78		1.93	0.094		0.23	0.0012	0.08	0.32
27	181	2.26	0.001	1.68	0.021	0.54	0.85		2.09	0.099		0.22	0.0013	0.08	0.35
28	188	2.34	0.001	1.66	0.020	0.52	0.86		2.09	0.096		0.20	0.0012	0.07	0.34
29	195	2.61	0.001	1.77	0.021	0.54	0.95		2.26	0.102		0.20	0.0013	0.08	0.37
30	202	2.56	0.001	1.66	0.020	0.49	0.91		2.15	0.095		0.17	0.0012	0.07	0.35
31	209	2.80	0.001	1.76	0.021	0.51	0.98		2.29	0.099		0.16	0.0012	0.07	0.37
32	217	2.86	0.001	1.72	0.020	0.48	0.99		2.28	0.096		0.14	0.0011	0.07	0.37
33	223	3.07	0.001	1.79	0.020	0.49	1.05		2.39	0.099		0.13	0.0011	0.07	0.38

Appendix 4.7 Table 7

Oxidation and Neutralization Results
Rice Lake High-Sulfur Waste Rock Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO [Ca+Mg] [SO ₄]	NEUTRALIZATION		
		Cumulative Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)		Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1	0	51	0.05		0.531	0.137	0.282	0.79	42		8.4
2	8	77	0.08	22.5	0.268	0.076	0.158	0.87	65	20.5	13.1
3	15	123	0.13	33.5	0.480	0.131	0.264	0.82	105	29.3	21.0
4	22	138	0.14	27.8	0.162	0.042	0.080	0.75	117	23.9	23.4
5	27	155	0.16	26.9	0.170	0.044	0.083	0.74	130	22.7	25.9
6	34	193	0.20	29.2	0.397	0.102	0.188	0.73	159	24.0	31.7
7	41	213	0.22	28.8	0.205	0.053	0.094	0.72	173	22.9	34.7
8	48	233	0.24	23.3	0.209	0.054	0.093	0.70	188	17.6	37.6
9	55	251	0.26	23.9	0.193	0.050	0.082	0.68	201	17.9	40.2
10	63	269	0.27	22.2	0.185	0.045	0.075	0.65	213	16.3	42.6
11	70	287	0.29	18.4	0.193	0.045	0.075	0.62	225	13.0	45.0
12	76	304	0.31	18.3	0.173	0.038	0.064	0.59	236	12.4	47.1
13	84	324	0.33	17.7	0.203	0.042	0.072	0.56	247	11.5	49.4
14	90	341	0.35	17.9	0.179	0.035	0.060	0.53	256	11.1	51.3
15	97	362	0.37	19.2	0.223	0.041	0.072	0.51	268	11.2	53.5
16	104	364	0.37	15.8	0.024	0.004	0.007	0.48	269	9.0	53.8
17	111	400	0.41	19.2	0.371	0.060	0.107	0.45	286	10.0	57.1
18	118	421	0.43	20.1	0.221	0.034	0.062	0.44	295	9.9	59.0
19	125	442	0.45	20.3	0.219	0.033	0.061	0.43	305	9.6	60.9
20	132	471	0.48	21.7	0.297	0.043	0.081	0.42	317	9.9	63.4
21	139	495	0.51	26.0	0.249	0.035	0.067	0.41	327	11.7	65.4
22	146	519	0.53	23.7	0.251	0.034	0.067	0.40	337	10.3	67.4
23	153	552	0.56	26.1	0.342	0.045	0.090	0.39	351	11.1	70.1
24	161	579	0.59	26.6	0.284	0.037	0.074	0.39	362	11.1	72.3
25	167	615	0.63	28.8	0.374	0.047	0.096	0.38	376	11.8	75.2
26	174	642	0.66	29.5	0.285	0.035	0.072	0.38	387	11.9	77.3
27	181	680	0.69	32.2	0.392	0.047	0.099	0.37	401	12.8	80.3
28	188	714	0.73	32.5	0.359	0.042	0.089	0.37	414	12.7	82.9
29	195	751	0.77	35.5	0.384	0.044	0.095	0.36	428	13.7	85.7
30	202	785	0.80	34.0	0.353	0.040	0.087	0.36	441	13.0	88.2
31	209	825	0.84	36.7	0.421	0.047	0.103	0.35	456	13.8	91.2
32	217	869	0.89	36.7	0.451	0.049	0.109	0.35	472	13.7	94.3
33	223	908	0.93	38.8	0.413	0.044	0.099	0.35	486	14.3	97.2

* Rates of sulfate production and NP depletion are 5-week moving averages

Appendix 4.8

Upper Mole Lake High-Sulfur Waste Rock Composite

Appendix 4.8 Table 1

Sample Characterization Upper Mole Lake High-Sulfur Waste Rock Composite

Metals Analysis		Waste Rock (ppm)
Aluminum	Al	66800
Antimony	Sb	20
Arsenic	As	46
Barium	Ba	330
Beryllium	Be	<1
Bismuth	Bi	<50
Cadmium	Cd	7
Calcium	Ca	3600
Carbon	C	1600
Chromium	Cr	9
Cobalt	Co	19
Copper	Cu	56
Gallium	Ga	15
Iron	Fe	65500
Lead	Pb	160
Lithium	Li	NA
Magnesium	Mg	26400
Manganese	Mn	480
Mercury	Hg	0.7
Molybdenum	Mo	<20
Nickel	Ni	<18
Phosphorus	P	NA
Potassium	K	18400
Selenium	Se	<3
Silicon	Si	286000
Silver	Ag	0.01
Sodium	Na	3000
Strontium	Sr	NA
Thallium	Tl	<10
Tin	Sn	<10
Titanium	Ti	650
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	180
Sulfur	S	44400

ABA Results	
Paste pH	7.9
S (Total) (%)	4.49
SO4 (%)	NA
S (Sulfide) (%)	3.78
AP (kg CaCO3/tonne)	118.1
NP (kg CaCO3/tonne)	6.8
CO2 (%)	NA
CO3 NP (kg CaCO3/tonne)	NA
Net NP (kg CaCO3/tonne)	-111.3
NP/AP	0.06

Note: NA = not analyzed

Sample Mass (kg)	78.18
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Appendix 4.8 Table 2

Parameters Measured Weekly
Upper Mole Lake High-Sulfur Waste Rock Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L)*	CUMULATIVE SULFATE (mg/kg)
24-Oct	1	0	6.475	6.8	1630	23		890	74
2-Nov	2	9	2.435	7.1	1480	11		821	99
9-Nov	3	16	4.934	5.4	1280	9		759	147
16-Nov	4	23	2.360	5.7	1260	<5		696	168
21-Nov	5	28	3.050	5.3	1260	<5		338	181
28-Nov	6	35	5.120	5.1	1020	<5		326	203
5-Dec	7	42	4.930	5.0	948	<5		314	222
12-Dec	8	49	6.000	4.9	711	<5		302	246
19-Dec	9	56	5.500	4.7	650		10	290	266
27-Dec	10	64	5.680	4.5	646		19	296	288
3-Jan	11	71	3.740	4.4	659		18	303	302
9-Jan	12	77	3.700	4.2	665		30	309	317
17-Jan	13	85	4.040	4.2	767		30	315	333
23-Jan	14	91	4.860	4.1	815		32	321	353
30-Jan	15	98	5.640	4.1	747		10	328	377
6-Feb	16	105	0.500	4.1	764		36	334	379
13-Feb	17	112	8.160	4.1	768		130	340	414
20-Feb	18	119	3.480	4.0	829		30	355	430
27-Feb	19	126	3.630	4.0	905		36	370	447
6-Mar	20	133	4.100	4.0	957		34	385	467
13-Mar	21	140	3.410	3.9	862		35	400	485
20-Mar	22	147	4.300	3.8	962		48	415	508
27-Mar	23	154	4.680	3.9	1000		62	430	533
4-Apr	24	162	4.680	3.9	878		41	445	560
10-Apr	25	168	5.030	3.9	945		47	460	590
17-Apr	26	175	4.700	3.9	819		40	475	618
24-Apr	27	182	4.860	3.9	835		60	490	649
1-May	28	189	3.400	3.8	872		61	505	671
8-May	29	196	4.380	3.7	1000		67	520	700
15-May	30	203	3.040	3.7	988		56	535	721
22-May	31	210	3.020	3.7	989		81	550	742
30-May	32	218	3.800	3.8	1040		78	565	769
5-Jun	33	224	3.360	3.8	1120		78	580	794
12-Jun	34	231	5.280	3.7	1070		88		
19-Jun	35	238	5.480	3.6	913		54		
26-Jun	36	245	4.160	3.6	840		62		
3-Jul	37	252	4.230	3.5	914				
10-Jul	38	259	5.400	3.4	926				
17-Jul	39	266	0.000						
24-Jul	40	273	9.350	3.1	1170				
31-Jul	41	280	4.040	2.9	1410				
7-Aug	42	287	5.440	2.9	1540				
14-Aug	43	294	5.820	2.9	1580				
21-Aug	44	301	5.380	2.9	1600				
30-Aug	45	310	5.380	2.9	1600				
6-Sep	46	317	5.010	3.0	1680		280		
11-Sep	47	322	4.480	2.9	1860		310		
18-Sep	48	329	4.190	2.4	1880		340		
25-Sep	49	336	4.640	2.8	2020		380		
3-Oct	50	344	4.400	2.8	2040		430		
9-Oct	51	350	3.830	2.8	2200		500		
16-Oct	52	357	4.590	2.8	2280				
23-Oct	53	364	3.800	2.8	2400				
30-Oct	54	371	3.870	2.7	2430				
6-Nov	55	378	4.500	2.7	2450				

* Measured values of sulfate shown in bold

Appendix 4.8 Table 3

Leachate Analysis
Upper Mole Lake High-Sulfur Waste Rock Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	5.8	0.010	0.043	110	0.140	0.16	8.0	130	3.2	27.3	0.026	56.0	0.49
2	9	6.0	0.012	0.037	120	0.083	0.15	7.9	120	3.0	27.1	0.022	34.0	0.36
3	16	4.7	0.009	0.032	115	0.081	0.13	6.7	106	2.95	23.3	0.022	24.5	0.38
4	23	3.3	0.005	0.027	110	0.079	0.10	5.5	92	2.9	19.5	0.022	15.0	0.40
5	28	0.6	< 0.005	0.032	100	0.110	0.12	0.9	84	2.8	18.4	0.019	11.0	0.79
6	35	0.7	0.014	0.031	88	0.097	0.19	0.9	71.3	2.53	15.8	0.017	8.7	0.78
7	42	0.9	0.024	0.030	76	0.085	0.27	1.0	58.5	2.25	13.3	0.015	6.5	0.76
8	49	1.0	0.033	0.029	63	0.072	0.34	1.0	45.8	1.98	10.7	0.012	4.2	0.75
9	56	1.2	< 0.005	0.028	51	0.059	0.41	1.0	33	1.7	8.1	0.010	1.9	0.73
10	64	1.3	0.005	0.027	52	0.064	0.45	1.0	33.4	1.84	7.8	0.023	1.8	0.80
11	71	1.4	0.005	0.027	53	0.068	0.50	1.0	33.8	1.98	7.5	0.035	1.7	0.87
12	77	1.5	0.005	0.026	54	0.073	0.54	1.0	34.1	2.11	7.2	0.048	1.6	0.94
13	85	1.7	0.005	0.026	55	0.077	0.59	1.0	34.5	2.25	7.0	0.060	1.5	1.02
14	91	1.8	0.005	0.025	56	0.082	0.63	1.0	34.9	2.39	6.7	0.073	1.4	1.09
15	98	1.9	0.005	0.024	57	0.086	0.67	1.0	35.3	2.53	6.4	0.085	1.3	1.16
16	105	2.0	0.005	0.024	58	0.091	0.72	1.0	35.6	2.66	6.1	0.098	1.2	1.23
17	112	2.1	< 0.005	0.023	59	0.095	0.76	1.0	36	2.8	5.8	0.110	1.1	1.30
18	119	2.4	0.005	0.023	62	0.103	0.81	1.2	37.9	3.08	5.7	0.104	1.1	1.51
19	126	2.7	0.005	0.023	65	0.111	0.85	1.4	39.9	3.36	5.6	0.099	1.1	1.73
20	133	3.1	0.005	0.024	69	0.118	0.90	1.6	41.8	3.64	5.5	0.093	1.1	1.94
21	140	3.4	0.005	0.024	72	0.126	0.95	1.8	43.8	3.93	5.4	0.087	1.1	2.15
22	147	3.7	0.005	0.024	75	0.134	0.99	2.0	45.7	4.21	5.3	0.081	1.1	2.36
23	154	4.0	0.005	0.024	78	0.142	1.04	2.2	47.6	4.49	5.2	0.076	1.1	2.58
24	162	4.3	0.005	0.024	81	0.150	1.08	2.4	49.6	4.77	5.1	0.070	1.1	2.79
25	168	4.7	0.005	0.025	85	0.158	1.13	2.6	51.5	5.05	5.0	0.064	1.1	3.00
26	175	5.0	0.005	0.025	88	0.165	1.18	2.7	53.4	5.33	4.9	0.058	1.1	3.21
27	182	5.3	0.005	0.025	91	0.173	1.22	2.9	55.4	5.61	4.8	0.053	1.1	3.43
28	189	5.6	0.005	0.025	94	0.181	1.27	3.1	57.3	5.89	4.7	0.047	1.1	3.64
29	196	5.9	0.005	0.025	97	0.189	1.32	3.3	59.3	6.18	4.6	0.041	1.1	3.85
30	203	6.2	0.005	0.025	100	0.197	1.36	3.5	61.2	6.46	4.5	0.035	1.1	4.06
31	210	6.6	0.005	0.026	104	0.204	1.41	3.7	63.1	6.74	4.4	0.030	1.1	4.28
32	218	6.9	0.005	0.026	107	0.212	1.45	3.9	65.1	7.02	4.3	0.024	1.1	4.49
33	224	7.2	< 0.005	0.026	110	0.220	1.50	4.1	67.0	7.30	4.20	0.018	1.1	4.70
34	231													
35	238													
36	245													
37	252													
38	259													
39	266													
40	273													
41	280													
42	287													

* Measured values shown in bold

Appendix 4.8 Table 4

**Cumulative Mass Flux
Upper Mole Lake High-Sulfur Waste Rock Composite**

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.48	0.001	0.004	9.1	0.01	0.013	0.66	10.8	0.27	2.3	0.002	4.6	0.04
2	9	0.67	0.001	0.005	12.8	0.01	0.02	0.91	14.5	0.36	3.1	0.003	5.7	0.05
3	16	0.96	0.002	0.007	20.1	0.02	0.03	1.33	21.2	0.54	4.6	0.004	7.2	0.08
4	23	1.06	0.002	0.008	23.4	0.02	0.03	1.50	24.0	0.63	5.2	0.005	7.7	0.09
5	28	1.08	0.002	0.009	27.3	0.03	0.03	1.53	27.2	0.74	5.9	0.006	8.1	0.12
6	35	1.13	0.003	0.011	33.1	0.03	0.05	1.59	31.9	0.91	6.9	0.007	8.7	0.17
7	42	1.19	0.005	0.013	37.8	0.04	0.06	1.65	35.6	1.05	7.8	0.008	9.1	0.22
8	49	1.27	0.007	0.015	42.7	0.04	0.09	1.73	39.1	1.20	8.6	0.009	9.4	0.27
9	56	1.35	0.007	0.017	46.3	0.05	0.12	1.80	41.4	1.32	9.1	0.009	9.6	0.33
10	64	1.45	0.008	0.019	50.1	0.05	0.15	1.87	43.9	1.45	9.7	0.011	9.7	0.38
11	71	1.52	0.008	0.020	52.6	0.06	0.17	1.92	45.5	1.55	10.1	0.013	9.8	0.43
12	77	1.59	0.008	0.021	55.1	0.06	0.20	1.97	47.1	1.65	10.4	0.015	9.8	0.47
13	85	1.67	0.008	0.023	58.0	0.06	0.23	2.02	48.9	1.76	10.8	0.018	9.9	0.52
14	91	1.78	0.009	0.024	61.5	0.07	0.27	2.08	51.0	1.91	11.2	0.022	10.0	0.59
15	98	1.92	0.009	0.026	65.6	0.07	0.32	2.15	53.6	2.09	11.6	0.029	10.1	0.67
16	105	1.93	0.009	0.026	66.0	0.07	0.32	2.16	53.8	2.11	11.7	0.029	10.1	0.68
17	112	2.15	0.010	0.029	72.1	0.08	0.40	2.26	57.6	2.40	12.3	0.041	10.2	0.82
18	119	2.26	0.010	0.030	74.9	0.09	0.44	2.32	59.3	2.54	12.5	0.045	10.3	0.88
19	126	2.38	0.010	0.031	77.9	0.09	0.48	2.38	61.1	2.70	12.8	0.050	10.3	0.96
20	133	2.55	0.010	0.032	81.5	0.10	0.52	2.46	63.3	2.89	13.1	0.055	10.4	1.07
21	140	2.69	0.011	0.033	84.6	0.11	0.57	2.54	65.2	3.06	13.3	0.059	10.4	1.16
22	147	2.90	0.011	0.034	88.8	0.11	0.62	2.65	67.7	3.29	13.6	0.063	10.5	1.29
23	154	3.14	0.011	0.036	93.4	0.12	0.68	2.78	70.6	3.56	13.9	0.068	10.6	1.44
24	162	3.40	0.012	0.037	98.3	0.13	0.75	2.92	73.5	3.84	14.2	0.072	10.6	1.61
25	168	3.69	0.012	0.039	103.7	0.14	0.82	3.08	76.9	4.17	14.6	0.076	10.7	1.80
26	175	3.99	0.012	0.040	109.0	0.15	0.89	3.25	80.1	4.49	14.9	0.079	10.8	2.00
27	182	4.32	0.012	0.042	114.7	0.16	0.97	3.43	83.5	4.84	15.2	0.083	10.8	2.21
28	189	4.57	0.013	0.043	118.8	0.17	1.02	3.57	86.0	5.10	15.4	0.085	10.9	2.37
29	196	4.90	0.013	0.044	124.2	0.18	1.10	3.75	89.3	5.44	15.6	0.087	10.9	2.58
30	203	5.14	0.013	0.045	128.1	0.19	1.15	3.89	91.7	5.69	15.8	0.088	11.0	2.74
31	210	5.39	0.013	0.046	132.1	0.20	1.20	4.03	94.1	5.95	16.0	0.089	11.0	2.91
32	218	5.73	0.014	0.048	137.3	0.21	1.27	4.22	97.3	6.29	16.2	0.091	11.1	3.13
33	224	6.04	0.014	0.049	142.0	0.22	1.34	4.40	100.2	6.61	16.3	0.091	11.1	3.33

Appendix 4.8 Table 5

**Cumulative Metal Extractions
Upper Mole Lake High-Sulfur Waste Rock Composite**

Test: **Leached under wet/dry alternating cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0	0.0007	0.0018	0.0011	0.3	0.06	0.02	0.001	0.04	0.06	0.012	0.07	0.15	0.02
2	9	0.0010	0.0026	0.001	0.4	0.07	0.03	0.001	0.05	0.07	0.017	0.09	0.19	0.03
3	16	0.001	0.000	0.002	0.6	0.10	0.05	0.002	0.08	0.11	0.025	0.14	0.24	0.04
4	23	0.002	0.000	0.002	0.7	0.11	0.05	0.002	0.09	0.13	0.028	0.16	0.26	0.05
5	28	0.002	0.000	0.003	0.8	0.14	0.06	0.002	0.10	0.15	0.032	0.19	0.27	0.07
6	35	0.002	0.000	0.003	0.9	0.17	0.08	0.002	0.12	0.19	0.038	0.22	0.29	0.09
7	42	0.002	0.000	0.004	1.1	0.20	0.11	0.003	0.13	0.22	0.042	0.25	0.30	0.12
8	49	0.002	0.000	0.005	1.2	0.23	0.16	0.003	0.15	0.25	0.047	0.29	0.31	0.15
9	56	0.002	0.000	0.005	1.3	0.25	0.21	0.003	0.16	0.27	0.050	0.31	0.32	0.18
10	64	0.002	0.000	0.006	1.4	0.27	0.27	0.003	0.17	0.30	0.053	0.36	0.32	0.21
11	71	0.002	0.000	0.006	1.5	0.29	0.31	0.003	0.17	0.32	0.055	0.42	0.33	0.24
12	77	0.002	0.000	0.006	1.5	0.31	0.36	0.003	0.18	0.34	0.057	0.49	0.33	0.26
13	85	0.003	0.000	0.007	1.6	0.33	0.41	0.003	0.19	0.37	0.059	0.60	0.33	0.29
14	91	0.003	0.000	0.007	1.7	0.36	0.48	0.003	0.19	0.40	0.061	0.75	0.33	0.33
15	98	0.003	0.000	0.008	1.8	0.39	0.57	0.003	0.20	0.44	0.063	0.95	0.34	0.37
16	105	0.003	0.000	0.008	1.8	0.39	0.58	0.003	0.20	0.44	0.064	0.97	0.34	0.38
17	112	0.003	0.000	0.009	2.0	0.44	0.72	0.003	0.22	0.50	0.067	1.36	0.34	0.45
18	119	0.003	0.000	0.009	2.1	0.47	0.78	0.004	0.22	0.53	0.068	1.51	0.34	0.49
19	126	0.004	0.000	0.009	2.2	0.50	0.85	0.004	0.23	0.56	0.070	1.66	0.34	0.54
20	133	0.004	0.000	0.010	2.3	0.53	0.94	0.004	0.24	0.60	0.071	1.83	0.35	0.59
21	140	0.004	0.000	0.010	2.4	0.56	1.01	0.004	0.25	0.64	0.072	1.95	0.35	0.64
22	147	0.004	0.000	0.010	2.5	0.60	1.11	0.004	0.26	0.69	0.074	2.10	0.35	0.72
23	154	0.005	0.000	0.011	2.6	0.64	1.22	0.004	0.27	0.74	0.076	2.25	0.35	0.80
24	162	0.005	0.000	0.011	2.7	0.69	1.33	0.004	0.28	0.80	0.077	2.39	0.35	0.90
25	168	0.006	0.000	0.012	2.9	0.74	1.46	0.005	0.29	0.87	0.079	2.53	0.36	1.00
26	175	0.006	0.000	0.012	3.0	0.79	1.59	0.005	0.30	0.94	0.081	2.64	0.36	1.11
27	182	0.006	0.000	0.013	3.2	0.85	1.73	0.005	0.32	1.01	0.082	2.75	0.36	1.23
28	189	0.007	0.000	0.013	3.3	0.89	1.82	0.005	0.33	1.06	0.083	2.82	0.36	1.32
29	196	0.007	0.000	0.013	3.5	0.95	1.96	0.006	0.34	1.13	0.085	2.90	0.36	1.44
30	203	0.008	0.000	0.014	3.6	0.99	2.05	0.006	0.35	1.19	0.086	2.94	0.37	1.52
31	210	0.008	0.000	0.014	3.7	1.03	2.15	0.006	0.36	1.24	0.087	2.98	0.37	1.62
32	218	0.009	0.000	0.014	3.8	1.08	2.27	0.006	0.37	1.31	0.088	3.02	0.37	1.74
33	224	0.009	0.000	0.015	3.9	1.13	2.39	0.007	0.38	1.38	0.089	3.05	0.37	1.85

Appendix 4.8 Table 6

**Metal Extraction Rates
Upper Mole Lake High-Sulfur Waste Rock Composite**

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average												
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1	0													
2	9	0.15	0.0003	0.001	2.91	0.002	0.00	0.19	2.91	0.073	0.66	0.0005	0.82	0.01
3	16	0.21	0.000	0.001	4.81	0.003	0.01	0.29	4.56	0.122	1.01	0.0009	1.14	0.02
4	23	0.18	0.000	0.001	4.36	0.003	0.00	0.25	4.02	0.112	0.88	0.0008	0.93	0.01
5	28	0.15	0.000	0.001	4.55	0.004	0.01	0.22	4.12	0.119	0.91	0.0009	0.87	0.02
6	35	0.13	0.000	0.001	4.79	0.004	0.01	0.19	4.23	0.128	0.93	0.0009	0.81	0.03
7	42	0.11	0.0007	0.002	5.30	0.005	0.01	0.16	4.48	0.146	0.99	0.0010	0.72	0.04
8	49	0.07	0.0011	0.002	4.79	0.005	0.01	0.08	3.80	0.139	0.85	0.0009	0.46	0.04
9	56	0.06	0.0012	0.002	4.85	0.005	0.02	0.06	3.70	0.146	0.84	0.0009	0.39	0.05
10	64	0.07	0.0011	0.002	4.42	0.005	0.02	0.07	3.23	0.138	0.74	0.0010	0.30	0.05
11	71	0.07	0.0010	0.002	3.79	0.004	0.02	0.06	2.64	0.125	0.61	0.0011	0.21	0.05
12	77	0.08	0.0007	0.002	3.46	0.004	0.03	0.06	2.30	0.120	0.53	0.0014	0.15	0.05
13	85	0.08	0.0003	0.002	2.97	0.004	0.03	0.06	1.90	0.110	0.43	0.0018	0.10	0.05
14	91	0.09	0.0003	0.001	3.04	0.004	0.03	0.06	1.92	0.119	0.41	0.0026	0.09	0.05
15	98	0.10	0.0003	0.001	3.20	0.005	0.03	0.06	2.00	0.132	0.40	0.0036	0.09	0.06
16	105	0.09	0.0002	0.001	2.75	0.004	0.03	0.05	1.72	0.116	0.33	0.0034	0.07	0.05
17	112	0.11	0.0003	0.001	3.39	0.005	0.04	0.06	2.10	0.151	0.38	0.0052	0.08	0.07
18	119	0.12	0.0003	0.001	3.48	0.005	0.04	0.06	2.14	0.160	0.36	0.0056	0.07	0.07
19	126	0.12	0.0003	0.001	3.29	0.005	0.04	0.06	2.01	0.157	0.32	0.0055	0.06	0.07
20	133	0.13	0.0003	0.001	3.19	0.005	0.04	0.06	1.94	0.159	0.29	0.0052	0.06	0.08
21	140	0.15	0.0003	0.001	3.74	0.006	0.05	0.08	2.28	0.190	0.33	0.0059	0.06	0.10
22	147	0.15	0.0002	0.001	3.33	0.006	0.04	0.08	2.03	0.177	0.27	0.0045	0.05	0.09
23	154	0.18	0.0003	0.001	3.71	0.007	0.05	0.09	2.26	0.204	0.28	0.0044	0.06	0.11
24	162	0.20	0.0003	0.001	3.96	0.007	0.05	0.10	2.42	0.223	0.28	0.0042	0.06	0.13
25	168	0.23	0.0003	0.001	4.45	0.008	0.06	0.12	2.71	0.256	0.29	0.0042	0.06	0.15
26	175	0.26	0.0003	0.001	4.87	0.009	0.06	0.14	2.97	0.286	0.30	0.0042	0.07	0.17
27	182	0.29	0.0003	0.002	5.18	0.010	0.07	0.16	3.16	0.310	0.31	0.0039	0.07	0.18
28	189	0.29	0.0003	0.001	5.06	0.010	0.07	0.16	3.09	0.307	0.28	0.0034	0.06	0.18
29	196	0.31	0.0003	0.001	5.33	0.010	0.07	0.17	3.25	0.329	0.28	0.0031	0.06	0.20
30	203	0.29	0.0003	0.001	4.87	0.009	0.07	0.16	2.97	0.305	0.25	0.0025	0.06	0.19
31	210	0.28	0.0002	0.001	4.62	0.009	0.06	0.16	2.81	0.292	0.22	0.0020	0.05	0.18
32	218	0.27	0.0002	0.001	4.40	0.009	0.06	0.15	2.68	0.283	0.20	0.0016	0.05	0.18
33	224	0.29	0.0002	0.001	4.66	0.009	0.06	0.17	2.84	0.302	0.20	0.0013	0.05	0.19

Appendix 4.8 Table 7

Oxidation and Neutralization Results
Upper Mole Lake High-Sulfur Waste Rock Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO [Ca + Mg] [SO ₄]	NEUTRALIZATION		
		Cumulative Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate* (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)		Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk)*	NP Consumed (%)
1	0	74	0.05		0.768	0.228	0.443	0.87	67		1.0
2	9	99	0.07	19.9	0.266	0.093	0.154	0.93	92	19.2	1.4
3	16	147	0.11	32.1	0.499	0.181	0.275	0.92	137	30.8	2.0
4	23	168	0.12	28.7	0.219	0.083	0.114	0.90	157	27.4	2.3
5	28	181	0.13	26.9	0.137	0.098	0.135	1.69	180	28.3	2.7
6	35	203	0.15	25.8	0.222	0.144	0.192	1.51	214	29.4	3.2
7	42	222	0.17	26.1	0.206	0.119	0.152	1.31	241	31.7	3.6
8	49	246	0.18	20.9	0.241	0.121	0.144	1.10	268	27.6	4.0
9	56	266	0.20	20.8	0.213	0.090	0.096	0.87	286	27.4	4.2
10	64	288	0.21	20.7	0.224	0.094	0.100	0.87	306	24.3	4.5
11	71	302	0.22	19.3	0.151	0.063	0.066	0.86	319	20.3	4.7
12	77	317	0.24	18.8	0.152	0.064	0.066	0.86	332	18.1	4.9
13	85	333	0.25	17.0	0.170	0.071	0.073	0.85	346	15.2	5.1
14	91	353	0.26	17.4	0.208	0.087	0.089	0.85	364	15.5	5.4
15	98	377	0.28	18.3	0.246	0.103	0.105	0.84	384	16.2	5.7
16	105	379	0.28	15.8	0.022	0.009	0.009	0.84	386	13.9	5.7
17	112	414	0.31	19.5	0.370	0.154	0.155	0.83	417	17.1	6.2
18	119	430	0.32	20.0	0.165	0.069	0.069	0.84	431	17.5	6.4
19	126	447	0.33	18.8	0.179	0.076	0.076	0.85	446	16.5	6.6
20	133	467	0.35	18.2	0.210	0.090	0.090	0.86	464	16.0	6.9
21	140	485	0.36	21.2	0.182	0.078	0.079	0.86	480	18.7	7.1
22	147	508	0.38	18.7	0.238	0.103	0.103	0.87	501	16.7	7.4
23	154	533	0.40	20.7	0.268	0.117	0.117	0.87	524	18.6	7.8
24	162	560	0.42	21.9	0.277	0.122	0.122	0.88	548	19.9	8.1
25	168	590	0.44	24.4	0.308	0.136	0.136	0.88	576	22.3	8.5
26	175	618	0.46	26.7	0.297	0.132	0.132	0.89	602	24.4	8.9
27	182	649	0.48	28.2	0.317	0.141	0.142	0.89	630	25.9	9.3
28	189	671	0.50	27.4	0.229	0.102	0.103	0.90	651	25.4	9.6
29	196	700	0.52	28.8	0.303	0.136	0.137	0.90	678	26.7	10.0
30	203	721	0.53	26.2	0.217	0.098	0.098	0.90	698	24.4	10.3
31	210	742	0.55	24.7	0.221	0.100	0.100	0.91	718	23.1	10.6
32	218	769	0.57	23.5	0.286	0.130	0.130	0.91	744	22.0	11.0
33	224	794	0.59	24.7	0.260	0.118	0.118	0.91	767	23.3	11.4

* Rates of sulfate production and NP depletion are 5-week moving averages

Appendix 4.9

Lower Mole Lake High-Sulfur Waste Rock Composite

Appendix 4.9 Table 1

Sample Characterization Lower Mole Lake High-Sulfur Waste Rock Composite

Metals Analysis		Waste Rock (ppm)
Aluminum	Al	63500
Antimony	Sb	60
Arsenic	As	190
Barium	Ba	260
Beryllium	Be	<1
Bismuth	Bi	<50
Cadmium	Cd	19
Calcium	Ca	6600
Carbon	C	3800
Chromium	Cr	9
Cobalt	Co	25
Copper	Cu	490
Gallium	Ga	12
Iron	Fe	78300
Lead	Pb	480
Lithium	Li	NA
Magnesium	Mg	19800
Manganese	Mn	640
Mercury	Hg	2.3
Molybdenum	Mo	<20
Nickel	Ni	<8
Phosphorus	P	NA
Potassium	K	21200
Selenium	Se	<3
Silicon	Si	280000
Silver	Ag	0.28
Sodium	Na	3500
Strontium	Sr	NA
Thallium	Tl	<10
Tin	Sn	60
Titanium	Ti	540
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	4200
Sulfur	S	44400

ABA Results	
Paste pH	5.8
S (Total) (%)	4.15
SO4 (%)	NA
S (Sulfide) (%)	3.53
AP (kg CaCO3/tonne)	110.3
NP (kg CaCO3/tonne)	21.0
CO2 (%)	NA
CO3 NP (kg CaCO3/tonne)	NA
Net NP (kg CaCO3/tonne)	-89.3
NP/AP	0.19

Note: NA = not analyzed

Sample Mass (kg)	74.32
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Appendix 4.9 Table 2

Parameters Measured Weekly
Lower Mole Lake High-Sulfur Waste Rock Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
24-Oct	1	0	5.100	3.9	2870		830	2100	144
1-Nov	2	8	7.180	3.7	4910		1100	1570	296
9-Nov	3	16	3.440	4.0	3070		430	1980	387
16-Nov	4	23	6.120	3.8	3110		280	2390	584
21-Nov	5	28	3.820	3.9	2520		80	1920	683
28-Nov	6	35	4.860	4.1	2220		93	1753	798
5-Dec	7	42	3.580	4.0	2360		82	1587	874
12-Dec	8	49	6.660	4.2	2060		60	1420	1001
20-Dec	9	57	4.600	4.2	1600		38	923	1058
27-Dec	10	64	3.000	4.2	1750		68	970	1098
3-Jan	11	71	4.560	4.0	2050		50	1017	1160
9-Jan	12	77	4.580	4.0	1910		54	1064	1226
17-Jan	13	85	3.740	3.9	1950		70	1112	1281
23-Jan	14	91	3.820	3.9	2070		78	1159	1341
30-Jan	15	98	4.140	3.9	2160		82	1206	1408
6-Feb	16	105	0.500	3.9	2240		78	1253	1417
13-Feb	17	112	8.590	3.9	2290		110	1300	1567
20-Feb	18	119	5.760	3.9	2240		92	1276	1666
27-Feb	19	126	4.890	3.9	1980		95	1251	1748
6-Mar	20	133	5.100	3.9	2000		86	1227	1832
13-Mar	21	140	5.040	3.7	1770			1203	1914
20-Mar	22	147	5.140	3.7	1850			1178	1995
27-Mar	23	154	4.380	3.8	1940			1154	2063
4-Apr	24	162	4.160	3.8	1820			1129	2127
10-Apr	25	168	4.150	3.7	2030			1105	2188
17-Apr	26	175	3.320	3.7	1830		120	1081	2236
24-Apr	27	182	5.050	3.7	1970		160	1056	2308
1-May	28	189	4.860	3.7	1960		140	1032	2376
8-May	29	196	5.460	3.6	1970		170	1008	2450
15-May	30	203	5.320	3.7	1740		130	983	2520
22-May	31	210	5.020	3.7	1630		150	959	2585
30-May	32	218	6.240	3.7	1590		140	934	2663
5-Jun	33	224	4.530	3.9	1610		130	910	2719
12-Jun	34	231	4.690	3.7	1590		140		
19-Jun	35	238	4.630	3.7	1500		120		
26-Jun	36	245	4.340	3.7	1520		140		
3-Jul	37	252	4.360	3.6	1740				
10-Jul	38	259	4.460	3.6	1630				
17-Jul	39	266	0.000						
24-Jul	40	273	5.620	3.5	1810				
31-Jul	41	280	3.600	3.4	1930				
7-Aug	42	287	4.180	3.3	1930				
14-Aug	43	294	3.590	3.4	1960				
21-Aug	44	301	3.780	3.3	2030				
30-Aug	45	310	4.800	3.2	2180				
6-Sep	46	317	3.900	3.2	2240		280		
11-Sep	47	322	4.040	3.0	2410		300		
18-Sep	48	329	4.350	2.6	2370		300		
25-Sep	49	336	4.500	2.9	2410		350		
3-Oct	50	344	4.490	2.9	2290		340		
9-Oct	51	350	4.870	2.9	2390		370		
16-Oct	52	357	4.640	3.0	2330				
23-Oct	53	364	4.920	2.9	2450				
30-Oct	54	371	4.880	2.9	2410				
6-Nov	55	378	4.790	2.8	2430				

* Measured values of sulfate shown in bold

Appendix 4.9 Table 3

Leachate Analysis
Lower Mole Lake High-Sulfur Waste Rock Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *																
		Aluminum Al	Antimony Sb	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1	0	26.0	< 0.050	0.033	0.020	0.047	180	3.30	120.0	190.0	210	22.0	0.0008	0.510	0.170	0.013	11.00	54.0
2	8	34.0	< 0.050	0.029	0.008	0.070	320	6.10	200.0	180.0	500	55.0	0.0009	0.930	0.360	0.120	17.00	84.0
3	16	21.1	0.060	0.033	0.007	0.051	320	4.35	124.0	109.0	395	42.50	0.0007	0.655	0.315	0.063	12.55	65.5
4	23	8.2	0.069	0.037	< 0.005	0.032	320	2.60	48.00	38.0	290	30.00	0.0005	0.380	0.270	0.006	8.10	37.0
5	28	4.1	0.062	0.025	0.008	0.027	260	1.50	24.00	16.0	190	19.00	0.0004	0.230	0.210	< 0.005	4.40	22.0
6	35	3.5	0.056	0.028	0.012	0.032	295	1.35	17.55	12.4	175	18.95	0.0009	0.180	0.245	0.005	5.55	21.0
7	42	2.8	0.053	0.031	0.012	0.029	278	1.11	12.93	9.1	148	16.48	0.0010	0.140	0.228	0.005	4.88	18.5
8	49	2.0	< 0.050	0.034	0.012	0.027	260	0.88	8.30	5.8	120	14.00	0.0011	0.100	0.210	< 0.005	4.20	16.0
9	57	1.1	< 0.050	0.009	0.008	0.018	190	0.57	5.50	2.9	80	9.10	0.0008	0.070	0.140	< 0.005	1.70	12.0
10	64	1.2		0.009	0.008	0.023	203	0.59	6.19	2.9	85	9.84	0.0007	0.073	0.150		1.70	14.4
11	71	1.2		0.009	0.008	0.028	215	0.61	6.88	2.9	90	10.58	0.0007	0.077	0.160		1.70	16.8
12	77	1.3		0.008	0.008	0.032	228	0.62	7.56	2.9	95	11.31	0.0006	0.080	0.170		1.70	19.1
13	85	1.4		0.008	0.008	0.037	240	0.64	8.25	2.9	100	12.05	0.0005	0.084	0.180		1.70	21.5
14	91	1.4		0.008	0.007	0.042	253	0.66	8.94	2.8	105	12.79	0.0004	0.087	0.190		1.70	23.9
15	98	1.5		0.008	0.007	0.047	265	0.68	9.63	2.8	110	13.53	0.0004	0.090	0.200		1.70	26.3
16	105	1.5		0.007	0.007	0.051	278	0.69	10.31	2.8	115	14.26	0.0003	0.094	0.210		1.70	28.6
17	112	1.6		0.007	0.007	0.056	290	0.71	11.00	2.8	120	15.00	< 0.0002	0.097	0.220		1.70	31.0
18	119	1.6		0.008	0.007	0.058	285	0.69	11.00	3.0	118	14.75	0.0002	0.094	0.214		1.65	31.8
19	126	1.6		0.008	0.007	0.060	280	0.67	11.00	3.1	116	14.50	0.0002	0.091	0.209		1.59	32.5
20	133	1.6		0.009	0.007	0.061	275	0.65	11.00	3.3	113	14.25	0.0002	0.088	0.203		1.54	33.3
21	140	1.7		0.009	0.007	0.063	270	0.63	11.00	3.5	111	14.00	0.0002	0.085	0.198		1.49	34.0
22	147	1.7		0.010	0.007	0.065	265	0.61	11.00	3.6	109	13.75	0.0002	0.082	0.192		1.43	34.8
23	154	1.7		0.010	0.007	0.067	260	0.59	11.00	3.8	107	13.50	0.0002	0.079	0.186		1.38	35.5
24	162	1.7		0.011	0.007	0.069	255	0.57	11.00	3.9	104	13.25	0.0002	0.076	0.181		1.32	36.3
25	168	1.7		0.012	0.008	0.071	250	0.55	11.00	4.1	102	13.00	0.0002	0.074	0.175		1.27	37.0
26	175	1.7		0.012	0.008	0.072	245	0.53	11.00	4.3	100	12.75	0.0002	0.071	0.169		1.22	37.8
27	182	1.7		0.013	0.008	0.074	240	0.51	11.00	4.4	98	12.50	0.0002	0.068	0.164		1.16	38.5
28	189	1.7		0.013	0.008	0.076	235	0.49	11.00	4.6	95	12.25	0.0002	0.065	0.158		1.11	39.3
29	196	1.8		0.014	0.008	0.078	230	0.47	11.00	4.8	93	12.00	0.0002	0.062	0.153		1.06	40.0
30	203	1.8		0.014	0.008	0.080	225	0.45	11.00	4.9	91	11.75	0.0002	0.059	0.147		1.00	40.8
31	210	1.8		0.015	0.008	0.081	220	0.43	11.00	5.1	89	11.50	0.0002	0.056	0.141		0.95	41.5
32	218	1.8		0.015	0.008	0.083	215	0.41	11.00	5.2	86	11.25	0.0002	0.053	0.136		0.89	42.3
33	224	1.8		0.016	0.008	0.085	210	0.39	11.00	5.4	84	11.00	< 0.0002	0.050	0.130		0.84	43.0
34	231																	
35	238																	
36	245																	
37	252																	
38	259																	
39	266																	
40	273																	
41	280																	
42	287																	

* Measured values shown in bold

Appendix 4.9 Table 4

Cumulative Mass Flux
Lower Mole Lake High-Sulfur Waste Rock Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																	
		Aluminum Al	Antimony Sb	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Selenium Se	Silver Ag	Sodium Na	Zinc Zn	
1	0	1.8	0.003	0.002	0.001	0.003	12	0.2	8.2	13.0	14.4	1.5	0.0001	0.035	0.01	0.001	0.8	3.7	
2	8	5.07	0.0083	0.005	0.002	0.010	43.3	0.82	27.56	30.43	62.7	6.82	0.0001	0.12	0.046	0.012	2.4	12.8	
3	16	6.05	0.0110	0.007	0.002	0.012	58.1	1.02	33.30	35.47	81.0	8.79	0.0002	0.16	0.061	0.015	3.0	15.8	
4	23	6.72	0.0167	0.010	0.003	0.015	84.4	1.23	37.25	38.60	104.9	11.26	0.0002	0.19	0.083	0.016	3.6	18.9	
5	28	6.93	0.0199	0.011	0.003	0.016	97.8	1.31	38.48	39.42	114.6	12.24	0.0002	0.20	0.094	0.016	3.9	20.0	
6	35	7.16	0.0235	0.013	0.004	0.018	117.1	1.40	39.63	40.23	126.1	13.48	0.0003	0.21	0.110	0.016	4.2	21.4	
7	42	7.29	0.0261	0.014	0.005	0.020	130.5	1.45	40.25	40.67	133.2	14.27	0.0003	0.22	0.121	0.017	4.5	22.3	
8	49	7.47	0.0306	0.017	0.006	0.022	153.8	1.53	41.00	41.19	143.9	15.52	0.0004	0.23	0.140	0.017	4.8	23.7	
9	57	7.54	0.0337	0.018	0.006	0.023	165.5	1.56	41.34	41.37	148.9	16.09	0.0005	0.23	0.149	0.017	5.0	24.4	
10	64	7.59		0.018	0.007	0.024	173.7	1.59	41.59	41.49	152.3	16.49	0.0005	0.23	0.155		5.0	25.0	
11	71	7.66		0.019	0.007	0.026	186.9	1.62	42.01	41.66	157.9	17.13	0.0006	0.24	0.164		5.1	26.0	
12	77	7.74		0.019	0.007	0.028	200.9	1.66	42.47	41.84	163.7	17.83	0.0006	0.24	0.175		5.2	27.2	
13	85	7.81		0.020	0.008	0.030	213.0	1.70	42.89	41.98	168.7	18.44	0.0006	0.25	0.184		5.3	28.3	
14	91	7.88		0.020	0.008	0.032	226.0	1.73	43.35	42.13	174.1	19.09	0.0006	0.25	0.194		5.4	29.5	
15	98	7.96		0.020	0.009	0.035	240.7	1.77	43.89	42.28	180.3	19.85	0.0007	0.26	0.205		5.5	31.0	
16	105	7.97		0.021	0.009	0.035	242.6	1.77	43.95	42.30	181.0	19.94	0.0007	0.26	0.206		5.5	31.2	
17	112	8.16		0.021	0.009	0.041	276.1	1.85	45.23	42.63	194.9	21.68	0.0007	0.27	0.232		5.7	34.8	
18	119	8.28		0.022	0.010	0.046	298.2	1.91	46.08	42.86	204.0	22.82	0.0007	0.28	0.248		5.8	37.2	
19	126	8.39		0.022	0.010	0.050	316.6	1.95	46.80	43.06	211.6	23.78	0.0007	0.28	0.262		5.9	39.4	
20	133	8.50		0.023	0.011	0.054	335.5	2.00	47.56	43.29	219.4	24.75	0.0007	0.29	0.276		6.0	41.7	
21	140	8.62		0.024	0.011	0.058	353.8	2.04	48.30	43.52	226.9	25.70	0.0007	0.29	0.289		6.1	44.0	
22	147	8.73		0.024	0.012	0.063	372.1	2.08	49.06	43.77	234.5	26.65	0.0008	0.30	0.303		6.2	46.4	
23	154	8.83		0.025	0.012	0.067	387.4	2.12	49.71	43.99	240.7	27.45	0.0008	0.30	0.314		6.3	48.5	
24	162	8.92		0.026	0.013	0.071	401.7	2.15	50.33	44.21	246.6	28.19	0.0008	0.31	0.324		6.4	50.5	
25	168	9.02		0.026	0.013	0.075	415.7	2.18	50.94	44.44	252.3	28.92	0.0008	0.31	0.333		6.5	52.5	
26	175	9.10		0.027	0.014	0.078	426.6	2.20	51.43	44.63	256.7	29.49	0.0008	0.32	0.341		6.5	54.2	
27	182	9.21		0.028	0.014	0.083	442.9	2.24	52.18	44.93	263.3	30.34	0.0008	0.32	0.352		6.6	56.9	
28	189	9.33		0.028	0.015	0.088	458.3	2.27	52.90	45.23	269.6	31.14	0.0008	0.32	0.363		6.7	59.4	
29	196	9.45		0.029	0.015	0.093	475.2	2.30	53.71	45.58	276.4	32.02	0.0008	0.33	0.374		6.8	62.4	
30	203	9.58		0.030	0.016	0.099	491.3	2.34	54.50	45.94	282.9	32.86	0.0009	0.33	0.384		6.8	65.3	
31	210	9.70		0.032	0.016	0.105	506.2	2.36	55.24	46.28	288.9	33.64	0.0009	0.34	0.394		6.9	68.1	
32	218	9.85		0.033	0.017	0.112	524.2	2.40	56.16	46.72	296.1	34.58	0.0009	0.34	0.405		7.0	71.6	
33	224	9.96		0.034	0.017	0.117	537.0	2.42	56.83	47.05	301.2	35.25	0.0009	0.34	0.413		7.0	74.2	

Appendix 4.9 Table 5

Cumulative Metal Extractions
Lower Mole Lake High-Sulfur Waste Rock Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																
		Aluminum Al	Antimony Sb	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1	0	0.003	0.006	0.0000	0.001	0.02	0.2	0.9	1.7	0.017	0.07	0.24	0.002	0.44	0.4	0.32	0.02	0.09
2	8	0.008	0.014	0.0000	0.001	0.05	0.7	3.3	5.6	0.039	0.32	1.07	0.006	1.56	1.5	4.44	0.07	0.30
3	16	0.010	0.018	0.0000	0.001	0.06	0.9	4.07	6.80	0.045	0.41	1.37	0.008	1.94	2.0	5.48	0.09	0.38
4	23	0.011	0.028	0.0000	0.001	0.08	1.3	4.9	7.6	0.049	0.53	1.76	0.010	2.33	2.8	5.66	0.10	0.45
5	28	0.011	0.033	0.0000	0.001	0.09	1.5	5.2	7.9	0.050	0.58	1.91	0.010	2.48	3.1	5.75	0.11	0.48
6	35	0.011	0.039	0.0000	0.002	0.10	1.8	5.59	8.09	0.051	0.64	2.11	0.013	2.63	3.7	5.86	0.12	0.51
7	42	0.011	0.043	0.0000	0.002	0.10	2.0	5.80	8.21	0.052	0.67	2.23	0.015	2.71	4.0	5.95	0.13	0.53
8	49	0.012	0.051	0.0000	0.002	0.12	2.3	6.1	8.4	0.053	0.73	2.43	0.019	2.82	4.7	6.11	0.14	0.56
9	57	0.012	0.056	0.0000	0.002	0.12	2.5	6.3	8.4	0.053	0.75	2.51	0.021	2.88	5.0	6.22	0.14	0.58
10	64	0.012		0.0000	0.003	0.13	2.6	6.35	8.49	0.053	0.77	2.58	0.023	2.91	5.2		0.14	0.60
11	71	0.012		0.0000	0.003	0.14	2.8	6.50	8.57	0.053	0.80	2.68	0.024	2.97	5.5		0.15	0.62
12	77	0.012		0.0000	0.003	0.15	3.0	6.65	8.67	0.053	0.83	2.79	0.026	3.03	5.8		0.15	0.65
13	85	0.012		0.0000	0.003	0.16	3.2	6.78	8.75	0.054	0.85	2.88	0.027	3.09	6.1		0.15	0.67
14	91	0.012		0.0000	0.003	0.17	3.4	6.92	8.85	0.054	0.88	2.98	0.028	3.14	6.5		0.15	0.70
15	98	0.013		0.0000	0.003	0.18	3.6	7.07	8.96	0.054	0.91	3.10	0.029	3.20	6.8		0.16	0.74
16	105	0.013		0.0000	0.003	0.18	3.7	7.09	8.97	0.054	0.91	3.12	0.029	3.21	6.9		0.16	0.74
17	112	0.013		0.0000	0.004	0.22	4.2	7.4	9.23	0.054	0.98	3.39	0.030	3.35	7.7		0.16	0.83
18	119	0.013		0.0000	0.004	0.24	4.5	7.63	9.40	0.055	1.03	3.57	0.031	3.44	8.3		0.17	0.89
19	126	0.013		0.0000	0.004	0.26	4.8	7.80	9.55	0.055	1.07	3.71	0.031	3.52	8.7		0.17	0.94
20	133	0.013		0.0000	0.004	0.28	5.1	7.98	9.71	0.055	1.11	3.87	0.032	3.59	9.2		0.17	0.99
21	140	0.014		0.0000	0.004	0.31	5.4	8.15	9.86	0.056	1.15	4.02	0.032	3.67	9.6		0.18	1.05
22	147	0.014		0.0000	0.005	0.33	5.6	8.32	10.01	0.056	1.18	4.16	0.033	3.74	10.1		0.18	1.10
23	154	0.014		0.0000	0.005	0.35	5.9	8.46	10.15	0.056	1.22	4.29	0.034	3.80	10.5		0.18	1.15
24	162	0.014		0.0000	0.005	0.37	6.1	8.59	10.27	0.056	1.25	4.40	0.034	3.85	10.8		0.18	1.20
25	168	0.014		0.0000	0.005	0.39	6.3	8.71	10.40	0.057	1.27	4.52	0.035	3.90	11.1		0.18	1.25
26	175	0.014		0.0000	0.005	0.41	6.5	8.81	10.50	0.057	1.30	4.61	0.035	3.94	11.4		0.19	1.29
27	182	0.015		0.0000	0.005	0.44	6.7	8.95	10.65	0.057	1.33	4.74	0.036	4.00	11.7		0.19	1.35
28	189	0.015		0.0000	0.006	0.46	6.9	9.07	10.80	0.058	1.36	4.87	0.036	4.05	12.1		0.19	1.41
29	196	0.015		0.0000	0.006	0.49	7.2	9.21	10.96	0.058	1.40	5.00	0.037	4.11	12.5		0.19	1.48
30	203	0.015		0.0000	0.006	0.52	7.4	9.34	11.12	0.059	1.43	5.13	0.037	4.16	12.8		0.19	1.55
31	210	0.015		0.0000	0.006	0.55	7.7	9.46	11.27	0.059	1.46	5.26	0.038	4.21	13.1		0.20	1.62
32	218	0.016		0.0001	0.007	0.59	7.9	9.59	11.46	0.060	1.50	5.40	0.039	4.26	13.5		0.20	1.71
33	224	0.016		0.0001	0.007	0.61	8.1	9.69	11.60	0.060	1.52	5.51	0.039	4.30	13.8		0.20	1.77

Appendix 4.9 Table 6

Metal Extraction Rates
Lower Mole Lake High-Sulfur Waste Rock Composite

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average																
		Aluminum Al	Antimony Sb	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Selenium Se	Silver Ag	Sulfur S	Zinc Zn
1	0																	
2	8	2.87	0.0001	0.0025	0.001	0.006	27.1	0.516	16.91	15.22	42.3	4.649	0.00008	0.079	0.030	0.010	1.44	7.95
3	16	1.86	0.0001	0.0019	0.000	0.004	20.0	0.346	10.96	9.82	29.1	3.185	0.00005	0.053	0.022	0.006	0.97	5.30
4	23	1.50	0.0001	0.0022	0.000	0.004	21.9	0.306	8.83	7.78	27.5	2.968	0.00005	0.046	0.022	0.005	0.88	4.61
5	28	1.29	0.0001	0.0022	0.000	0.003	21.4	0.270	7.56	6.60	25.1	2.682	0.00005	0.041	0.021	0.004	0.78	4.07
6	35	1.08	0.0001	0.0021	0.001	0.003	20.9	0.234	6.28	5.44	22.3	2.393	0.00005	0.035	0.020	0.003	0.70	3.53
7	42	0.46	0.0001	0.0019	0.001	0.002	17.9	0.131	2.61	2.11	14.5	1.533	0.00004	0.019	0.015	0.001	0.43	1.95
8	49	0.30	0.0001	0.0023	0.001	0.002	20.3	0.109	1.63	1.21	13.4	1.429	0.00006	0.015	0.017	0.000	0.40	1.67
9	57	0.17	0.0001	0.0017	0.001	0.002	16.7	0.069	0.84	0.57	9.1	0.994	0.00006	0.009	0.013	0.000	0.27	1.15
10	64	0.13		0.0014	0.001	0.002	14.8	0.054	0.60	0.40	7.3	0.826	0.00006	0.007	0.012		0.22	0.98
11	71	0.10		0.0012	0.001	0.001	13.6	0.044	0.46	0.28	6.2	0.711	0.00005	0.005	0.011		0.17	0.91
12	77	0.09		0.0010	0.001	0.002	14.1	0.043	0.44	0.23	6.1	0.712	0.00005	0.005	0.011		0.15	0.99
13	85	0.07		0.0005	0.000	0.001	11.5	0.032	0.37	0.15	4.8	0.566	0.00003	0.004	0.009		0.09	0.90
14	91	0.07		0.0004	0.000	0.002	12.4	0.034	0.41	0.16	5.2	0.619	0.00003	0.004	0.009		0.09	1.05
15	98	0.08		0.0005	0.000	0.002	13.8	0.037	0.47	0.16	5.8	0.692	0.00003	0.005	0.010		0.10	1.23
16	105	0.06		0.0004	0.000	0.002	11.5	0.030	0.40	0.13	4.8	0.579	0.00002	0.004	0.009		0.08	1.06
17	112	0.08		0.0004	0.000	0.003	15.0	0.038	0.55	0.16	6.2	0.769	0.00002	0.005	0.011		0.10	1.51
18	119	0.10		0.0005	0.000	0.003	17.5	0.044	0.66	0.18	7.3	0.902	0.00002	0.006	0.013		0.11	1.84
19	126	0.10		0.0005	0.000	0.004	18.1	0.044	0.69	0.19	7.5	0.936	0.00001	0.006	0.014		0.11	1.97
20	133	0.11		0.0005	0.000	0.004	19.0	0.046	0.73	0.20	7.8	0.981	0.00001	0.006	0.014		0.11	2.13
21	140	0.13		0.0006	0.001	0.005	22.2	0.053	0.87	0.24	9.2	1.152	0.00002	0.007	0.017		0.13	2.55
22	147	0.11		0.0006	0.001	0.004	19.2	0.045	0.77	0.23	7.9	0.995	0.00001	0.006	0.014		0.11	2.32
23	154	0.11		0.0006	0.000	0.004	17.9	0.042	0.73	0.23	7.3	0.926	0.00001	0.006	0.013		0.10	2.24
24	162	0.10		0.0006	0.000	0.004	16.5	0.038	0.69	0.22	6.8	0.859	0.00001	0.005	0.012		0.09	2.16
25	168	0.10		0.0006	0.000	0.004	16.0	0.036	0.68	0.23	6.6	0.833	0.00001	0.005	0.012		0.09	2.18
26	175	0.10		0.0006	0.000	0.004	14.6	0.033	0.63	0.22	6.0	0.757	0.00001	0.004	0.010		0.08	2.06
27	182	0.10		0.0007	0.000	0.004	14.2	0.031	0.62	0.23	5.8	0.736	0.00001	0.004	0.010		0.07	2.10
28	189	0.10		0.0007	0.000	0.004	14.2	0.031	0.64	0.25	5.8	0.738	0.00001	0.004	0.010		0.07	2.19
29	196	0.11		0.0008	0.000	0.005	15.1	0.032	0.70	0.28	6.1	0.788	0.00001	0.004	0.010		0.07	2.44
30	203	0.11		0.0009	0.000	0.005	15.1	0.031	0.71	0.30	6.1	0.789	0.00001	0.004	0.010		0.07	2.54
31	210	0.12		0.0010	0.001	0.005	15.9	0.032	0.76	0.33	6.4	0.830	0.00001	0.004	0.011		0.07	2.77
32	218	0.12		0.0010	0.001	0.006	15.8	0.032	0.77	0.35	6.4	0.825	0.00001	0.004	0.010		0.07	2.87
33	224	0.13		0.0011	0.001	0.006	15.7	0.031	0.79	0.36	6.3	0.823	0.00001	0.004	0.010		0.07	2.97

Appendix 4.9 Table 7

**Oxidation and Neutralization Rates
Lower Mole Lake High-Sulfur Waste Rock Composite**

Test: Leached under wet/dry alternating cycles
Water Sample: Bottom seepage

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO [Ca + Mg] [SO ₄]	NEUTRALIZATION		
		Cumulative Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate* (mg/kg/week)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)		Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/week)*	NP Consumed (%)
1	0	144	0.12		1.501	0.309	0.593	0.60	90		0.4
2	8	296	0.24	132.7	1.580	0.773	1.988	1.75	366	241.6	1.7
3	16	387	0.31	106.5	0.955	0.370	0.752	1.18	479	169.9	2.3
4	23	584	0.47	134.0	2.050	0.659	0.983	0.80	643	168.1	3.1
5	28	683	0.55	134.7	1.028	0.334	0.402	0.72	716	156.5	3.4
6	35	798	0.64	130.7	1.194	0.482	0.471	0.80	812	144.3	3.9
7	42	874	0.70	119.0	0.796	0.334	0.292	0.79	874	104.6	4.2
8	49	1001	0.80	130.2	1.326	0.582	0.443	0.77	977	105.7	4.7
9	57	1058	0.85	97.6	0.595	0.294	0.204	0.84	1027	79.0	4.9
10	64	1098	0.88	80.6	0.408	0.204	0.141	0.85	1061	67.0	5.1
11	71	1160	0.93	70.5	0.650	0.330	0.227	0.86	1117	59.3	5.3
12	77	1226	0.98	70.3	0.683	0.350	0.241	0.87	1176	60.3	5.6
13	85	1281	1.03	54.5	0.583	0.302	0.207	0.87	1227	48.6	5.8
14	91	1341	1.08	58.2	0.620	0.324	0.222	0.88	1281	52.5	6.1
15	98	1408	1.13	64.0	0.700	0.369	0.252	0.89	1344	58.2	6.4
16	105	1417	1.14	52.8	0.088	0.047	0.032	0.89	1351	48.3	6.4
17	112	1567	1.26	68.3	1.565	0.838	0.571	0.90	1492	63.3	7.1
18	119	1666	1.34	79.1	1.030	0.552	0.376	0.90	1585	73.8	7.5
19	126	1748	1.40	81.4	0.858	0.461	0.313	0.90	1662	76.2	7.9
20	133	1832	1.47	84.8	0.877	0.472	0.320	0.90	1742	79.6	8.3
21	140	1914	1.54	99.4	0.849	0.458	0.310	0.90	1818	93.4	8.7
22	147	1995	1.60	85.7	0.849	0.458	0.310	0.90	1895	80.6	9.0
23	154	2063	1.66	79.5	0.708	0.383	0.258	0.91	1959	74.8	9.3
24	162	2127	1.71	73.6	0.658	0.357	0.240	0.91	2019	69.3	9.6
25	168	2188	1.76	71.2	0.643	0.349	0.234	0.91	2077	67.1	9.9
26	175	2236	1.80	64.5	0.503	0.274	0.183	0.91	2123	60.9	10.1
27	182	2308	1.85	62.6	0.748	0.408	0.273	0.91	2191	59.2	10.4
28	189	2376	1.91	62.5	0.703	0.384	0.256	0.91	2255	59.2	10.7
29	196	2450	1.97	66.5	0.771	0.422	0.281	0.91	2325	63.1	11.1
30	203	2520	2.02	66.4	0.733	0.403	0.267	0.91	2392	63.0	11.4
31	210	2585	2.08	69.7	0.675	0.372	0.246	0.92	2454	66.2	11.7
32	218	2663	2.14	69.0	0.817	0.451	0.298	0.92	2529	65.7	12.0
33	224	2719	2.18	68.6	0.578	0.320	0.211	0.92	2582	65.4	12.3

* Rates of sulfate production and NP depletion are 5-week moving averages

Appendix 4.10

Fine Tailings - Leached Under Saturated Conditions, Followed by Wet/Dry Cycles

Appendix 4.10 Table 1

Sample Characterization Fine Tailings - Leached under saturated conditions followed by wet/dry cycles

Metals Analysis		Tails (ppm)	Process Water (mg/L)
Aluminum	Al	48800	1.40
Antimony	Sb	64	<0.1
Arsenic	As	2300	<0.1
Barium	Ba	60	0.0196
Beryllium	Be	<50	<0.0006
Bismuth	Bi	20	<0.1
Cadmium	Cd	40	<0.0002
Calcium	Ca	8600	299
Carbon	C	5800	NA
Chromium	Cr	210	0.056
Cobalt	Co	55	0.041
Copper	Cu	1400	0.063
Gallium	Ga	21	NA
Iron	Fe	177000	0.41
Lead	Pb	6300	0.270
Lithium	Li	NA	NA
Magnesium	Mg	20500	0.15
Manganese	Mn	670	0.0046
Mercury	Hg	1.0	NA
Molybdenum	Mo	<20	<0.04
Nickel	Ni	40	0.006
Phosphorus	P	NA	NA
Potassium	K	13100	10.3
Selenium	Se	30	0.287
Silicon	Si	180000	NA
Silver	Ag	29.4	0.003
Sodium	Na	2700	30
Strontium	Sr	NA	NA
Thallium	Tl	20	<0.003
Tin	Sn	28	<0.1
Titanium	Ti	1700	<0.003
Tungsten	W	NA	NA
Vanadium	V	NA	NA
Zinc	Zn	11200	0.445
Sulfate	SO4	500	1200*
Sulfur	S	176000	NA

ABA Results	
Paste pH	6.5
S (Total) (%)	30.7
SO4 (%)	500
S (sulfide) (%)	27.0
AP (kg CaCO3/tonne)	959
NP (kg CaCO3/tonne)	30
CO2 (%)	1.53
CO3 NP (kg CaCO3/tonne)	34.7
Net NP (kg CaCO3/tonne)	-929
NP/AP	0.03

Sample Mass (kg)	18.20
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* concentration estimated

Note: NA = Not Analyzed

Appendix 4.10 Table 2

**Parameters Measured Weekly
Fine Tailings**

Test: Leached under saturated conditions, followed by wet/dry cycle
Water Sample: Bottom seepage

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (µS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L)	CUMULATIVE SULFATE (mg/kg) **
14-Dec	1 *	56	4.500	6.9	1830	37		717	-119
18-Jan	2 *	91	4.500	7.5	1920	52		3640	781
21-Feb	3	125	5.200	7.3	2040	26		3443	1764
28-Feb	4	132	4.420	7.2	1480	20		3246	2553
7-Mar	5	139	3.360	7.5	1450	20		3049	3116
13-Mar	6	145	5.050	4.8	939	5		2853	3907
21-Mar	7	153	3.320	6.3	1340	<5		2656	4392
28-Mar	8	160	3.780	5.9	1350	<5		2459	4902
4-Apr	9	167	3.720	6.0	1240	<5		2262	5365
11-Apr	10	174	7.610	5.0	1350	<5		2065	6228
18-Apr	11	181	3.450	4.3	1090		27	1868	6582
25-Apr	12	188	3.380	4.1	1140		33	1671	6893
2-May	13	195	3.600	4.1	1220		27	1474	7184
10-May	14	203	3.900	4.0	1070		30	1278	7458
17-May	15	210	3.900	4.0	1070		22	1081	7689
23-May	16	216	3.600	4.0	1060		35	884	7864
31-May	17	224	3.780	4.0	1040		47	687	8007
6-Jun	18	230	3.840	4.0	1030		23	490	8110
12-Jun	19	236	5.100	5.7	814				
20-Jun	20	244	2.980	4.1	929		21		
27-Jun	21	251	4.240	4.0	879		20		
5-Jul	22	259	4.580	4.1	1100		28		
11-Jul	23	265	2.900	4.4	922		19		
17-Jul	24	271	0.000						
25-Jul	25	279	4.960	4.0	1080		12		
1-Aug	26	286	2.220	3.5	780		15		
8-Aug	27	293	3.590	3.7	1080		15		
15-Aug	28	300	4.140	3.9	1110		<10		
22-Aug	29	307	3.350	4.6	1060		<10		
31-Aug	30	316	4.280	5.7	938	<5			
6-Sep	31	322	4.360	6.9	952	8			
12-Sep	32	328	2.710	6.8	952	12			
19-Sep	33	335	4.540	6.8	923	12			
26-Sep	34	342	2.820	6.9	933	15			
3-Oct	35	349	4.820	6.8	793	35			
10-Oct	36	356	2.980	6.9	813	18			
17-Oct	37	363	2.980	6.9	747				
24-Oct	38	370	4.300	6.7	688				
31-Oct	39	377	3.100	6.8	717				
7-Nov	40	384	3.480	6.8	606				

* saturated conditions

** Measured values of sulfate shown in bold

Appendix 4.10 Table 3

Leachate Analysis
Fine Tailings

Test: Leached under saturated conditions, followed by wet/dry cycle
Water Sample: Bottom seepage

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) **															
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1 *	56	0.41	0.04	0.28	< 0.006	270	0.500	0.03	0.08	2.80	0.39	26.0	0.8	8.1	0.035	67.0	0.87
2 *	91	0.45	0.04	0.21	< 0.005	340	0.028	0.03	0.28	2.80	0.26	24.0	1.2	8.8	0.038	63.0	0.80
3	125	0.43	0.038	0.20	0.005	328	0.020	0.03	0.25	2.68	0.25	22.7	1.3	8.4	0.036	50.0	0.98
4	132	0.41	0.036	0.19	0.005	315	0.020	0.03	0.23	2.57	0.24	21.4	1.4	8.1	0.034	47.0	1.15
5	139	0.39	0.035	0.18	0.006	303	0.020	0.03	0.22	2.45	0.23	20.1	1.5	7.7	0.033	44.0	1.33
6	145	0.37	0.033	0.18	0.006	290	0.020	0.03	0.21	2.34	0.23	18.8	1.6	7.4	0.031	41.0	1.50
7	153	0.35	0.032	0.15	0.006	278	0.020	0.03	0.19	2.22	0.22	17.4	1.7	7.0	0.029	37.9	1.68
8	160	0.33	0.030	0.14	0.006	265	0.020	0.03	0.18	2.10	0.21	16.1	1.8	6.7	0.027	34.9	1.85
9	167	0.31	0.029	0.13	0.006	253	0.020	0.03	0.17	1.99	0.20	14.8	1.9	6.3	0.025	31.9	2.03
10	174	0.29	0.027	0.12	0.007	240	0.005	0.03	0.15	1.87	0.19	13.5	2.1	6.0	0.024	28.9	2.20
11	181	0.26	0.026	0.11	0.007	228	0.005	0.03	0.14	1.75	0.18	12.2	2.2	5.6	0.022	25.9	2.38
12	188	0.24	0.024	0.10	0.007	215	0.005	0.03	0.13	1.64	0.17	10.9	2.3	5.2	0.020	22.9	2.55
13	195	0.22	0.023	0.08	0.007	203	0.005	0.03	0.11	1.52	0.16	9.6	2.4	4.9	0.018	19.9	2.73
14	203	0.20	0.021	0.07	0.007	190	0.005	0.03	0.10	1.41	0.16	8.3	2.5	4.5	0.016	16.9	2.90
15	210	0.18	0.020	0.06	0.007	178	0.005	0.03	0.09	1.29	0.15	6.9	2.6	4.2	0.014	13.8	3.08
16	216	0.16	0.018	0.05	0.008	165	0.005	0.03	0.07	1.17	0.14	5.6	2.7	3.8	0.013	10.8	3.25
17	224	0.14	0.017	0.04	0.008	153	0.005	0.03	0.06	1.06	0.13	4.3	2.8	3.5	0.011	7.8	3.43
18	230	0.12	0.015	0.03	0.008	140	0.010	0.03	0.05	0.94	0.12	3.0	2.9	3.1	0.009	4.8	3.60
19	236																
20	244																
21	251																
22	259																
23	265																

* saturated conditions

Appendix 4.10 Table 4

**Cumulative Mass Flux
Fine Tailings**

Test: Leached under saturated conditions, followed by wet/dry cycle
 Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)															
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1 *	56	-0.24	-0.003	0.059	0.001	-7.2	0.110	0.00	0.004	0.59	0.030	6.4	0.194	-0.54	-0.062	6.7	0.11
2 *	91	-0.48	-0.018	0.11	0.003	3.0	0.102	-0.01	0.05	1.18	0.03	12.3	0.5	-0.91	-0.12	12.4	0.19
3	125	-0.357	-0.008	0.163	0.004	97	0.108	0.002	0.123	1.95	0.10	18.8	0.9	1.50	-0.114	26.6	0.5
4	132	-0.258	0.001	0.209	0.005	173	0.113	0.009	0.180	2.57	0.16	24.0	1.2	3.46	-0.105	38.1	0.8
5	139	-0.186	0.008	0.241	0.006	229	0.117	0.015	0.221	3.02	0.20	27.7	1.5	4.89	-0.099	46.2	1.0
6	145	-0.084	0.017	0.287	0.008	309	0.122	0.023	0.278	3.67	0.26	32.9	1.9	6.94	-0.091	57.5	1.4
7	153	-0.021	0.022	0.315	0.009	360	0.126	0.029	0.313	4.08	0.30	36.0	2.3	8.22	-0.085	64.5	1.7
8	160	0.047	0.029	0.344	0.010	415	0.130	0.035	0.350	4.51	0.35	39.4	2.6	9.60	-0.080	71.7	2.1
9	167	0.109	0.034	0.371	0.012	467	0.134	0.041	0.384	4.92	0.39	42.4	3.0	10.89	-0.075	78.2	2.5
10	174	0.229	0.046	0.421	0.014	567	0.136	0.053	0.448	5.70	0.47	48.1	3.9	13.38	-0.065	90.3	3.4
11	181	0.279	0.051	0.441	0.016	610	0.137	0.059	0.475	6.03	0.50	50.4	4.3	14.44	-0.061	95.2	3.9
12	188	0.324	0.055	0.459	0.017	650	0.138	0.064	0.498	6.34	0.53	52.4	4.7	15.41	-0.057	99.5	4.4
13	195	0.368	0.060	0.476	0.018	690	0.139	0.070	0.521	6.64	0.56	54.3	5.2	16.37	-0.053	103.4	4.9
14	203	0.411	0.064	0.491	0.020	731	0.140	0.076	0.542	6.94	0.60	56.1	5.7	17.34	-0.050	107.0	5.5
15	210	0.450	0.068	0.505	0.022	769	0.141	0.082	0.560	7.22	0.63	57.5	6.3	18.24	-0.047	110.0	6.2
16	216	0.482	0.072	0.515	0.023	801	0.142	0.088	0.575	7.45	0.66	58.7	6.8	18.99	-0.044	112.1	6.8
17	224	0.512	0.075	0.523	0.025	833	0.143	0.094	0.587	7.67	0.68	59.6	7.4	19.71	-0.042	113.7	7.5
18	230	0.537	0.078	0.529	0.026	863	0.145	0.100	0.597	7.87	0.71	60.2	8.0	20.36	-0.040	114.7	8.3
19	236																
20	244																
21	251																
22	259																
23	265																

* saturated conditions

Appendix 4.10 Table 5

Cumulative Metal Extractions
Fine Tailings

Test: Leached under saturated conditions, followed by wet/dry cycle
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)															
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1 *	56	-0.0005	0.000	0.0699	0.004	-0.1	0.052	-0.007	0.000	0.000	0.000	0.031	0.03	-0.004	-0.208	0.247	0.001
2 *	91	-0.0010	-0.001	0.178	0.007	0.0	0.049	-0.012	0.004	0.001	0.000	0.060	0.07	-0.007	-0.413	0.458	0.002
3	125	-0.001	0.000	0.272	0.010	1.1	0.051	0.004	0.009	0.001	0.002	0.092	0.13	0.011	-0.378	0.987	0.004
4	132	-0.001	0.000	0.348	0.014	2.0	0.054	0.017	0.013	0.001	0.003	0.117	0.18	0.026	-0.351	1.409	0.007
5	139	0.000	0.000	0.402	0.016	2.7	0.056	0.027	0.016	0.002	0.003	0.135	0.22	0.037	-0.331	1.710	0.009
6	145	0.000	0.001	0.478	0.020	3.6	0.058	0.042	0.020	0.002	0.004	0.160	0.29	0.053	-0.302	2.131	0.013
7	153	0.000	0.001	0.525	0.023	4.2	0.060	0.052	0.022	0.002	0.005	0.176	0.34	0.063	-0.285	2.387	0.015
8	160	0.000	0.001	0.574	0.026	4.8	0.062	0.063	0.025	0.003	0.005	0.192	0.39	0.073	-0.266	2.656	0.019
9	167	0.000	0.001	0.618	0.029	5.4	0.064	0.074	0.027	0.003	0.006	0.207	0.45	0.083	-0.249	2.897	0.022
10	174	0.000	0.002	0.701	0.036	6.6	0.065	0.097	0.032	0.003	0.007	0.234	0.58	0.102	-0.216	3.345	0.031
11	181	0.001	0.002	0.735	0.039	7.1	0.065	0.107	0.034	0.003	0.008	0.246	0.64	0.110	-0.202	3.527	0.035
12	188	0.001	0.002	0.765	0.042	7.6	0.066	0.117	0.036	0.004	0.008	0.256	0.70	0.118	-0.190	3.684	0.039
13	195	0.001	0.003	0.793	0.046	8.0	0.066	0.127	0.037	0.004	0.009	0.265	0.77	0.125	-0.178	3.830	0.044
14	203	0.001	0.003	0.819	0.050	8.5	0.067	0.139	0.039	0.004	0.009	0.273	0.85	0.132	-0.166	3.963	0.049
15	210	0.001	0.003	0.841	0.054	8.9	0.067	0.150	0.040	0.004	0.010	0.281	0.94	0.139	-0.156	4.073	0.055
16	216	0.001	0.003	0.858	0.058	9.3	0.068	0.160	0.041	0.004	0.010	0.286	1.02	0.145	-0.148	4.152	0.061
17	224	0.001	0.003	0.872	0.062	9.7	0.068	0.171	0.042	0.004	0.011	0.291	1.10	0.150	-0.140	4.212	0.067
18	230	0.001	0.003	0.881	0.066	10.0	0.069	0.182	0.043	0.004	0.011	0.294	1.19	0.155	-0.134	4.250	0.074
19	236																
20	244																
21	251																
22	259																
23	265																
24	271																
25	279																
26	286																
27	293																
28	300																
29	307																
30	316																
31	322																
32	328																
33	335																
34	342																
35	349																
36	356																
37	363																
38	370																

* saturated conditions

Appendix 4.10 Table 6

**Metal Extraction Rates
Fine Tailings**

Test: Leached under saturated conditions, followed by wet/dry cycle
 Water Sample: Bottom seepage

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average															
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1 *	56																
2 *	91	-0.047	-0.003	0.009	0.000	2.03	-0.0015	-0.001	0.010	0.12	0.000	1.18	0.06	-0.07	-0.012	1.14	0.02
3	125	-0.011	0.000	0.011	0.000	10.52	-0.0002	0.001	0.012	0.14	0.007	1.26	0.07	0.21	-0.005	2.03	0.04
4	132	-0.001	0.000	0.014	0.000	16.60	0.0003	0.001	0.016	0.18	0.012	1.62	0.09	0.37	-0.004	2.89	0.06
5	139	0.005	0.001	0.015	0.000	19.91	0.0006	0.002	0.018	0.21	0.014	1.79	0.11	0.46	-0.003	3.33	0.08
6	145	0.013	0.002	0.018	0.001	24.89	0.0010	0.002	0.022	0.24	0.018	2.08	0.14	0.59	-0.002	4.00	0.10
7	153	0.052	0.005	0.024	0.001	40.31	0.0026	0.004	0.029	0.33	0.031	2.68	0.20	1.03	0.004	5.88	0.17
8	160	0.081	0.007	0.036	0.001	63.69	0.0044	0.007	0.045	0.51	0.049	4.13	0.35	1.62	0.007	9.01	0.33
9	167	0.073	0.007	0.032	0.001	58.72	0.0042	0.006	0.041	0.47	0.046	3.69	0.37	1.49	0.006	8.04	0.35
10	174	0.083	0.008	0.036	0.002	67.62	0.0039	0.008	0.046	0.54	0.053	4.08	0.48	1.70	0.007	8.83	0.49
11	181	0.071	0.007	0.030	0.001	58.48	0.0029	0.007	0.038	0.46	0.046	3.41	0.46	1.46	0.006	7.33	0.48
12	188	0.069	0.007	0.029	0.002	58.01	0.0024	0.007	0.037	0.45	0.046	3.27	0.49	1.44	0.006	7.00	0.53
13	195	0.064	0.006	0.026	0.002	55.01	0.0018	0.007	0.034	0.43	0.044	2.98	0.51	1.36	0.005	6.34	0.56
14	203	0.059	0.006	0.023	0.002	51.37	0.0012	0.007	0.031	0.39	0.041	2.65	0.52	1.26	0.005	5.60	0.58
15	210	0.043	0.004	0.016	0.001	39.25	0.0010	0.006	0.022	0.29	0.032	1.84	0.46	0.95	0.003	3.82	0.53
16	216	0.041	0.004	0.015	0.001	38.27	0.0010	0.006	0.020	0.28	0.031	1.66	0.50	0.91	0.003	3.38	0.59
17	224	0.036	0.004	0.012	0.001	35.61	0.0010	0.006	0.017	0.26	0.029	1.39	0.52	0.84	0.003	2.77	0.62
18	230	0.034	0.004	0.011	0.002	34.52	0.0013	0.006	0.015	0.25	0.029	1.18	0.56	0.80	0.003	2.27	0.68
19	236																
20	244																
21	251																
22	259																
23	265																
24	271																
25	279																
26	286																
27	293																
28	300																
29	307																
30	316																
31	322																
32	328																
33	335																
34	342																
35	349																
36	356																
37	363																
38	370																

* saturated conditions

Appendix 4.10 Table 7

Oxidation and Neutralization Results
Fine Tailings

Test: Leached under saturated conditions, followed by wet/dry cycle
Water Sample: Bottom seepage

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO [Ca + Mg] [SO4]	NEUTRALIZATION		
		Cumulative Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)		Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1 **	56	-119	-0.01		-1.24	-0.18	0.26	-0.07	8		0.0
2 **	91	781	0.08	180.0	9.38	0.25	0.24	0.05	58	9.9	0.2
3	125	1764	0.19	191.1	10.25	2.34	0.27	0.25	319	31.5	1.1
4	132	2553	0.28	246.1	8.21	1.91	0.21	0.26	531	48.2	1.8
5	139	3116	0.34	272.8	5.86	1.40	0.15	0.26	686	57.2	2.3
6	145	3907	0.42	316.7	8.24	2.01	0.21	0.27	909	70.8	3.0
7	153	4392	0.48	407.7	5.05	1.27	0.13	0.28	1048	111.8	3.5
8	160	4902	0.53	627.6	5.32	1.38	0.14	0.28	1200	176.2	4.0
9	167	5365	0.58	562.4	4.82	1.29	0.12	0.29	1341	162.0	4.5
10	174	6228	0.68	622.5	8.99	2.51	0.23	0.30	1615	185.8	5.4
11	181	6582	0.71	520.1	3.69	1.08	0.10	0.32	1733	160.2	5.8
12	188	6893	0.75	500.2	3.23	1.00	0.08	0.33	1841	158.5	6.1
13	195	7184	0.78	456.4	3.04	1.00	0.08	0.36	1949	149.8	6.5
14	203	7458	0.81	407.0	2.85	1.02	0.07	0.38	2058	139.3	6.9
15	210	7689	0.83	284.2	2.41	0.95	0.06	0.42	2159	105.7	7.2
16	216	7864	0.85	256.4	1.82	0.82	0.05	0.47	2245	102.5	7.5
17	224	8007	0.87	216.7	1.49	0.79	0.04	0.56	2328	94.7	7.8
18	230	8110	0.88	185.2	1.08	0.74	0.03	0.71	2404	91.2	8.0
19	236										
20	244										
21	251										
22	259										
23	265										

* Rates of sulfate production and NP depletion are 5-week moving averages

** Saturated conditions

Appendix 4.11

Whole Tailings - Leached Under Saturated Conditions, Followed by Wet/Dry Cycles

Appendix 4.11 Table 1

Sample Characterization

Whole Tailings - Leached under saturated conditions followed by wet/dry cycles

Metals Analysis		Tails (ppm)	Process Water (mg/L)
Aluminum	Al	30600	1.40
Antimony	Sb	68	<0.1
Arsenic	As	2500	<0.1
Barium	Ba	54	0.0196
Beryllium	Be	<50	<0.0006
Bismuth	Bi	<20	<0.1
Cadmium	Cd	28	<0.0002
Calcium	Ca	6800	299
Carbon	C	5000	NA
Chromium	Cr	100	0.056
Cobalt	Co	69	0.041
Copper	Cu	860	0.063
Gallium	Ga	16	NA
Iron	Fe	232000	0.41
Lead	Pb	4300	0.270
Lithium	Li	NA	NA
Magnesium	Mg	14900	0.15
Manganese	Mn	580	0.0046
Mercury	Hg	1.6	NA
Molybdenum	Mo	<20	<0.04
Nickel	Ni	22	0.006
Phosphorus	P	NA	NA
Potassium	K	7600	10.3
Selenium	Se	35	0.287
Silicon	Si	160000	NA
Silver	Ag	22.2	0.003
Sodium	Na	1600	30
Strontium	Sr	NA	NA
Thallium	Tl	14	<0.003
Tin	Sn	24	<0.1
Titanium	Ti	1400	<0.003
Tungsten	W	NA	NA
Vanadium	V	NA	NA
Zinc	Zn	8100	0.445
Sulfate	SO ₄	1900	1200 *
Sulfur	S	249000	NA

ABA Results	
Paste pH	6.2
S (Total) (%)	29.7
SO ₄ (%)	1940
S (sulfide) (%)	27.8
AP (kg CaCO ₃ /tonne)	927
NP (kg CaCO ₃ /tonne)	27
CO ₂ (%)	1.39
CO ₃ NP (kg CaCO ₃ /tonne)	31.5
Net NP (kg CaCO ₃ /tonne)	-900
NP/AP	0.03

Sample Mass (kg)	22.70
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* concentration estimated

Note: NA = Not Analyzed

Appendix 4.11 Table 2

**Parameters Measured Weekly
Whole Tailings**

Test: **Leached under saturated conditions, followed by wet/dry cycle**
 Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
14-Dec	1 *	56	3.400	6.8	3120	86		1550	52
18-Jan	2 *	91	4.500	7.2	3070	79		1910	193
21-Feb	3	125	4.320	7.4	3310	40		1819	539
28-Feb	4	132	4.200	7.5	2490	62		1728	859
7-Mar	5	139	3.380	7.7	1820	59		1636	1103
13-Mar	6	145	4.700	7.4	1440	51		1545	1422
21-Mar	7	153	3.520	7.5	1280	50		1454	1648
28-Mar	8	160	3.520	7.4	1170	46		1363	1859
4-Apr	9	167	3.440	7.5	1280	48		1271	2052
11-Apr	10	174	7.380	7.1	1420	32		1180	2435
18-Apr	11	181	3.410	7.2	1040	38		1089	2599
25-Apr	12	188	3.470	7.3	1040	45		998	2751
2-May	13	195	3.540	7.4	1400	54		906	2893
10-May	14	203	3.580	7.4	1500	47		815	3021
17-May	15	210	3.810	7.4	1290	51		724	3143
23-May	16	216	3.580	7.4	1120	57		633	3243
31-May	17	224	3.620	7.4	1110	56		541	3329
6-Jun	18	230	3.800	7.5	974	53		450	3404
12-Jun	19	236	4.480	7.1	909	59			
20-Jun	20	244	3.800	7.5	905	46			
27-Jun	21	251	3.780	7.6	900	56			
5-Jul	22	259	3.660	7.7	888	50			
11-Jul	23	265	3.800	7.6	826	50			
17-Jul	24	271	0.000						
25-Jul	25	279	3.600	7.6	771	49			
1-Aug	26	286	2.940	7.2	876	52			
8-Aug	27	293	3.940	6.9	850	51			
15-Aug	28	300	3.920	7.3	858	50			
22-Aug	29	307	3.870	7.4	777	49			
31-Aug	30	316	3.760	7.4	800	50			
6-Sep	31	322	3.880	7.6	754	48			
12-Sep	32	328	3.810	7.6	698	44			
19-Sep	33	335	3.740	7.3	678	41			
26-Sep	34	342	3.760	7.2	639	40			
3-Oct	35	349	3.760	7.0	649	42			
10-Oct	36	356	3.750	7.2	636	43			
17-Oct	37	363	3.320	7.1	649				
24-Oct	38	370	3.340	6.9	565				
31-Oct	39	377	3.360	6.9	636				
7-Nov	40	384	3.520	6.9	556				

* saturated conditions

** Measured values of sulfate shown in bold

Appendix 4.11 Table 3

Leachate Analysis
Whole Tailings

Test: **Leached under saturated conditions, followed by wet/dry cycle**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L)**																
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1*	56	0.20	0.033	0.07	0.02	480	0.011	0.15	0.02	2.90	1.50	85.0	14.0	0.110	8.8	0.130	49.0	31.0
2*	91	0.63	0.140	0.05	0.44	550	0.020	0.72	2.90	26.00	4.10	430.0	63.0	0.450	44.0	0.880	220.0	32.0
3	125	0.59	0.132	0.05	0.41	525	0.020	0.88	2.72	24.38	3.85	405.5	58.3	0.423	41.4	0.808	206.5	30.2
4	132	0.58	0.124	0.05	0.39	500	0.020	0.83	2.54	22.76	3.59	381.0	55.5	0.396	38.8	0.756	193.1	28.5
5	139	0.52	0.115	0.05	0.36	475	0.020	0.59	2.36	21.14	3.34	356.5	51.8	0.369	36.1	0.704	179.6	26.7
6	145	0.48	0.107	0.04	0.33	450	0.020	0.54	2.18	19.52	3.09	332.0	48.1	0.343	33.5	0.652	166.2	25.0
7	153	0.44	0.099	0.04	0.31	425	0.020	0.50	2.00	17.90	2.84	307.5	44.3	0.316	30.9	0.600	152.7	23.2
8	160	0.41	0.091	0.04	0.28	400	0.020	0.45	1.81	16.27	2.58	283.0	40.6	0.289	28.3	0.548	139.3	21.4
9	167	0.37	0.083	0.04	0.25	375	0.020	0.41	1.63	14.65	2.33	258.5	36.8	0.262	25.6	0.496	125.8	19.7
10	174	0.33	0.075	0.04	0.23	350	< 0.005	0.37	1.45	13.03	2.08	234.0	33.1	0.235	23.0	0.445	112.4	17.9
11	181	0.29	0.066	0.03	0.20	325	0.005	0.32	1.27	11.41	1.82	209.5	29.4	0.208	20.4	0.393	98.9	16.1
12	188	0.26	0.058	0.03	0.17	300	0.005	0.28	1.09	9.79	1.57	185.0	25.6	0.181	17.8	0.341	85.4	14.4
13	195	0.22	0.050	0.03	0.14	275	0.005	0.23	0.91	8.17	1.32	160.5	21.9	0.154	15.1	0.289	72.0	12.6
14	203	0.18	0.042	0.03	0.12	250	0.005	0.19	0.73	6.55	1.06	136.0	18.2	0.128	12.5	0.237	58.5	10.9
15	210	0.14	0.034	0.03	0.09	225	0.005	0.14	0.55	4.93	0.81	111.5	14.4	0.101	9.9	0.185	45.1	9.1
16	216	0.11	0.025	0.02	0.06	200	0.005	0.10	0.37	3.31	0.56	87.0	10.7	0.074	7.3	0.133	31.6	7.3
17	224	0.07	0.017	0.02	0.04	175	0.005	0.06	0.19	1.69	0.31	62.5	6.9	0.047	4.6	0.081	18.2	5.6
18	230	< 0.03	0.009	0.02	0.01	150	< 0.005	0.01	0.01	0.07	0.05	38.0	3.2	< 0.020	2.0	0.029	4.70	3.8
19	236																	
20	244																	
21	251																	
22	259																	
23	265																	
24	271																	
25	279																	
26	286																	
27	293																	

* saturated conditions ** Measured values shown in bold

Appendix 4.11 Table 4

Cumulative Mass Flux
Whole Tailings

Test: Leached under saturated conditions, followed by wet/dry cycle
Water Sample Bottom seepage

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn	
1 *	56	-0.18	-0.003	0.008	0.003	27.1	-0.007	0.02	-0.007	0.37	0.184	14.2	2.096	0.02	-0.10	-0.024	2.8	4.58	
2 *	91	-0.33	0.005	0.01	0.091	76.9	-0.014	0.15	0.56	5.45	0.94	99.4	14.6	0.10	6.58	0.09	40.5	10.83	
3	125	-0.22	0.030	0.02	0.169	177	-0.010	0.28	1.07	10.09	1.68	176.6	25.9	0.18	14.45	0.24	79.8	16.6	
4	132	-0.12	0.053	0.03	0.241	269	-0.006	0.40	1.54	14.30	2.34	247.1	36.1	0.26	21.62	0.38	115.5	21.9	
5	139	-0.04	0.071	0.04	0.294	340	-0.003	0.48	1.89	17.44	2.84	300.2	43.8	0.31	27.00	0.49	142.3	25.8	
6	145	0.06	0.093	0.05	0.363	433	0.001	0.60	2.34	21.48	3.48	368.9	53.8	0.38	33.93	0.62	176.7	31.0	
7	153	0.13	0.108	0.06	0.410	499	0.004	0.67	2.65	24.26	3.92	416.6	60.7	0.43	38.72	0.72	200.4	34.6	
8	160	0.19	0.122	0.06	0.454	561	0.007	0.74	2.93	26.78	4.32	460.5	67.0	0.48	43.10	0.80	222.0	37.9	
9	167	0.25	0.135	0.07	0.492	618	0.010	0.81	3.18	29.00	4.67	499.6	72.5	0.52	46.99	0.88	241.0	40.9	
10	174	0.35	0.159	0.08	0.565	732	0.012	0.93	3.65	33.24	5.35	575.7	83.3	0.59	54.46	1.02	277.6	46.7	
11	181	0.40	0.169	0.08	0.595	781	0.012	0.97	3.85	34.96	5.62	607.2	87.7	0.62	57.52	1.08	292.4	49.1	
12	188	0.44	0.178	0.09	0.621	826	0.013	1.02	4.01	36.45	5.86	635.5	91.6	0.65	60.24	1.13	305.5	51.3	
13	195	0.47	0.186	0.09	0.643	869	0.014	1.05	4.15	37.73	6.07	660.5	95.0	0.68	62.60	1.18	316.7	53.3	
14	203	0.50	0.192	0.10	0.662	909	0.015	1.08	4.27	38.76	6.23	681.9	97.9	0.70	64.57	1.21	325.9	55.0	
15	210	0.52	0.198	0.10	0.677	946	0.016	1.11	4.36	39.59	6.37	700.7	100.3	0.71	66.23	1.25	333.5	56.5	
16	216	0.54	0.202	0.11	0.687	978	0.016	1.12	4.42	40.11	6.46	714.4	102.0	0.72	67.37	1.27	338.5	57.7	
17	224	0.55	0.205	0.11	0.693	1006	0.017	1.13	4.45	40.38	6.51	724.4	103.1	0.73	68.11	1.28	341.4	58.6	
18	230	0.56	0.206	0.11	0.695	1031	0.018	1.13	4.45	40.39	6.52	730.7	103.7	0.74	68.44	1.28	342.2	59.2	
19	236																		
20	244																		
21	251																		
22	259																		
23	265																		
24	271																		
25	279																		
26	286																		
27	293																		

* saturated conditions

Appendix 4.11 Table 5

Cumulative Metals Extraction
Whole Tailings

Test: Leached under saturated conditions, followed by wet/dry cycle
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1 *	56	-0.0006	0.000	0.015	0.012	0.4	-0.007	0.024	-0.0008	0.000	0.004	0.095	0.36	0.07	-0.001	-0.067	0.18	0.057
2 *	91	-0.0011	0.000	0.027	0.324	1.1	-0.014	0.219	0.065	0.002	0.022	0.667	2.51	0.47	0.087	0.257	2.53	0.134
3	125	-0.001	0.001	0.045	0.604	2.6	-0.010	0.405	0.125	0.004	0.039	1.185	4.46	0.84	0.190	0.697	4.99	0.205
4	132	0.000	0.002	0.061	0.860	4.0	-0.006	0.574	0.179	0.006	0.054	1.658	6.23	1.17	0.284	1.096	7.22	0.270
5	139	0.000	0.003	0.074	1.051	5.0	-0.003	0.701	0.220	0.008	0.066	2.015	7.56	1.42	0.355	1.396	8.89	0.319
6	145	0.000	0.004	0.091	1.297	6.4	0.001	0.864	0.273	0.009	0.081	2.476	9.28	1.74	0.447	1.782	11.04	0.383
7	153	0.000	0.004	0.103	1.466	7.3	0.004	0.976	0.309	0.010	0.091	2.796	10.46	1.96	0.510	2.048	12.52	0.427
8	160	0.001	0.005	0.114	1.620	8.3	0.007	1.078	0.341	0.012	0.100	3.090	11.54	2.17	0.567	2.291	13.87	0.468
9	167	0.001	0.005	0.125	1.757	9.1	0.010	1.168	0.370	0.013	0.109	3.353	12.51	2.35	0.618	2.506	15.06	0.505
10	174	0.001	0.006	0.146	2.018	10.8	0.012	1.341	0.425	0.014	0.124	3.864	14.36	2.70	0.717	2.919	17.35	0.577
11	181	0.001	0.007	0.156	2.124	11.5	0.012	1.411	0.447	0.015	0.131	4.075	15.12	2.84	0.757	3.087	18.28	0.607
12	188	0.001	0.007	0.165	2.218	12.2	0.013	1.472	0.467	0.016	0.136	4.265	15.80	2.96	0.793	3.236	19.09	0.634
13	195	0.002	0.007	0.174	2.298	12.8	0.014	1.525	0.483	0.016	0.141	4.433	16.39	3.07	0.824	3.365	19.79	0.658
14	203	0.002	0.008	0.182	2.364	13.4	0.015	1.568	0.496	0.017	0.145	4.577	16.88	3.17	0.850	3.471	20.37	0.679
15	210	0.002	0.008	0.190	2.419	13.9	0.016	1.604	0.507	0.017	0.148	4.702	17.30	3.24	0.871	3.560	20.84	0.698
16	216	0.002	0.008	0.197	2.454	14.4	0.016	1.627	0.514	0.017	0.150	4.795	17.59	3.29	0.886	3.620	21.16	0.712
17	224	0.002	0.008	0.203	2.475	14.8	0.017	1.640	0.517	0.017	0.151	4.861	17.78	3.33	0.896	3.657	21.34	0.723
18	230	0.002	0.008	0.210	2.481	15.2	0.018	1.642	0.517	0.017	0.152	4.904	17.87	3.34	0.901	3.670	21.39	0.731
19	236																	
20	244																	
21	251																	
22	259																	
23	265																	
24	271																	
25	279																	
26	286																	
27	293																	

* saturated conditions

Appendix 4.11 Table 6

Metal Extraction Rates
Whole Tailings

Test: Leached under saturated conditions, followed by wet/dry cycle
Water Sample: Bottom seepage

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/hk) - 5 Cycle Moving Average																
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1 *	56																	
2 *	91	-0.031	0.002	0.001	0.017	9.95	-0.0014	0.027	0.112	1.01	0.152	17.04	2.50	0.018	1.34	0.023	7.53	1.2511
3	125	-0.004	0.003	0.002	0.017	15.18	-0.0003	0.027	0.110	0.99	0.151	16.47	2.41	0.017	1.48	0.027	7.81	1.22
4	132	0.006	0.005	0.002	0.022	22.31	0.0000	0.035	0.143	1.28	0.199	21.45	3.14	0.022	2.00	0.038	10.38	1.59
5	139	0.012	0.006	0.003	0.025	26.39	0.0003	0.039	0.160	1.44	0.224	24.12	3.52	0.025	2.29	0.043	11.76	1.79
6	145	0.019	0.007	0.003	0.028	31.94	0.0006	0.046	0.185	1.66	0.259	27.90	4.07	0.029	2.68	0.051	13.67	2.08
7	153	0.052	0.012	0.005	0.036	47.67	0.0020	0.059	0.237	2.12	0.336	35.81	5.20	0.037	3.63	0.071	18.05	2.68
8	160	0.082	0.018	0.008	0.057	76.87	0.0034	0.093	0.372	3.34	0.528	56.78	8.22	0.059	5.73	0.112	28.43	4.27
9	167	0.073	0.016	0.007	0.050	69.73	0.0033	0.082	0.328	2.94	0.466	50.51	7.28	0.052	5.07	0.099	25.10	3.81
10	174	0.079	0.018	0.008	0.054	78.34	0.0030	0.088	0.352	3.16	0.502	55.11	7.89	0.056	5.49	0.107	27.05	4.18
11	181	0.066	0.015	0.007	0.045	67.54	0.0023	0.073	0.292	2.62	0.417	46.33	6.60	0.047	4.59	0.089	22.50	3.53
12	188	0.062	0.014	0.007	0.042	65.46	0.0019	0.068	0.272	2.44	0.389	43.78	6.19	0.044	4.30	0.083	21.02	3.35
13	195	0.056	0.013	0.006	0.038	61.64	0.0014	0.062	0.244	2.19	0.350	40.01	5.62	0.040	3.90	0.075	18.95	3.08
14	203	0.049	0.011	0.006	0.033	56.54	0.0009	0.054	0.211	1.90	0.304	35.45	4.93	0.035	3.42	0.066	16.51	2.75
15	210	0.033	0.008	0.005	0.022	41.76	0.0008	0.035	0.137	1.23	0.199	24.29	3.31	0.023	2.29	0.044	10.88	1.91
16	216	0.028	0.007	0.004	0.018	39.50	0.0008	0.030	0.115	1.03	0.168	21.44	2.86	0.020	1.97	0.037	9.21	1.71
17	224	0.022	0.005	0.004	0.014	34.91	0.0008	0.022	0.085	0.76	0.126	17.28	2.23	0.016	1.53	0.029	6.98	1.41
18	230	0.017	0.004	0.004	0.010	32.35	0.0008	0.016	0.059	0.53	0.090	14.04	1.72	0.012	1.17	0.021	5.09	1.18
19	236																	
20	244																	
21	251																	
22	259																	
23	265																	
24	271																	
25	279																	
26	286																	
27	293																	

* saturated conditions

Appendix 4.11 Table 7

Oxidation and Neutralization Results
Whole Tailings

Test: Leached under saturated conditions, followed by wet/dry cycle
Water Sample: Bottom seepage

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO [Ca + Mg] [SO ₄]	NEUTRALIZATION		
		Cumulative Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/awk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)		Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/awk) *	NP Consumed (%)
1 **	56	52	0.01		0.55	0.68	0.58	2.31	126		0.5
2 **	91	193	0.02	28.1	1.47	1.24	3.51	3.24	601	95.0	2.2
3	125	539	0.06	49.4	3.61	2.50	3.18	1.57	1169	105.8	4.3
4	132	859	0.10	74.3	3.33	2.31	2.90	1.57	1690	144.0	6.3
5	139	1103	0.12	88.6	2.54	1.77	2.18	1.56	2085	165.2	7.7
6	145	1422	0.16	107.8	3.33	2.33	2.83	1.55	2601	194.7	9.6
7	153	1648	0.18	164.2	2.35	1.65	1.96	1.54	2962	266.5	11.0
8	160	1859	0.21	264.0	2.20	1.55	1.81	1.53	3298	425.8	12.2
9	167	2052	0.23	238.6	2.01	1.42	1.61	1.51	3601	382.2	13.3
10	174	2435	0.27	266.6	4.00	2.84	3.13	1.50	4199	422.7	15.6
11	181	2599	0.29	228.8	1.70	1.22	1.30	1.48	4450	359.5	16.5
12	188	2751	0.31	220.7	1.59	1.15	1.16	1.45	4681	343.8	17.3
13	195	2893	0.32	206.7	1.47	1.07	1.03	1.43	4891	318.7	18.1
14	203	3021	0.34	188.5	1.34	0.99	0.88	1.40	5078	287.2	18.8
15	210	3143	0.35	137.5	1.27	0.94	0.77	1.35	5250	204.4	19.4
16	216	3243	0.36	128.7	1.04	0.79	0.56	1.30	5385	187.0	19.9
17	224	3329	0.37	112.3	0.90	0.70	0.41	1.23	5496	158.4	20.4
18	230	3404	0.38	102.3	0.78	0.63	0.26	1.13	5585	138.7	20.7
19	236										
20	244										
21	251										
22	259										
23	265										
24	271										
25	279										
26	286										
27	293										

* Rates of sulfate production and NP depletion are 5-week moving averages

** Saturated conditions

Appendix 4.12

Whole Tailings - Leached Under Alternating Wet/Dry Cycles

Appendix 4.12 Table 1

Sample Characterization

Whole Tailings - Leached under alternating wet/dry cycles

Metals Analysis		(ppm)
Aluminum	Al	30600
Antimony	Sb	68
Arsenic	As	2500
Barium	Ba	54
Beryllium	Be	<50
Bismuth	Bi	<20
Cadmium	Cd	28
Calcium	Ca	6800
Carbon	C	5000
Chromium	Cr	100
Cobalt	Co	69
Copper	Cu	860
Gallium	Ga	16
Iron	Fe	232000
Lead	Pb	4300
Lithium	Li	NA
Magnesium	Mg	14900
Manganese	Mn	580
Mercury	Hg	1.6
Molybdenum	Mo	<20
Nickel	Ni	22
Phosphorus	P	NA
Potassium	K	7600
Selenium	Se	35
Silicon	Si	160000
Silver	Ag	22.2
Sodium	Na	1600
Strontium	Sr	NA
Thallium	Tl	14
Tin	Sn	24
Titanium	Ti	1400
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	8100

ABA Results	
Paste pH	6.2
S (Total) (%)	29.7
SO4 (%)	1940
S (sulfide) (%)	27.8
AP (kg CaCO3/tonne)	927
NP (kg CaCO3/tonne)	27
CO2 (%)	1.39
CO3 NP (kg CaCO3/tonne)	31.5
Net NP (kg CaCO3/tonne)	-900
NP/AP	0.03

Sample Mass (kg)	30.10
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Appendix 4.12 Table 2

**Parameters Measured Weekly
Whole Tailings**

Test: **Leached under alternating wet/dry cycles**
 Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (μ S/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) *	CUMULATIVE SULFATE (mg/kg)
25-Oct	1	0	2.120	7.6	1860	1000		747	53
2-Nov	2	8	4.510	6.5	1400	380		564	137
9-Nov	3	15	4.570	5.5	936	200		252	175
16-Nov	4	22	4.020	6.2	921	22		356	223
22-Nov	5	28	4.750	5.9	1160	30		438	292
29-Nov	6	35	5.220	6.0	1680	46		784	428
6-Dec	7	42	4.620	7.3	2310	75		1129	601
13-Dec	8	49	5.570	7.1	2510	82		1475	874
20-Dec	9	56	4.460	7.6	3150	51		1820	1144
27-Dec	10	63	4.720	7.6	2980	100		1715	1413
3-Jan	11	70	4.700	7.3	2600	92		1610	1664
10-Jan	12	77	4.330	6.8	2260	79		1505	1881
17-Jan	13	84	3.640	7.2	2230	71		1400	2050
24-Jan	14	91	2.960	7.2	2000	34		1235	2171
31-Jan	15	98	3.060	7.0	2070	26		1070	2280
8-Feb	16	106	3.400	6.7	1790	31		905	2382
15-Feb	17	113	5.120	7.0	1600	20		740	2508
21-Feb	18	119	3.780	7.1	1370	29		743	2601
28-Feb	19	126	3.460	6.5	1280	20		745	2687
7-Mar	20	133	3.240	6.4	1320	17		748	2768
14-Mar	21	140	3.520	6.5	1060	12		750	2855
21-Mar	22	147	3.540	6.3	1090	17		753	2944
28-Mar	23	154	3.500	6.3	1090	16		755	3032
4-Apr	24	161	3.600	6.4	1540	24		758	3122
11-Apr	25	168	3.430	6.6	1720	35		760	3209
18-Apr	26	175	3.120	6.4	1380	20		763	3288
25-Apr	27	182	3.200	6.2	1260	11		765	3369
2-May	28	189	3.290	6.2	1360	10		768	3453
10-May	29	197	3.200	6.2	1380	9		770	3535
17-May	30	204	3.640	6.4	1390	16		773	3628
23-May	31	210	3.480	6.6	1470	29		775	3718
31-May	32	218	3.420	6.2	1260	15		778	3806
6-Jun	33	224	3.960	7.0	1400	28		780	3909
12-Jun	34	230	3.850	6.2	1440	33			
20-Jun	35	238	4.060	6.8	1390	34			
27-Jun	36	245	4.020	7.0	1380	37			
5-Jul	37	253	3.820	7.1	1360	39			
11-Jul	38	259	3.800	7.0	1160	32			
17-Jul	39	265	0.000						
25-Jul	40	273	3.800	7.4	1220	28			
1-Aug	41	280	3.210	6.4	1390	8			
8-Aug	42	287	4.010	6.4	1420	20			
15-Aug	43	294	4.040	6.6	1350	27			
22-Aug	44	301	4.020	6.6	1200	25			
31-Aug	45	310	3.660	6.6	1160	25			
6-Sep	46	316	3.900	6.9	1060	21			
12-Sep	47	322	3.760	6.8	1080	21			
19-Sep	48	329	3.660	6.4	1080	17			
26-Sep	49	336	3.720	6.3	1010	21			
3-Oct	50	343	3.530	6.3	1010	19			
10-Oct	51	350	3.650	6.4	976	22			
17-Oct	52	357	3.500	6.5	946				
24-Oct	53	364	3.360	6.2	979				
31-Oct	54	371	3.380	5.9	1040				
7-Nov	55	378	3.340	6.0	979				

* Measured values of sulfate shown in bold

Appendix 4.12 Table 3

Leachate Analysis
Whole Tailings

Test: Leached under alternating wet/dry cycles
Water Sample: Bottom seepage

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L)*																		
		Aluminum Al	Arsimony Sb	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1	0	0.39	< 0.050	0.061	0.042	0.059	300	0.059	0.120	2.2	0.60	66.0	4.5	0.0005	0.044	7.00	0.061	< 0.005	11.00	22.0
2	8	0.40	0.064	0.052	0.030	0.044	220	0.035	0.150	2.10	0.43	51.0	3.5	0.0002	0.037	< 4.80	0.042	< 0.005	6.90	17.0
3	15	1.50	0.057	0.206	0.023	0.031	170	0.031	0.255	13.05	1.12	44.0	3.1	0.0003	0.030	4.80	0.039	0.009	5.30	15.0
4	22	2.60	< 0.050	0.360	0.016	0.017	120	0.027	0.360	24.00	1.80	37.0	2.7	0.0003	0.023	< 4.80	0.035	0.013	3.70	13.0
5	28	1.40	0.051	0.200	0.017	0.024	130	0.022	0.200	13.00	0.96	46.0	3.0	0.0002	0.034	< 4.80	0.043	< 0.005	4.00	11.0
6	35	1.07	0.052	0.152	0.020	0.022	230	0.024	0.162	10.08	0.77	62.0	5.0	0.0003	0.056	5.23	0.054	0.006	4.90	16.8
7	42	0.74	0.053	0.105	0.023	0.021	330	0.026	0.124	7.15	0.57	78.0	7.0	0.0003	0.077	5.65	0.064	0.006	5.80	22.5
8	49	0.40	0.053	0.057	0.025	0.019	430	0.028	0.085	4.23	0.38	94.0	9.0	0.0004	0.099	6.08	0.075	0.007	6.70	28.3
9	56	0.07	0.054	0.009	0.028	0.017	530	0.030	0.047	1.30	0.18	110.0	11.0	0.0004	0.120	6.50	0.085	0.007	7.60	34.0
10	63	0.06	0.053	0.013	0.028	0.019	518	0.030	0.055	1.10	0.20	95.5	10.3	0.0004	0.114	5.90	0.072	0.008	6.20	34.0
11	70	0.04	0.052	0.016	0.028	0.022	505	0.029	0.063	0.91	0.22	81.0	9.6	0.0003	0.108	5.30	0.059	0.008	4.80	34.0
12	77	0.02	0.051	0.020	0.028	0.024	493	0.029	0.070	0.71	0.24	66.5	8.8	< 0.0003	0.102	4.70	0.046	0.009	3.40	34.0
13	84	0.01	< 0.050	0.023	0.028	0.026	480	0.028	0.078	0.51	0.26	52.0	8.1	< 0.0002	0.096	4.10	0.033	0.009	2.00	34.0
14	91	0.02	0.050	0.021	0.027	0.030	423	0.037	0.065	0.39	0.22	50.0	7.8	0.0002	0.092	3.40	0.035	0.008	1.72	33.0
15	98	0.03	0.050	0.019	0.025	0.033	365	0.046	0.053	0.27	0.18	48.0	7.5	0.0002	0.088	2.70	0.037	0.007	1.44	32.0
16	106	0.04	0.050	0.016	0.024	0.037	308	0.055	0.040	0.14	0.14	46.0	7.1	0.0002	0.083	2.00	0.039	0.006	1.16	31.0
17	113	0.05	< 0.050	0.014	0.022	0.040	250	0.064	0.027	< 0.02	0.10	44.0	6.8	< 0.0002	0.079	1.30	0.041	< 0.005	0.88	30.0
18	119	0.05	0.05	0.014	0.022	0.039	246	0.062	0.030	0.03	0.12	46.6	7.0	0.079	1.30	0.041	0.005	0.88	30.1	
19	126	0.05	0.05	0.014	0.021	0.038	243	0.061	0.033	0.03	0.14	49.3	7.1	0.079	1.30	0.042	0.005	0.87	30.3	
20	133	0.05	0.05	0.014	0.021	0.037	239	0.059	0.036	0.04	0.15	51.9	7.3	0.078	1.30	0.042	0.005	0.87	30.4	
21	140	0.05	0.05	0.014	0.021	0.036	235	0.057	0.039	0.04	0.17	54.5	7.5	0.078	1.30	0.043	0.005	0.87	30.5	
22	147	0.05	0.05	0.013	0.020	0.035	231	0.055	0.042	0.05	0.19	57.1	7.6	0.078	1.30	0.043	0.005	0.87	30.6	
23	154	0.04	0.04	0.013	0.020	0.034	228	0.054	0.045	0.05	0.21	59.8	7.8	0.078	1.30	0.043	0.005	0.87	30.8	
24	161	0.04	0.04	0.013	0.019	0.033	224	0.052	0.048	0.06	0.23	62.4	7.9	0.078	1.30	0.044	0.005	0.86	30.9	
25	168	0.04	0.04	0.013	0.019	0.033	220	0.050	0.052	0.06	0.25	65.0	8.1	0.078	1.30	0.044	0.005	0.86	31.0	
26	175	0.04	0.04	0.013	0.019	0.032	216	0.048	0.055	0.07	0.27	67.6	8.3	0.077	1.30	0.044	0.005	0.86	31.1	
27	182	0.04	0.04	0.013	0.018	0.031	213	0.047	0.058	0.07	0.29	70.3	8.4	0.077	1.30	0.045	0.005	0.86	31.3	
28	189	0.04	0.04	0.013	0.018	0.030	209	0.045	0.061	0.08	0.31	72.9	8.6	0.077	1.30	0.045	0.005	0.85	31.4	
29	197	0.04	0.04	0.013	0.018	0.029	205	0.043	0.064	0.08	0.32	75.5	8.8	0.077	1.30	0.046	0.005	0.85	31.5	
30	204	0.03	0.03	0.012	0.017	0.028	201	0.041	0.067	0.09	0.34	78.1	8.9	0.077	1.30	0.046	0.005	0.85	31.6	
31	210	0.03	0.03	0.012	0.017	0.027	198	0.040	0.070	0.09	0.36	80.8	9.1	0.076	1.30	0.046	0.005	0.85	31.8	
32	218	0.03	0.03	0.012	0.016	0.026	194	0.038	0.073	0.10	0.38	83.4	9.2	0.076	1.30	0.047	0.005	0.84	31.9	
33	224	< 0.03	0.03	0.012	0.016	0.025	190	0.036	0.076	0.10	0.40	86.0	9.4	0.076	1.30	0.047	< 0.005	0.84	32.0	
34	230																			
35	238																			
36	245																			
37	253																			
38	259																			
39	265																			
40	273																			
41	280																			
42	287																			
43	294																			

* Measured values shown in bold

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Appendix 4.12 Table 4

Cumulative Mass Flux
Whole Tailings

Test Leached under alternating wet/dry cycles
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																			
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn	
1	0	0.03	0.004	0.00	0.00	21.1	0.000	0.00	0.01	0.15	0.042	4.6	0.3	0.0000	0.00	0.49	0.004	0.000	0.8	1.55	
2	8	0.09	0.012	0.01	0.01	54.1	0.000	0.01	0.03	0.47	0.11	12.3	0.8	0.0001	0.01	1.21	0.011	0.001	1.8	4.10	
3	15	0.32	0.043	0.01	0.02	79.9	0.002	0.01	0.07	2.45	0.28	19.0	1.3	0.0001	0.01	1.94	0.016	0.002	2.6	6.4	
4	22	0.66	0.091	0.01	0.02	95.9	0.006	0.02	0.12	5.66	0.52	23.9	1.7	0.0002	0.02	2.58	0.021	0.004	3.1	8.1	
5	28	0.88	0.123	0.02	0.02	116	0.009	0.02	0.15	7.71	0.67	31.2	2.1	0.0002	0.02	3.34	0.028	0.005	3.7	9.8	
6	35	1.07	0.149	0.02	0.03	156	0.011	0.03	0.18	9.45	0.80	41.9	3.0	0.0002	0.03	4.25	0.037	0.006	4.6	12.8	
7	42	1.18	0.165	0.02	0.03	207	0.013	0.03	0.20	10.55	0.89	53.9	4.1	0.0003	0.04	5.11	0.047	0.007	5.5	16.2	
8	49	1.26	0.176	0.03	0.03	287	0.015	0.03	0.21	11.33	0.96	71.3	5.8	0.0003	0.06	6.24	0.061	0.008	6.7	21.4	
9	56	1.27	0.177	0.03	0.03	365	0.016	0.04	0.22	11.53	0.98	87.6	7.4	0.0004	0.08	7.20	0.073	0.009	7.8	26.5	
10	63	1.28	0.179	0.04	0.04	446	0.018	0.04	0.23	11.70	1.02	102.6	9.0	0.0005	0.10	8.13	0.085	0.010	8.8	31.8	
11	70	1.28	0.182	0.04	0.04	525	0.019	0.05	0.24	11.84	1.05	115.2	10.5	0.0005	0.11	8.95	0.094	0.012	9.6	37.1	
12	77	1.29	0.185	0.04	0.04	596	0.020	0.05	0.25	11.94	1.08	124.8	11.8	0.0005	0.13	9.63	0.100	0.013	10.1	42.0	
13	84	1.29	0.187	0.05	0.05	654	0.020	0.06	0.26	12.00	1.12	131.1	12.7	0.0006	0.14	10.12	0.104	0.014	10.3	46.1	
14	91	1.29	0.189	0.05	0.05	696	0.021	0.06	0.26	12.04	1.14	136.0	13.5	0.0006	0.15	10.46	0.108	0.015	10.5	49.4	
15	98	1.29	0.191	0.05	0.05	733	0.021	0.06	0.27	12.07	1.16	140.9	14.3	0.0006	0.16	10.73	0.112	0.015	10.6	52.6	
16	106	1.30	0.193	0.06	0.06	767	0.022	0.07	0.27	12.09	1.17	146.1	15.1	0.0006	0.17	10.96	0.116	0.016	10.7	56.1	
17	113	1.30	0.195	0.06	0.06	810	0.023	0.08	0.28	12.09	1.19	153.5	16.2	0.0007	0.18	11.18	0.123	0.017	10.9	61.2	
18	119	1.31	0.197	0.06	0.07	841	0.023	0.09	0.28	12.09	1.20	159.4	17.1		0.19	11.34	0.128	0.017	11.0	65.0	
19	126	1.32	0.199	0.06	0.07	869	0.024	0.10	0.29	12.10	1.22	165.1	17.9		0.20	11.49	0.133	0.018	11.1	68.5	
20	133	1.32	0.200	0.07	0.08	894	0.024	0.10	0.29	12.10	1.23	170.6	18.7		0.21	11.63	0.138	0.019	11.2	71.7	
21	140	1.33	0.202	0.07	0.08	922	0.025	0.11	0.29	12.10	1.26	177.0	19.6		0.22	11.79	0.143	0.019	11.3	75.3	
22	147	1.33	0.203	0.07	0.09	949	0.025	0.12	0.30	12.11	1.28	183.7	20.5		0.23	11.94	0.148	0.020	11.4	78.9	
23	154	1.34	0.205	0.07	0.09	976	0.025	0.12	0.30	12.12	1.30	190.7	21.4		0.24	12.09	0.153	0.020	11.5	82.5	
24	161	1.34	0.207	0.08	0.09	1002	0.026	0.13	0.31	12.12	1.33	198.1	22.3		0.24	12.24	0.158	0.021	11.6	86.2	
25	168	1.35	0.208	0.08	0.10	1027	0.026	0.13	0.32	12.13	1.36	205.6	23.2		0.25	12.39	0.163	0.022	11.7	89.7	
26	175	1.35	0.209	0.08	0.10	1050	0.026	0.14	0.32	12.14	1.39	212.6	24.1		0.26	12.53	0.167	0.022	11.8	92.9	
27	182	1.36	0.211	0.08	0.10	1072	0.026	0.14	0.33	12.14	1.42	220.0	25.0		0.27	12.67	0.172	0.023	11.9	96.3	
28	189	1.36	0.212	0.08	0.11	1095	0.026	0.15	0.33	12.15	1.45	228.0	25.9		0.28	12.81	0.177	0.023	12.0	99.7	
29	197	1.36	0.213	0.09	0.11	1117	0.027	0.15	0.34	12.16	1.48	236.0	26.9		0.29	12.95	0.182	0.024	12.1	103.0	
30	204	1.37	0.215	0.09	0.11	1141	0.027	0.16	0.35	12.17	1.53	245.5	27.9		0.30	13.10	0.188	0.024	12.2	106.9	
31	210	1.37	0.216	0.09	0.12	1164	0.027	0.16	0.36	12.18	1.57	254.8	29.0		0.30	13.25	0.193	0.025	12.3	110.5	
32	218	1.38	0.218	0.09	0.12	1186	0.027	0.17	0.37	12.19	1.61	264.3	30.0		0.31	13.40	0.198	0.025	12.4	114.2	
33	224	1.38	0.219	0.09	0.12	1211	0.027	0.17	0.38	12.20	1.66	275.6	31.3		0.32	13.57	0.204	0.026	12.5	118.4	
34	230																				
35	238																				
36	245																				
37	253																				
38	259																				
39	265																				
40	273																				
41	280																				
42	287																				
43	294																				

Appendix 4.12 Table 5

Cumulative Metal Extractions
Whole Tailings

Test: Leached under alternating wet/dry cycles
Water Sample Bottom seepage

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																		
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1	0	0.000	0.000	0.005	0.015	0.3	0.000	0.006	0.001	0.000	0.001	0.031	0.05	0.01	0.01	0.01	0.002	0.05	0.02	
2	8	0.000	0.000	0.014	0.038	0.8	0.000	0.014	0.004	0.000	0.002	0.082	0.15	0.04	0.02	0.03	0.005	0.11	0.05	
3	15	0.001	0.002	0.020	0.055	1.2	0.002	0.020	0.008	0.001	0.006	0.127	0.23	0.06	0.03	0.05	0.011	0.16	0.08	
4	22	0.002	0.004	0.024	0.063	1.4	0.006	0.026	0.014	0.002	0.012	0.160	0.29	0.07	0.03	0.06	0.019	0.19	0.10	
5	28	0.003	0.005	0.029	0.077	1.7	0.009	0.031	0.017	0.003	0.016	0.209	0.37	0.10	0.04	0.08	0.022	0.23	0.12	
6	35	0.003	0.006	0.036	0.090	2.3	0.011	0.037	0.021	0.004	0.019	0.281	0.52	0.14	0.06	0.11	0.027	0.29	0.16	
7	42	0.004	0.007	0.042	0.102	3.0	0.013	0.043	0.023	0.005	0.021	0.362	0.70	0.20	0.07	0.13	0.031	0.34	0.20	
8	49	0.004	0.007	0.051	0.114	4.2	0.015	0.050	0.025	0.005	0.022	0.478	0.99	0.28	0.08	0.17	0.036	0.42	0.26	
9	56	0.004	0.007	0.058	0.123	5.4	0.016	0.056	0.025	0.005	0.023	0.588	1.27	0.36	0.09	0.21	0.041	0.49	0.33	
10	63	0.004	0.007	0.066	0.134	6.6	0.018	0.063	0.026	0.005	0.024	0.688	1.55	0.44	0.11	0.24	0.046	0.55	0.39	
11	70	0.004	0.007	0.074	0.146	7.7	0.019	0.070	0.028	0.005	0.024	0.773	1.81	0.52	0.12	0.27	0.052	0.60	0.46	
12	77	0.004	0.007	0.082	0.158	8.8	0.020	0.076	0.029	0.005	0.025	0.837	2.03	0.58	0.13	0.29	0.057	0.63	0.52	
13	84	0.004	0.007	0.088	0.169	9.6	0.020	0.081	0.030	0.005	0.026	0.880	2.20	0.64	0.13	0.30	0.062	0.64	0.57	
14	91	0.004	0.008	0.093	0.180	10.2	0.021	0.086	0.031	0.005	0.026	0.913	2.33	0.68	0.14	0.31	0.066	0.65	0.61	
15	98	0.004	0.008	0.098	0.192	10.8	0.021	0.093	0.031	0.005	0.027	0.945	2.46	0.72	0.14	0.32	0.069	0.66	0.65	
16	106	0.004	0.008	0.103	0.206	11.3	0.022	0.102	0.032	0.005	0.027	0.980	2.60	0.76	0.14	0.33	0.072	0.67	0.69	
17	113	0.004	0.008	0.110	0.231	11.9	0.023	0.117	0.032	0.005	0.028	1.030	2.80	0.82	0.15	0.35	0.076	0.68	0.76	
18	119	0.004	0.008	0.115	0.248	12.4	0.023	0.129	0.033	0.005	0.028	1.070	2.95	0.87	0.15	0.37	0.079	0.69	0.80	
19	126	0.004	0.008	0.119	0.264	12.8	0.024	0.139	0.033	0.005	0.028	1.108	3.09	0.91	0.15	0.38	0.081	0.69	0.85	
20	133	0.004	0.008	0.123	0.278	13.2	0.024	0.148	0.034	0.005	0.029	1.145	3.22	0.95	0.15	0.39	0.084	0.70	0.89	
21	140	0.004	0.008	0.128	0.293	13.6	0.025	0.158	0.034	0.005	0.029	1.188	3.37	0.99	0.16	0.41	0.086	0.71	0.93	
22	147	0.004	0.008	0.132	0.308	14.0	0.025	0.167	0.035	0.005	0.030	1.233	3.53	1.03	0.16	0.42	0.089	0.71	0.97	
23	154	0.004	0.008	0.136	0.322	14.3	0.025	0.176	0.035	0.005	0.030	1.280	3.68	1.07	0.16	0.44	0.092	0.72	1.02	
24	161	0.004	0.008	0.141	0.337	14.7	0.026	0.185	0.036	0.005	0.031	1.330	3.85	1.11	0.16	0.45	0.094	0.73	1.06	
25	168	0.004	0.008	0.145	0.350	15.1	0.026	0.193	0.037	0.005	0.032	1.380	4.01	1.15	0.16	0.47	0.097	0.73	1.11	
26	175	0.004	0.008	0.148	0.361	15.4	0.026	0.201	0.037	0.005	0.032	1.427	4.15	1.19	0.16	0.48	0.099	0.74	1.15	
27	182	0.004	0.008	0.152	0.373	15.8	0.026	0.208	0.038	0.005	0.033	1.477	4.31	1.23	0.17	0.49	0.102	0.74	1.19	
28	189	0.004	0.008	0.155	0.385	16.1	0.026	0.215	0.039	0.005	0.034	1.530	4.47	1.27	0.17	0.51	0.104	0.75	1.23	
29	197	0.004	0.009	0.159	0.396	16.4	0.027	0.221	0.040	0.005	0.035	1.584	4.63	1.30	0.17	0.52	0.107	0.75	1.27	
30	204	0.004	0.009	0.163	0.408	16.8	0.027	0.229	0.041	0.005	0.035	1.647	4.82	1.34	0.17	0.54	0.109	0.76	1.32	
31	210	0.004	0.009	0.166	0.419	17.1	0.027	0.235	0.042	0.005	0.036	1.710	5.00	1.38	0.17	0.55	0.112	0.77	1.36	
32	218	0.004	0.009	0.170	0.429	17.4	0.027	0.242	0.042	0.005	0.037	1.774	5.18	1.42	0.18	0.57	0.114	0.77	1.41	
33	224	0.005	0.009	0.174	0.441	17.8	0.027	0.248	0.044	0.005	0.039	1.850	5.39	1.47	0.18	0.58	0.117	0.78	1.46	
34	230																			
35	238																			
36	245																			
37	253																			
38	259																			
39	265																			
40	273																			
41	280																			
42	287																			
43	294																			

Appendix 4.12 Table 6

Metal Extraction Rates
Whole Tailings

Test: Leached under alternating wet/dry cycles
Water Sample: Bottom seepage

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average																			
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn	
1	0																				
2	8	0.052	0.007	0.004	0.006	28.84	0.0000	0.0046	0.0197	0.275	0.056	6.69	0.459	0.00003	0.0049	0.629	0.0055	0.0007	0.90	2.23	
3	15	0.134	0.018	0.004	0.005	27.43	0.0010	0.0046	0.0286	1.071	0.109	6.68	0.464	0.00003	0.0047	0.676	0.0057	0.0010	0.86	2.25	
4	22	0.202	0.028	0.003	0.004	23.80	0.0019	0.0043	0.0348	1.750	0.151	6.13	0.431	0.00004	0.0042	0.665	0.0053	0.0012	0.74	2.09	
5	28	0.214	0.030	0.003	0.004	23.83	0.0021	0.0043	0.0352	1.888	0.156	6.63	0.457	0.00004	0.0046	0.712	0.0059	0.0012	0.74	2.07	
6	35	0.208	0.029	0.003	0.004	27.04	0.0022	0.0042	0.0338	1.860	0.152	7.45	0.539	0.00004	0.0056	0.751	0.0066	0.0011	0.76	2.24	
7	42	0.225	0.032	0.003	0.004	31.48	0.0027	0.0041	0.0340	2.076	0.161	8.57	0.668	0.00004	0.0071	0.803	0.0075	0.0012	0.76	2.49	
8	49	0.194	0.027	0.003	0.003	42.55	0.0026	0.0042	0.0293	1.829	0.140	10.77	0.914	0.00005	0.0099	0.884	0.0091	0.0012	0.85	3.10	
9	56	0.124	0.018	0.004	0.003	55.41	0.0021	0.0044	0.0209	1.209	0.096	13.11	1.176	0.00005	0.0129	0.951	0.0108	0.0010	0.98	3.78	
10	63	0.078	0.011	0.004	0.003	65.96	0.0018	0.0045	0.0157	0.798	0.070	14.28	1.370	0.00005	0.0151	0.957	0.0114	0.0011	1.02	4.39	
11	70	0.043	0.006	0.004	0.003	73.75	0.0015	0.0046	0.0120	0.477	0.050	14.66	1.494	0.00005	0.0165	0.941	0.0113	0.0011	1.00	4.87	
12	77	0.021	0.004	0.004	0.003	77.79	0.0013	0.0046	0.0102	0.278	0.039	14.18	1.533	0.00005	0.0171	0.903	0.0107	0.0012	0.92	5.16	
13	84	0.006	0.002	0.004	0.003	73.49	0.0010	0.0042	0.0090	0.134	0.032	11.96	1.396	0.00004	0.0158	0.778	0.0087	0.0012	0.72	4.94	
14	91	0.004	0.002	0.004	0.003	66.09	0.0009	0.0041	0.0089	0.103	0.031	9.68	1.223	0.00004	0.0140	0.652	0.0069	0.0011	0.52	4.58	
15	98	0.003	0.002	0.003	0.003	57.28	0.0007	0.0041	0.0082	0.074	0.028	7.66	1.052	0.00003	0.0122	0.522	0.0054	0.0010	0.36	4.16	
16	106	0.003	0.002	0.003	0.003	47.11	0.0006	0.0043	0.0070	0.048	0.024	6.00	0.890	0.00002	0.0104	0.390	0.0043	0.0009	0.23	3.69	
17	113	0.004	0.002	0.003	0.004	41.60	0.0006	0.0056	0.0059	0.028	0.020	5.59	0.868	0.00002	0.0102	0.302	0.0044	0.0008	0.16	3.74	
18	119																				
19	126																				
20	133																				
21	140																				
22	147																				
23	154																				
24	161																				
25	168																				
26	175																				
27	182																				
28	189																				
29	197																				
30	204																				
31	210																				
32	218																				
33	224																				
34	230																				
35	238																				
36	245																				
37	253																				
38	259																				
39	265																				
40	273																				
41	280																				
42	287																				
43	294																				

Appendix 4.12 Table 7

Oxidation and Neutralization Results
Whole Tailings

Test: Leached under alternating wet/dry cycles

Water Sample: Bottom seepage

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO [Ca + Mg] [SO4]	NEUTRALIZATION		
		Cumulative Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate* (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)		Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk)*	NP Consumed (%)
1	0	53	0.01		0.55	0.53	0.19	1.31	72		0.3
2	8	137	0.02	73.94	0.88	0.82	0.31	1.29	186	99.62	0.7
3	15	175	0.02	57.29	0.40	0.65	0.27	2.31	278	96.07	1.0
4	22	223	0.03	54.19	0.50	0.40	0.20	1.22	338	84.72	1.3
5	28	292	0.03	59.86	0.72	0.51	0.30	1.13	419	86.86	1.6
6	35	428	0.05	75.06	1.42	1.00	0.44	1.02	563	98.28	2.1
7	42	601	0.07	95.55	1.81	1.27	0.49	0.97	739	113.94	2.7
8	49	874	0.10	143.85	2.84	1.99	0.72	0.95	1010	150.69	3.7
9	56	1144	0.13	189.58	2.81	1.96	0.67	0.94	1273	192.49	4.7
10	63	1413	0.16	224.13	2.80	2.03	0.62	0.94	1538	223.66	5.7
11	70	1664	0.19	247.23	2.62	1.97	0.52	0.95	1787	244.70	6.6
12	77	1881	0.21	255.87	2.26	1.77	0.39	0.96	2003	252.82	7.4
13	84	2050	0.23	235.16	1.76	1.45	0.26	0.97	2174	232.91	8.1
14	91	2171	0.24	205.52	1.27	1.04	0.20	0.98	2298	205.05	8.5
15	98	2280	0.26	173.48	1.13	0.93	0.20	1.00	2411	174.72	8.9
16	106	2382	0.27	139.66	1.06	0.87	0.21	1.02	2520	142.46	9.3
17	113	2508	0.28	122.04	1.31	1.06	0.31	1.05	2657	127.03	9.8
18	119	2601	0.29	110.31	0.97	0.77	0.24	1.04	2758	116.74	10.2
19	126	2687	0.30	103.15	0.89	0.70	0.23	1.04	2851	110.51	10.6
20	133	2768	0.31	97.49	0.84	0.64	0.23	1.04	2938	105.39	10.9
21	140	2855	0.32	97.37	0.91	0.69	0.26	1.04	3033	105.75	11.2
22	147	2944	0.33	89.67	0.92	0.68	0.28	1.04	3129	97.22	11.6
23	154	3032	0.34	86.02	0.91	0.66	0.29	1.04	3224	93.10	11.9
24	161	3122	0.35	87.01	0.94	0.67	0.31	1.03	3321	94.03	12.3
25	168	3209	0.36	88.24	0.90	0.63	0.30	1.03	3414	95.21	12.6
26	175	3288	0.37	86.51	0.82	0.56	0.29	1.03	3499	93.20	13.0
27	182	3369	0.38	85.07	0.85	0.56	0.31	1.03	3586	91.52	13.3
28	189	3453	0.39	84.29	0.87	0.57	0.33	1.03	3676	90.54	13.6
29	197	3535	0.40	80.25	0.85	0.54	0.33	1.03	3764	86.06	13.9
30	204	3628	0.41	81.58	0.97	0.61	0.39	1.02	3863	87.34	14.3
31	210	3718	0.42	86.02	0.93	0.57	0.38	1.02	3959	91.96	14.7
32	218	3806	0.43	84.99	0.92	0.55	0.39	1.02	4053	90.72	15.0
33	224	3909	0.44	91.17	1.07	0.62	0.47	1.02	4162	97.16	15.4
34	230										
35	238										
36	245										
37	253										
38	259										
39	265										
40	273										
41	280										
42	287										
43	294										

* Rates of sulfate production and NP depletion are 5-week moving averages

Appendix 4.13

Lime Amended Whole Tailings - Leached Under Alternating Wet/Dry Conditions

Appendix 4.13 Table 1

Sample Characterization Lime Amended Whole Tailings - Leached under alternating wet/dry conditions

Metals Analysis		(ppm)
Aluminum	Al	30600
Antimony	Sb	68
Arsenic	As	2500
Barium	Ba	54
Beryllium	Be	<50
Bismuth	Bi	<20
Cadmium	Cd	28
Calcium	Ca	6800
Carbon	C	5000
Chromium	Cr	100
Cobalt	Co	69
Copper	Cu	860
Gallium	Ga	16
Iron	Fe	232000
Lead	Pb	4300
Lithium	Li	NA
Magnesium	Mg	14900
Manganese	Mn	580
Mercury	Hg	1.6
Molybdenum	Mo	<20
Nickel	Ni	22
Phosphorus	P	NA
Potassium	K	7600
Selenium	Se	35
Silicon	Si	160000
Silver	Ag	22.2
Sodium	Na	1600
Strontium	Sr	NA
Thallium	Tl	14
Tin	Sn	24
Titanium	Ti	1400
Tungsten	W	NA
Vanadium	V	NA
Zinc	Zn	8100

ABA Results	
Paste pH	6.2
S (Total) (%)	29.7
SO4 (%)	1940
S (sulfide) (%)	27.8
AP (kg CaCO3/tonne)	927
NP (kg CaCO3/tonne)	27
CO2 (%)	1.39
CO3 NP (kg CaCO3/tonne)	31.5
Net NP (kg CaCO3/tonne)	-900
NP/AP	0.03

Sample Mass (kg)	34.80
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Appendix 4.13 Table 2

Parameters Measured Weekly
Lime Amended Whole Tailings

Test: Leached under alternating wet/dry cycles
Water Sample: Bottom seepage

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT (µS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L)*	CUMULATIVE SULFATE (mg/kg)
25-Oct	1	0	3.010	11.6	800	17		326	28
2-Nov	2	8	4.080	11.2	2160	18		169	48
9-Nov	3	15	4.360	11.2	1250	23		134	65
16-Nov	4	22	4.450	11.0	1170	190		98	77
22-Nov	5	28	4.870	10.9	896	200		91	90
29-Nov	6	35	4.560	10.8	998	172		95	102
6-Dec	7	42	4.120	10.7	1000	146		100	114
12-Dec	8	48	7.630	10.6	1010	510		104	137
21-Dec	9	57	4.300	9.2	633	36		115	151
28-Dec	10	64	4.710	10.2	727	78		139	170
4-Jan	11	71	4.620	10.2	817	52		163	192
10-Jan	12	77	4.160	10.9	886	73		186	214
17-Jan	13	84	2.920	10.3	756	39		210	232
24-Jan	14	91	1.000	11.0	1380	150			
31-Jan	15	98	0.400	8.3	770	47			
8-Feb	16	106	2.520	8.8	980	24			
15-Feb	17	113	1.350	8.3	961				
21-Feb	18	119	2.460	9.2	1120				
28-Feb	19	126	1.880	8.2	1150				
7-Mar	20	133	1.840	7.8	1140				
14-Mar	21	140	2.150	7.4	1130				
21-Mar	22	147	2.520	8.0	1260				
28-Mar	23	154	2.500	7.7	1230				
4-Apr	24	161	2.580	7.2	907				
11-Apr	25	168	2.360	7.8	918				
18-Apr	26	175	2.150	7.2	955				
25-Apr	27	182	2.490	7.3	947				
2-May	28	189	2.520	7.3	965				
10-May	29	197	2.600	7.0	976				
17-May	30	204	3.000	6.6	1030				
23-May	31	210	2.840	6.8	1140				
31-May	32	218	2.750	7.2	1010				
6-Jun	33	224	3.550	7.4	1030				
12-Jun	34	230	3.360	7.6	937				
20-Jun	35	238	3.220	7.5	922				
27-Jun	36	245	3.450	7.6	963				
5-Jul	37	253	3.350	7.5	965				
11-Jul	38	259	3.290	7.7	888				
17-Jul	39	265	0.000						
25-Jul	40	273	3.510	7.4	872				
1-Aug	41	280	2.160	7.1	812				
8-Aug	42	287	3.620	7.0	927				
15-Aug	43	294	3.740	7.4	968				
22-Aug	44	301	3.380	7.5	898				
31-Aug	45	310	3.160	7.4	867				
6-Sep	46	316	3.580	7.7	847				
12-Sep	47	322	3.460	7.5	884	22			
19-Sep	48	329	3.230	7.2	911	25			
26-Sep	49	336	3.450	7.2	852	20			
3-Oct	50	343	3.120	7.3	897	89			
10-Oct	51	350	3.090	7.3	928	33			
17-Oct	52	357	3.050	7.3	871				
24-Oct	53	364	2.820	6.9	856				
31-Oct	54	371	2.720	7.0	943				
7-Nov	55	378	2.640	6.9	879				

* Measured values of sulfate shown in bold

Appendix 4.13 Table 3

Leachate Analysis
Lime Amended Whole Tailings

Test: **Leached under alternating wet/dry cycles**
Water Sample: **Bottom seepage**

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) *																		
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn	
1	0	0.14	0.210	0.066	< 0.005	760	0.01	0.920	0.6	53.0	0.3	0.01	< 0.0002	0.05	35.7	0.3300	0.005	21.0	2.20	
2	8	0.44	0.260	0.035	< 0.005	360	< 0.01	0.660	3.6	28.0	1.2	0.02	< 0.0002	0.03	19.2	0.2200	0.005	10.0	0.46	
3	15	2.72	0.730	0.026	0.005	260	0.02	0.760	47.8	19.5	6.1	0.19	0.0004	0.03	13.3	0.1900	0.009	7.1	2.23	
4	22	5.00	1.200	0.016	< 0.005	160	0.03	0.860	92.0	11.0	11.0	0.36	0.0006	0.02	7.4	0.1600	0.013	4.2	4.00	
5	28	9.40	1.900	0.022	0.008	130	0.05	1.300	140	9.00	20.0	0.58	0.0014	0.04	6.5	0.1500	0.018	3.5	7.10	
6	35	8.00	1.733	0.021	0.009	140	0.04	1.333	120	8.97	22.3	0.72	0.0010	0.05	6.0	0.1567	0.016	3.4	6.60	
7	42	6.60	1.567	0.020	0.010	150	0.04	1.367	100	8.93	24.7	0.85	0.0006	0.07	5.5	0.1633	0.014	3.3	6.10	
8	48	5.20	1.400	0.019	0.011	160	0.03	1.400	80.0	8.90	27.0	0.99	< 0.0002	0.08	5.0	0.1700	0.012	3.2	5.60	
9	57	5.40	1.200	0.002	< 0.005	120	0.03	0.910	90.0	3.50	13.0	0.36	0.0010	0.06	< 4.8	0.1400	0.014	2.8	3.30	
10	64	4.48	0.955	0.006	0.005	125	0.03	0.773	70.5	3.05	13.3	0.30	0.0008	0.06	5.0	0.1238	0.012	2.9	2.88	
11	71	3.55	0.710	0.010	0.005	130	0.02	0.635	51.0	2.60	13.5	0.24	0.0006	0.07	5.3	0.1075	0.010	3.1	2.45	
12	77	2.63	0.465	0.014	0.005	135	0.02	0.498	31.5	2.15	13.8	0.18	0.0004	0.07	5.5	0.0913	0.007	3.2	2.03	
13	84	1.70	0.220	0.018	< 0.005	140	< 0.01	0.360	12.0	1.70	14.0	0.12	< 0.0002	0.07	5.7	0.0750	< 0.005	3.3	1.60	
14	91																			
15	98																			
16	106																			
17	113																			
18	119																			
19	126																			
20	133																			
21	140																			
22	147																			
23	154																			
24	161																			
25	168																			
26	175																			
27	182																			
28	189																			
29	197																			
30	204																			
31	210																			
32	218																			
33	224																			
34	230																			
35	236																			
36	245																			
37	253																			
38	259																			
39	265																			
40	273																			
41	280																			
42	287																			
43	294																			

* Measured values shown in bold

Appendix 4.13 Table 4

Cumulative Mass Flux
Lime Amended Whole Tailings

Test: Leached under alternating wet/dry cycles
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																		
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1	0	0.01	0.02	0.006	0.000	65.7	0.001	0.001	0.08	0.05	4.584	0.03	0.00	0.0000	0.00	3.09	0.029	0.000	1.82	0.19
2	8	0.06	0.05	0.010	0.001	107.9	0.001	0.002	0.16	0.47	7.87	0.17	0.00	0.0000	0.01	5.34	0.054	0.001	2.99	0.24
3	15	0.40	0.14	0.013	0.002	140.5	0.004	0.004	0.25	6.46	10.31	0.93	0.03	0.0001	0.01	7.01	0.078	0.002	3.88	0.52
4	22	1.04	0.29	0.015	0.002	161.0	0.009	0.008	0.36	18.23	11.72	2.34	0.07	0.0002	0.01	7.95	0.099	0.004	4.42	1.04
5	28	2.36	0.56	0.018	0.003	179.2	0.020	0.014	0.54	37.82	12.98	5.14	0.15	0.0004	0.02	8.86	0.120	0.006	4.91	2.03
6	35	3.41	0.79	0.021	0.005	197.5	0.030	0.019	0.72	53.54	14.15	8.07	0.25	0.0005	0.03	9.65	0.140	0.008	5.35	2.89
7	42	4.19	0.97	0.023	0.006	215.3	0.039	0.023	0.88	65.38	15.21	11.0	0.35	0.0006	0.03	10.30	0.159	0.010	5.74	3.62
8	48	5.33	1.28	0.027	0.008	250.4	0.055	0.030	1.19	82.92	17.16	16.9	0.57	0.0006	0.05	11.39	0.197	0.013	6.44	4.84
9	57	6.00	1.43	0.028	0.009	265.2	0.060	0.034	1.30	94.04	17.59	18.5	0.61	0.0007	0.06	11.99	0.214	0.014	6.79	5.25
10	64	6.60	1.56	0.028	0.009	282.1	0.065	0.037	1.40	103.58	18.01	20.3	0.65	0.0008	0.07	12.67	0.231	0.016	7.18	5.64
11	71	7.07	1.65	0.030	0.010	299.4	0.068	0.040	1.49	110.35	18.35	22.1	0.68	0.0009	0.08	13.36	0.245	0.017	7.59	5.97
12	77	7.39	1.71	0.031	0.011	315.5	0.071	0.042	1.55	114.12	18.61	23.7	0.70	0.0010	0.08	14.02	0.256	0.018	7.97	6.21
13	84	7.53	1.72	0.033	0.011	327.2	0.072	0.042	1.58	115.13	18.75	24.9	0.72	0.0010	0.09	14.50	0.262	0.019	8.25	6.34
14	91																			
15	98																			
16	106																			
17	113																			
18	119																			
19	126																			
20	133																			
21	140																			
22	147																			
23	154																			
24	161																			
25	168																			
26	175																			
27	182																			
28	189																			
29	197																			
30	204																			
31	210																			
32	218																			
33	224																			
34	230																			
35	238																			
36	245																			
37	253																			
38	259																			
39	265																			
40	273																			
41	280																			
42	287																			
43	294																			

Appendix 4.13 Table 5

Cumulative Metal Extractions
Lime Amended Whole Tailings

Test: Leached under alternating wet/dry cycles
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na
1	0	0.000	0.001	0.011	0.002	1.0	0.001	0.001	0.497	0.000	0.107	0.000	0.00	0.02	0.04	0.08	0.002	0.11	0.00
2	8	0.000	0.002	0.018	0.004	1.6	0.001	0.003	0.981	0.000	0.183	0.001	0.00	0.04	0.07	0.16	0.005	0.19	0.00
3	15	0.001	0.006	0.024	0.006	2.1	0.004	0.006	1.576	0.003	0.240	0.006	0.00	0.05	0.09	0.22	0.010	0.24	0.01
4	22	0.003	0.012	0.028	0.008	2.4	0.009	0.011	2.263	0.008	0.272	0.016	0.01	0.06	0.10	0.28	0.017	0.28	0.01
5	28	0.008	0.022	0.034	0.012	2.6	0.020	0.020	3.400	0.016	0.302	0.034	0.03	0.09	0.12	0.34	0.029	0.31	0.03
6	35	0.011	0.031	0.039	0.016	2.9	0.030	0.028	4.492	0.023	0.329	0.054	0.04	0.12	0.13	0.40	0.038	0.33	0.04
7	42	0.014	0.039	0.043	0.021	3.2	0.039	0.034	5.504	0.028	0.354	0.074	0.06	0.16	0.14	0.46	0.045	0.36	0.04
8	48	0.017	0.051	0.051	0.029	3.7	0.055	0.044	7.422	0.036	0.399	0.113	0.10	0.24	0.15	0.56	0.057	0.40	0.06
9	57	0.020	0.057	0.051	0.031	3.9	0.060	0.049	8.125	0.041	0.409	0.124	0.11	0.27	0.16	0.61	0.065	0.42	0.06
10	64	0.022	0.062	0.053	0.034	4.1	0.065	0.054	8.778	0.045	0.419	0.136	0.11	0.31	0.17	0.66	0.072	0.45	0.07
11	71	0.023	0.066	0.055	0.036	4.4	0.068	0.058	9.305	0.048	0.427	0.148	0.12	0.35	0.18	0.70	0.078	0.47	0.07
12	77	0.024	0.068	0.058	0.038	4.6	0.071	0.060	9.677	0.049	0.433	0.159	0.12	0.39	0.18	0.73	0.082	0.50	0.08
13	84	0.025	0.069	0.061	0.040	4.8	0.072	0.061	9.866	0.050	0.436	0.167	0.12	0.41	0.19	0.75	0.084	0.52	0.08
14	91																		
15	98																		
16	106																		
17	113																		
18	119																		
19	126																		
20	133																		
21	140																		
22	147																		
23	154																		
24	161																		
25	168																		
26	175																		
27	182																		
28	189																		
29	197																		
30	204																		
31	210																		
32	218																		
33	224																		
34	230																		
35	238																		
36	245																		
37	253																		
38	259																		
39	265																		
40	273																		
41	280																		
42	287																		
43	294																		

001

Appendix 4.13 Table 6

Metal Extraction Rates
Lime Amended Whole Tailings

Test Leached under alternating wet/dry cycles
Water Sample Bottom seepage

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average																		
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Mercury Hg	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn	
1	0																			
2	8	0.045	0.027	0.004	0.0005	36.93	0.0010	0.068	0.37	2.87	0.12	0.002	0.0000	0.003	1.970	0.023	0.001	1.03	0.05	
3	15	0.183	0.057	0.003	0.0006	34.90	0.0016	0.081	2.99	2.67	0.42	0.013	0.0000	0.003	1.828	0.023	0.001	0.96	0.16	
4	22	0.328	0.088	0.003	0.0006	30.30	0.0021	0.090	5.78	2.27	0.74	0.023	0.0000	0.003	1.548	0.022	0.001	0.83	0.27	
5	28	0.587	0.135	0.003	0.0007	28.36	0.0032	0.116	9.44	2.10	1.28	0.039	0.0001	0.004	1.443	0.023	0.001	0.77	0.46	
6	35	0.679	0.154	0.003	0.0008	26.36	0.0037	0.128	10.70	1.91	1.61	0.050	0.0001	0.004	1.312	0.022	0.002	0.71	0.54	
7	42	0.849	0.190	0.003	0.0010	22.10	0.0044	0.149	13.36	1.51	2.23	0.071	0.0001	0.005	1.021	0.022	0.002	0.57	0.69	
8	48	1.045	0.242	0.003	0.0014	23.30	0.0055	0.198	16.22	1.45	3.39	0.114	0.0001	0.009	0.931	0.025	0.002	0.54	0.92	
9	57	0.990	0.227	0.003	0.0013	20.84	0.0052	0.188	15.16	1.18	3.23	0.108	0.0001	0.009	0.807	0.023	0.002	0.47	0.84	
10	64	0.825	0.194	0.002	0.0012	20.01	0.0045	0.167	12.79	0.98	2.95	0.097	0.0001	0.010	0.740	0.022	0.002	0.44	0.70	
11	71	0.713	0.168	0.002	0.0011	19.80	0.0040	0.150	11.05	0.82	2.73	0.085	0.0001	0.010	0.723	0.020	0.002	0.44	0.60	
12	77	0.640	0.147	0.002	0.0010	20.04	0.0036	0.134	9.75	0.68	2.55	0.071	0.0001	0.010	0.744	0.019	0.002	0.45	0.52	
13	84	0.428	0.087	0.001	0.0006	14.95	0.0024	0.076	6.26	0.31	1.56	0.029	0.0001	0.008	0.603	0.013	0.001	0.35	0.29	
14	91	-1.235	-0.294	-0.006	-0.0018	-54.60	-0.0069	-0.268	-19.36	-3.62	-3.81	-0.126	-0.0001	-0.012	-2.468	-0.044	-0.003	-1.40	-1.08	
15	98	-1.359	-0.320	-0.006	-0.0020	-58.08	-0.0076	-0.289	-21.33	-3.71	-4.18	-0.134	-0.0002	-0.014	-2.608	-0.048	-0.003	-1.48	-1.16	
16	106	-1.415	-0.330	-0.006	-0.0020	-59.87	-0.0080	-0.298	-22.07	-3.67	-4.42	-0.137	-0.0002	-0.015	-2.673	-0.049	-0.003	-1.52	-1.19	
17	113	-1.436	-0.332	-0.006	-0.0021	-61.35	-0.0081	-0.301	-22.19	-3.62	-4.62	-0.137	-0.0002	-0.017	-2.726	-0.050	-0.004	-1.55	-1.21	
18	119																			
19	126																			
20	133																			
21	140																			
22	147																			
23	154																			
24	161																			
25	168																			
26	175																			
27	182																			
28	189																			
29	197																			
30	204																			
31	210																			
32	218																			
33	224																			
34	230																			
35	238																			
36	245																			
37	253																			
38	259																			
39	265																			
40	273																			
41	280																			
42	287																			
43	294																			

Appendix 4.13 Table 7

Oxidation and Neutralization Results
Lime Amended Whole Tailings

Test: Leached under alternating wet/dry cycles

Water Sample: Bottom seepage

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO [Ca + Mg] [SO ₄]	NEUTRALIZATION		
		Cumulative Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/week)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)		Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/week) *	NP Consumed (%)
1	0	28	0.00		0.29	1.64	0.00	5.60	164		0.6
2	8	48	0.01	17.34	0.21	1.06	0.01	5.14	271	92.83	1.0
3	15	65	0.01	17.05	0.17	0.81	0.03	4.85	355	88.98	1.3
4	22	77	0.01	15.61	0.13	0.51	0.06	4.36	412	78.79	1.5
5	28	90	0.01	15.45	0.13	0.45	0.12	4.30	469	76.15	1.7
6	35	103	0.01	14.97	0.14	0.46	0.12	4.26	527	72.50	2.0
7	42	115	0.01	13.76	0.12	0.44	0.12	4.59	583	64.41	2.2
8	48	138	0.02	15.47	0.24	0.88	0.24	4.72	695	72.19	2.6
9	57	152	0.02	14.92	0.15	0.37	0.07	2.95	739	65.41	2.7
10	64	171	0.02	15.68	0.20	0.42	0.07	2.54	789	62.17	2.9
11	71	192	0.02	17.34	0.22	0.43	0.07	2.25	839	60.74	3.1
12	77	214	0.02	19.93	0.23	0.40	0.07	2.03	886	60.61	3.3
13	84	232	0.03	18.36	0.18	0.29	0.05	1.86	921	43.79	3.4
14	91										
15	98										
16	106										
17	113										
18	119										
19	126										
20	133										
21	140										
22	147										
23	154										
24	161										
25	168										
26	175										
27	182										
28	189										
29	197										
30	204										
31	210										
32	218										
33	224										
34	230										
35	238										
36	245										
37	253										
38	259										
39	265										
40	273										
41	280										
42	287										
43	294										

* Rates of sulfate production and NP depletion are 5-week moving averages

Appendix 4.14

Backfill Coarse Tailings - Leached Under Wet/Dry Cycles Followed by Saturated Conditions

Appendix 4.14 Table 1

Sample Characterization Backfill Coarse Tailings - Leached under wet/dry cycles followed by saturated conditions

Metals Analysis		Tails (ppm)	Groundwater (mg/L)
Aluminum	Al	18400	<0.03
Antimony	Sb	70	<0.04
Arsenic	As	2600	<0.005
Barium	Ba	50	0.012
Beryllium	Be	<50	<0.005 *
Bismuth	Bi	<20	<0.20 *
Cadmium	Cd	20	<0.005
Calcium	Ca	5600	25.0
Carbon	C	4400	NA
Chromium	Cr	30	<0.005
Cobalt	Co	79	<0.010
Copper	Cu	500	0.027
Gallium	Ga	13	NA
Iron	Fe	268000	0.030
Lead	Pb	2900	<0.04
Lithium	Li	NA	NA
Magnesium	Mg	11200	13.000
Manganese	Mn	520	0.011
Mercury	Hg	2.0	<0.0002
Molybdenum	Mo	<20	<0.020
Nickel	Ni	<20	<0.015
Phosphorus	P	NA	NA
Potassium	K	3900	0.750
Selenium	Se	38	<0.005
Silicon	Si	150000	NA
Silver	Ag	17.4	<0.005
Sodium	Na	800	1.90
Strontium	Sr	NA	NA
Thallium	Tl	10	<0.040
Tin	Sn	22	<0.24
Titanium	Ti	1200	<0.050
Tungsten	W	NA	NA
Vanadium	V	NA	NA
Zinc	Zn	6000	0.44
Sulfate	SO4	2900	9.90
Sulfur	S	297000	NA

ABA Results	
Paste pH	6.0
S (Total) (%)	29.0
SO4 (%)	2900
S (sulfide) (%)	28.3
AP (kg CaCO3/tonne)	906
NP (kg CaCO3/tonne)	25
CO2 (%)	1.29
CO3 NP (kg CaCO3/tonne)	30
Net NP (kg CaCO3/tonne)	-881
NP/AP	0.03

Sample Mass (kg)	8.12
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* Value Estimated

Note: NA = Not Analyzed

Appendix 4.14 Table 2

Parameters Measured Weekly Backfill Coarse Tailings

Test: **Leached under wet/dry cycles followed by saturated conditions**
 Water Sample: **Bottom seepage**

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) **	CUMULATIVE SULFATE (mg/kg)
19-Oct	1*	7	4.500	6.3	3830			2300	1275
14-Dec	2*	63	0.000						1275
21-Dec	3	70	4.400	6.0	2610	70		1480	2071
28-Dec	4	77	4.500	6.5	2430	24		1570	2936
3-Jan	5	83	0.400	7.0	2750	44		1055	2987
11-Jan	6	91	4.500	6.6	773	71		540	3281
17-Jan	7	97	2.750	6.6	829	86		370	3403
23-Jan	8	103	0.500	6.7	916	87		332	3423
30-Jan	9	110	0.500	6.7	876	96		294	3440
8-Feb	10	119	4.500	7.2	617	110		256	3577
15-Feb	11	126	0.500	6.8	815	72		255	3592
21-Feb	12	132	0.500	7.0	688	90		255	3607
28-Feb	13	139	0.500	7.0	848	100		254	3622
7-Mar	14	146	0.500	7.0	764	110		253	3637
13-Mar	15	152	0.500	7.0	697	110		252	3652
21-Mar	16	160	0.500	7.0	704	120		252	3667
28-Mar	17	167	0.500	7.1	681	110		251	3682
4-Apr	18	174	4.500	7.0	708	120		250	3815
10-Apr	19	180	0.500	7.1	678	80		251	3829
18-Apr	20	188	0.500	7.4	737	96		253	3844
25-Apr	21	195	0.500	7.5	704	110		254	3859
1-May	22	201	0.500	7.4	724	110		255	3875
8-May	23	208	0.500	7.2	736	110		256	3890
15-May	24	215	0.500	7.1	665	10		258	3905
22-May	25	222	0.500	7.3	642	110		259	3920
31-May	26	231	0.500	7.2	639	110		260	3936
6-Jun	27	237	0.500	7.4	655	100		261	3951
12-Jun	28	243	0.500	7.0	655	100		263	3967
20-Jun	29	251	0.500	7.2	660	97		264	3982
26-Jun	30	257	0.500	7.1	684	100		265	3998
3-Jul	31	264	0.500	7.2	693			266	4014
11-Jul	32	272	0.250	7.1	686			268	4022
17-Jul	33	278	0.000					269	4022
25-Jul	34	286	2.000	6.9	694	90		270	4086
31-Jul	35	292	0.250	7.0	688				
7-Aug	36	299	0.250	6.8	724				
14-Aug	37	306	0.250	7.2	720				
21-Aug	38	313	0.250	7.0	673				
30-Aug	39	322	0.250	6.9	726				
6-Sep	40	329	2.000	7.1	715	81			
11-Sep	41	334	2.000	6.9	744	66			
18-Sep	42	341	2.000	7.2	683	66			
25-Sep	43	348	2.000	7.0	633	62			
3-Oct	44	356	2.000	7.0	572	64			
10-Oct	45	363	2.000	6.9	517	66			
17-Oct	46	370	2.000	7.0	478				
23-Oct	47	376	2.000	7.1	485				
30-Oct	48	383	2.000	7.1	458				
6-Nov	49	390	2.000	6.9	472				

* Wet dry cycles ** Measured values of sulfate shown in bold

Appendix 4.14 Table 3

Leachate Analysis
Backfill Coarse Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) **																		
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn	
1*	7	2.40	0.530	0.130	0.330	440	0.03	0.70	0.170	44.0	1.20	220.0	27.0	0.37	8.80	0.160	0.022	43.0	240.0	
2*	63																			
3	70	4.70	1.500	0.044	0.230	480	0.03	0.63	0.350	100.0	3.50	320.0	44.0	0.48	8.40	0.360	0.057	38.0	190.0	
4	77	0.24	0.080	0.025	0.069	460	< 0.005	0.17	0.042	2.20	0.43	88.0	13.0	0.17	4.80	0.056	0.015	6.80	64.0	
5	83	0.32	0.086	0.027	0.052	350	< 0.005	0.12	0.041	2.50	0.46	65.0	9.10	0.12	4.80	0.043	0.010	4.60	43.0	
6	91	0.39	0.091	0.029	0.034	240	< 0.005	0.06	0.039	2.80	0.48	42.0	5.20	0.06	4.80	0.030	< 0.005	3.40	22.0	
7	97	0.05	0.022	0.032	0.021	200	< 0.005	0.03	0.007	0.02	0.03	31.0	3.60	0.04	2.80	0.015	< 0.005	3.10	12.0	
8	103	0.04	0.022	0.033	0.016	165	0.005	0.03	0.007	0.02	0.04	28.3	3.03	0.03	3.47	0.012	0.005	3.20	9.1	
9	110	0.04	0.021	0.033	0.011	131	0.005	0.02	0.008	0.02	0.06	25.7	2.47	0.03	4.13	0.008	0.005	3.30	6.3	
10	119	0.03	0.021	0.034	0.006	96	< 0.005	0.01	0.008	< 0.02	0.07	23.0	1.90	< 0.02	4.80	< 0.005	< 0.005	3.40	3.4	
11	126	0.03	0.024	0.03	0.006	132	0.005	0.01	0.008	0.02	0.07	24.3	1.91	0.02	4.3	0.005	0.005	3.50	3.1	
12	132	0.04	0.028	0.03	0.006	167	0.005	0.01	0.007	0.02	0.07	25.5	1.93	0.02	3.9	0.005	0.005	3.60	2.9	
13	139	0.04	0.031	0.03	0.006	203	0.005	0.01	0.007	0.03	0.06	26.8	1.94	0.02	3.4	0.005	0.005	3.70	2.6	
14	146	0.05	0.034	0.03	0.006	238	0.005	0.01	0.007	0.03	0.06	28.0	1.95	0.02	3.0	0.005	0.005	3.80	2.4	
15	152	0.05	0.037	0.03	0.005	274	0.005	0.01	0.006	0.03	0.05	29.3	1.96	0.02	2.5	0.005	0.005	3.90	2.1	
16	160	0.06	0.041	0.03	0.005	309	0.005	0.01	0.006	0.03	0.05	30.5	1.98	0.02	2.0	0.005	0.005	4.00	1.8	
17	167	0.06	0.044	0.03	0.005	345	0.005	0.01	0.005	0.03	0.04	31.8	1.99	0.02	1.6	0.005	0.005	4.10	1.6	
18	174	0.07	0.047	0.03	< 0.005	380	< 0.005	< 0.01	< 0.006	0.04	0.04	33.0	2.00	< 0.02	1.1	< 0.005	< 0.005	4.20	1.3	
19	180	0.07	0.047	0.03	0.005	362	0.005	0.01	0.005	0.04	0.04	33.6	2.03	0.02	1.1	0.008	0.005	4.22	1.3	
20	188	0.06	0.047	0.03	0.005	343	0.005	0.01	0.005	0.03	0.04	34.1	2.05	0.02	1.0	0.011	0.005	4.25	1.2	
21	195	0.06	0.047	0.03	0.005	325	0.005	0.01	0.005	0.03	0.04	34.7	2.08	0.02	1.0	0.014	0.005	4.28	1.2	
22	201	0.06	0.047	0.03	0.005	306	0.005	0.01	0.005	0.03	0.04	35.3	2.10	0.02	1.0	0.017	0.005	4.30	1.1	
23	208	0.06	0.047	0.03	0.005	288	0.005	0.01	0.005	0.03	0.03	35.8	2.13	0.02	0.9	0.020	0.005	4.33	1.1	
24	215	0.06	0.047	0.03	0.005	269	0.005	0.01	0.005	0.03	0.03	36.4	2.15	0.02	0.9	0.023	0.005	4.35	1.0	
25	222	0.05	0.047	0.03	0.005	251	0.005	0.01	0.005	0.03	0.03	36.9	2.18	0.02	0.9	0.026	0.005	4.38	1.0	
26	231	0.05	0.047	0.03	0.005	233	0.005	0.01	0.005	0.03	0.03	37.5	2.20	0.02	0.9	0.029	0.005	4.40	1.0	
27	237	0.05	0.046	0.03	0.005	214	0.005	0.01	0.005	0.03	0.03	38.1	2.23	0.02	0.8	0.031	0.005	4.43	0.9	
28	243	0.05	0.046	0.03	0.005	196	0.005	0.01	0.005	0.03	0.03	38.6	2.25	0.02	0.8	0.034	0.005	4.45	0.9	
29	251	0.05	0.046	0.03	0.005	177	0.005	0.01	0.005	0.03	0.03	39.2	2.28	0.02	0.8	0.037	0.005	4.48	0.8	
30	257	0.04	0.046	0.03	0.005	159	0.005	0.01	0.005	0.02	0.03	39.8	2.30	0.02	0.7	0.040	0.005	4.50	0.8	
31	264	0.04	0.046	0.03	0.005	140	0.005	0.01	0.005	0.02	0.03	40.3	2.33	0.02	0.7	0.043	0.005	4.53	0.7	
32	272	0.04	0.046	0.03	0.005	122	0.005	0.01	0.005	0.02	0.03	40.9	2.35	0.02	0.7	0.046	0.005	4.55	0.7	
33	278	0.04	0.046	0.03	0.005	103	0.005	0.01	0.005	0.02	0.02	41.4	2.38	0.02	0.6	0.049	0.005	4.58	0.7	
34	286	0.04	0.046	0.03	< 0.005	85	< 0.005	< 0.01	< 0.005	< 0.02	0.02	42.0	2.40	< 0.02	< 0.6	0.052	< 0.005	4.60	0.62	
35	292																			
36	299																			

* Wet dry cycles

** Measured values shown in bold

Appendix 4.14 Table 4

Cumulative Mass Flux
Backfill Coarse Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																		
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn	
1*	7	1.33	0.294	0.072	0.183	243.8	0.015	0.388	0.094	24.4	0.67	121.9	14.96	0.205	4.88	0.089	0.012	23.8	133.0	
2*	63	1.33	0.294	0.072	0.183	243.8	0.015	0.388	0.094	24.4	0.67	121.9	14.96	0.205	4.88	0.089	0.012	23.8	133.0	
3	70	3.87	1.105	0.089	0.306	490.4	0.028	0.727	0.269	78.6	2.55	288.3	38.80	0.461	9.02	0.282	0.042	43.4	235.7	
4	77	3.99	1.148	0.097	0.343	731.5	0.030	0.818	0.278	79.8	2.78	329.8	46.00	0.551	11.27	0.312	0.049	45.6	270.9	
5	83	4.01	1.152	0.097	0.345	747.5	0.030	0.824	0.278	79.9	2.80	332.4	46.45	0.557	11.47	0.314	0.049	45.7	273.0	
6	91	4.22	1.201	0.107	0.363	866.6	0.031	0.856	0.285	81.4	3.05	348.5	49.32	0.588	13.71	0.329	0.050	46.5	285.0	
7	97	4.23	1.208	0.114	0.369	925.9	0.032	0.866	0.278	81.4	3.06	354.6	50.54	0.598	14.40	0.334	0.051	46.9	288.9	
8	103	4.23	1.209	0.115	0.370	934.5	0.032	0.867	0.277	81.4	3.06	355.5	50.72	0.600	14.57	0.334	0.051	47.0	289.4	
9	110	4.23	1.210	0.116	0.371	941.0	0.032	0.868	0.276	81.4	3.06	356.3	50.87	0.601	14.78	0.334	0.052	47.1	289.8	
10	119	4.24	1.220	0.128	0.372	980.4	0.034	0.871	0.265	81.4	3.09	361.8	51.92	0.608	17.02	0.336	0.053	47.9	291.4	
11	126	4.24	1.222	0.130	0.373	986.9	0.034	0.872	0.264	81.4	3.09	362.5	52.04	0.609	17.25	0.336	0.053	48.0	291.6	
12	132	4.24	1.223	0.131	0.373	995.7	0.034	0.872	0.263	81.4	3.10	363.3	52.16	0.609	17.44	0.336	0.053	48.1	291.8	
13	139	4.24	1.225	0.132	0.373	1006.6	0.034	0.872	0.262	81.4	3.10	364.1	52.27	0.610	17.60	0.336	0.053	48.2	291.9	
14	146	4.25	1.227	0.134	0.373	1019.7	0.034	0.873	0.260	81.4	3.10	365.1	52.39	0.611	17.74	0.336	0.054	48.4	292.0	
15	152	4.25	1.229	0.135	0.373	1035.0	0.034	0.873	0.259	81.4	3.10	366.1	52.51	0.612	17.84	0.337	0.054	48.5	292.1	
16	160	4.25	1.231	0.136	0.374	1052.5	0.035	0.873	0.258	81.4	3.11	367.1	52.63	0.612	17.92	0.337	0.054	48.6	292.2	
17	167	4.25	1.234	0.138	0.374	1072.2	0.035	0.874	0.256	81.4	3.11	368.3	52.76	0.613	17.97	0.337	0.054	48.7	292.3	
18	174	4.28	1.259	0.149	0.375	1268.9	0.036	0.876	0.244	81.4	3.12	379.4	53.86	0.620	18.17	0.338	0.055	50.0	292.7	
19	180	4.29	1.261	0.150	0.375	1289.7	0.036	0.877	0.243	81.4	3.12	380.7	53.98	0.621	18.19	0.339	0.056	50.2	292.8	
20	188	4.29	1.264	0.152	0.375	1309.2	0.036	0.877	0.241	81.4	3.12	382.0	54.11	0.622	18.20	0.339	0.056	50.3	292.8	
21	195	4.29	1.267	0.153	0.376	1327.7	0.037	0.877	0.240	81.4	3.12	383.3	54.24	0.622	18.22	0.340	0.056	50.4	292.9	
22	201	4.29	1.270	0.154	0.376	1345.0	0.037	0.878	0.239	81.4	3.12	384.7	54.36	0.623	18.23	0.341	0.056	50.6	292.9	
23	208	4.30	1.272	0.155	0.376	1361.2	0.037	0.878	0.237	81.4	3.12	386.1	54.49	0.624	18.25	0.342	0.056	50.7	293.0	
24	215	4.30	1.275	0.157	0.376	1376.3	0.037	0.878	0.236	81.4	3.12	387.5	54.63	0.625	18.26	0.343	0.056	50.9	293.0	
25	222	4.30	1.278	0.158	0.376	1390.2	0.037	0.878	0.235	81.4	3.12	389.0	54.76	0.625	18.26	0.344	0.056	51.0	293.0	
26	231	4.30	1.280	0.159	0.376	1402.9	0.037	0.879	0.233	81.4	3.13	390.5	54.89	0.626	18.27	0.346	0.057	51.2	293.1	
27	237	4.31	1.283	0.160	0.377	1414.6	0.038	0.879	0.232	81.4	3.13	392.0	55.03	0.627	18.27	0.348	0.057	51.4	293.1	
28	243	4.31	1.286	0.162	0.377	1425.1	0.038	0.879	0.231	81.4	3.13	393.6	55.17	0.628	18.28	0.350	0.057	51.5	293.1	
29	251	4.31	1.289	0.163	0.377	1434.5	0.038	0.880	0.229	81.4	3.13	395.2	55.31	0.629	18.28	0.352	0.057	51.7	293.2	
30	257	4.31	1.291	0.164	0.377	1442.7	0.038	0.880	0.228	81.4	3.13	396.9	55.45	0.629	18.28	0.354	0.057	51.8	293.2	
31	264	4.31	1.294	0.165	0.377	1449.8	0.038	0.880	0.227	81.4	3.13	398.5	55.59	0.630	18.27	0.357	0.057	52.0	293.2	
32	272	4.31	1.295	0.166	0.377	1452.8	0.038	0.880	0.226	81.4	3.13	399.4	55.66	0.630	18.27	0.358	0.057	52.1	293.2	
33	278	4.31	1.295	0.166	0.377	1452.8	0.038	0.880	0.226	81.4	3.13	399.4	55.66	0.630	18.27	0.358	0.057	52.1	293.2	
34	286	4.32	1.306	0.170	0.378	1467.6	0.039	0.882	0.220	81.4	3.13	406.5	56.25	0.634	18.23	0.370	0.058	52.7	293.2	
35	292																			
36	299																			

* Wet dry cycles

Note: mass flux values for cycles conducted under saturated conditions have been corrected for metals content in groundwater

Appendix 4.14 Table 5

Cumulative Metal Extractions
Backfill Coarse Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7	0.007	0.011	0.144	0.914	4.4	0.050	0.491	0.019	0.009	0.023	1.09	2.88	1.03	0.13	0.23	0.07	2.98	2.22
2*	63	0.007	0.011	0.144	0.914	4.4	0.050	0.491	0.019	0.009	0.023	1.09	2.88	1.03	0.13	0.23	0.07	2.98	2.22
3	70	0.021	0.043	0.179	1.531	8.8	0.094	0.920	0.054	0.029	0.088	2.57	7.46	2.31	0.23	0.74	0.24	5.42	3.93
4	77	0.022	0.044	0.193	1.715	13.1	0.099	1.035	0.056	0.030	0.096	2.94	8.85	2.76	0.29	0.82	0.28	5.69	4.52
5	83	0.022	0.044	0.195	1.727	13.3	0.099	1.042	0.056	0.030	0.097	2.97	8.93	2.78	0.29	0.83	0.28	5.71	4.55
6	91	0.023	0.046	0.213	1.814	15.5	0.104	1.084	0.057	0.030	0.105	3.11	9.48	2.94	0.35	0.87	0.29	5.81	4.75
7	97	0.023	0.046	0.227	1.846	16.5	0.107	1.096	0.056	0.030	0.105	3.17	9.72	2.99	0.37	0.88	0.29	5.87	4.82
8	103	0.023	0.047	0.230	1.850	16.7	0.107	1.097	0.055	0.030	0.105	3.17	9.75	3.00	0.37	0.88	0.30	5.88	4.82
9	110	0.023	0.047	0.232	1.853	16.8	0.108	1.099	0.055	0.030	0.106	3.18	9.78	3.00	0.38	0.88	0.30	5.89	4.83
10	119	0.023	0.047	0.257	1.862	17.5	0.112	1.103	0.053	0.030	0.107	3.23	9.98	3.04	0.44	0.88	0.30	5.99	4.86
11	126	0.023	0.047	0.259	1.863	17.6	0.113	1.103	0.053	0.030	0.107	3.24	10.01	3.04	0.44	0.88	0.31	6.00	4.86
12	132	0.023	0.047	0.262	1.864	17.8	0.113	1.104	0.053	0.030	0.107	3.24	10.03	3.05	0.45	0.88	0.31	6.02	4.86
13	139	0.023	0.047	0.265	1.865	18.0	0.114	1.104	0.052	0.030	0.107	3.25	10.05	3.05	0.45	0.88	0.31	6.03	4.86
14	146	0.023	0.047	0.267	1.866	18.2	0.114	1.105	0.052	0.030	0.107	3.26	10.08	3.05	0.45	0.89	0.31	6.04	4.87
15	152	0.023	0.047	0.270	1.867	18.5	0.115	1.105	0.052	0.030	0.107	3.27	10.10	3.06	0.46	0.89	0.31	6.06	4.87
16	160	0.023	0.047	0.273	1.868	18.8	0.115	1.105	0.052	0.030	0.107	3.28	10.12	3.06	0.46	0.89	0.31	6.08	4.87
17	167	0.023	0.047	0.275	1.869	19.1	0.116	1.106	0.051	0.030	0.107	3.29	10.15	3.07	0.46	0.89	0.31	6.09	4.87
18	174	0.023	0.048	0.298	1.876	22.7	0.120	1.109	0.049	0.030	0.108	3.39	10.36	3.10	0.47	0.89	0.32	6.25	4.88
19	180	0.023	0.049	0.301	1.876	23.0	0.121	1.110	0.049	0.030	0.108	3.39	10.36	3.10	0.47	0.89	0.32	6.27	4.88
20	188	0.023	0.049	0.304	1.877	23.4	0.121	1.110	0.048	0.030	0.108	3.40	10.38	3.10	0.47	0.89	0.32	6.29	4.88
21	195	0.023	0.049	0.306	1.878	23.7	0.122	1.110	0.048	0.030	0.108	3.41	10.41	3.11	0.47	0.89	0.32	6.29	4.88
22	201	0.023	0.049	0.309	1.879	24.0	0.123	1.111	0.048	0.030	0.108	3.42	10.43	3.11	0.47	0.89	0.32	6.31	4.88
23	208	0.023	0.049	0.311	1.879	24.3	0.123	1.111	0.047	0.030	0.108	3.43	10.45	3.12	0.47	0.90	0.32	6.34	4.88
24	215	0.023	0.049	0.313	1.880	24.6	0.124	1.112	0.047	0.030	0.108	3.45	10.48	3.12	0.47	0.90	0.32	6.34	4.88
25	222	0.023	0.049	0.316	1.881	24.8	0.124	1.112	0.047	0.030	0.108	3.46	10.51	3.12	0.47	0.90	0.32	6.36	4.88
26	231	0.023	0.049	0.318	1.882	25.1	0.125	1.112	0.047	0.030	0.108	3.47	10.53	3.13	0.47	0.91	0.32	6.38	4.88
27	237	0.023	0.049	0.321	1.883	25.3	0.125	1.113	0.046	0.030	0.108	3.49	10.56	3.13	0.47	0.91	0.33	6.40	4.88
28	243	0.023	0.049	0.323	1.883	25.4	0.126	1.113	0.046	0.030	0.108	3.50	10.58	3.13	0.47	0.92	0.33	6.42	4.88
29	251	0.023	0.050	0.325	1.884	25.6	0.126	1.114	0.046	0.030	0.108	3.51	10.61	3.14	0.47	0.92	0.33	6.44	4.89
30	257	0.023	0.050	0.328	1.885	25.8	0.127	1.114	0.046	0.030	0.108	3.50	10.66	3.15	0.47	0.93	0.33	6.46	4.89
31	264	0.023	0.050	0.330	1.886	25.9	0.127	1.114	0.045	0.030	0.108	3.54	10.69	3.15	0.47	0.94	0.33	6.48	4.89
32	272	0.023	0.050	0.331	1.886	25.9	0.127	1.115	0.045	0.030	0.108	3.56	10.70	3.15	0.47	0.94	0.33	6.50	4.89
33	278	0.023	0.050	0.331	1.886	25.9	0.127	1.115	0.045	0.030	0.108	3.57	10.70	3.15	0.47	0.94	0.33	6.51	4.89
34	286	0.023	0.050	0.340	1.889	26.2	0.129	1.116	0.044	0.030	0.108	3.57	10.70	3.15	0.47	0.94	0.33	6.51	4.89
35	292																		
36	299																		

* Wet dry cycles

Compiled by: RWL
Checked by: JET

Appendix 4.14 Table 6

Metal Extraction Rates
Backfill Coarse Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/wk) - 5 Cycle Moving Average																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7																		
2*	63																		
3	70	0.282	0.090	0.002	0.014	27.39	0.0015	0.038	0.019	6.019	0.210	18.48	2.65	0.0284	0.46	0.0215	0.0033	2.17	11.413
4	77	0.266	0.085	0.002	0.016	48.76	0.0015	0.043	0.018	5.537	0.211	20.79	3.10	0.0346	0.64	0.0223	0.0036	2.17	13.794
5	83	0.247	0.079	0.002	0.015	46.39	0.0014	0.040	0.017	5.111	0.197	19.39	2.90	0.0324	0.61	0.0208	0.0034	2.01	12.898
6	91	0.240	0.076	0.003	0.015	51.90	0.0013	0.039	0.016	4.753	0.199	18.88	2.86	0.0319	0.74	0.0201	0.0032	1.89	12.666
7	97	0.597	0.188	0.009	0.038	140.42	0.0035	0.098	0.038	11.741	0.492	47.90	7.32	0.0809	1.96	0.0504	0.0080	4.75	32.097
8	103	0.077	0.022	0.005	0.014	94.21	0.0008	0.030	0.002	0.606	0.108	14.26	2.53	0.0294	1.18	0.0110	0.0021	0.77	11.395
9	110	0.050	0.013	0.004	0.006	44.46	0.0006	0.011	0.000	0.351	0.060	5.61	1.03	0.0105	0.75	0.0047	0.0006	0.33	3.999
10	119	0.045	0.013	0.006	0.005	45.29	0.0008	0.009	-0.003	0.297	0.057	5.72	1.06	0.0100	1.08	0.0042	0.0008	0.43	3.577
11	126	0.005	0.004	0.005	0.002	24.06	0.0005	0.003	-0.004	-0.002	0.008	2.81	0.54	0.0041	0.71	0.0013	0.0005	0.30	1.323
12	132	0.003	0.003	0.003	0.001	13.96	0.0004	0.001	-0.003	-0.002	0.008	1.75	0.32	0.0022	0.61	0.0005	0.0004	0.24	0.570
13	139	0.003	0.003	0.003	0.001	14.02	0.0004	0.001	-0.003	-0.001	0.008	1.68	0.30	0.0020	0.59	0.0004	0.0004	0.24	0.476
14	146	0.003	0.003	0.003	0.001	15.30	0.0004	0.001	-0.003	-0.001	0.008	1.71	0.30	0.0019	0.58	0.0004	0.0004	0.25	0.429
15	152	0.002	0.002	0.001	0.000	11.59	0.0002	0.000	-0.001	0.000	0.003	0.90	0.13	0.0008	0.17	0.0002	0.0002	0.12	0.142
16	160	0.002	0.002	0.001	0.000	13.50	0.0002	0.000	-0.001	0.000	0.002	0.95	0.12	0.0008	0.14	0.0002	0.0002	0.12	0.121
17	167	0.002	0.002	0.001	0.000	15.30	0.0002	0.000	-0.001	0.000	0.002	1.00	0.12	0.0008	0.11	0.0002	0.0002	0.12	0.101
18	174	0.008	0.007	0.003	0.000	52.46	0.0004	0.001	-0.003	0.001	0.004	3.05	0.32	0.0020	0.11	0.0004	0.0004	0.36	0.170
19	180	0.008	0.007	0.003	0.000	55.57	0.0004	0.001	-0.004	0.001	0.004	3.21	0.33	0.0021	0.09	0.0004	0.0004	0.37	0.161
20	188	0.008	0.007	0.003	0.000	53.32	0.0004	0.001	-0.003	0.001	0.003	3.09	0.31	0.0019	0.07	0.0005	0.0004	0.36	0.142
21	195	0.008	0.007	0.003	0.000	55.04	0.0004	0.001	-0.004	0.001	0.003	3.23	0.32	0.0020	0.06	0.0006	0.0004	0.37	0.138
22	201	0.008	0.007	0.003	0.000	56.17	0.0004	0.001	-0.004	0.001	0.003	3.37	0.33	0.0021	0.05	0.0008	0.0004	0.38	0.136
23	208	0.003	0.003	0.001	0.000	19.00	0.0002	0.000	-0.001	0.000	0.001	1.37	0.13	0.0008	0.02	0.0007	0.0002	0.15	0.046
24	215	0.003	0.003	0.001	0.000	17.32	0.0002	0.000	-0.001	0.000	0.001	1.37	0.13	0.0008	0.01	0.0009	0.0002	0.15	0.042
25	222	0.003	0.003	0.001	0.000	16.66	0.0002	0.000	-0.001	0.000	0.001	1.45	0.13	0.0008	0.01	0.0011	0.0002	0.15	0.041
26	231	0.002	0.003	0.001	0.000	14.63	0.0001	0.000	-0.001	0.000	0.001	1.40	0.13	0.0007	0.01	0.0012	0.0001	0.15	0.036
27	237	0.002	0.003	0.001	0.000	13.53	0.0001	0.000	-0.001	0.000	0.001	1.43	0.13	0.0007	0.01	0.0014	0.0001	0.15	0.034
28	243	0.002	0.003	0.001	0.000	12.78	0.0002	0.000	-0.001	0.000	0.001	1.51	0.13	0.0008	0.01	0.0016	0.0002	0.15	0.032
29	251	0.002	0.003	0.001	0.000	11.32	0.0001	0.000	-0.001	0.000	0.001	1.50	0.13	0.0007	0.00	0.0017	0.0001	0.15	0.029
30	257	0.002	0.003	0.001	0.000	10.51	0.0002	0.000	-0.0014	0.000	0.001	1.58	0.14	0.0008	0.00	0.0020	0.0002	0.16	0.027
31	264	0.002	0.003	0.001	0.000	9.94	0.0002	0.000	-0.0014	0.000	0.001	1.71	0.15	0.0008	0.00	0.0023	0.0002	0.17	0.026
32	272	0.002	0.002	0.001	0.000	7.64	0.0001	0.000	-0.0012	0.000	0.000	1.48	0.13	0.0007	0.00	0.0021	0.0001	0.14	0.020
33	278	0.001	0.002	0.001	0.000	5.54	0.0001	0.000	-0.0009	0.000	0.000	1.16	0.10	0.0005	0.00	0.0017	0.0001	0.11	0.015
34	286	0.002	0.003	0.001	0.000	6.62	0.0002	0.000	-0.0018	-0.001	0.000	2.27	0.19	0.0010	-0.01	0.0037	0.0002	0.21	0.019
35	292																		
36	299																		

* Wet dry cycles

Appendix 4.14 Table 7

**Oxidation and Neutralization Results
Backfill Coarse Tailings**

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO [Ca + Mg] [SO ₄]	NEUTRALIZATION		
		Cumulative Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)		Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1**	7	1275	0.15		13.28	6.10	5.02	0.84	1111		4.4
2**	63	1275	0.15								0.0
3	70	2071	0.24	88.5	8.30	6.16	6.85	1.57	1301	21.1	5.2
4	77	2936	0.34	166.1	9.01	6.03	1.71	0.86	2075	96.3	8.3
5	83	2987	0.34	157.7	0.54	0.40	0.11	0.94	2125	93.4	8.5
6	91	3281	0.38	167.2	3.06	2.98	0.66	1.19	2489	114.8	10.0
7	97	3403	0.39	438.2	1.27	1.48	0.25	1.36	2663	548.2	10.7
8	103	3423	0.39	286.7	0.21	0.22	0.04	1.23	2688	294.2	10.8
9	110	3440	0.40	107.0	0.18	0.16	0.03	1.07	2707	134.2	10.8
10	119	3577	0.41	114.6	1.42	0.98	0.23	0.85	2829	136.8	11.3
11	126	3592	0.41	62.2	0.16	0.16	0.03	1.22	2848	71.7	11.4
12	132	3607	0.41	40.8	0.16	0.22	0.03	1.60	2873	42.1	11.5
13	139	3622	0.42	38.7	0.16	0.27	0.03	1.97	2904	41.9	11.6
14	146	3637	0.42	38.2	0.16	0.33	0.04	2.35	2940	45.3	11.8
15	152	3652	0.42	15.9	0.16	0.38	0.04	2.73	2983	32.7	11.9
16	160	3667	0.42	15.4	0.15	0.44	0.04	3.11	3031	37.7	12.1
17	167	3682	0.42	14.9	0.15	0.49	0.05	3.49	3085	42.4	12.3
18	174	3815	0.44	38.5	1.39	4.92	0.46	3.88	3622	143.7	14.5
19	180	3829	0.44	39.6	0.15	0.52	0.05	3.68	3679	152.1	14.7
20	188	3844	0.44	37.4	0.16	0.49	0.05	3.49	3734	146.0	14.9
21	195	3859	0.44	38.5	0.16	0.46	0.05	3.30	3785	150.9	15.1
22	201	3875	0.45	39.7	0.16	0.43	0.06	3.11	3834	154.3	15.3
23	208	3890	0.45	15.5	0.16	0.40	0.06	2.93	3880	53.1	15.5
24	215	3905	0.45	15.1	0.16	0.38	0.06	2.74	3924	48.9	15.7
25	222	3920	0.45	15.6	0.16	0.35	0.06	2.56	3965	47.6	15.9
26	231	3936	0.45	14.8	0.16	0.32	0.06	2.38	4003	42.3	16.0
27	237	3951	0.45	14.9	0.16	0.29	0.06	2.20	4038	39.7	16.2
28	243	3967	0.46	15.4	0.16	0.26	0.06	2.02	4071	38.2	16.3
29	251	3982	0.46	15.0	0.16	0.23	0.07	1.85	4101	34.5	16.4
30	257	3998	0.46	15.6	0.16	0.21	0.07	1.67	4129	32.8	16.5
31	264	4014	0.46	16.6	0.16	0.18	0.07	1.50	4153	31.9	16.6
32	272	4022	0.46	14.1	0.08	0.07	0.04	1.33	4164	25.2	16.7
33	278	4022	0.46	11.0	0.00	0.00	0.00		4164	18.6	16.7
34	286	4086	0.47	20.7	0.67	0.37	0.29	0.99	4231	25.9	16.9
35	292										
36	299										

* Rates of sulfate production and NP depletion are 5-week moving averages

** Wet dry cycles

Appendix 4.15

Backfill Cemented Coarse Tailings - Leached Under Wet/Dry Cycles Followed by Saturated Conditions

Appendix 4.15 Table 1

Sample Characterization Backfill Cemented Coarse Tailings - Leached under wet/dry cycles followed by saturated conditions

Metals Analysis		Tails (ppm)	Groundwater (mg/L)
Aluminum	Al	18400	<0.03
Antimony	Sb	70	<0.04
Arsenic	As	2600	<0.005
Barium	Ba	50	0.012
Beryllium	Be	<50	<0.005 *
Bismuth	Bi	<20	<0.20 *
Cadmium	Cd	20	<0.005
Calcium	Ca	5600	25.0
Carbon	C	4400	NA
Chromium	Cr	30	<0.005
Cobalt	Co	79	<0.010
Copper	Cu	500	0.027
Gallium	Ga	13	NA
Iron	Fe	268000	0.030
Lead	Pb	2900	<0.04
Lithium	Li	NA	NA
Magnesium	Mg	11200	13.000
Manganese	Mn	520	0.011
Mercury	Hg	2.0	<0.0002
Molybdenum	Mo	<20	<0.020
Nickel	Ni	<20	<0.015
Phosphorus	P	NA	NA
Potassium	K	3900	0.750
Selenium	Se	38	<0.005
Silicon	Si	150000	NA
Silver	Ag	17.4	<0.005
Sodium	Na	800	1.90
Strontium	Sr	NA	NA
Thallium	Tl	10	<0.040
Tin	Sn	22	<0.24
Titanium	Ti	1200	<0.050
Tungsten	W	NA	NA
Vanadium	V	NA	NA
Zinc	Zn	6000	0.44
Sulfate	SO4	2900	9.90
Sulfur	S	297000	NA

ABA Results	
Paste pH	6
S (Total) (%)	29
SO4 (%)	2900
S (sulfide) (%)	28.3
AP (kg CaCO3/tonne)	906
NP (kg CaCO3/tonne)	25
CO2 (%)	1.29
CO3 NP (kg CaCO3/tonne)	30
Net NP (kg CaCO3/tonne)	-881
NP/AP	0.03

Sample Mass (kg)	25.60
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* Value Estimated

Note: NA = Not Analyzed

Appendix 4.15 Table 2

Parameters Measured Weekly
Backfill Cemented Coarse Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) **	CUMULATIVE SULFATE (mg/kg)
19-Oct	1*	7	4.500	12.1	6830			1190	209
14-Dec	2*	63	4.500	11.4	4210	350		1390	454
21-Dec	3	70	4.500	12.0	4330	510		1340	687
28-Dec	4	77	4.500	10.0	3970	550		915	846
3-Jan	5	83	0.400	10.4	3860	470		738	858
11-Jan	6	91	4.500	11.9	3290	560		561	955
17-Jan	7	97	2.750	12.1	3190			485	1006
23-Jan	8	103	0.500	12.1	3110	530		409	1013
30-Jan	9	110	0.500	12.4	3120	520		332	1020
8-Feb	10	119	4.500	12.1	3145	520		256	1063
15-Feb	11	126	0.500	12.2	3100	510		265	1068
21-Feb	12	132	0.500	12.2	2990	500		275	1073
28-Feb	13	139	0.500	12.4	3180	500		284	1079
7-Mar	14	146	0.500	12.2	2910	500		293	1084
13-Mar	15	152	0.500	12.2	2710	500		302	1090
21-Mar	16	160	0.500	12.2	2810	480		312	1096
28-Mar	17	167	0.500	12.2	2790	480		321	1102
4-Apr	18	174	4.500	12.0	2810	440		330	1158
10-Apr	19	180	0.500	12.0	2710	470		334	1164
18-Apr	20	188	0.500	12.0	2690	470		339	1171
25-Apr	21	195	0.500	11.5	2540	450		343	1177
1-May	22	201	0.500	11.2	2670	420		348	1184
8-May	23	208	0.500	11.1	2630	400		352	1191
15-May	24	215	0.500	11.1	2300			356	1197
22-May	25	222	0.500	11.2	2310	410		361	1204
31-May	26	231	0.500	11.1	2350	390		365	1211
6-Jun	27	237	0.500	11.3	2380	380		369	1218
12-Jun	28	243	0.500	11.9	2220	370		374	1225
20-Jun	29	251	0.500	11.9	2220	370		378	1232
26-Jun	30	257	0.500	11.9	2190	340		383	1240
3-Jul	31	264	0.500	11.8	2160			387	1247
11-Jul	32	272	0.250	11.7	2060			391	1251
17-Jul	33	278	0.000					396	1251
25-Jul	34	286	2.000	11.5	2110	320		400	1281
31-Jul	35	292	0.250	11.1	2120				
7-Aug	36	299	0.250	10.8	2050				
14-Aug	37	306	0.250	11.8	2100				
21-Aug	38	313	0.250	11.3	2040				
30-Aug	39	322	0.250	11.3	1970				
6-Sep	40	329	2.000	11.4	1920	300			
11-Sep	41	334	2.000	11.3	2130	300			
18-Sep	42	341	2.000	11.8	2190	310			
25-Sep	43	348	2.000	11.2	2150	300			
3-Oct	44	356	2.000	11.3	2110	300			
10-Oct	45	363	2.000	11.5	2050	300			
17-Oct	46	370	2.000	11.2	1920				
23-Oct	47	376	2.000	11.1	2050				
30-Oct	48	383	2.000	11.0	1980				
6-Nov	49	390	2.000	11.2	2070				

* Wet dry cycles ** Measured values of sulfate shown in bold

Appendix 4.15 Table 3

Leachate Analysis
Backfill Cemented Coarse Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) **															
		Abrumum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn	
1*	7	0.30	0.012	0.230	570	1.700	0.035	0.16	0.770	0.06	< 0.005	0.064	456	0.088	160.0	0.075	
2*	63	0.14	0.011	0.060	250	0.017	0.009	0.23	< 0.040	1.30	0.021	0.030	244	0.034	65.0	0.037	
3	70	0.11	0.014	0.091	440	0.008	< 0.005	0.06	0.078	0.04	< 0.005	0.041	256	0.032	82.0	0.180	
4	77	0.10	0.012	0.084	410	< 0.005	0.008	0.16	0.075	0.07	< 0.005	0.034	197	0.040	56.0	0.020	
5	83	0.10	0.011	0.078	375	0.005	0.007	0.10	0.082	0.06	0.005	0.038	169	0.032	48.0	0.115	
6	91	0.10	0.010	0.072	340	< 0.005	0.005	0.03	0.089	0.06	< 0.005	0.042	140	0.024	40.0	0.210	
7	97	0.08	0.010	0.081	340	< 0.005	0.005	0.04	0.130	1.00	0.150	0.028	100	0.027	29.0	0.650	
8	103	0.08	0.009	0.072	323	0.005	0.005	0.03	0.109	0.68	0.102	0.027	91.7	0.025	26.0	0.440	
9	110	0.08	0.007	0.064	307	0.005	0.006	0.03	0.087	0.35	0.053	0.025	83.3	0.022	23.0	0.230	
10	119	0.08	< 0.006	0.055	290	< 0.005	0.006	0.02	0.066	0.03	0.005	0.024	75.0	0.020	20.0	0.020	
11	126	0.09	0.006	0.054	290	0.005	0.006	0.03	0.063	0.03	0.005	0.024	71.3	0.020	19.4	0.021	
12	132	0.09	0.006	0.053	290	0.005	0.006	0.05	0.060	0.03	0.005	0.024	67.5	0.019	18.8	0.022	
13	139	0.10	0.006	0.052	290	0.005	0.006	0.06	0.056	0.03	0.005	0.024	63.8	0.019	18.1	0.023	
14	146	0.10	0.006	0.051	290	0.005	0.006	0.07	0.053	0.03	0.005	0.024	60.0	0.018	17.5	0.025	
15	152	0.11	0.005	0.049	290	0.005	0.005	0.08	0.050	0.03	0.005	0.023	56.3	0.018	16.9	0.026	
16	160	0.11	0.005	0.048	290	0.005	0.005	0.10	0.047	0.03	0.005	0.023	52.5	0.017	16.3	0.027	
17	167	0.12	0.005	0.047	290	0.005	0.005	0.11	0.043	0.03	0.005	0.023	48.8	0.017	15.6	0.028	
18	174	0.12	< 0.006	0.046	290	< 0.005	< 0.005	0.12	< 0.040	< 0.03	< 0.006	0.023	45.0	0.016	15.0	0.029	
19	180	0.11	0.012	0.046	292	0.005	0.005	0.11	0.039	0.03	0.005	0.023	43.9	0.016	14.8	0.028	
20	188	0.11	0.018	0.046	294	0.005	0.005	0.11	0.037	0.03	0.005	0.023	42.9	0.017	14.6	0.028	
21	195	0.10	0.025	0.047	296	0.005	0.005	0.10	0.036	0.03	0.005	0.023	41.8	0.017	14.4	0.027	
22	201	0.10	0.031	0.047	298	0.005	0.005	0.10	0.034	0.03	0.005	0.023	40.8	0.017	14.3	0.027	
23	208	0.09	0.038	0.047	299	0.005	0.005	0.09	0.033	0.03	0.005	0.023	39.7	0.018	14.1	0.026	
24	215	0.09	0.044	0.047	301	0.005	0.005	0.08	0.031	0.03	0.005	0.023	38.6	0.018	13.9	0.026	
25	222	0.08	0.051	0.047	303	0.005	0.005	0.08	0.030	0.03	0.005	0.023	37.6	0.018	13.7	0.025	
26	231	0.08	0.058	0.048	305	0.005	0.005	0.07	0.029	0.03	0.005	0.024	36.5	0.019	13.5	0.025	
27	237	0.07	0.064	0.048	307	0.005	0.005	0.06	0.027	0.03	0.005	0.024	35.4	0.019	13.3	0.024	
28	243	0.07	0.071	0.048	309	0.005	0.005	0.06	0.026	0.03	0.005	0.024	34.4	0.019	13.1	0.023	
29	251	0.06	0.077	0.048	311	0.005	0.005	0.05	0.024	0.03	0.005	0.024	33.3	0.019	12.9	0.023	
30	257	0.06	0.084	0.048	313	0.005	0.005	0.05	0.023	0.03	0.005	0.024	32.3	0.020	12.8	0.022	
31	264	0.05	0.090	0.048	314	0.005	0.005	0.04	0.021	0.03	0.005	0.024	31.2	0.020	12.6	0.022	
32	272	0.05	0.097	0.049	316	0.005	0.005	0.03	0.020	0.03	0.005	0.024	30.1	0.020	12.4	0.021	
33	278	0.04	0.103	0.049	318	0.005	0.005	0.03	0.018	0.03	0.005	0.024	29.1	0.021	12.2	0.021	
34	286	0.04	0.110	0.049	320	< 0.005	< 0.005	0.02	0.017	< 0.03	0.005	0.024	28.0	0.021	12.0	< 0.020	
35	292																
36	299																

* Wet dry cycles

Appendix 4.15 Table 4

Cumulative Mass Flux
Backfill Cemented Coarse Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)														
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1*	7	0.05	0.002	0.040	100.2	0.299	0.006	0.028	0.14	0.0	0.001	0.011	80.2	0.015	28.1	0.013
2*	63	0.08	0.004	0.051	144.1	0.302	0.008	0.069	0.14	0.2	0.005	0.017	123.0	0.021	39.6	0.020
3	70	0.09	0.006	0.065	217.1	0.302	0.004	0.074	0.15	-2.0	0.004	0.024	167.9	0.027	53.6	-0.026
4	77	0.11	0.008	0.078	284.8	0.303	0.001	0.097	0.16	-4.3	0.002	0.030	202.4	0.033	63.1	-0.100
5	83	0.11	0.008	0.079	290.2	0.303	0.000	0.098	0.16	-4.5	0.002	0.030	205.0	0.034	63.9	-0.105
6	91	0.12	0.009	0.089	345.6	0.303	-0.004	0.098	0.18	-6.8	0.001	0.038	229.5	0.037	70.6	-0.145
7	97	0.13	0.010	0.097	379.4	0.304	-0.006	0.099	0.19	-8.1	0.016	0.041	240.2	0.040	73.5	-0.123
8	103	0.13	0.010	0.098	385.3	0.304	-0.006	0.099	0.19	-8.3	0.018	0.041	241.9	0.041	73.9	-0.123
9	110	0.13	0.010	0.099	390.8	0.304	-0.007	0.099	0.19	-8.6	0.019	0.042	243.6	0.041	74.4	-0.127
10	119	0.15	0.011	0.106	437.4	0.304	-0.011	0.097	0.20	-10.8	0.018	0.046	256.6	0.044	77.5	-0.201
11	126	0.15	0.011	0.107	442.5	0.304	-0.011	0.097	0.20	-11.1	0.018	0.046	258.0	0.044	77.9	-0.209
12	132	0.15	0.011	0.108	447.7	0.304	-0.011	0.097	0.20	-11.4	0.018	0.047	259.3	0.045	78.2	-0.217
13	139	0.15	0.011	0.109	452.9	0.304	-0.012	0.098	0.20	-11.6	0.017	0.047	260.5	0.045	78.5	-0.225
14	146	0.15	0.011	0.109	458.1	0.304	-0.012	0.099	0.20	-11.9	0.017	0.048	261.7	0.045	78.8	-0.233
15	152	0.15	0.011	0.110	463.2	0.304	-0.013	0.100	0.20	-12.1	0.017	0.048	262.8	0.046	79.1	-0.241
16	160	0.16	0.011	0.111	468.4	0.304	-0.013	0.101	0.20	-12.4	0.017	0.049	263.8	0.046	79.4	-0.249
17	167	0.16	0.011	0.112	473.6	0.304	-0.013	0.103	0.20	-12.6	0.017	0.049	264.7	0.046	79.7	-0.258
18	174	0.18	0.012	0.117	520.2	0.305	-0.017	0.118	0.21	-14.9	0.016	0.053	272.5	0.048	82.0	-0.330
19	180	0.18	0.012	0.118	525.4		-0.018	0.120	0.21	-15.2		0.054	273.3	0.049	82.2	-0.338
20	188	0.18	0.012	0.119	530.6		-0.018	0.121	0.21	-15.4		0.054	274.2	0.049	82.5	-0.346
21	195	0.18	0.013	0.120	535.9		-0.019	0.123	0.21	-15.7		0.055	275.0	0.049	82.7	-0.354
22	201	0.18	0.013	0.120	541.2		-0.019	0.124	0.21	-15.9		0.055	275.7	0.050	83.0	-0.362
23	208	0.18	0.014	0.121	546.6		-0.020	0.125	0.21	-16.2		0.055	276.5	0.050	83.2	-0.370
24	215	0.19	0.015	0.122	552.0		-0.020	0.126	0.21	-16.4		0.056	277.2	0.050	83.4	-0.378
25	222	0.19	0.016	0.122	557.4		-0.020	0.127	0.21	-16.7		0.056	278.0	0.051	83.7	-0.386
26	231	0.19	0.017	0.123	562.9		-0.021	0.128	0.21	-16.9		0.057	278.7	0.051	83.9	-0.394
27	237	0.19	0.018	0.124	568.4		-0.021	0.129	0.21	-17.2		0.057	279.3	0.051	84.1	-0.403
28	243	0.19	0.019	0.124	573.9		-0.022	0.129	0.21	-17.4		0.058	280.0	0.051	84.3	-0.411
29	251	0.19	0.021	0.125	579.5		-0.022	0.130	0.21	-17.7		0.058	280.6	0.052	84.5	-0.419
30	257	0.19	0.022	0.126	585.1		-0.023	0.130	0.21	-17.9		0.059	281.2	0.052	84.8	-0.427
31	264	0.19	0.024	0.126	590.8		-0.023	0.130	0.21	-18.2		0.059	281.8	0.052	85.0	-0.435
32	272	0.19	0.025	0.127	593.6		-0.023	0.130	0.21	-18.3		0.059	282.1	0.053	85.1	-0.439
33	278	0.19	0.025	0.127	593.6		-0.023	0.130	0.21	-18.3		0.059	282.1	0.053	85.1	-0.439
34	286	0.20	0.033	0.130	616.7		-0.025	0.129	0.21	-19.3		0.061	284.3	0.054	85.9	-0.472
35	292															
36	299															

* Wet dry cycles

Note: mass flux values for cycles conducted under saturated conditions have been corrected for metals content in groundwater

Appendix 4.15 Table 5

Cumulative Metal Extractions
Backfill Cemented Coarse Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)														
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1*	7	0.000	0.000	0.081	1.8	1.00	0.001	0.0000	0.005	0.000	0.000	0.06	2.06	0.04	3.5	0.000
2*	63	0.000	0.000	0.102	2.6	1.01	0.002	0.0000	0.005	0.002	0.001	0.08	3.16	0.06	4.9	0.000
3	70	0.001	0.000	0.130	3.9	1.01	0.001	0.0000	0.005	-0.018	0.001	0.12	4.31	0.07	6.7	0.000
4	77	0.001	0.000	0.155	5.1	1.01	0.000	0.0000	0.006	-0.038	0.000	0.15	5.19	0.09	7.9	-0.002
5	83	0.001	0.000	0.157	5.2	1.01	0.000	0.0000	0.006	-0.040	0.000	0.15	5.26	0.09	8.0	-0.002
6	91	0.001	0.000	0.178	6.2	1.01	-0.001	0.0000	0.006	-0.061	0.000	0.19	5.88	0.10	8.8	-0.002
7	97	0.001	0.000	0.193	6.8	1.01	-0.001	0.0000	0.006	-0.072	0.003	0.20	6.16	0.11	9.2	-0.002
8	103	0.001	0.000	0.195	6.9	1.01	-0.001	0.0000	0.007	-0.074	0.003	0.21	6.20	0.11	9.2	-0.002
9	110	0.001	0.000	0.197	7.0	1.01	-0.001	0.0000	0.007	-0.076	0.004	0.21	6.25	0.11	9.3	-0.002
10	119	0.001	0.000	0.213	7.8	1.01	-0.002	0.0000	0.007	-0.097	0.003	0.23	6.58	0.12	9.7	-0.003
11	126	0.001	0.000	0.214	7.9	1.01	-0.002	0.0000	0.007	-0.099	0.003	0.23	6.62	0.12	9.7	-0.003
12	132	0.001	0.000	0.216	8.0	1.01	-0.002	0.0000	0.007	-0.101	0.003	0.23	6.65	0.12	9.8	-0.004
13	139	0.001	0.000	0.217	8.1	1.01	-0.002	0.0000	0.007	-0.104	0.003	0.24	6.68	0.12	9.8	-0.004
14	146	0.001	0.000	0.219	8.2	1.01	-0.002	0.0000	0.007	-0.106	0.003	0.24	6.71	0.12	9.9	-0.004
15	152	0.001	0.000	0.220	8.3	1.01	-0.003	0.0000	0.007	-0.108	0.003	0.24	6.74	0.12	9.9	-0.004
16	160	0.001	0.000	0.222	8.4	1.01	-0.003	0.0000	0.007	-0.110	0.003	0.24	6.76	0.12	9.9	-0.004
17	167	0.001	0.000	0.223	8.5	1.01	-0.003	0.0000	0.007	-0.113	0.003	0.25	6.79	0.12	10.0	-0.004
18	174	0.001	0.000	0.235	9.3	1.02	-0.003	0.0000	0.007	-0.133	0.003	0.27	6.99	0.13	10.2	-0.005
19	180	0.001	0.000	0.236	9.4		-0.004	0.0000	0.007	-0.135		0.27	7.01	0.13	10.3	-0.006
20	188	0.001	0.000	0.238	9.5		-0.004	0.0000	0.007	-0.138		0.27	7.03	0.13	10.3	-0.006
21	195	0.001	0.000	0.239	9.6		-0.004	0.0000	0.007	-0.140		0.27	7.05	0.13	10.3	-0.006
22	201	0.001	0.001	0.240	9.7		-0.004	0.0000	0.007	-0.142		0.27	7.07	0.13	10.4	-0.006
23	208	0.001	0.001	0.242	9.8		-0.004	0.0000	0.007	-0.144		0.28	7.09	0.13	10.4	-0.006
24	215	0.001	0.001	0.243	9.9		-0.004	0.0000	0.007	-0.147		0.28	7.11	0.13	10.4	-0.006
25	222	0.001	0.001	0.244	10.0		-0.004	0.0000	0.007	-0.149		0.28	7.13	0.13	10.5	-0.006
26	231	0.001	0.001	0.246	10.1		-0.004	0.0000	0.007	-0.151		0.28	7.15	0.13	10.5	-0.007
27	237	0.001	0.001	0.247	10.1		-0.004	0.0000	0.007	-0.153		0.29	7.16	0.13	10.5	-0.007
28	243	0.001	0.001	0.249	10.2		-0.004	0.0000	0.007	-0.156		0.29	7.18	0.14	10.5	-0.007
29	251	0.001	0.001	0.250	10.3		-0.004	0.0000	0.007	-0.158		0.29	7.20	0.14	10.6	-0.007
30	257	0.001	0.001	0.252	10.4		-0.005	0.0000	0.007	-0.160		0.29	7.21	0.14	10.6	-0.007
31	264	0.001	0.001	0.253	10.5		-0.005	0.0000	0.007	-0.162		0.30	7.23	0.14	10.6	-0.007
32	272	0.001	0.001	0.254	10.6		-0.005	0.0000	0.007	-0.164		0.30	7.23	0.14	10.6	-0.007
33	278	0.001	0.001	0.254	10.6		-0.005	0.0000	0.007	-0.164		0.30	7.23	0.14	10.6	-0.007
34	286	0.001	0.001	0.259	11.0		-0.005	0.0000	0.007	-0.173		0.31	7.29	0.14	10.7	-0.008
35	292															
36	299															

* Wet dry cycles

Appendix 4.15 Table 6

Metal Extraction Rates
Backfill Cemented Coarse Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kgwt) - 5 Cycle Moving Average														
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Sodium Na	Zinc Zn
1*	7															
2*	63															
3	70	0.005	0.0004	0.003	12.99	0.0004	-0.0003	0.005	0.0019	-0.23	0.000	0.0014	9.75	0.0012	2.83	-0.004
4	77	0.006	0.0006	0.004	18.46	0.0004	-0.0006	0.007	0.0027	-0.43	0.000	0.0018	12.23	0.0018	3.50	-0.011
5	83	0.005	0.0005	0.004	17.50	0.0004	-0.0005	0.006	0.0026	-0.42	0.000	0.0018	11.50	0.0017	3.29	-0.011
6	91	0.006	0.0006	0.004	20.45	0.0004	-0.0008	0.006	0.0033	-0.57	0.000	0.0022	12.45	0.0018	3.54	-0.013
7	97	0.011	0.0012	0.009	48.44	0.0004	-0.0028	0.006	0.0092	-1.71	0.002	0.0050	24.11	0.0038	6.98	-0.029
8	103	0.008	0.0009	0.007	35.67	0.0003	-0.0022	0.005	0.0077	-1.33	0.003	0.0037	15.70	0.0029	4.31	-0.021
9	110	0.005	0.0005	0.004	22.49	0.0002	-0.0016	0.000	0.0059	-0.90	0.003	0.0025	8.73	0.0016	2.38	-0.006
10	119	0.007	0.0006	0.005	28.61	0.0002	-0.0021	0.000	0.0068	-1.23	0.003	0.0030	10.03	0.0020	2.66	-0.019
11	126	0.004	0.0003	0.004	19.38	0.0002	-0.0015	0.000	0.0048	-0.86	0.003	0.0017	5.70	0.0014	1.46	-0.013
12	132	0.003	0.0002	0.002	13.65	0.0001	-0.0011	0.000	0.0025	-0.65	0.000	0.0012	3.82	0.0009	0.95	-0.019
13	139	0.003	0.0002	0.002	13.15	0.0001	-0.0010	0.000	0.0023	-0.64	0.000	0.0012	3.61	0.0009	0.89	-0.020
14	146	0.003	0.0002	0.002	13.08	0.0001	-0.0010	0.000	0.0021	-0.64	0.000	0.0012	3.52	0.0008	0.87	-0.021
15	152	0.002	0.0001	0.001	5.49	0.0001	-0.0004	0.001	0.0008	-0.27	0.000	0.0005	1.31	0.0003	0.34	-0.009
16	160	0.002	0.0001	0.001	5.33	0.0001	-0.0004	0.001	0.0007	-0.26	0.000	0.0005	1.19	0.0003	0.31	-0.008
17	167	0.002	0.0001	0.001	5.18	0.0000	-0.0004	0.001	0.0006	-0.25	0.000	0.0005	1.08	0.0003	0.29	-0.008
18	174	0.005	0.0001	0.002	13.46	0.0001	-0.0011	0.004	0.0011	-0.66	0.000	0.0012	2.39	0.0007	0.69	-0.021
19	180	0.005	0.0002	0.002	13.86		-0.0011	0.004	0.0011	-0.68		0.0012	2.40	0.0007	0.70	-0.022
20	188	0.005	0.0002	0.002	13.10		-0.0011	0.004	0.0010	-0.64		0.0011	2.22	0.0007	0.65	-0.020
21	195	0.005	0.0003	0.002	13.50		-0.0011	0.004	0.0010	-0.66		0.0012	2.24	0.0007	0.66	-0.021
22	201	0.005	0.0004	0.002	13.93		-0.0012	0.004	0.0010	-0.68		0.0012	2.27	0.0007	0.68	-0.022
23	208	0.002	0.0004	0.001	5.44		-0.0004	0.001	0.0003	-0.26		0.0005	0.83	0.0003	0.25	-0.008
24	215	0.002	0.0006	0.001	5.32		-0.0004	0.001	0.0003	-0.25		0.0005	0.78	0.0003	0.24	-0.008
25	222	0.002	0.0007	0.001	5.52		-0.0004	0.001	0.0003	-0.26		0.0005	0.78	0.0003	0.24	-0.008
26	231	0.001	0.0008	0.001	5.25		-0.0004	0.001	0.0002	-0.25		0.0004	0.72	0.0003	0.23	-0.008
27	237	0.001	0.0009	0.001	5.28		-0.0004	0.001	0.0002	-0.25		0.0004	0.70	0.0003	0.22	-0.008
28	243	0.001	0.0011	0.001	5.47		-0.0004	0.001	0.0002	-0.25		0.0005	0.70	0.0003	0.23	-0.008
29	251	0.001	0.0012	0.001	5.35		-0.0004	0.001	0.0001	-0.25		0.0004	0.66	0.0003	0.22	-0.008
30	257	0.001	0.0013	0.001	5.54		-0.0004	0.001	0.0001	-0.25		0.0005	0.66	0.0003	0.22	-0.008
31	264	0.001	0.0015	0.001	5.92		-0.0005	0.000	0.0001	-0.27		0.0005	0.67	0.0004	0.23	-0.009
32	272	0.001	0.0014	0.001	5.05		-0.0004	0.000	0.0001	-0.23		0.0004	0.56	0.0003	0.19	-0.007
33	278	0.001	0.0011	0.000	3.94		-0.0003	0.000	0.0000	-0.18		0.0003	0.43	0.0002	0.15	-0.006
34	286	0.001	0.0025	0.001	7.43		-0.0006	0.000	0.0000	-0.33		0.0006	0.73	0.0005	0.26	-0.011
35	292															
36	299															

* Wet dry cycles

Appendix 4.15 Table 7

Oxidation and Neutralization Rates
Backfill Cemented Coarse Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO [Ca + Mg] [SO ₄]	NEUTRALIZATION		
		Cumulative Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)		Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1**	7	209	0.02		2.18	2.50	0.00	1.15	251		1.0
2**	63	454	0.05		4.72	3.60	0.01	0.76	361		1.4
3	70	687	0.08	53.1	2.44	1.82	-0.09	0.71	534	31.5	2.1
4	77	846	0.10	63.7	1.66	1.69	-0.09	0.96	694	44.4	2.8
5	83	858	0.10	59.7	0.12	0.14	-0.01	1.08	707	42.0	2.8
6	91	955	0.11	62.1	1.01	1.38	-0.09	1.28	836	48.8	3.3
7	97	1006	0.12	113.7	0.53	0.85	-0.05	1.49	915	114.1	3.7
8	103	1013	0.12	69.2	0.08	0.15	-0.01	1.67	929	83.7	3.7
9	110	1020	0.12	36.8	0.07	0.14	-0.01	1.94	942	52.5	3.8
10	119	1063	0.12	39.9	0.45	1.16	-0.09	2.38	1049	66.4	4.2
11	126	1068	0.12	22.7	0.05	0.13	-0.01	2.29	1061	44.9	4.2
12	132	1073	0.12	13.5	0.05	0.13	-0.01	2.21	1073	31.4	4.3
13	139	1079	0.12	12.7	0.06	0.13	-0.01	2.14	1084	30.2	4.3
14	146	1084	0.12	12.5	0.06	0.13	-0.01	2.07	1096	30.1	4.4
15	152	1090	0.13	5.7	0.06	0.13	-0.01	2.00	1108	12.6	4.4
16	160	1096	0.13	5.7	0.06	0.13	-0.01	1.94	1120	12.2	4.5
17	167	1102	0.13	5.7	0.06	0.13	-0.01	1.88	1132	11.9	4.5
18	174	1158	0.13	15.9	0.59	1.16	-0.09	1.83	1239	30.9	5.0
19	180	1164	0.13	16.5	0.07	0.13	-0.01	1.82	1251	31.9	5.0
20	188	1171	0.13	15.7	0.07	0.13	-0.01	1.81	1263	30.1	5.1
21	195	1177	0.14	16.3	0.07	0.13	-0.01	1.80	1275	31.0	5.1
22	201	1184	0.14	16.9	0.07	0.13	-0.01	1.79	1288	32.0	5.2
23	208	1191	0.14	6.7	0.07	0.13	-0.01	1.78	1300	12.5	5.2
24	215	1197	0.14	6.6	0.07	0.13	-0.01	1.77	1312	12.3	5.2
25	222	1204	0.14	6.9	0.07	0.14	-0.01	1.76	1325	12.7	5.3
26	231	1211	0.14	6.6	0.07	0.14	-0.01	1.75	1338	12.1	5.4
27	237	1218	0.14	6.7	0.07	0.14	-0.01	1.74	1350	12.2	5.4
28	243	1225	0.14	6.9	0.07	0.14	-0.01	1.73	1363	12.6	5.5
29	251	1232	0.14	6.8	0.07	0.14	-0.01	1.72	1376	12.4	5.5
30	257	1240	0.14	7.1	0.08	0.14	-0.01	1.71	1389	12.8	5.6
31	264	1247	0.14	7.6	0.08	0.14	-0.01	1.71	1402	13.7	5.6
32	272	1251	0.14	6.5	0.04	0.07	-0.01	1.70	1409	11.7	5.6
33	278	1251	0.14	5.1	0.00	0.00	0.00		1409	9.1	5.6
34	286	1281	0.15	9.8	0.32	0.58	-0.04	1.68	1462	17.2	5.8
35	292										
36	299										

* Rates of sulfate production and NP depletion are 5-week moving averages

** Wet dry cycles

Appendix 4.16

Backfill Whole Tailings - Leached Under Wet/Dry Cycles Followed by Saturated Conditions

Appendix 4.16 Table 1

Sample Characterization Backfill Whole Tailings - Leached under wet/dry cycles followed by saturated conditions

Metals Analysis		Tails (ppm)	Groundwater (mg/L)
Aluminum	Al	30600	<0.03
Antimony	Sb	68	<0.04
Arsenic	As	2500	<0.005
Barium	Ba	54	0.012
Beryllium	Be	<50	<0.005 *
Bismuth	Bi	<20	<0.20 *
Cadmium	Cd	28	<0.005
Calcium	Ca	6800	25.0
Carbon	C	5000	NA
Chromium	Cr	100	<0.005
Cobalt	Co	69	<0.010
Copper	Cu	860	0.027
Gallium	Ga	16	NA
Iron	Fe	232000	0.030
Lead	Pb	4300	<0.04
Lithium	Li	NA	NA
Magnesium	Mg	14900	13.000
Manganese	Mn	580	0.011
Mercury	Hg	1.6	<0.0002
Molybdenum	Mo	<20	<0.020
Nickel	Ni	22	<0.015
Phosphorus	P	NA	NA
Potassium	K	7600	0.750
Selenium	Se	35	<0.005
Silicon	Si	160000	NA
Silver	Ag	22.2	<0.005
Sodium	Na	1600	1.90
Strontium	Sr	NA	NA
Thallium	Tl	14	<0.040
Tin	Sn	24	<0.24
Titanium	Ti	1400	<0.050
Tungsten	W	NA	NA
Vanadium	V	NA	NA
Zinc	Zn	8100	0.44
Sulfate	SO4	1900.0	9.90
Sulfur	S	249000.0	NA

ABA Results	
Paste pH	6.2
S (Total) (%)	29.7
SO4 (%)	1940
S (sulfide) (%)	27.8
AP (kg CaCO3/tonne)	927
NP (kg CaCO3/tonne)	27
CO2 (%)	1.39
CO3 NP (kg CaCO3/tonne)	31.5
Net NP (kg CaCO3/tonne)	-900
NP/AP	0.03

Sample Mass (kg)	7.08
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* Value Estimated

Note: NA = Not Analyzed

Appendix 4.16 Table 2

Parameters Measured Weekly
Backfill Whole Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom Bottom seepage

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT. (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) **	CUMULATIVE SULFATE (mg/kg)
19-Oct	1*	7	4.500	7.2	2530			1150	731
14-Dec	2*	63	0.000						731
21-Dec	3	70	4.400	7.0	1990	74		1440	1620
28-Dec	4	77	4.500	7.2	1380	76		608	2000
3-Jan	5	83	0.400	6.5	2030	34		452	2025
11-Jan	6	91	4.500	6.9	566	82		295	2206
17-Jan	7	97	2.750	7.2	631	66		260	2303
23-Jan	8	103	0.500	6.6	838	75		274	2322
30-Jan	9	110	4.500	6.6	1030	78		287	2498
8-Feb	10	119	0.500	7.0	1090	90		301	2519
15-Feb	11	126	0.500	6.7	997	59		301	2539
21-Feb	12	132	0.500	6.9	793	71		301	2560
28-Feb	13	139	0.500	6.9	947	79		301	2580
7-Mar	14	146	0.500	6.9	877	88		301	2601
13-Mar	15	152	0.500	6.9	805	94		300	2621
21-Mar	16	160	0.500	6.9	811	97		300	2642
28-Mar	17	167	0.500	7.0	818	92		300	2662
4-Apr	18	174	4.500	7.0	824	96		300	2847
11-Apr	19	181	0.500	6.8	809	60		303	2867
18-Apr	20	188	0.500	7.0	932	67		306	2888
25-Apr	21	195	0.500	6.4	874	71		309	2909
1-May	22	201	0.500	6.8	983	69		313	2931
8-May	23	208	0.500	6.7	1050	64		316	2952
15-May	24	215	0.500	6.6	972	72		319	2974
22-May	25	222	0.500	7.0	720	63		322	2996
31-May	26	231	0.500	6.8	823	73		325	3019
6-Jun	27	237	0.500	7.0	830	89		328	3041
12-Jun	28	243	0.500	6.6	792	76		331	3064
20-Jun	29	251	0.500	6.7	849	76		334	3087
26-Jun	30	257	0.500	6.9	780	69		338	3110
3-Jul	31	264	0.500	6.6	902			341	3133
11-Jul	32	272	0.250	6.7	965			344	3145
17-Jul	33	278	0.000					347	3145
25-Jul	34	286	2.000	6.6	970	63		350	3241
31-Jul	35	292	0.250	6.4	985				
7-Aug	36	299	0.250	6.4	1080				
14-Aug	37	306	0.250	6.6	1050				
21-Aug	38	313	0.250	6.6	1100				
30-Aug	39	322	0.250	6.5	1160				
6-Sep	40	329	2.000	7.2	775	49			
11-Sep	41	334	2.000	6.7	834	51			
18-Sep	42	341	2.000	6.7	762	59			
25-Sep	43	348	2.000	6.7	696	60			
3-Oct	44	356	2.000	6.7	619	74			
10-Oct	45	363	2.000	6.8	609	64			
17-Oct	46	370	2.000	6.9	520				
23-Oct	47	376	2.000	6.9	502				
30-Oct	48	383	2.000	6.9	490				
6-Nov	49	390	2.000	6.8	522				

* Wet dry cycles

** measured values of sulfate shown in bold

Appendix 4.16 Table 3

Leachate Analysis
Backfill Whole Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L) **																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7	18.00	3.600	0.250	0.052	410	0.21	0.18	1.30	250.00	8.30	110.0	6.60	0.07	6.70	0.200	0.092	40.0	20.0
2*	63																		
3	70	3.00	0.360	0.028	0.036	270	0.032	0.06	0.35	22.00	1.80	80.0	7.30	0.07	7.20	0.070	0.006	23.0	19.0
4	77	1.60	0.240	0.032	0.014	230	0.020	0.03	0.20	14.00	0.85	42.0	2.90	0.04	4.80	0.030	0.006	8.10	6.9
5	83	1.75	0.250	0.038	0.016	205	0.021	0.03	0.20	14.50	0.98	37.5	2.75	0.04	4.80	0.021	0.005	6.50	6.7
6	91	1.90	0.260	0.044	0.018	180	0.022	0.02	0.20	15.00	1.10	33.0	2.60	0.04	4.80	0.012	< 0.005	4.90	6.6
7	97	6.20	2.200	0.036	0.055	120	0.300	0.03	2.40	79.00	23.0	39.0	3.50	0.05	2.60	0.033	< 0.005	3.10	22.0
8	103	4.28	1.495	0.032	0.039	127	0.203	0.03	1.62	53.80	15.46	35.7	3.13	0.04	3.33	0.027	0.005	3.40	16.3
9	110	2.37	0.791	0.027	0.023	133	0.105	0.02	0.84	28.60	7.92	32.3	2.77	0.03	4.07	0.021	0.005	3.70	10.7
10	119	0.45	0.086	0.023	0.007	140	0.008	0.02	0.06	3.40	0.38	29.0	2.40	0.02	4.80	0.015	< 0.005	4.00	5.0
11	126	0.40	0.079	0.02	0.007	135	0.008	0.02	0.053	3.00	0.34	28.8	2.33	0.02	4.4	0.014	0.005	4.01	4.6
12	132	0.35	0.073	0.02	0.007	130	0.007	0.02	0.046	2.60	0.30	28.5	2.25	0.02	4.1	0.013	0.005	4.03	4.2
13	139	0.29	0.066	0.02	0.006	125	0.007	0.02	0.039	2.20	0.25	28.3	2.18	0.02	3.7	0.011	0.005	4.04	3.7
14	146	0.24	0.059	0.03	0.006	120	0.007	0.01	0.033	1.80	0.21	28.0	2.10	0.02	3.3	0.010	0.005	4.05	3.3
15	152	0.19	0.052	0.03	0.006	115	0.006	0.01	0.026	1.40	0.17	27.8	2.03	0.02	2.9	0.009	0.005	4.06	2.9
16	160	0.14	0.046	0.03	0.006	110	0.006	0.01	0.019	1.00	0.13	27.5	1.95	0.02	2.6	0.008	0.005	4.08	2.5
17	167	0.08	0.039	0.03	0.005	105	0.005	0.01	0.012	0.60	0.08	27.3	1.88	0.02	2.2	0.006	0.005	4.09	2.0
18	174	0.03	0.032	0.03	0.005	100	0.005	0.01	0.005	0.20	0.04	27.0	1.80	0.02	1.80	0.005	< 0.005	4.10	1.6
19	181	0.05	0.040	0.03	0.006	103	0.005	0.01	0.01	0.50	0.05	28.2	1.91	0.020	1.79	0.005	0.005	4.23	1.7
20	188	0.08	0.048	0.03	0.006	105	0.005	0.01	0.01	0.80	0.05	29.4	2.03	0.020	1.79	0.005	0.005	4.36	1.9
21	195	0.10	0.056	0.03	0.007	108	0.005	0.01	0.01	1.10	0.06	30.6	2.14	0.020	1.78	0.005	0.005	4.49	2.0
22	201	0.13	0.064	0.03	0.007	110	0.005	0.01	0.01	1.40	0.07	31.8	2.25	0.020	1.78	0.005	0.005	4.63	2.2
23	208	0.15	0.072	0.03	0.008	113	0.005	0.01	0.01	1.70	0.08	32.9	2.36	0.020	1.77	0.005	0.005	4.76	2.3
24	215	0.18	0.080	0.03	0.008	115	0.005	0.01	0.01	2.00	0.08	34.1	2.48	0.020	1.76	0.005	0.005	4.89	2.5
25	222	0.20	0.088	0.03	0.009	118	0.005	0.01	0.02	2.30	0.09	35.3	2.59	0.020	1.76	0.005	0.005	5.02	2.6
26	231	0.23	0.096	0.03	0.010	120	0.005	0.02	0.02	2.60	0.10	36.5	2.70	0.020	1.75	0.005	0.005	5.15	2.8
27	237	0.25	0.104	0.03	0.010	123	0.005	0.02	0.02	2.90	0.11	37.7	2.81	0.020	1.74	0.005	0.005	5.28	2.9
28	243	0.27	0.112	0.03	0.011	125	0.005	0.02	0.02	3.20	0.12	38.9	2.93	0.020	1.74	0.005	0.005	5.41	3.0
29	251	0.30	0.120	0.02	0.011	128	0.005	0.02	0.02	3.50	0.12	40.1	3.04	0.020	1.73	0.005	0.005	5.54	3.2
30	257	0.32	0.128	0.02	0.012	130	0.005	0.02	0.02	3.80	0.13	41.3	3.15	0.020	1.73	0.005	0.005	5.68	3.3
31	264	0.35	0.136	0.02	0.012	133	0.005	0.02	0.03	4.10	0.14	42.4	3.26	0.020	1.72	0.005	0.005	5.81	3.5
32	272	0.37	0.144	0.02	0.013	135	0.005	0.02	0.03	4.40	0.15	43.6	3.38	0.020	1.71	0.005	0.005	5.94	3.6
33	278	0.40	0.152	0.02	0.013	138	0.005	0.02	0.03	4.70	0.15	44.8	3.49	0.020	1.71	0.005	0.005	6.07	3.8
34	286	0.42	0.16	0.02	0.014	140	< 0.005	0.02	0.03	5.00	0.16	46.0	3.60	< 0.02	1.70	< 0.005	< 0.005	6.20	3.9
35	292																		
36	299																		

* Wet dry cycles

** measured values shown in bold

Appendix 4.16 Table 4

Cumulative Mass Flux
Backfill Whole Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7	11.44	2.288	0.159	0.033	260.6	0.133	0.102	0.826	158.9	5.28	69.9	4.19	0.041	4.26	0.127	0.058	25.4	12.7
2*	63	11.44	2.288	0.159	0.033	260.6	0.133	0.102	0.826	158.9	5.28	69.9	4.19	0.041	4.26	0.127	0.058	25.4	12.7
3	70	13.30	2.510	0.169	0.054	412.9	0.152	0.138	1.027	172.6	6.382	111.6	8.72	0.083	8.27	0.169	0.061	38.5	24.2
4	77	14.30	2.661	0.182	0.061	543.1	0.163	0.155	1.137	181.4	6.909	130.0	10.56	0.101	10.84	0.187	0.062	42.5	28.4
5	83	14.40	2.675	0.183	0.062	553.3	0.164	0.156	1.147	182.2	6.963	131.4	10.72	0.102	11.07	0.188	0.062	42.7	28.7
6	91	15.60	2.839	0.203	0.072	651.8	0.176	0.167	1.257	191.8	7.650	144.1	12.36	0.121	13.64	0.194	0.064	44.6	32.6
7	97	18.00	3.692	0.213	0.092	688.7	0.292	0.178	2.178	222.4	16.58	154.2	13.72	0.138	14.36	0.205	0.065	45.1	40.9
8	103	18.30	3.798	0.214	0.095	695.9	0.306	0.180	2.291	226.2	17.67	155.8	13.94	0.141	14.55	0.207	0.065	45.2	42.1
9	110	19.80	4.299	0.224	0.108	764.8	0.371	0.191	2.808	244.4	22.69	168.1	15.69	0.156	16.65	0.219	0.067	46.4	48.6
10	119	19.83	4.305	0.225	0.108	772.9	0.372	0.192	2.810	244.6	22.71	169.2	15.86	0.156	16.94	0.220	0.067	46.5	48.9
11	126	19.86	4.310	0.225	0.108	780.7	0.372	0.193	2.812	244.8	22.73	170.3	16.02	0.157	17.20	0.221	0.067	46.7	49.2
12	132	19.88	4.315	0.226	0.109	788.1	0.373	0.194	2.813	245.0	22.75	171.4	16.18	0.158	17.43	0.221	0.067	46.8	49.4
13	139	19.90	4.320	0.227	0.109	795.1	0.373	0.195	2.814	245.2	22.77	172.5	16.33	0.159	17.64	0.222	0.067	47.0	49.7
14	146	19.91	4.324	0.228	0.109	801.8	0.373	0.195	2.814	245.3	22.78	173.5	16.48	0.160	17.82	0.222	0.068	47.1	49.9
15	152	19.93	4.327	0.229	0.109	808.2	0.373	0.196	2.814	245.4	22.79	174.6	16.62	0.161	17.97	0.223	0.068	47.3	50.0
16	160	19.93	4.330	0.230	0.110	814.2	0.374	0.196	2.814	245.5	22.80	175.6	16.76	0.162	18.10	0.223	0.068	47.4	50.2
17	167	19.94	4.333	0.231	0.110	819.9	0.374	0.197	2.813	245.5	22.81	176.6	16.89	0.163	18.20	0.224	0.068	47.6	50.3
18	174	19.95	4.351	0.241	0.111	867.5	0.375	0.200	2.799	245.6	22.82	185.5	18.03	0.171	18.87	0.225	0.070	49.0	51.0
19	181	19.95	4.354	0.242	0.112	873.0	0.376	0.200	2.797	245.6	22.82	186.6	18.16	0.171	18.94	0.225	0.070	49.1	51.1
20	188	19.96	4.357	0.243	0.112	878.6	0.376	0.201	2.796	245.7	22.82	187.7	18.30	0.172	19.01	0.225	0.070	49.3	51.2
21	195	19.96	4.361	0.244	0.112	884.5	0.376	0.201	2.795	245.8	22.83	189.0	18.45	0.173	19.09	0.226	0.070	49.5	51.3
22	201	19.97	4.365	0.245	0.113	890.5	0.376	0.202	2.794	245.9	22.83	190.3	18.61	0.174	19.16	0.226	0.070	49.7	51.5
23	208	19.98	4.370	0.246	0.113	896.7	0.376	0.203	2.793	246.0	22.83	191.7	18.78	0.175	19.23	0.226	0.071	49.9	51.6
24	215	19.99	4.376	0.247	0.113	903.0	0.376	0.203	2.792	246.1	22.84	193.2	18.95	0.176	19.30	0.226	0.071	50.1	51.7
25	222	20.00	4.382	0.248	0.114	909.5	0.377	0.204	2.791	246.3	22.84	194.8	19.13	0.177	19.37	0.226	0.071	50.3	51.9
26	231	20.02	4.388	0.249	0.114	916.3	0.377	0.205	2.790	246.5	22.85	196.4	19.32	0.178	19.44	0.227	0.071	50.5	52.0
27	237	20.04	4.396	0.249	0.115	923.1	0.377	0.205	2.790	246.7	22.86	198.2	19.52	0.178	19.51	0.227	0.071	50.8	52.2
28	243	20.05	4.403	0.250	0.115	930.2	0.377	0.206	2.789	246.9	22.86	200.0	19.73	0.179	19.58	0.227	0.071	51.0	52.41
29	251	20.07	4.412	0.251	0.116	937.4	0.377	0.207	2.789	247.1	22.87	201.9	19.94	0.180	19.65	0.227	0.072	51.3	52.60
30	257	20.10	4.420	0.252	0.117	944.9	0.377	0.208	2.789	247.4	22.88	203.9	20.16	0.181	19.72	0.227	0.072	51.6	52.80
31	264	20.12	4.430	0.253	0.117	952.4	0.378	0.209	2.789	247.7	22.89	206.0	20.39	0.182	19.79	0.227	0.072	51.8	53.02
32	272	20.13	4.435	0.254	0.118	956.3	0.378	0.210	2.789	247.9	22.89	207.1	20.51	0.182	19.82	0.228	0.072	52.0	53.13
33	278	20.13	4.435	0.254	0.118	956.3	0.378	0.210	2.789	247.9	22.89	207.1	20.51	0.182	19.82	0.228	0.072	52.0	53.13
34	286	20.25	4.479	0.257	0.121	988.8	0.378	0.214	2.789	249.3	22.93	216.4	21.53	0.186	20.09	0.228	0.073	53.2	54.11
35	292																		
36	299																		

* Wet dry cycles

Note: mass flux values for cycles conducted under saturated conditions have been corrected for metals content in groundwater

Appendix 4.16 Table 5

Cumulative Metal Extractions
Backfill Whole Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7	0.037	0.092	0.294	0.118	3.8	0.133	0.147	0.096	0.068	0.123	0.469	0.72	0.19	0.056	0.363	0.263	1.589	0.157
2*	63	0.037	0.092	0.294	0.118	3.8	0.133	0.147	0.096	0.068	0.123	0.469	0.72	0.19	0.056	0.363	0.263	1.589	0.157
3	70	0.043	0.100	0.313	0.192	6.1	0.152	0.201	0.119	0.074	0.148	0.749	1.50	0.38	0.109	0.483	0.273	2.409	0.299
4	77	0.047	0.106	0.336	0.218	8.0	0.163	0.224	0.132	0.078	0.161	0.872	1.82	0.46	0.143	0.533	0.280	2.655	0.350
5	83	0.047	0.107	0.339	0.221	8.1	0.164	0.226	0.133	0.079	0.162	0.882	1.85	0.47	0.146	0.536	0.281	2.671	0.354
6	91	0.051	0.114	0.377	0.256	9.6	0.176	0.242	0.146	0.083	0.178	0.967	2.13	0.55	0.180	0.553	0.288	2.790	0.402
7	97	0.059	0.148	0.394	0.329	10.1	0.292	0.258	0.253	0.096	0.385	1.035	2.36	0.63	0.189	0.587	0.293	2.819	0.505
8	103	0.060	0.152	0.396	0.338	10.2	0.306	0.261	0.266	0.098	0.411	1.046	2.40	0.64	0.191	0.592	0.293	2.826	0.519
9	110	0.065	0.172	0.414	0.385	11.2	0.371	0.278	0.326	0.105	0.528	1.128	2.70	0.71	0.219	0.626	0.300	2.898	0.599
10	119	0.065	0.172	0.416	0.386	11.4	0.372	0.279	0.327	0.105	0.528	1.136	2.73	0.71	0.223	0.628	0.301	2.907	0.603
11	126	0.065	0.172	0.417	0.387	11.5	0.372	0.280	0.327	0.106	0.529	1.143	2.76	0.72	0.226	0.630	0.302	2.916	0.607
12	132	0.065	0.173	0.419	0.388	11.6	0.373	0.281	0.327	0.106	0.529	1.150	2.79	0.72	0.229	0.632	0.303	2.925	0.610
13	139	0.065	0.173	0.421	0.389	11.7	0.373	0.282	0.327	0.106	0.530	1.158	2.82	0.72	0.232	0.634	0.304	2.935	0.613
14	146	0.065	0.173	0.422	0.390	11.8	0.373	0.283	0.327	0.106	0.530	1.165	2.84	0.73	0.234	0.636	0.304	2.944	0.616
15	152	0.065	0.173	0.424	0.391	11.9	0.373	0.284	0.327	0.106	0.530	1.172	2.87	0.73	0.236	0.637	0.305	2.954	0.618
16	160	0.065	0.173	0.426	0.392	12.0	0.374	0.285	0.327	0.106	0.530	1.179	2.89	0.74	0.238	0.638	0.306	2.964	0.619
17	167	0.065	0.173	0.428	0.392	12.1	0.374	0.285	0.327	0.106	0.530	1.185	2.91	0.74	0.239	0.639	0.307	2.973	0.621
18	174	0.065	0.174	0.445	0.398	12.8	0.375	0.290	0.325	0.106	0.531	1.245	3.11	0.78	0.248	0.643	0.314	3.061	0.630
19	181	0.065	0.174	0.447	0.399	12.8	0.376	0.290	0.325	0.106	0.531	1.252	3.13	0.78	0.249	0.644	0.315	3.071	0.631
20	188	0.065	0.174	0.449	0.400	12.9	0.376	0.291	0.325	0.106	0.531	1.260	3.16	0.78	0.250	0.644	0.316	3.082	0.632
21	195	0.065	0.174	0.451	0.401	13.0	0.376	0.292	0.325	0.106	0.531	1.268	3.18	0.79	0.251	0.645	0.316	3.093	0.634
22	201	0.065	0.175	0.453	0.402	13.1	0.376	0.293	0.325	0.106	0.531	1.277	3.21	0.79	0.252	0.645	0.317	3.105	0.635
23	208	0.065	0.175	0.455	0.403	13.2	0.376	0.294	0.325	0.106	0.531	1.287	3.24	0.80	0.253	0.646	0.318	3.118	0.637
24	215	0.065	0.175	0.457	0.405	13.3	0.376	0.294	0.325	0.106	0.531	1.297	3.27	0.80	0.254	0.646	0.319	3.131	0.639
25	222	0.065	0.175	0.459	0.406	13.4	0.377	0.295	0.325	0.106	0.531	1.307	3.30	0.80	0.255	0.647	0.320	3.145	0.641
26	231	0.065	0.176	0.460	0.408	13.5	0.377	0.297	0.324	0.106	0.531	1.318	3.33	0.81	0.256	0.647	0.320	3.159	0.643
27	237	0.065	0.176	0.462	0.410	13.6	0.377	0.298	0.324	0.106	0.532	1.330	3.37	0.81	0.257	0.648	0.321	3.174	0.645
28	243	0.066	0.176	0.464	0.412	13.7	0.377	0.299	0.324	0.106	0.532	1.342	3.40	0.82	0.258	0.648	0.322	3.190	0.647
29	251	0.066	0.176	0.465	0.414	13.8	0.377	0.300	0.324	0.107	0.532	1.355	3.44	0.82	0.259	0.649	0.323	3.206	0.649
30	257	0.066	0.177	0.467	0.417	13.9	0.377	0.302	0.324	0.107	0.532	1.369	3.48	0.82	0.260	0.649	0.324	3.222	0.652
31	264	0.066	0.177	0.469	0.419	14.0	0.378	0.303	0.324	0.107	0.532	1.383	3.52	0.83	0.260	0.650	0.324	3.240	0.655
32	272	0.066	0.177	0.470	0.420	14.1	0.378	0.304	0.324	0.107	0.532	1.390	3.54	0.83	0.261	0.650	0.325	3.248	0.656
33	278	0.066	0.177	0.470	0.420	14.1	0.378	0.304	0.324	0.107	0.532	1.390	3.54	0.83	0.261	0.650	0.325	3.248	0.656
34	286	0.066	0.179	0.476	0.432	14.5	0.378	0.310	0.324	0.107	0.533	1.452	3.71	0.85	0.264	0.652	0.328	3.324	0.668
35	292																		
36	299																		

* Wet dry cycles

Appendix 4.16 Table 6

Metal Extraction Rates
Backfill Whole Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kg/hwk) - 5 Cycle Moving Average																	
		Aluminum Al	Arsenic As	Barium Ba	Cadmium Cd	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Nickel Ni	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7																		
2*	63																		
3	70	0.206	0.025	0.001	0.002	16.92	0.0020	0.004	0.022	1.517	0.123	4.63	0.50	0.0046	0.45	0.0047	0.0002	1.46	1.282
4	77	0.286	0.037	0.002	0.003	28.26	0.0029	0.005	0.031	2.253	0.163	6.01	0.64	0.0059	0.66	0.0059	0.0004	1.71	1.564
5	83	0.273	0.036	0.002	0.003	26.96	0.0028	0.005	0.030	2.151	0.155	5.66	0.60	0.0056	0.63	0.0056	0.0004	1.59	1.473
6	91	0.347	0.046	0.004	0.003	32.60	0.0036	0.005	0.036	2.739	0.198	6.18	0.68	0.0067	0.78	0.0055	0.0005	1.60	1.654
7	97	1.351	0.289	0.011	0.012	88.15	0.0326	0.016	0.278	13.081	2.326	17.35	1.96	0.0200	2.08	0.0161	0.0013	4.05	5.810
8	103	1.062	0.273	0.010	0.009	60.04	0.0327	0.009	0.268	11.387	2.394	9.38	1.11	0.0123	1.33	0.0081	0.0009	1.42	3.777
9	110	1.166	0.347	0.009	0.010	47.01	0.0442	0.008	0.354	13.356	3.347	8.08	1.09	0.0116	1.23	0.0069	0.0009	0.82	4.285
10	119	1.055	0.317	0.008	0.009	42.69	0.0404	0.007	0.323	12.130	3.062	7.36	1.00	0.0105	1.14	0.0063	0.0009	0.73	3.922
11	126	0.851	0.294	0.004	0.007	25.77	0.0392	0.005	0.311	10.615	3.017	5.25	0.73	0.0072	0.71	0.0054	0.0006	0.40	3.322
12	132	0.375	0.125	0.003	0.003	19.87	0.0161	0.003	0.127	4.517	1.236	3.45	0.49	0.0040	0.61	0.0032	0.0005	0.34	1.700
13	139	0.310	0.101	0.003	0.003	19.29	0.0130	0.003	0.102	3.683	0.993	3.25	0.47	0.0035	0.60	0.0029	0.0004	0.34	1.479
14	146	0.023	0.005	0.001	0.000	7.21	0.0003	0.001	0.001	0.176	0.019	1.06	0.15	0.0009	0.23	0.0007	0.0002	0.15	0.255
15	152	0.021	0.005	0.001	0.000	7.49	0.0003	0.001	0.001	0.163	0.017	1.14	0.16	0.0009	0.22	0.0007	0.0002	0.16	0.246
16	160	0.016	0.004	0.001	0.000	6.91	0.0003	0.001	0.000	0.129	0.014	1.09	0.15	0.0009	0.19	0.0005	0.0002	0.16	0.208
17	167	0.012	0.004	0.001	0.000	6.36	0.0003	0.001	0.000	0.097	0.010	1.04	0.14	0.0009	0.15	0.0004	0.0002	0.15	0.172
18	174	0.010	0.006	0.003	0.000	14.48	0.0005	0.001	-0.003	0.088	0.010	2.61	0.34	0.0023	0.25	0.0006	0.0005	0.40	0.273
19	181	0.008	0.006	0.003	0.000	14.23	0.0005	0.001	-0.003	0.069	0.007	2.61	0.34	0.0023	0.22	0.0006	0.0005	0.40	0.251
20	188	0.006	0.006	0.003	0.000	13.70	0.0005	0.001	-0.004	0.059	0.006	2.56	0.33	0.0022	0.20	0.0005	0.0004	0.40	0.231
21	195	0.006	0.006	0.003	0.001	14.05	0.0005	0.001	-0.004	0.062	0.005	2.67	0.34	0.0023	0.20	0.0005	0.0005	0.41	0.231
22	201	0.006	0.007	0.003	0.001	14.54	0.0005	0.001	-0.004	0.076	0.005	2.82	0.35	0.0024	0.20	0.0005	0.0005	0.43	0.240
23	208	0.006	0.004	0.001	0.000	6.00	0.0002	0.001	-0.001	0.078	0.003	1.28	0.15	0.0009	0.07	0.0002	0.0002	0.19	0.116
24	215	0.008	0.004	0.001	0.000	6.18	0.0002	0.001	-0.001	0.100	0.004	1.36	0.16	0.0009	0.07	0.0002	0.0002	0.20	0.126
25	222	0.010	0.005	0.001	0.000	6.36	0.0002	0.001	-0.001	0.121	0.004	1.45	0.17	0.0009	0.07	0.0002	0.0002	0.21	0.137
26	231	0.011	0.005	0.001	0.000	6.18	0.0002	0.001	-0.001	0.135	0.004	1.45	0.17	0.0009	0.07	0.0002	0.0002	0.21	0.139
27	237	0.013	0.006	0.001	0.000	6.35	0.0002	0.001	-0.001	0.156	0.005	1.53	0.18	0.0009	0.07	0.0002	0.0002	0.21	0.149
28	243	0.015	0.007	0.001	0.000	6.71	0.0002	0.001	-0.001	0.181	0.006	1.66	0.19	0.0009	0.07	0.0002	0.0002	0.23	0.163
29	251	0.016	0.007	0.001	0.001	6.69	0.0002	0.001	-0.001	0.197	0.006	1.70	0.19	0.0009	0.07	0.0002	0.0002	0.23	0.168
30	257	0.018	0.008	0.001	0.001	7.06	0.0002	0.001	-0.0005	0.224	0.007	1.83	0.21	0.0009	0.07	0.0002	0.0002	0.25	0.183
31	264	0.021	0.009	0.001	0.001	7.68	0.0002	0.001	-0.0004	0.260	0.008	2.03	0.23	0.0009	0.07	0.0002	0.0002	0.27	0.205
32	272	0.019	0.008	0.001	0.001	6.64	0.0002	0.001	-0.0002	0.235	0.007	1.78	0.20	0.0008	0.06	0.0002	0.0002	0.24	0.181
33	278	0.016	0.006	0.001	0.000	5.23	0.0001	0.001	-0.0001	0.191	0.006	1.41	0.16	0.0006	0.05	0.0001	0.0001	0.19	0.145
34	286	0.034	0.014	0.001	0.001	10.28	0.0002	0.001	0.0001	0.422	0.012	2.90	0.32	0.0011	0.09	0.0002	0.0002	0.38	0.301
35	292																		
36	299																		

* Wet dry cycles

Appendix 4.16 Table 7

Oxidation and Neutralization Rates
Backfill Whole Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO [Ca + Mg] [SO ₄]	NEUTRALIZATION		
		Cumulative Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate * (mg/kg/wk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)		Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/wk) *	NP Consumed (%)
1**	7	731	0.08		7.61	6.51	2.88	1.23	939		3.5
2**	63	731	0.08						939		3.5
3	70	1620	0.18	98.8	9.26	3.81	1.71	0.60	1491	61.3	5.5
4	77	2000	0.22	126.9	3.96	3.26	0.76	1.01	1893	95.4	7.0
5	83	2025	0.23	119.2	0.26	0.25	0.06	1.20	1924	90.7	7.1
6	91	2206	0.25	122.9	1.89	2.46	0.52	1.58	2223	106.9	8.2
7	97	2303	0.26	323.7	1.01	0.92	0.42	1.32	2356	291.8	8.7
8	103	2322	0.26	148.9	0.19	0.18	0.07	1.26	2381	188.7	8.8
9	110	2498	0.28	105.7	1.84	1.72	0.51	1.21	2604	150.8	9.6
10	119	2519	0.28	96.0	0.21	0.20	0.05	1.17	2629	137.0	9.7
11	126	2539	0.28	66.6	0.21	0.19	0.05	1.12	2653	86.0	9.8
12	132	2560	0.29	51.3	0.21	0.19	0.05	1.08	2676	63.8	9.9
13	139	2580	0.29	50.3	0.21	0.18	0.04	1.03	2698	61.6	10.0
14	146	2601	0.29	20.0	0.21	0.17	0.04	0.99	2719	22.4	10.1
15	152	2621	0.29	21.8	0.21	0.16	0.04	0.94	2739	23.4	10.1
16	160	2642	0.30	21.1	0.21	0.15	0.04	0.90	2758	21.8	10.2
17	167	2662	0.30	20.5	0.21	0.14	0.04	0.86	2776	20.2	10.3
18	174	2847	0.32	53.3	1.92	1.19	0.37	0.81	2932	46.9	10.9
19	181	2867	0.32	53.3	0.22	0.14	0.04	0.84	2950	46.3	10.9
20	188	2888	0.32	51.9	0.22	0.14	0.05	0.87	2969	44.8	11.0
21	195	2909	0.33	53.5	0.22	0.15	0.05	0.89	2989	46.1	11.1
22	201	2931	0.33	55.3	0.22	0.15	0.05	0.92	3009	47.9	11.1
23	208	2952	0.33	21.8	0.22	0.15	0.06	0.94	3031	20.2	11.2
24	215	2974	0.33	22.0	0.23	0.16	0.06	0.97	3053	21.1	11.3
25	222	2996	0.34	22.2	0.23	0.16	0.06	0.99	3075	21.9	11.4
26	231	3019	0.34	21.2	0.23	0.17	0.07	1.02	3099	21.4	11.5
27	237	3041	0.34	21.4	0.23	0.17	0.07	1.04	3123	22.2	11.6
28	243	3064	0.34	22.3	0.24	0.18	0.08	1.06	3149	23.6	11.7
29	251	3087	0.35	21.8	0.24	0.18	0.08	1.09	3175	23.7	11.8
30	257	3110	0.35	22.7	0.24	0.19	0.08	1.11	3201	25.2	11.9
31	264	3133	0.35	24.3	0.24	0.19	0.09	1.13	3229	27.5	12.0
32	272	3145	0.35	20.8	0.12	0.10	0.04	1.15	3243	23.9	12.0
33	278	3145	0.35	16.2	0.00	0.00	0.00		3243	18.9	12.0
34	286	3241	0.36	30.9	1.00	0.81	0.38	1.19	3363	37.6	12.5
35	292										
36	299										

* Rates of sulfate production and NP depletion are 5-week moving averages

** Wet dry cycles

Appendix 4.17

Backfill Cemented Whole Tailings - Leached Under Wet/Dry Cycles Followed by Saturated Conditions

Appendix 4.17 Table 1

Sample Characterization Backfill Cemented Whole Tailings - Leached under wet/dry cycles followed by saturated conditions

Metals Analysis		Tails (ppm)	Groundwater (mg/L)
Aluminum	Al	30600	<0.03
Antimony	Sb	68	<0.04
Arsenic	As	2500	<0.005
Barium	Ba	54	0.012
Beryllium	Be	<50	<0.005 *
Bismuth	Bi	<20	<0.20 *
Cadmium	Cd	28	<0.005
Calcium	Ca	6800	25.0
Carbon	C	5000	NA
Chromium	Cr	100	<0.005
Cobalt	Co	69	<0.010
Copper	Cu	860	0.027
Gallium	Ga	16	NA
Iron	Fe	232000	0.030
Lead	Pb	4300	<0.04
Lithium	Li	NA	NA
Magnesium	Mg	14900	13.000
Manganese	Mn	580	0.011
Mercury	Hg	1.6	<0.0002
Molybdenum	Mo	<20	<0.020
Nickel	Ni	22	<0.015
Phosphorus	P	NA	NA
Potassium	K	7600	0.750
Selenium	Se	35	<0.005
Silicon	Si	160000	NA
Silver	Ag	22.2	<0.005
Sodium	Na	1600	1.90
Strontium	Sr	NA	NA
Thallium	Tl	14	<0.040
Tin	Sn	24	<0.24
Titanium	Ti	1400	<0.050
Tungsten	W	NA	NA
Vanadium	V	NA	NA
Zinc	Zn	8100	0.44
Sulfate	SO4	1900.0	9.90
Sulfur	S	249000.0	NA

ABA Results	
Paste pH	6.2
S (Total) (%)	29.7
SO4 (%)	1940
S (sulfide) (%)	27.8
AP (kg CaCO3/tonne)	927
NP (kg CaCO3/tonne)	27
CO2 (%)	1.39
CO3 NP (kg CaCO3/tonne)	31.5
Net NP (kg CaCO3/tonne)	-900
NP/AP	0.03

Sample Mass (kg)	25.30
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* Value Estimated

Note: NA = Not Analyzed

Appendix 4.17 Table 2

Parameters Measured Weekly
Backfill Cemented Whole Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

DATE	CYCLE	DAYS	VOLUME (L)	pH	CONDUCT (uS/cm)	ALKALINITY (mg/L)	ACIDITY (mg/L)	SULFATE (mg/L) **	CUMULATIVE SULFATE (mg/kg)
19-Oct	1*	7	4.500	8.9	5940			1620	288
14-Dec	2*	63	4.500	6.9	5090	<5		1640	580
21-Dec	3	70	4.500	6.2	4420	<5		1690	879
28-Dec	4	77	4.500	6.6	3850	<5		2000	1233
3-Jan	5	83	0.400	4.0	3960			1860	1262
11-Jan	6	91	4.500	7.3	3130	17		1720	1566
17-Jan	7	97	2.000	6.5	3190	8		1500	1684
23-Jan	8	103	0.500	6.6	3140	12		2370	1730
30-Jan	9	110	0.500	6.5	3200	10		3240	1794
8-Feb	10	119	4.500	9.1	2971	22		4110	2524
15-Feb	11	126	0.500	7.8	2890	24		3796	2598
21-Feb	12	132	0.500	7.8	2940	19		3483	2667
28-Feb	13	139	0.500	7.6	3150	17		3169	2729
7-Mar	14	146	0.500	7.7	2890	13		2855	2786
13-Mar	15	152	0.500	7.7	2720	13		2541	2836
21-Mar	16	160	0.500	7.6	2840	<5		2228	2880
28-Mar	17	167	0.500	7.6	2810	<5		1914	2917
4-Apr	18	174	4.500	7.4	2860	<5		1600	3200
11-Apr	19	181	0.500	9.1	2570	32		1594	3231
18-Apr	20	188	0.500	9.0	2660	37		1588	3262
25-Apr	21	195	0.500	9.0	2540	22		1581	3294
1-May	22	201	0.500	8.7	2690	20		1575	3324
8-May	23	208	0.500	8.2	2690	32		1569	3355
15-May	24	215	0.500	8.0	2490	14		1563	3386
22-May	25	222	0.500	8.1	2420	21		1556	3417
31-May	26	231	0.500	8.0	2400	17		1550	3447
6-Jun	27	237	0.500	8.2	2510	10		1544	3477
12-Jun	28	243	0.500	7.6	2430	13		1538	3507
20-Jun	29	251	0.500	7.8	2370	19		1531	3538
26-Jun	30	257	0.500	7.7	2460	16		1525	3567
3-Jul	31	264	0.500	7.7	2350			1519	3597
11-Jul	32	272	0.500	7.6	2340	13		1513	3627
17-Jul	33	278	0.000					1506	3627
25-Jul	34	286	2.000	8.1	2340	14		1500	3745
31-Jul	35	292	0.500	8.6	2340	17			
7-Aug	36	299	0.500	8.4	2320	6			
14-Aug	37	306	0.500	8.6	2370	15			
21-Aug	38	313	0.500	8.5	2330	14			
30-Aug	39	322	0.500	8.2	2310	5			
6-Sep	40	329	2.000	8.6	2260	16			
11-Sep	41	334	2.000	8.8	2420	18			
18-Sep	42	341	2.000	9.4	2410	23			
25-Sep	43	348	2.000	9.4	2450	20			
3-Oct	44	356	2.000	9.3	2390	21			
10-Oct	45	363	2.000	9.5	2380	32			
17-Oct	46	370	2.000	8.9	2280				
23-Oct	47	376	2.000	9.5	2430				
30-Oct	48	383	2.000	9.5	2430				
6-Nov	49	390	2.000	9.4	2480				

* Wet dry cycles ** Measured values of sulfate shown in bold

Appendix 4.17 Table 3

Leachate Analysis
Backfill Cemented Whole Tailings

Test: Leached under wet/dry cycles followed by saturated conditions

Water Sample: Bottom seepage

CYCLE	DAYS	LEACHATE ANALYSIS (mg/L)**																	
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn	
1*	7	0.31	0.210	0.470	850	0.600	0.026	0.08	1.10	0.12	4.50	0.260	0.120	525	0.140	0.041	170	0.180	
2*	63	0.31	0.030	0.093	720	0.044	0.022	0.04	2.20	0.28	11.00	1.100	< 0.020	321	0.140	0.031	94.0	0.360	
3	70	0.40	0.034	0.098	840	0.090	0.022	0.11	1.30	0.18	8.00	1.500	0.050	264	0.150	0.035	80.0	0.200	
4	77	0.24	0.013	0.079	790	0.022	0.030	0.17	0.47	0.05	5.30	1.600	0.058	198	0.150	0.040	64.0	0.100	
5	83	0.21	0.011	0.073	770	0.016	0.03	0.14	0.37	0.04	4.50	1.600	0.0	166	0.120	0.036	44.0	0.088	
6	91	0.18	0.009	0.067	750	0.010	0.023	0.10	0.28	0.04	3.70	1.600	0.037	136	0.090	0.031	34.0	0.075	
7	97	0.08	0.011	0.057	730	0.005	0.014	0.05	0.14	0.04	3.80	0.970	0.061	100	0.067	0.014	22.0	0.530	
8	103	0.08	0.010	0.056	717	0.005	0.01	0.05	0.10	0.04	3.27	0.890	0.062	95.9	0.063	0.012	20.0	0.363	
9	110	0.08	0.008	0.054	703	0.005	0.01	0.05	0.06	0.04	2.73	0.810	0.064	91.9	0.058	0.010	18.0	0.197	
10	119	0.08	0.007	0.053	690	0.005	< 0.010	0.05	0.02	0.04	2.20	0.730	0.065	87.8	0.054	0.008	16.0	0.030	
11	126	0.08	0.008	0.052	693	0.005	0.010	0.042	0.02	0.04	2.13	0.660	0.071	82.3	0.054	0.008	15.25	0.029	
12	132	0.08	0.009	0.050	695	0.005	0.010	0.037	0.02	0.04	2.05	0.590	0.076	76.9	0.054	0.007	14.50	0.029	
13	139	0.08	0.011	0.049	698	0.005	0.010	0.031	0.02	0.04	1.98	0.520	0.082	71.4	0.054	0.007	13.75	0.028	
14	146	0.07	0.012	0.048	700	0.005	0.010	0.026	0.02	0.04	1.90	0.450	0.088	65.9	0.054	0.007	13.00	0.027	
15	152	0.07	0.013	0.046	703	0.005	0.010	0.021	0.02	0.04	1.83	0.380	0.093	60.4	0.054	0.006	12.25	0.026	
16	160	0.07	0.015	0.045	705	0.005	0.010	0.016	0.02	0.04	1.75	0.310	0.099	55.0	0.054	0.006	11.50	0.026	
17	167	0.07	0.016	0.043	708	0.005	0.010	0.010	0.02	0.04	1.68	0.240	0.104	49.5	0.054	0.005	10.75	0.025	
18	174	0.07	0.017	0.042	710	< 0.005	0.010	< 0.005	0.02	< 0.04	1.60	0.170	0.110	44.0	0.054	< 0.005	10.00	0.024	
19	181	0.06	0.016	0.041	708	0.005	0.010	0.005	0.02	0.038	1.55	0.161	0.108	42.8	0.055		9.95	0.024	
20	188	0.06	0.015	0.041	706	0.005	0.010	0.005	0.02	0.035	1.50	0.152	0.105	41.5	0.055		9.90	0.024	
21	195	0.06	0.015	0.040	704	0.005	0.010	0.005	0.02	0.033	1.46	0.142	0.103	40.3	0.056		9.85	0.023	
22	201	0.06	0.014	0.040	703	0.005	0.010	0.005	0.02	0.031	1.41	0.133	0.100	39.0	0.056		9.80	0.023	
23	208	0.06	0.013	0.039	701	0.005	0.010	0.005	0.02	0.028	1.36	0.124	0.098	37.8	0.057		9.75	0.023	
24	215	0.05	0.012	0.039	699	0.005	0.010	0.005	0.02	0.026	1.31	0.115	0.095	36.5	0.057		9.70	0.023	
25	222	0.05	0.011	0.038	697	0.005	0.010	0.005	0.02	0.024	1.26	0.106	0.093	35.3	0.058		9.65	0.022	
26	231	0.05	0.011	0.038	695	0.005	0.010	0.005	0.02	0.022	1.22	0.097	0.090	34.0	0.058		9.60	0.022	
27	237	0.05	0.010	0.037	693	0.005	0.010	0.005	0.02	0.019	1.17	0.087	0.088	32.8	0.059		9.55	0.022	
28	243	0.04	0.009	0.036	691	0.005	0.010	0.005	0.02	0.017	1.12	0.078	0.085	31.5	0.059		9.50	0.022	
29	251	0.04	0.008	0.036	689	0.005	0.010	0.005	0.02	0.015	1.07	0.069	0.083	30.3	0.060		9.45	0.021	
30	257	0.04	0.007	0.035	688	0.005	0.010	0.005	0.02	0.012	1.02	0.060	0.080	29.0	0.060		9.40	0.021	
31	264	0.04	0.006	0.035	686	0.005	0.010	0.005	0.02	0.010	0.97	0.051	0.078	27.8	0.061		9.35	0.021	
32	272	0.03	0.006	0.034	684	0.005	0.010	0.005	0.02	0.008	0.93	0.041	0.075	26.5	0.061		9.30	0.021	
33	278	0.03	0.005	0.034	682	0.005	0.010	0.005	0.02	0.005	0.88	0.032	0.073	25.3	0.062		9.25	0.020	
34	286	0.03	< 0.004	0.033	680	< 0.005	< 0.010	< 0.005	< 0.02	< 0.003	0.83	0.023	0.070	24.0	0.062		9.20	< 0.020	
35	292																		
36	299																		

* Wet dry cycles ** Measured values shown in bold

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Appendix 4.17 Table 4

Cumulative Mass Flux
Backfill Cemented Whole Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE MASS FLUX (mg/kg sample)																
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7	0.06	0.037	0.084	151	0.107	0.005	0.014	0.2	0.02	0.8	0.05	0.021	93.4	0.025	0.007	30.2	0.032
2*	63	0.11	0.043	0.100	279	0.115	0.009	0.021	0.6	0.07	2.8	0.24	0.025	150.5	0.050	0.013	47.0	0.094
3	70	0.18	0.048	0.115	424	0.130	0.012	0.035	0.8	0.10	1.9	0.51	0.033	197.3	0.076	0.019	60.8	0.052
4	77	0.22	0.050	0.127	560	0.134	0.016	0.061	0.9	0.10	0.5	0.79	0.042	232.0	0.102	0.025	70.1	-0.009
5	83	0.22	0.050	0.128	572	0.134	0.016	0.063	0.9	0.10	0.4	0.81	0.043	234.6	0.104	0.026	70.8	-0.014
6	91	0.25	0.051	0.138	701	0.135	0.020	0.076	0.9	0.11	-1.3	1.10	0.049	258.5	0.120	0.031	76.5	-0.079
7	97	0.26	0.052	0.142	757	0.135	0.020	0.078	0.9	0.11	-2.0	1.17	0.053	266.4	0.125	0.032	78.1	-0.072
8	103	0.26	0.052	0.143	770	0.135	0.020	0.078	0.9	0.11	-2.2	1.19	0.055	268.2	0.126	0.032	78.4	-0.074
9	110	0.26	0.052	0.143	784	0.135	0.021	0.078	0.9	0.11	-2.4	1.21	0.056	270.0	0.127	0.032	78.8	-0.079
10	119	0.27	0.053	0.151	902	0.136	0.021	0.082	0.9	0.11	-4.3	1.33	0.067	285.5	0.136	0.033	81.3	-0.152
11	126	0.27	0.053	0.151	915	0.136	0.022	0.082	0.9	0.12	-4.5	1.35	0.068	287.1	0.137	0.033	81.5	-0.160
12	132	0.27	0.053	0.152	929	0.136	0.022	0.083	0.9	0.12	-4.8	1.36	0.069	288.6	0.138	0.033	81.8	-0.168
13	139	0.27	0.054	0.153	942	0.136	0.022	0.083	0.9	0.12	-5.0	1.37	0.071	290.0	0.139	0.033	82.0	-0.176
14	146	0.28	0.054	0.154	955	0.136	0.022	0.083	0.9	0.12	-5.2	1.38	0.072	291.3	0.140	0.033	82.2	-0.184
15	152	0.28	0.054	0.154	969	0.136	0.022	0.082	0.9	0.12	-5.4	1.38	0.074	292.5	0.141	0.034	82.4	-0.192
16	160	0.28	0.054	0.155	982	0.136	0.022	0.082	0.9	0.12	-5.6	1.39	0.076	293.6	0.142	0.034	82.6	-0.200
17	167	0.28	0.054	0.156	995	0.136	0.022	0.082	0.9	0.12	-5.9	1.39	0.078	294.5	0.143	0.034	82.8	-0.209
18	174	0.29	0.057	0.161	1117	0.137	0.023	0.078	0.9	0.12	-7.9	1.42	0.097	302.2	0.153	0.034	84.2	-0.283
19	181	0.29	0.057	0.161	1131	0.137	0.023	0.078	0.9	0.12	-8.1	1.43	0.099	303.1	0.154	0.034	84.4	-0.291
20	188	0.29	0.058	0.162	1144	0.137	0.023	0.077	0.9	0.12	-8.4	1.43	0.101	303.9	0.155	0.034	84.6	-0.299
21	195	0.29	0.058	0.163	1158	0.137	0.023	0.077	0.9	0.12	-8.6	1.43	0.103	304.6	0.156	0.034	84.7	-0.307
22	201	0.29	0.058	0.163	1171	0.137	0.023	0.076	0.9	0.12	-8.8	1.43	0.105	305.4	0.157	0.034	84.9	-0.316
23	208	0.29	0.058	0.164	1184	0.137	0.024	0.076	0.9	0.12	-9.0	1.44	0.107	306.1	0.158	0.034	85.0	-0.324
24	215	0.29	0.058	0.164	1198	0.137	0.024	0.075	0.9	0.12	-9.3	1.44	0.108	306.8	0.159	0.034	85.2	-0.332
25	222	0.29	0.059	0.165	1211	0.137	0.024	0.075	0.9	0.12	-9.5	1.44	0.110	307.5	0.160	0.034	85.3	-0.340
26	231	0.29	0.059	0.165	1224	0.137	0.024	0.075	0.9	0.12	-9.7	1.44	0.112	308.2	0.161	0.034	85.5	-0.349
27	237	0.30	0.059	0.166	1237	0.137	0.024	0.074	0.9	0.12	-10.0	1.44	0.114	308.8	0.162	0.034	85.6	-0.357
28	243	0.30	0.059	0.166	1251	0.137	0.024	0.074	0.9	0.12	-10.2	1.44	0.115	309.4	0.163	0.034	85.8	-0.365
29	251	0.30	0.059	0.167	1264	0.137	0.024	0.073	0.9	0.12	-10.4	1.45	0.117	310.0	0.164	0.034	85.9	-0.373
30	257	0.30	0.059	0.167	1277	0.137	0.024	0.073	0.9	0.12	-10.7	1.45	0.118	310.6	0.166	0.033	86.1	-0.382
31	264	0.30	0.059	0.168	1290	0.137	0.024	0.072	0.9	0.12	-10.9	1.45	0.120	311.1	0.167	0.033	86.2	-0.390
32	272	0.30	0.059	0.168	1303	0.137	0.024	0.072	0.9	0.12	-11.2	1.45	0.121	311.6	0.168	0.033	86.4	-0.398
33	278	0.30	0.059	0.168	1303	0.137	0.024	0.072	0.9	0.12	-11.2	1.45	0.121	311.6	0.168	0.033	86.4	-0.398
34	286	0.30	0.060	0.170	1355	0.138	0.025	0.070	0.9	0.12	-12.1	1.45	0.126	313.4	0.173	0.033	87.0	-0.431
35	292																	
36	299																	

* Wet dry cycles

Appendix 4.17 Table 5

Cumulative Metal Extractions
Backfill Cemented Whole Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	CUMULATIVE METAL EXTRACTIONS (%)																
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7	0.000	0.001	0.155	2.2	0.107	0.007	0.002	0.000	0.000	0.005	0.01	0.11	1.229	0.071	0.033	1.890	0.000
2*	63	0.000	0.002	0.185	4.1	0.115	0.012	0.002	0.000	0.002	0.019	0.04	0.12	1.980	0.142	0.058	2.935	0.001
3	70	0.001	0.002	0.214	6.2	0.130	0.017	0.004	0.000	0.002	0.013	0.09	0.17	2.596	0.217	0.084	3.803	0.001
4	77	0.001	0.002	0.236	8.2	0.134	0.023	0.007	0.000	0.002	0.003	0.14	0.21	3.053	0.292	0.114	4.382	0.000
5	83	0.001	0.002	0.238	8.4	0.134	0.024	0.007	0.000	0.002	0.002	0.14	0.22	3.087	0.298	0.116	4.424	0.000
6	91	0.001	0.002	0.256	10.3	0.135	0.028	0.009	0.000	0.003	-0.009	0.19	0.24	3.401	0.342	0.139	4.781	-0.001
7	97	0.001	0.002	0.262	11.1	0.135	0.029	0.009	0.000	0.003	-0.014	0.20	0.27	3.505	0.357	0.143	4.880	-0.001
8	103	0.001	0.002	0.264	11.3	0.135	0.030	0.009	0.000	0.003	-0.015	0.21	0.27	3.529	0.360	0.144	4.902	-0.001
9	110	0.001	0.002	0.265	11.5	0.135	0.030	0.009	0.000	0.003	-0.016	0.21	0.28	3.553	0.363	0.145	4.922	-0.001
10	119	0.001	0.002	0.279	13.3	0.136	0.031	0.010	0.000	0.003	-0.029	0.23	0.33	3.757	0.389	0.149	5.079	-0.002
11	126	0.001	0.002	0.280	13.5	0.136	0.031	0.010	0.000	0.003	-0.031	0.23	0.34	3.778	0.392	0.149	5.095	-0.002
12	132	0.001	0.002	0.282	13.7	0.136	0.031	0.010	0.000	0.003	-0.032	0.23	0.35	3.798	0.395	0.150	5.111	-0.002
13	139	0.001	0.002	0.283	13.9	0.136	0.031	0.010	0.000	0.003	-0.033	0.24	0.35	3.816	0.398	0.150	5.126	-0.002
14	146	0.001	0.002	0.284	14.0	0.136	0.032	0.010	0.000	0.003	-0.035	0.24	0.36	3.833	0.401	0.151	5.139	-0.002
15	152	0.001	0.002	0.286	14.2	0.136	0.032	0.010	0.000	0.003	-0.036	0.24	0.37	3.849	0.404	0.151	5.152	-0.002
16	160	0.001	0.002	0.287	14.4	0.136	0.032	0.010	0.000	0.003	-0.038	0.24	0.38	3.863	0.407	0.151	5.164	-0.002
17	167	0.001	0.002	0.288	14.6	0.136	0.032	0.010	0.000	0.003	-0.039	0.24	0.39	3.875	0.410	0.151	5.175	-0.003
18	174	0.001	0.002	0.298	16.4	0.137	0.033	0.009	0.000	0.003	-0.053	0.25	0.48	3.977	0.436	0.153	5.265	-0.003
19	181	0.001	0.002	0.299	16.6	0.137	0.033	0.009	0.000	0.003	-0.055	0.25	0.50	3.988	0.439		5.275	-0.004
20	188	0.001	0.002	0.300	16.8	0.137	0.034	0.009	0.000	0.003	-0.056	0.25	0.51	3.998	0.442		5.285	-0.004
21	195	0.001	0.002	0.301	17.0	0.137	0.034	0.009	0.000	0.003	-0.058	0.25	0.51	4.008	0.445		5.295	-0.004
22	201	0.001	0.002	0.302	17.2	0.137	0.034	0.009	0.000	0.003	-0.059	0.25	0.52	4.018	0.448		5.304	-0.004
23	208	0.001	0.002	0.303	17.4	0.137	0.034	0.009	0.000	0.003	-0.061	0.25	0.53	4.028	0.451		5.314	-0.004
24	215	0.001	0.002	0.304	17.6	0.137	0.034	0.009	0.000	0.003	-0.062	0.25	0.54	4.037	0.454		5.324	-0.004
25	222	0.001	0.002	0.305	17.8	0.137	0.034	0.009	0.000	0.003	-0.064	0.25	0.55	4.046	0.457		5.333	-0.004
26	231	0.001	0.002	0.306	18.0	0.137	0.034	0.009	0.000	0.003	-0.065	0.25	0.56	4.055	0.460		5.343	-0.004
27	237	0.001	0.002	0.307	18.2	0.137	0.035	0.009	0.000	0.003	-0.067	0.25	0.57	4.063	0.463		5.352	-0.004
28	243	0.001	0.002	0.308	18.4	0.137	0.035	0.009	0.000	0.003	-0.068	0.25	0.58	4.071	0.466		5.362	-0.005
29	251	0.001	0.002	0.309	18.6	0.137	0.035	0.009	0.000	0.003	-0.070	0.25	0.58	4.079	0.470		5.371	-0.005
30	257	0.001	0.002	0.310	18.8	0.137	0.035	0.008	0.000	0.003	-0.072	0.25	0.59	4.086	0.473		5.380	-0.005
31	264	0.001	0.002	0.310	19.0	0.137	0.035	0.008	0.000	0.003	-0.073	0.25	0.60	4.093	0.476		5.389	-0.005
32	272	0.001	0.002	0.311	19.2	0.137	0.035	0.008	0.000	0.003	-0.075	0.25	0.61	4.100	0.479		5.399	-0.005
33	278	0.001	0.002	0.311	19.2	0.137	0.035	0.008	0.000	0.003	-0.075	0.25	0.61	4.100	0.479		5.399	-0.005
34	286	0.001	0.002	0.314	19.9	0.138	0.036	0.008	0.000	0.003	-0.081	0.25	0.63	4.124	0.493		5.435	-0.005
35	292																	
36	299																	

* Wet dry cycles

Appendix 4.17 Table 6

Metal Extraction Rates
Backfill Cemented Whole Tailings

Test: Leached under wet/dry cycles followed by saturated conditions
Water Sample: Bottom seepage

CYCLE	DAYS	METAL EXTRACTION RATES (mg/kgwt) - 5 Cycle Moving Average																
		Aluminum Al	Arsenic As	Barium Ba	Calcium Ca	Chromium Cr	Cobalt Co	Copper Cu	Iron Fe	Lead Pb	Magnesium Mg	Manganese Mn	Molybdenum Mo	Potassium K	Selenium Se	Silver Ag	Sodium Na	Zinc Zn
1*	7																	
2*	63																	
3	70	0.014	0.0012	0.004	30.34	0.0026	0.001	0.0024	0.069	0.0087	0.119	0.051	0.001	11.55	0.006	0.0013	3.40	0.002
4	77	0.016	0.0013	0.004	40.91	0.0027	0.001	0.0047	0.070	0.0083	-0.030	0.074	0.002	13.86	0.008	0.0018	3.99	-0.004
5	83	0.015	0.0012	0.004	38.76	0.0025	0.001	0.0045	0.065	0.0077	-0.040	0.071	0.002	13.01	0.007	0.0017	3.73	-0.004
6	91	0.016	0.0012	0.005	45.82	0.0024	0.001	0.0052	0.062	0.0072	-0.174	0.088	0.002	13.76	0.008	0.0020	3.85	-0.009
7	97	0.030	0.0019	0.009	98.31	0.0043	0.002	0.0117	0.074	0.0080	-0.983	0.192	0.006	23.86	0.015	0.0039	6.41	-0.034
8	103	0.017	0.0008	0.006	73.44	0.0011	0.002	0.0090	0.029	0.0023	-0.865	0.145	0.005	15.05	0.011	0.0028	3.73	-0.027
9	110	0.009	0.0005	0.003	47.42	0.0004	0.001	0.0037	0.012	0.0014	-0.617	0.088	0.003	8.06	0.005	0.0015	1.83	-0.015
10	119	0.010	0.0006	0.004	64.17	0.0004	0.001	0.0038	0.010	0.0019	-0.913	0.101	0.005	9.90	0.006	0.0014	2.04	-0.027
11	126	0.004	0.0004	0.003	42.86	0.0002	0.000	0.0014	0.002	0.0013	-0.652	0.050	0.004	5.72	0.004	0.0005	1.01	-0.016
12	132	0.003	0.0003	0.002	34.36	0.0001	0.000	0.0010	0.000	0.0010	-0.550	0.037	0.003	4.46	0.003	0.0003	0.74	-0.019
13	139	0.003	0.0003	0.002	33.33	0.0001	0.000	0.0009	0.000	0.0010	-0.539	0.035	0.003	4.24	0.003	0.0003	0.69	-0.020
14	146	0.003	0.0003	0.002	33.32	0.0001	0.000	0.0008	0.000	0.0010	-0.542	0.033	0.003	4.14	0.003	0.0003	0.68	-0.021
15	152	0.001	0.0002	0.001	14.10	0.0001	0.000	0.0001	0.000	0.0004	-0.231	0.011	0.002	1.48	0.001	0.0001	0.25	-0.009
16	160	0.001	0.0002	0.001	13.73	0.0001	0.000	0.0000	0.000	0.0004	-0.226	0.009	0.002	1.33	0.001	0.0001	0.23	-0.008
17	167	0.001	0.0002	0.001	13.39	0.0000	0.000	-0.0001	0.000	0.0004	-0.221	0.007	0.002	1.18	0.001	0.0001	0.20	-0.008
18	174	0.003	0.0007	0.002	35.10	0.0001	0.000	-0.0009	0.000	0.0010	-0.583	0.011	0.005	2.44	0.003	0.0001	0.45	-0.021
19	181	0.003	0.0007	0.002	35.13	0.0001	0.000	-0.0010	-0.001	0.0010	-0.584	0.010	0.005	2.35	0.003	0.0001	0.43	-0.021
20	188	0.003	0.0007	0.002	34.17	0.0001	0.000	-0.0010	0.000	0.0010	-0.569	0.009	0.005	2.21	0.003	0.0001	0.41	-0.021
21	195	0.003	0.0007	0.002	35.14	0.0001	0.000	-0.0011	-0.001	0.0010	-0.587	0.008	0.005	2.21	0.003	0.0001	0.42	-0.021
22	201	0.003	0.0007	0.002	36.16	0.0001	0.000	-0.0012	-0.001	0.0010	-0.605	0.008	0.006	2.24	0.003	0.0001	0.43	-0.022
23	208	0.001	0.0002	0.001	13.82	0.0001	0.000	-0.0004	0.000	0.0003	-0.235	0.003	0.002	0.80	0.001	-0.0001	0.16	-0.008
24	215	0.001	0.0002	0.001	13.78	0.0001	0.000	-0.0004	0.000	0.0002	-0.236	0.002	0.002	0.78	0.001	-0.0001	0.16	-0.008
25	222	0.001	0.0002	0.001	13.74	0.0001	0.000	-0.0004	0.000	0.0002	-0.237	0.002	0.002	0.75	0.001	-0.0001	0.16	-0.008
26	231	0.001	0.0002	0.001	12.95	0.0000	0.000	-0.0004	0.000	0.0001	-0.225	0.002	0.002	0.69	0.001	0.0000	0.15	-0.008
27	237	0.001	0.0002	0.001	12.91	0.0000	0.000	-0.0004	0.000	0.0001	-0.226	0.002	0.002	0.66	0.001	0.0000	0.15	-0.008
28	243	0.001	0.0002	0.001	13.24	0.0000	0.000	-0.0004	0.000	0.0000	-0.233	0.002	0.002	0.66	0.001	0.0000	0.15	-0.008
29	251	0.001	0.0001	0.000	12.84	0.0000	0.000	-0.0004	0.000	0.0000	-0.227	0.001	0.002	0.61	0.001	0.0000	0.15	-0.008
30	257	0.001	0.0001	0.000	13.17	0.0000	0.000	-0.0004	0.000	-0.0001	-0.235	0.001	0.002	0.61	0.001	0.0000	0.15	-0.008
31	264	0.001	0.0001	0.000	13.93	0.0001	0.000	-0.0005	0.000	-0.0001	-0.250	0.001	0.002	0.62	0.001	-0.0001	0.16	-0.009
32	272	0.000	0.0001	0.000	13.09	0.0000	0.000	-0.0004	0.000	-0.0002	-0.237	0.001	0.002	0.56	0.001	0.0000	0.15	-0.008
33	278	0.000	0.0001	0.000	10.46	0.0000	0.000	-0.0003	0.000	-0.0001	-0.190	0.001	0.001	0.44	0.001	0.0000	0.12	-0.007
34	286	0.000	0.0001	0.001	18.19	0.0001	0.000	-0.0006	0.000	-0.0004	-0.335	0.001	0.002	0.69	0.002	-0.0001	0.20	-0.012
35	292																	
36	299																	

* Wet dry cycles

Appendix 4.17 Table 7

**Oxidation and Neutralization Rates
Backfill Cemented Whole Tailings**

Test: **Leached under wet/dry cycles followed by saturated conditions**
Water Sample: **Bottom seepage**

CYCLE	DAYS	OXIDATION			MOLES EXTRACTED			MOLE RATIO [Ca + Mg] [SO ₄]	NEUTRALIZATION		
		Cumulative Sulfate Flux (mg/kg)	Sulfur Depletion (%)	Sulfate Prod. Rate* (mg/kg/awk)	Sulfate (mmol/kg)	Ca (mmol/kg)	Mg (mmol/kg)		Cum. NP Depletion (mg/kg)	NP Depletion Rate (mg/kg/awk)*	NP Consumed (%)
1**	7	288	0.03		3.00	3.78	0.03	1.27	381		1.4
2**	63	580	0.07						381		1.4
3	70	879	0.10	65.6	3.11	3.62	-0.04	1.15	740	39.9	2.7
4	77	1233	0.14	94.5	3.69	3.40	-0.06	0.91	1075	69.3	4.0
5	83	1262	0.14	89.7	0.30	0.29	-0.01	0.95	1103	66.5	4.1
6	91	1566	0.18	106.5	3.17	3.22	-0.07	1.00	1419	86.5	5.3
7	97	1684	0.19	227.3	1.23	1.39	-0.03	1.11	1555	241.7	5.8
8	103	1730	0.19	180.7	0.49	0.34	-0.01	0.69	1589	180.0	5.9
9	110	1794	0.20	119.1	0.66	0.34	-0.01	0.49	1621	116.0	6.0
10	119	2524	0.28	245.3	7.60	2.96	-0.08	0.38	1909	156.7	7.1
11	126	2598	0.29	206.5	0.78	0.33	-0.01	0.41	1941	104.5	7.2
12	132	2667	0.30	196.6	0.71	0.33	-0.01	0.45	1973	83.6	7.3
13	139	2729	0.31	194.2	0.65	0.33	-0.01	0.50	2006	81.1	7.4
14	146	2786	0.31	192.8	0.59	0.33	-0.01	0.55	2038	81.1	7.5
15	152	2836	0.32	66.2	0.52	0.33	-0.01	0.62	2071	34.3	7.7
16	160	2880	0.32	57.9	0.46	0.34	-0.01	0.72	2104	33.4	7.8
17	167	2917	0.33	50.0	0.39	0.34	-0.01	0.84	2136	32.6	7.9
18	174	3200	0.36	94.1	2.95	3.05	-0.08	1.01	2433	85.3	9.0
19	181	3231	0.36	89.1	0.33	0.34	-0.01	1.01	2465	85.4	9.1
20	188	3262	0.37	83.0	0.32	0.34	-0.01	1.01	2498	83.1	9.3
21	195	3294	0.37	82.8	0.32	0.34	-0.01	1.01	2531	85.4	9.4
22	201	3324	0.37	83.9	0.32	0.33	-0.01	1.01	2563	87.9	9.5
23	208	3355	0.38	32.0	0.32	0.33	-0.01	1.01	2596	33.6	9.6
24	215	3386	0.38	31.8	0.32	0.33	-0.01	1.01	2628	33.5	9.7
25	222	3417	0.38	31.7	0.32	0.33	-0.01	1.01	2660	33.4	9.9
26	231	3447	0.39	29.8	0.32	0.33	-0.01	1.01	2692	31.4	10.0
27	237	3477	0.39	29.7	0.32	0.33	-0.01	1.01	2724	31.3	10.1
28	243	3507	0.39	30.4	0.31	0.33	-0.01	1.02	2756	32.1	10.2
29	251	3538	0.40	29.5	0.31	0.33	-0.01	1.02	2788	31.2	10.3
30	257	3567	0.40	30.2	0.31	0.33	-0.01	1.02	2820	32.0	10.4
31	264	3597	0.40	31.9	0.31	0.33	-0.01	1.02	2852	33.8	10.6
32	272	3627	0.41	29.9	0.31	0.33	-0.01	1.02	2883	31.8	10.7
33	278	3627	0.41	23.9	0.00	0.00	0.00		2883	25.4	10.7
34	286	3745	0.42	41.5	1.23	1.29	-0.04	1.02	3009	44.1	11.1
35	292										
36	299										

* Rates of sulfate production and NP depletion are 5-week moving averages

** Wet dry cycles