Metal Leaching and Acid Rock Drainage Potential Characterization

Sisson Project

FINAL

Prepared for

Northcliff Resources Ltd.

Prepared by

SRK Consulting (Canada) Inc.
1CN019.000
August 2013

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1 Introduction

1.1 Background

Within its Sisson Project, Northcliff Resources Ltd. is proposing to extract tungsten and molybdenum from the Sisson deposit, located approximately 60 km northwest of Fredericton, New Brunswick. SRK Consulting (Canada) Inc. was retained by Northcliff to characterize the potential for metal leaching and acid rock drainage (ML/ARD) for the project. This report presents the findings of the ML/ARD characterization program and is intended to be submitted as a supporting document for Northcliff's Environmental Impact Assessment (EIA) report.

1.2 Geological Setting

1.2.1 Property Geology

The following summary of the property geology is taken from the Canadian National Instrument 43-101 Technical Report on the Sisson Project (Samuel Engineering 2013).

The deposit type at Sisson has been described as a granite-related porphyry tungsten-molybdenum-copper deposit. It is centered on a north-trending contact between igneous (Acadian) intrusions to the west and older metavolcanic and metasedimentary rocks to the east (Figure 1). Regional metamorphism is overprinted by contact metamorphism due to the intrusion of the Howard Peak Granodiorite. Porphyry-style alteration is present, although it is not as intense or widely distributed as typical copper porphyry systems. The most common alteration observed is biotite and sericite, with strongest alteration along the contact of the western gabbro with the eastern section of the deposit, referred to as the Turnbull Mountain Formation. Tungsten and molybdenum are predominantly present as scheelite and molybdenite that appear to be vein and fracture controlled.

Geological studies to date indicate economically viable mineralization occurs in four contiguous zones. Zones I and II are narrow, structurally controlled zones that extend north from Zone III, which hosts the bulk of the deposit. The Ellipse Zone extends northwest from the southwest corner of Zone III. The western half of Zone III is predominantly gabbro, and lithologies to the east of the gabbro intrusion and north of the Ellipse Zone are metamorphosed, consisting predominantly of volcanic and sedimentary rocks of the Turnbull Mountain formation and minor Miramichi group. The Ellipse Zone is made up of quartz diorite and lesser gabbro of the Howard Peak Granodiorite. The major lithologies are listed in Table 1, including a brief description and the associated lithocode for sample types used in this report. A plan view of the lithologies is provided in Figure 2 and a cross section in Figure 3.

The main sulphide minerals are pyrite and pyrrhotite, which typically average 1 to 2%. Minor arsenopyrite, sphalerite, galena and bismuth minerals are also present. Carbonates, primarily calcite, appear to be minor and are associated with narrow (i.e. less than 10 cm) quartz veins. Also noted in the quartz veins is fluorite. Based on geologic observations, ARD potential needs to be considered due to the presence of sulphides and limited amounts of carbonate minerals.

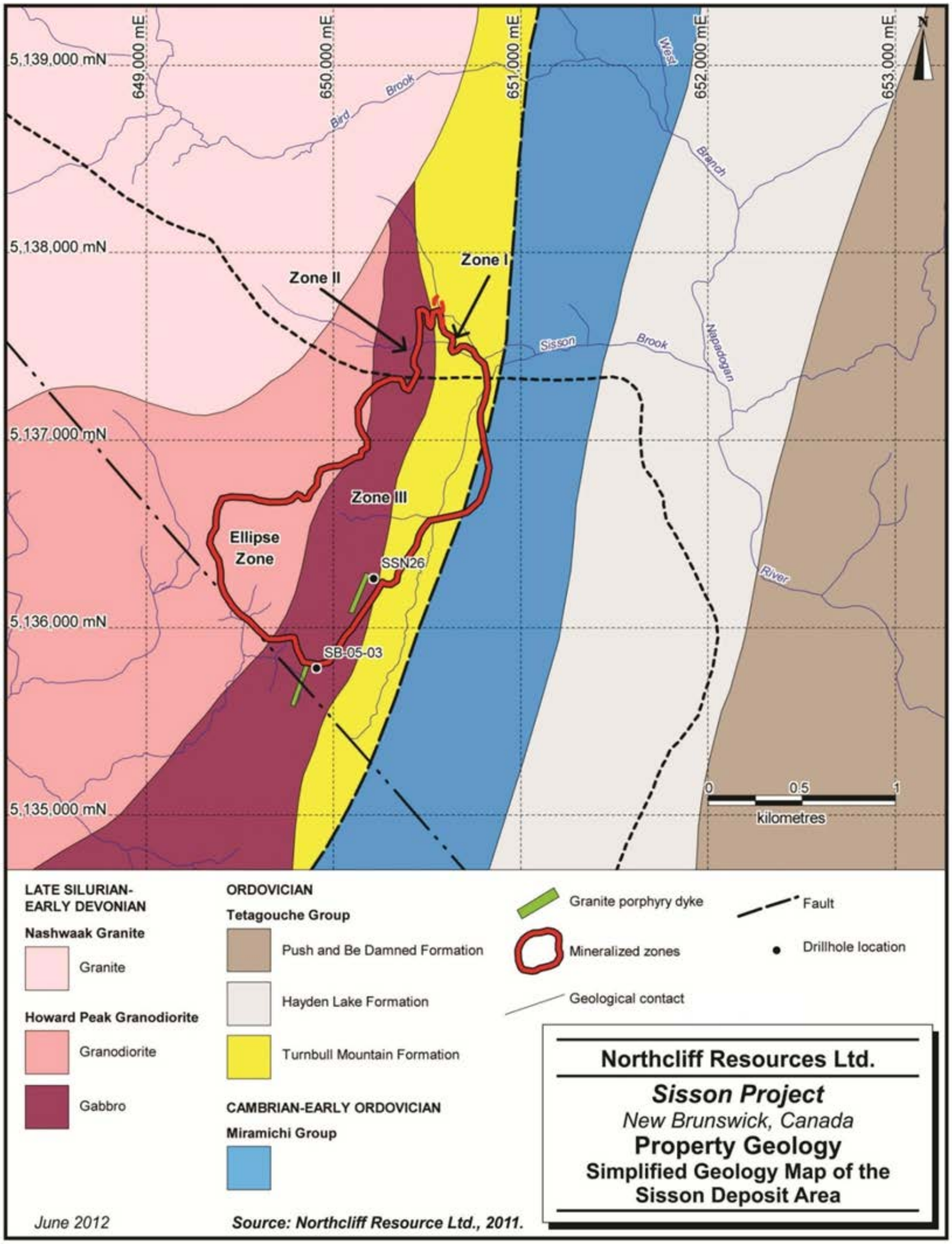

Figure 1: Sisson Project geology (reproduced from Samuel (2013)). Dashed line is an existing transmission line and fire road.

Table 1: Summary of major lithologies at Sisson (reproduced from Samuel (2013)).

Rock Types Used to Model the Sisson Deposit			
Model Unit	**Unit Name**	**Mineralization**	**Constituent Rock Types**
IQD	Quartz diorite	Western part of the Ellipse Zone	Quartz diorite phase, Howard Peak Granodiorite; internally homogenous
IGB	Gabbro	Eastern part of the Ellipse Zone, Zone II and western part of Zone III	Gabbro phase, Howard Peak Granodiorite; internally homogeneous
FTA	Felsic tuff – augen-bearing	Western part of Zone III	Thinly interbedded felsic > mafic > mafic crystal tuff; defined by eastern limit of augen bearing felsic tuff
FTC	Felsic tuff combined	Central part of Zone III	Moderately to thinly interbedded mafic crystal > felsic > mafic tuff
WKB1	Biotite wacke 1	Zone II and central part of Zone III	Medium grained biotite wacke, commonly with contact metamorphic andalusite; contains minor mafic and felsic tuff near eastern and western contacts
FT4	Felsic tuff 4	Central and eastern parts of Zone III	Interbedded mafic crystal > mafic > felsic tuff; increasing biotite wacke interbeds toward eastern and western margins
WKB2/3	Biotite wacke 2/3	Eastern part of Zone III	Fine grained biotite wacke with minor interbeds of mafic tuff; lacks andalusite
WKB4	Biotite wacke 4	Low-grade mineralization near the eastern margin of Zone III	Fine grained biotite wacke with interbeds of siliceous siltstone and quartzite; may be the western margin of the Miramichi Group; locally contains staurolite

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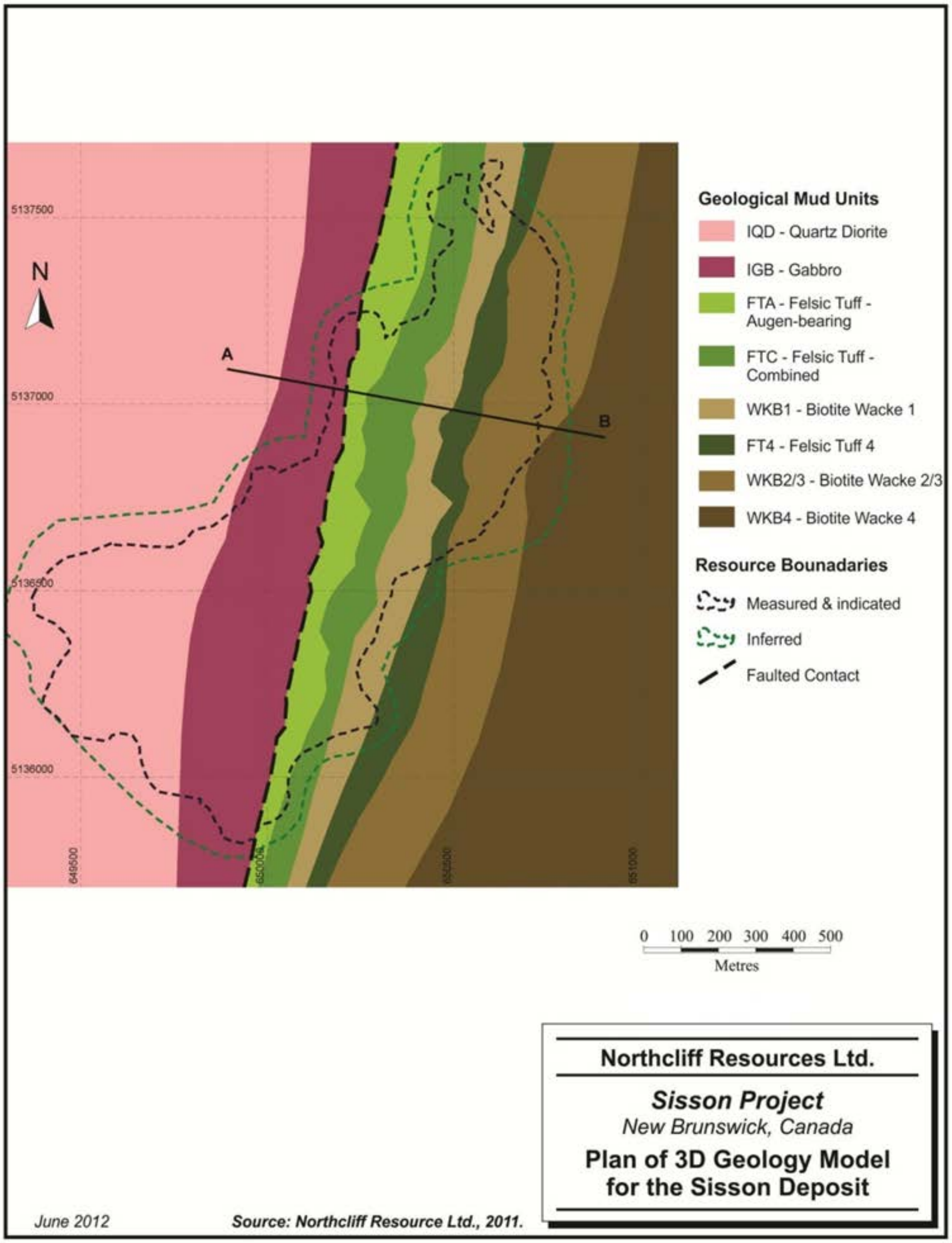


Northcliff Resources Ltd.

Sisson Project
New Brunswick, Canada

Plan of 3D Geology Model for the Sisson Deposit

June 2012

Source: Northcliff Resource Ltd., 2011.

Figure 2: Sisson geological modelling units (reproduced from Samuel (2013)).

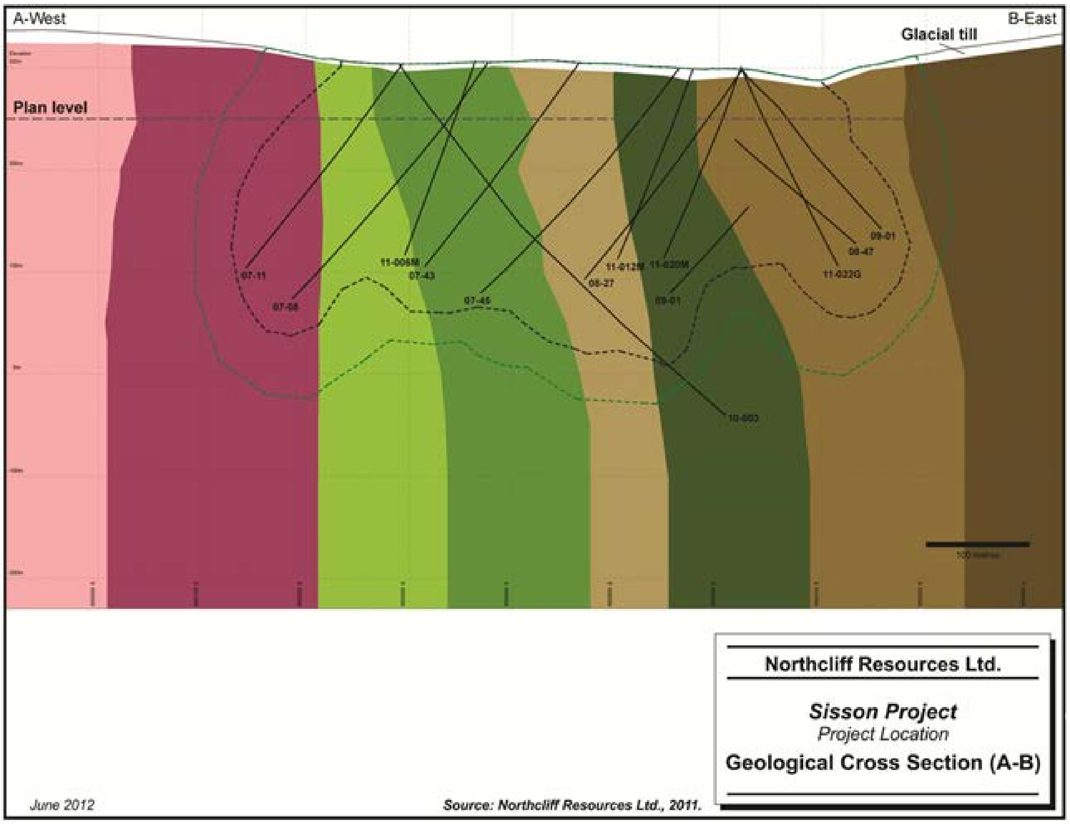


Figure 3: Geological cross section of A-B from Figure 2 (reproduced from Samuel (2013)).

1.3 Previous ML/ARD Characterization Work

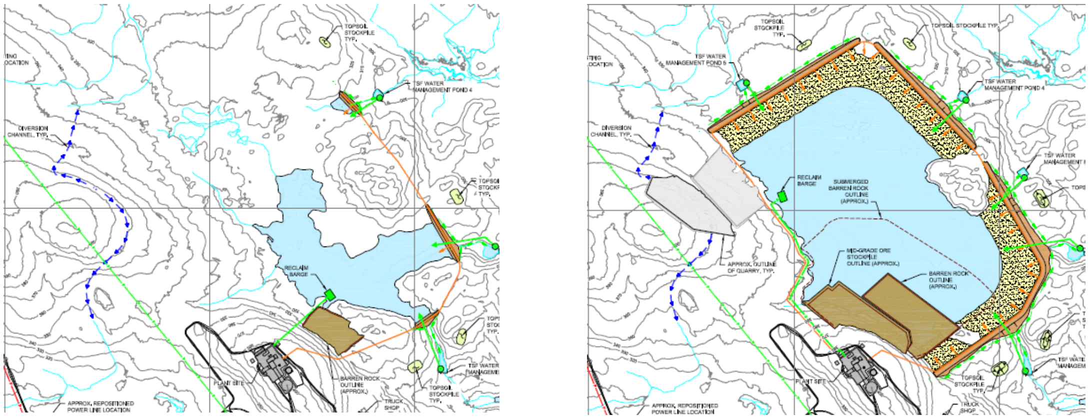
Prior to SRK's involvement, the Mine Drainage Assessment Group (MDAG 2008) conducted preliminary acid-base accounting characterization studies on the Project. Eighty-five drill core composites were selected to represent barren rock and ore. Results from the assessment indicated potential for ARD throughout the barren rock. However, as the project understanding evolved, many of the samples tested were classified as ore and several regions of the resource did not have any testing performed leading to the need for additional study.

1.4 Sisson Project Mine Plan

The mine plan at Sisson includes conventional open pit mining with truck and shovel removal of ore, mid-grade ore, and barren rock. Processing of ore will produce molybdenite tailings and tungsten/scheelite tailings at approximate proportions of 5 to 95%, respectively. Tailings will be stored in a tailings storage facility (TSF) with the majority of tailings submerged under water. Small beaches will be present next to the TSF embankments. Barren rock and mid-grade ore will be placed within the TSF or, in the last phase of mining, backfilled in the open pit. Detailed descriptions are provided in Samuel (2013). It should be noted that the terms barren rock and mid-grade ore used by the project team are synonymous with the more familiar terms waste rock and low grade ore, respectively.

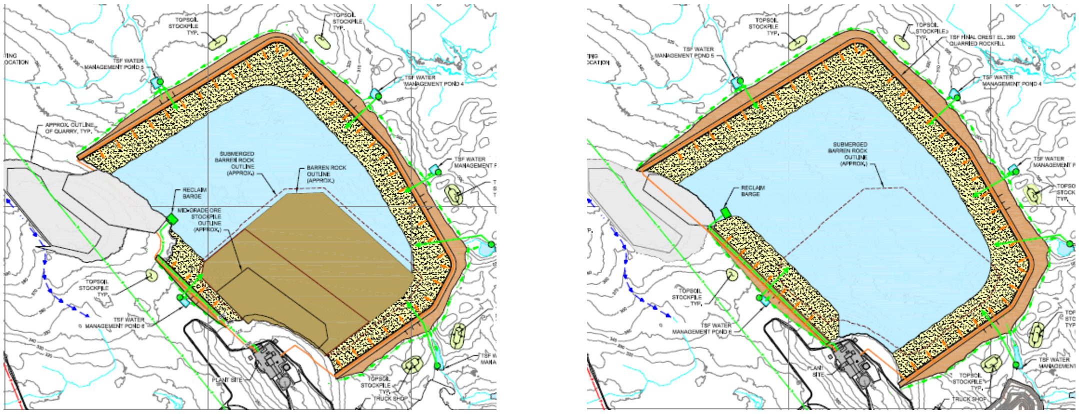
The plan for storage of barren rock and tailings was developed using initial observations of the geological and geochemical setting, preliminary findings by MDAG and refined as further geochemical data became available. Mine site configuration and development over the life of mine is provided in Figure 4. The following elements in the context of ML/ARD management are included:

- An open pit which will flood when mining ceases addressing ML/ARD of pit walls at closure (only a small (mean height ~ 22 m) high wall will remain);
- Construction of the tailings embankments and other site fills using locally quarried rock with negligible ML/ARD potential;
- Except in the last phase of mining, storage of all barren rock in the TSF with no more than two years of weathering prior to submergence;
- Residual barren rock backfilled in the open pit during the last six years of mine life and then submerged under water;
- All mid-grade ore placed within the TSF to facilitate submergence at closure if not processed;
- Separate storage of molybdenite and tungsten tailings;
- Subaqueous storage of sulphidic molybdenite tailings to inhibit ML/ARD;
- Conventional beach deposition of non-PAG (potentially acid generating) tungsten tailings;
- Refining of scheelite concentrate to produce ammonium paratungstate (APT) as well as a calcium hydroxide residue, acidic raffinate and a metal purification residue;
- On-site storage of APT calcium hydroxide and raffinate in lined ponds within the TSF and shipment of the metals purification residue to an off-site approved disposal facility; and
- Treatment of surplus water before discharge during operations and, for as long as necessary during post-closure.



Phase 1 (end of year -1)

Phase 2 (end of year 7)



Phase 3 (end of year 17)

Phase 4 (end of mine life – year 27)

Figure 4: Phased site configuration over life of mine (Knight Piésold in Samuel 2013).

1.5 Report Structure

This report contains the following main headings:

- Section 2, Characterization Design, explains the design of the geochemical testing program in the context of project data requirements.
- Section 3, Characterization Methods, summarizes the geochemical characterization methods.
- Section 4, Results, describes the results of the geochemical characterization program.
- Section 5, Management Plan, provides an overview of how ML/ARD potential findings have been used to inform the project design and minimize leaching effects.
- Section 6, Source Term Development, shows water quality predictions for each facility at the site.
- Section 7 provides conclusions for the study.

1.6 Acknowledgements

This report was prepared by SRK Consulting (Canada) Inc. with input from the following organizations:

- Northcliff Resources Ltd.—Collection of rock samples, set-up and monitoring of field barrel tests, and exploration geochemistry database review.
- Moose Mountain Technical Services—Barren rock block model and scheduling.
- Maxxam Analytics—Geochemical testing of rock, tailings, and borrow source materials.
- Knight Piésold (KP)—Collection of pit wall and quarry samples, waste facility configuration, and water balance data.

2 Characterization Design

2.1 Introduction

The two objectives of the geochemical testing program were to:

- Provide design criteria for the planning, operation and management of the various facilities containing geological materials at the site to the project engineers. These criteria include segregation criteria to address ML/ARD potential, criteria to define exposure times for reaction materials, and recommendations for construction of facilities such as placement methods; and
- Predict the chemistry of water coming into contact with geological materials as “source terms” for inputs into the water quality modelling for the site.

The underlying basis for the design of the program is the development of conceptual geochemical models (CGMs), which capture the expected geochemical performance of each project component for which a source term is required. CGMs frame the geochemical questions that need to be answered for each component and therefore focus on the characterization program by selecting the appropriate methodologies for sample collection, testing, and data interpretation. The following sections describe the CGMs.

2.2 Conceptual Geochemical Models

2.2.1 Overall

Review of the geological setting (Section 1.2) indicates the following general observations on geochemical performance of wastes and facilities at the site:

- Both pyrite and pyrrhotite occur throughout the host rocks ranging from 1 to 2% implying that at least PAG with associated ML is a consideration for the Project.
- Molybdenite and scheelite will be primarily associated with ore, although still likely present in barren rock and tailings and leaching effects need to be considered.

- Minor amounts of arsenopyrite, sphalerite, galena and bismuth minerals are present, which may be an indication that arsenic, zinc, lead and bismuth may leach regardless of pH.
- The deposit does not have a gossan and no naturally acidic seeps have been encountered in the area.
- Minor amounts of calcite and fluorite have been noted, typically in narrow veins. Calcite appears to be the dominant carbonate mineral.
- Some delay of ARD may be expected from calcite, although long term weathering is expected to deplete carbonates before acid generating sulphides are depleted.
- The mineral deposit model indicates that sulphide mineralization is ubiquitous throughout the deposit, which is supported by ML/ARD characterization studies and the exploration database.

The following sections outline the CGMs for specific site facilities and material types.

2.2.2 Tailings Storage Facility

The TSF will contain four main waste types:

- PAG waste/barren rock;
- PAG low-grade/mid-grade ore;
- PAG molybdenite flotation tailings; and
- Non-PAG tungsten flotation tailings.

Barren Rock and Mid-Grade Ore

Barren rock and mid-grade ore will initially be placed sub-aerially and will weather under dominantly non-acidic conditions. The process pond is expected to rise and submerge barren rock in the TSF within two years of placement. Mid-grade ore will be inundated closer to the end of the mine life if not processed. Water inundation will inhibit long term sulphide oxidation and therefore the onset of ARD. Dissolution of accumulated secondary minerals formed under exposed conditions will occur until concentrations in the rock pore spaces reach levels constrained by mineral solubility. Displacement of pore water will result in a loading source to the pond. In the long term, inundated barren rock and mid-grade ore will be exposed to low oxygen concentrations controlled by advective flux of water through the rock. This could result in dissolution of secondary iron oxides formed under oxidizing conditions and resultant release of sorbed trace elements though in general the limited exposure to oxidizing conditions is not expected to result in significant accumulation of oxidation products. Reductive dissolution is also a possibility but is expected to be limited.

Tailings

Molybdenite tailings would be deposited subaqueously into the process pond as a slurry and result in immediate and permanent saturation. Under these conditions, minimal weathering of the tailings is expected. Reductive dissolution effects are expected to be minimal when fresh ore is being processed due to the limited formation of secondary minerals in ore prior to processing. Processing of oxidized mid-grade ore at the end of mine life could result in secondary minerals (primarily hydrous ferric oxides) in the tailings. Residual organic process reagents could facilitate reductive dissolution of these secondary minerals.

Tungsten flotation tailings (both rougher and cleaner) will be disposed of on the tailings beaches, some of which will remain partially as an unsaturated wedge against the embankment. A large part of the tailings will become saturated as the phreatic surface in the facility rises. Oxidation rates in well and fully saturated tailings near and below the phreatic surface will be very low. If oxidation takes place, it will occur as oxygen penetrates the tailings mass due to diffusion. The rate of diffusion of oxygen will be controlled by the physical characteristics of the tailings, the degree of saturation and the rate of oxidation. Oxidation can be expected to be most intense at the surface and processes will be broadly similar to weathering of barren rock (e.g. oxidation of sulphides in response to the presence of oxygen, neutralization of acidity by reaction with acid consuming minerals, and leaching of soluble minerals and weathering products). However, the depth of the weathering front in the tailings will depend on the sulphide content of the tailings. Lower sulphide content is expected to result in greater oxygen penetration as rates of oxygen consumption will be slower than re-charge. As with the other waste type, reductive dissolution of oxidation products is also expected to be limited.

The tailings embankments will be constructed from non-PAG quarry rock. These components will be partly unsaturated. CGMs are described in other sections.

Chemical loadings in process water will be derived from process chemicals, leaching of secondary minerals formed in ore prior to processing, and oxidation of sulphides occurring during processing. Oxidation of pyrrhotite during processing may result in formation of unstable thiosalts. Processing of stockpiled mid-grade ore at the conclusion of mining may result in greater chemical loads for some parameters in the process than when processing freshly mined ore. These chemical loads will be depend on the how long the mid-grade is stockpiled and, therefore, will need to be assessed at a later date.

2.2.3 APT Residue

APT residue (waste) will be produced from processing scheelite ($CaWO_4$) concentrate for the Project. Three waste streams will be produced, with two of them needing to be stored on-site in lined ponds within the TSF footprint for eventual submergence and closure under tailings and water. These two on-site wastes include a calcium hydroxide residue and raffinate. Both waste streams are from the purification processes and will contain trace elements such as arsenic, molybdenum, copper, etc. Raffinate is expected to be acidic (pH 2). Currently the two residues are assumed to have no impact on TSF water quality or the surrounding environment on account of containment design.

The third waste stream, small amounts of a metals purification residue, is expected to be classified as hazardous waste; it will be placed in sealed drums daily and shipped off site for disposal at an approved and regulated facility. This material was not characterized as part of this study.

2.2.4 Overburden and Soil

Overburden will consist of surficial material which is predominantly glacial till stripped from the pit area, the TSF embankment foundations, and the on-site quarry for construction. These materials are expected to consist of transported and locally derived weathered rock. Where locally derived rock is present, weathering and leaching will occur, although sulphides will likely be absent or extremely low in concentration. Contact water characteristics are expected to be controlled mainly by secondary minerals formed by weathering over geological time.

2.2.5 Open Pit

Operational

Water chemistry of the operational pit sump will be a combination of inflows from groundwater, direct precipitation and contact water flow over broken rock on benches and the pit walls. Non-PAG and PAG walls are expected to be non-acidic during operations with the greatest loadings coming from shattered bedrock on benches and less load from walls. Broken rock will weather and leach with the same processes as indicated for barren rock. In the last six years of mine life, barren rock will be placed within the pit and contribute to the pit sump water quality as indicated in Section 2.2.2.

Closure

During closure, flooding of the pit will occur resulting in submergence of walls and backfilled barren rock. As the water level rises, oxidation of flooding walls and barren rock will be reduced but any residual oxidation products will be flushed and contribute to total load in the pit lake. High walls remaining un-submerged after final flooding will continue to contribute loadings to the pit lake water before it is discharged, with treatment as required to meet permit conditions.

2.2.6 Nitrogen Model

Emulsion based explosives will be used for blasting in the pit. However, as emulsion is still based on ANFO chemistry, incomplete combustion will result in explosives residuals which contribute to nitrogen forms (nitrate, nitrite, and ammonia) in waters contacting blasted rock including barren rock, construction fill, ore, and pit walls.

2.3 Characterization Program Design

The characterization program was designed using the mine facilities as a checklist and incorporating data needs indicated by the CGMs. Sixteen different mine component/facilities that could be sources of element loads and other parameters to surface and groundwater were identified during development of the plan for the project site. Variants within the sources (for example, sub-aerial, flushing and submerged for PAG rock) resulted in 24 individual source terms for input into the overall site water quality model. Several variants were eliminated during the planning process (e.g. milled mid-grade, cyclone, sand embankments) resulting in 16 individual source terms. A summary of individual source terms and the facilities they represent is provided in Table 11.

For each source term, design criteria requirements and water chemistry inputs were identified and used to determine testwork design components and are outlined in Section 3.

3 Characterization Methods

3.1 Basis

Sample acquisition, testing approaches, and data interpretation for ML/ARD characterization of mine waste expected to be produced from the Project was guided by years of experience at other mine sites and also internationally recognized best practices documents. The guidance and procedures that were used have been documented in several reports including:

- Canadian Mine Environment Neutral Drainage (MEND) reports (MEND 1991; MEND 2009);
- Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia (Price 1997); and
- The Guide for Acid Rock Drainage (GARD) produced by the International Network for Acid Prevention (INAP 2010, http://www.inap.com.au/).

3.2 Sample Acquisition Methods

3.2.1 Barren rock and Mid-grade Ore

Barren rock sampling specifically for geochemical purposes was conducted by SRK to expand on the original work performed by MDAG and resolve spatial and ore grade sampling concerns. Infill sampling was performed on 184 composite samples from 1.5 m long intervals to represent barren rock and minor amounts of mid-grade ore material. The rock types tested for this study cover the major lithologic areas of the proposed pit as described in Section 1.2.

Tungsten and molybdenum mineralization is vein and fracture controlled at Sisson and large blocks of different lithologic zones with inherent varying alteration patterns would be mined. As a result, sample selection was not based on porphyry alteration patterns.

Samples for static testing were selected as follows:

- Using the coverage provided by the exploration database, Northcliff identified 1,676 intervals for sampling to provide in-fill data for inductively coupled plasma (ICP) analysis.
- In consulting with Northcliff's geologists, SRK used a stratified random sampling method based on rock type to select 184 samples for ABA testing. No lithologic boundaries were included in the drill core composites. Of these samples, six were classified as mid-grade ore based on tungsten grade. The approach used was broadly comparable to that previously

developed by SRK and accepted by regulators (e.g. for the Galore Creek Project located in northwestern British Columbia (SRK Consulting, 2006)).

Interpretation of the results indicated that sulphide mineralization and ARD potential were widespread throughout the deposit and correlations between rock type and mining block were not readily apparent. Following interpretation of static data, samples were selected for laboratory kinetic testing (humidity cells), saturated column tests and field barrel tests to determine rates of oxidation as inputs to waste management and to ensure the mining plan was suitably conservative to include submergence times that were faster than the time delay before the onset of acidic conditions.

For laboratory testing, three samples for each major rock type (gabbro, felsic tuff, mafic tuff, biotite wacke, and quartz diorite) were selected to represent average composition, non-PAG and PAG to evaluate reactivity of median and elevated (95th percentile) sulphide concentrations. The non-PAG samples were selected to assess ML for non-PAG samples.

Saturated column tests were performed on samples of PAG mid-grade ore, PAG gabbro, and a composite of PAG mafic tuff and PAG quartz diorite.

The field barrels were splits from five of the humidity cells, and therefore represented the average composition for each of the main lithology types.

Based on SRK's understanding of the site geology, sampling was adequately representative of the main geochemical features expected in barren rock and mid-grade ore to inform management decision for the Project. Figure 5 shows the locations of all drill holes from which samples were obtained for geochemical testing.

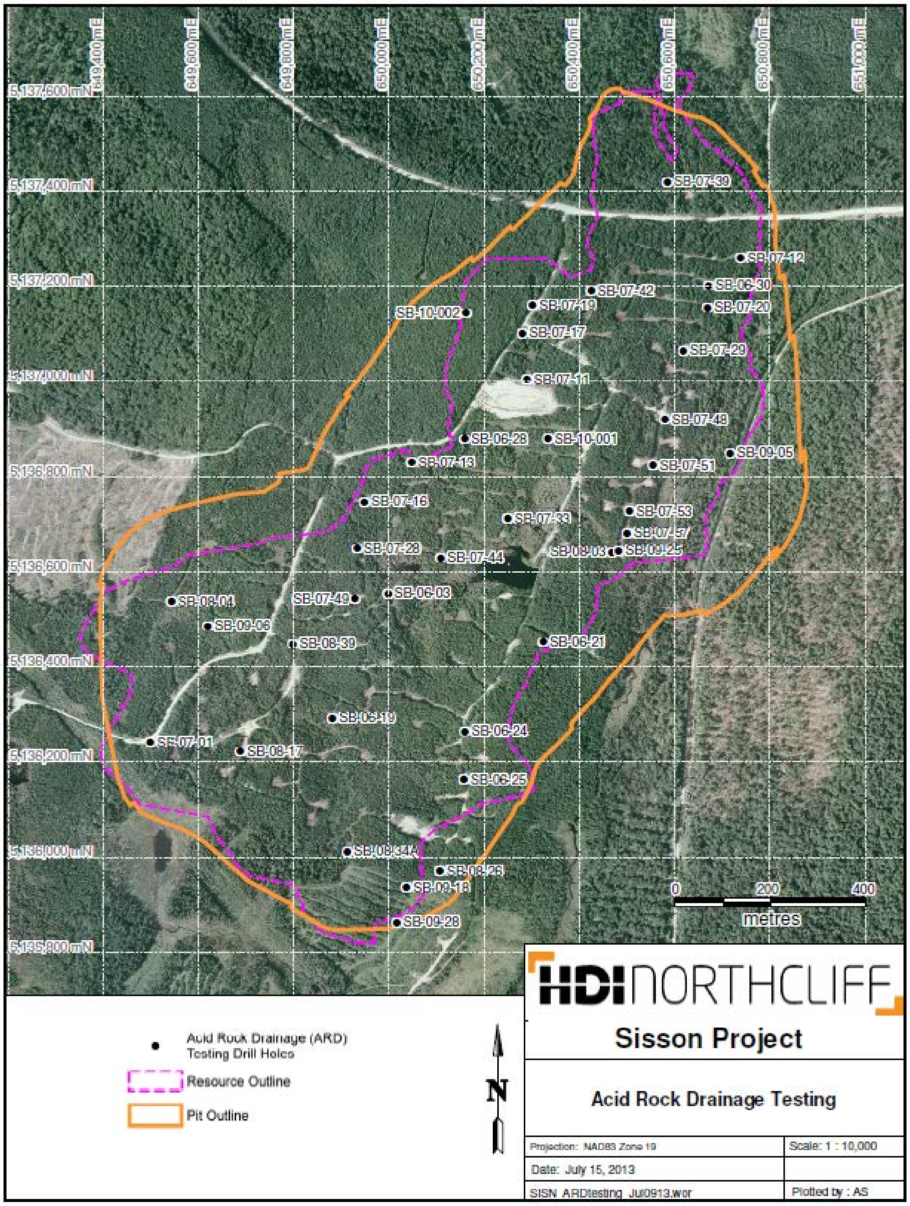


Figure 5: Proposed mining area and location of drill hole collars used for ML/ARD characterization studies (Source: Northcliff).

3.2.2 Pit Walls

As part of geotechnical pit wall investigations performed by KP for the Project, composites from drill core were selected by SRK for ML/ARD characterization. All drill core logs and sulphur analyses were reviewed from the geotechnical drilling program (571 samples) and a range of characteristics produced (i.e. 5th, 25th, mean, 75th, 95th percentiles). Subsequently, 140 samples were selected for each major lithology type range of sulphur characteristics to match the range of characteristics. Samples were composited by taking two consecutive samples from the pre-existing pulps so that each composited sample represented 6 m of drill core. This compositing approach resulted in 70 samples being submitted for static tests.

The range of characteristics in rock type and sulphur content were compared to previously selected barren rock humidity cells and it was determined that pit wall water quality predictions could be confidently established from the barren rock humidity cells.

3.2.3 Tailings and Process Water

Metallurgical testing was performed by SGS Lakefield under the direction of Bolu Consulting from two master ore composites (Y1-10 MC#2 and Y1-10 Comp) created from a range of lithologies to represent the first 10 years of mining. Testwork was completed in three phases and provided tailings and process water (metallurgical supernatant) which were sampled for geochemical testing:

- Y1-10 MC#2: Locked Cycle Test;
- Y1-10 Comp: Pilot Plant Test representing final process to generate concentrate; and
- Y1-10 Comp: Locked cycle test for clarification testing and generation of representative process water.

Acid-base accounting and composition analyses were performed on all tailings streams (including rougher and cleaner portions). However, as it was decided early during feasibility studies for the Project to segregate molybdenite and tungsten tailings and store the molybdenite tailings subaqueously, only kinetic testing was performed on tailings that would be deposited unsaturated in the TSF (e.g. tungsten tailings).

3.2.4 Ammonium Paratungstate Residue

Calcium hydroxide and raffinate was produced from processing test work on the scheelite concentrate produced from the Y1-10 Comp locked cycle test. The calcium hydroxide residue was recovered for geochemical characterization. Not enough raffinate was available for testing and instead the primary composition of the solution was provided. The primary composition will help inform management alternatives, although trace element composition remains to be defined.

3.2.5 Overburden

Samples from geotechnical test pitting investigations performed by KP were submitted for element composition and the results were provided to SRK. Additional overburden sampling is planned as part of geotechnical investigations in early fall 2013 and acid-base accounting analyses will be performed at that time.

3.2.6 Quarry Borrow Samples

A quarry will be developed adjacent to the north-west corner of the TSF (grey shaded area in Figure 4) and is situated in the Nashwaak granite. The quarry will be approximately 1.2 km long by 0.4 km wide and is intended to provide borrow material for TSF embankment construction. Geotechnical investigations in the vicinity of the proposed quarry provided drill core samples for ML/ARD characterization. Six samples from two different drill holes (drill holes SB-11-MW-006D and SB-11-MW-016) were provided for static and kinetic testing. Each sample was 3 m long and did not cross over lithology boundaries.

3.3 Analytical Methods

3.3.1 Sample Preparation

Rock samples obtained from core were prepared in several ways to obtain samples for the various analytical methods:

- Static analyses were performed on a pulp prepared to pass a 200 mesh sieve.
- All laboratory kinetic testing was performed on samples jaw crushed to pass a ¼-inch sieve.
- Field kinetic testing was performed on samples jaw crushed to pass a 1-inch sieve.

Tungsten rougher and molybdenite tailings were screened to three size fractions using sieves at 100 and 200 mesh. Tungsten cleaner tailings were tested without particle size screening due to limited sample availability.

3.3.2 Physical Analyses

All samples submitted for kinetic testing were characterized for particle size distribution using particle sieves at ¼-inch and 10, 35, 100, and 270 mesh.

3.3.3 Mineralogical Analyses

Mineralogical analyses included:

- Optical mineralogy was performed by Mineral Services Canada (MSC).
- Rietveld X-ray diffraction (XRD) performed by University of BC Department of Earth Ocean and Atmospheric Sciences (UBCEOAS).
- Electron microprobe on mineral grains were performed by UBCEOAS.

All rock samples and tailings tested as humidity cells (17 rock, 3 tailings) were submitted for mineralogical characterization primarily to support evaluation of the performance of kinetic results. It should be noted that in Appendix A1 and A3, MSC samples 15 to 22 were not set up as humidity cells for the project as they were all ore grade material. Only humidity cells from MSC samples 1 to 14 were tested.

3.3.4 Static Geochemical Tests

Static geochemical tests provide the basis for understanding potential reactivity and therefore ML/ARD potential of a sample. The static geochemical tests performed included:

- Total sulphur by Leco furnace;
- Sulphate determined using hydrochloric acid;
- Sulphate determined by sodium carbonate leach;
- Neutralization potential by Modified Acid Base Account (Coastech 1991) method;
- Total inorganic carbon determined by coulometric methods;

- Paste pH determined by the Sobek et al (1978) method;
- Paste conductivity using the same procedure as the paste pH; and
- Element scan (including sulphur) using ICP following aqua-regia digestion, including low level Hg.

3.3.5 Humidity Cells

Rock Samples

Fifteen samples were selected for humidity cell testing based on rock type using sulphur content as the primary selection criterion. For each rock type, two rock types were selected to represent near median sulphur content and sulphur content exceeding the 90th percentile of the rock type. Samples with lower sulphur content were also chosen (one per rock type) to evaluate ML in the absence of acidic conditions. Concentrations of arsenic and copper were also included as secondary selection criteria so that leaching characteristics could be evaluated with respect to these elements. The consideration of arsenic and copper was on account of the results from the static geochemical tests performed by SRK, MDAG, and the exploration database indicating that they had potential for ML. One sample of mid-grade ore was selected to primarily evaluate element leaching as tungsten grade is not correlated to sulphur concentrations.

The resulting samples and duration of testing at the time of this report are provided in Table 2. Geochemical characteristics of the samples are provided in Table 7.

Table 2: Summary of Sisson Project humidity cell tests.

HCT ID	Lithology	Weeks Tested	Test Status
HC 1	Gabbro	89	Test complete
HC 2	Felsic tuff	89	Test complete
HC 2D	Felsic tuff - duplicate	89	Test complete
HC 3	Mafic tuff	89	*Test continuing*
HC 4	Biotite wacke	89	Test complete
HC 5	Quartz diorite	89	Test complete
HC 6	PAG Gabbro	89	Test complete
HC 7	NAG Gabbro	89	Test complete
HC 8	PAG Mafic tuff	89	*Test continuing*
HC 9	Uncertain biotite wacke	89	Test complete
HC 10	PAG Quartz diorite	89	*Test continuing*
HC 11	NAG Quartz dirorite	89	Test complete
HC 12	< 0.1% Gabbro	89	Test complete
HC 13	< 0.1% Felsic tuff	89	Test complete
HC 14	Mid-grade ore	89	*Test continuing*
HC 16	Rougher Tails (SP-Wtail-2011)	59	Test complete
HC 16D	Rougher Tails (SP-Wtail-2011)	59	Test complete
HC 17	Quarry Material/Barren rock	38	*Test continuing*
HC 18	Quarry Material/Barren rock	38	*Test continuing*
HC-19	Rougher Tails (FS2)	30	*Test continuing*

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The humidity cells were operated using the procedure described by Price (2009). Leachates were collected and analysed as follows.

Weekly analyses performed were:

- Volume recovered;
- pH; and
- Conductivity.

The following parameters were measured weekly for the first two weeks and then every two weeks thereafter:

- Acidity;
- Alkalinity;
- pH;
- Sulphate;
- Chloride;
- Fluoride;
- Element scan; and
- Low level mercury.

The tests were initiated on September 19, 2011, and had yielded 89 weeks of data at the time the data was interpreted for this report. Eight cells were shut down on June 12, 2013, as they had been exhibiting stable leaching oxidation rates over several months, with the sample material preserved to limit oxidation in the event they need to be re-started. Six cells are continuing.

Tailings Samples

The three tailings humidity cells being tested are using the configuration for tailings humidity cell specified by Price (2009). Leachates are analysed using the same protocol as the barren rock humidity cell.

Two of the tailings (SP-WTail-2011-1 and SP-WTail-2011-2) tests were initiated on April 2, 2012, while the third tailing sample (FS2) was started on November 5, 2012. The tailings tests started on April 2, 2012, yielded 61 weeks of data and were shut down on June 12, 2013. The sample started on November 5, 2012, had yielded 30 weeks of data at the time the data was interpreted and is continuing. A summary of tailings humidity cells is provided in Table 2.

3.3.6 Saturated Columns

Three PAG humidity cells were selected to be tested as saturated columns to evaluate leaching under water saturated conditions in the TSF. The three samples were:

- Mid-grade ore composite (HC 14);

- PAG Gabbro (HC 6); and
- PAG mafic tuff and PAG quartz diorite (comprised of 50% HC 8 and 50% HC 10).

The tests are being performed on 1 kg of each sample in a 5 cm inner diameter column. The height of rock in the column is 26 cm and is covered by 30 cm of deionized water. The water level is maintained to account for removal by sampling and evaporation. Each week, 300 mL of water is recovered from the base of the column for analysis for the same parameters as humidity cells.

3.3.7 On-Site Kinetic Tests

On-site kinetic or barrel tests were constructed in the fall of 2011 based on methodology originally developed by SRK in consultation with regulators at the British Columbia Ministry of Energy and Mines in 2004 for a coal project (Western Canadian Coal 2005). The method has subsequently been applied in numerous geological and climatological settings in British Columbia, Alberta, Northwest Territories, Nunavut, Alaska, and Minnesota.

Sample feed was prepared using the following sequence:

- Northcliff geologists and SRK discussed the geology of the site in terms of major lithologic zones and minable units and determined that five major lithologic units would cover the range of expected rock types in the deposit.
- Drill holes from 2006, 2007, 2009, and 2010 were chosen for sample acquisition as they were determined to have the greatest geochemical coverage of the deposit and most well preserved.
- For each major rock type (i.e. gabbro, felsic tuff, mafic tuff, biotite wacke and quartz diorite) 300 kg of half diamond drill core was selected and shipped to SGS Lakefield for crushing and blending.
- SGS crushed all samples to pass a 1-inch screen and composited. A split of the composite was retained for static and mineralogical testing in humidity cells as indicated in Section 3.2.5.
- The crushed material was returned to the site and placed in the barrels by Northcliff.
- One blank barrel was also set-up for quality assurance / quality control (QA/QC) purposes.

Ongoing monitoring of the barrels is being performed by Northcliff personnel as part of baseline water quality sampling. Beginning at the start of each month, the leachate collection pail is inspected once each week. The volume of leachate is recorded along with pH, conductivity and temperature. Once sufficient leachate is available for testing, samples are collected and the remaining leachate is discarded.

Data available at the time of interpretation included leachate samples obtained from each barrel up to June 2013.

3.3.8 Tailings Process Water Ageing Test

Process water generated during metallurgical testing was used in an ageing test to assess the degradation of process reagents (i.e. potassium amyl xanthate or PAX). A series of glass flasks were set-up with exposure to sunlight and air exchange and were allowed to sit for 2, 4, and 8 weeks. At the end of each time period, the sample was analysed for the same parameters as the tailings tests, with the addition of the following:

- Nitrate, nitrite and ammonia;
- Thiosalts (partially oxidized sulphur species);
- Carbon di-sulphide (xanthate degradation product); and
- Dissolved organic carbon.

3.3.9 Leach Tests

Shake flask extraction tests (SFE) (Price 2009) were performed on APT calcium hydroxide residues to evaluate load flushed by contact with meteoric water or storage in water. The sample was not screened for particle size and leachates were analysed using the methods and detection limits indicated in Section 3.2.10. Based on operation of other APT plants, the metals purification residue was assumed to hazardous and required off-site disposal.

3.3.10 Solution Analyses

Solutions produced by various test procedures have been analysed for the parameters indicated in Table 4.

3.3.11 Quality Control

QC measures for the analytical procedures are specified by agreement between SRK and Maxxam Analytics, the analytical laboratory (SRK 2011a). For the Sisson Project, the specific QC measures are indicated in Table 3.

Table 3: Quality control measure by program.

Procedure	Number of Tests	Blank Tests	Duplicates
Static tests	263	26	26
Humidity cells	21	1	2
SFE	2		
Saturated columns	3	1	
Field barrels	5	1	

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Table 4: List of analytes and detection limits used for testing solutions produced by extraction, laboratory kinetic tests and site kinetic tests

Parameter	Unit	Barrel	Columns	HCT	SFE	Parameter	Unit	Barrel	Columns	HCT	SFE
Conductivity	µS/cm	2	0.5	0.5	0.5	Calcium (Ca)-Dissolved	mg/L	0.05	0.05	0.05	0.05
Hardness (as $CaCO_3$)	mg/L	0.5	0.5	0.5	0.5	Cesium (Cs) - Dissolved	mg/L	--	0.00005	0.00005	0.00005
pH	pH	0.1	N/A	N/A	N/A	Chromium (Cr)-Dissolved	mg/L	0.0001	0.0001	0.0001	0.0001
Total Suspended Solids	mg/L	1	--	--	--	Cobalt (Co)-Dissolved	mg/L	0.0001	0.000005	0.000005	0.000005
Total Dissolved Solids	mg/L	10	--	--	--	Copper (Cu)-Dissolved	mg/L	0.0002	0.00005	0.00005	0.00005
Acidity (mg $CaCO_3$/L) 8.3	mg/L	5	0.5	0.5	0.5	Iron (Fe)-Dissolved	mg/L	0.01	0.001	0.001	0.001
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	2	--	--	0.5	Lanthanum (La) - Dissolved	mg/L	--	0.00005	0.00005	0.00005
Total Alkalinity	mg/L	2	0.5	0.5	0.5	Lead (Pb)-Dissolved	mg/L	0.00005	0.000005	0.000005	0.000005
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	2	--	--	0.5	Lithium (Li)-Dissolved	mg/L	0.0005	0.0005	0.0005	0.0005
Alkalinity, Total (as $CaCO_3$)	mg/L	2	--	--	--	Magnesium (Mg)-Dissolved	mg/L	0.1	0.05	0.05	0.05
Ammonia, Total (as N)	mg/L	--	--	--	--	Manganese (Mn)-Dissolved	mg/L	0.00005	0.00005	0.00005	0.00005
Bromide (Br)	mg/L	0.5	--	--	--	Mercury (Hg) - Dissolved	mg/L	0.025	0.000002	0.000002	--
Chloride (Cl)	mg/L	5	0.5	0.5	0.5	Molybdenum (Mo)-Dissolved	mg/L	0.00005	0.00005	0.00005	0.00005
Fluoride (F)	mg/L	0.2	0.05	0.05	0.01	Nickel (Ni)-Dissolved	mg/L	0.0005	0.00002	0.00002	0.00002
Nitrate and Nitrite (as N)	mg/L	--	--	--	--	Phosphorus (P)-Dissolved	mg/L	--	0.002	0.002	0.002
Nitrate (as N)	mg/L	--	--	--	--	Potassium (K)-Dissolved	mg/L	0.05	0.05	0.05	0.05
Nitrite (as N)	mg/L	--	--	--	--	Rubidium (Rb) -Dissolved	mg/L	--	0.00005	0.00005	0.00005
Orthophosphate-Dissolved (as P)	mg/L	0.001	--	--	--	Selenium (Se)-Dissolved	mg/L	0.0001	0.00004	0.00004	0.00004
Phosphorus (P)-Total	mg/L	--	--	--	--	Silicon (Si)-Dissolved	mg/L	0.05	0.1	0.1	0.1
Sulfate (SO4)	mg/L	1	0.5	0.5	0.5	Silver (Ag)-Dissolved	mg/L	0.00001	0.000005	0.000005	0.000005
Cyanides	mg/L	--	--	--	--	Sodium (Na)-Dissolved	mg/L	0.05	0.05	0.05	0.05
Cyanide, Weak Acid Diss	mg/L	--	--	--	--	Strontium (Sr)-Dissolved	mg/L	0.0002	0.00005	0.00005	0.00005
Cyanide, Total	mg/L	--	--	--	--	Sulphur (S) -Dissolved	mg/L	--	10	3	10
Thiocyanate (SCN)	mg/L	--	--	--	--	Tellurium (Te) -Dissolved	mg/L	0.0001	0.00002	0.00002	0.00002
Cyanide, Free	mg/L	--	--	--	--	Thallium (Tl)-Dissolved	mg/L	0.00001	0.000002	0.000002	0.000002
Dissolved Organic Carbon	mg/L	--	--	--	--	Thorium (Th) -Dissolved	mg/L	--	0.000005	0.000005	0.000005
Aluminum (Al)-Dissolved	mg/L	0.001	0.001	0.0002	0.0002	Tin (Sn)-Dissolved	mg/L	0.0001	0.00001	0.0002	0.0002
Antimony (Sb)-Dissolved	mg/L	0.0001	0.0001	0.00002	0.00002	Titanium (Ti)-Dissolved	mg/L	0.001	0.0005	0.0005	0.0005
Arsenic (As)-Dissolved	mg/L	0.0001	0.0001	0.00002	0.00002	Tungsten (W) - Dissolved	mg/L	0.0001	0.00001	0.00001	0.00001
Barium (Ba)-Dissolved	mg/L	0.00005	0.0001	0.00002	0.00002	Uranium (U)-Dissolved	mg/L	0.0001	0.000002	0.000002	0.000002
Beryllium (Be)-Dissolved	mg/L	0.0001	0.00005	0.00001	0.00001	Vanadium (V)-Dissolved	mg/L	0.001	0.0002	0.0002	0.0002
Bismuth (Bi)-Dissolved	mg/L	0.0005	0.00003	0.000005	0.000005	Zinc (Zn)-Dissolved	mg/L	0.001	0.0001	0.0001	0.0001
Boron (B)-Dissolved	mg/L	0.01	0.3	0.05	0.05	Zirconium (Zr) -Dissolved	mg/L	--	0.0001	0.0001	0.0001
Cadmium (Cd)-Dissolved	mg/L	0.00001	0.000005	0.000005	0.000005						

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4 Results

4.1 Quality Assurance for Analytical Data

The following QA checks with their associated outcomes are outlined below:

Solid Sample Tests

- Sulphur balance: Total sulphur was always greater than sulphate sulphur when detected at concentrations greater than 10 times the limit of detection (LOD).
- Neutralization potential was consistent with the fizz test: All of the samples produced fizz ratings consistent with NP values.
- NP consistent with carbonate content: When carbonate was present, modified NP correlated well with carbonate content (r = 0.91).
- Internal Laboratory Duplicates: Duplicates were assessed with respect to a relative percent difference (RPD) target of 15%. All duplicates had excellent reproducibility at concentrations greater than ten times the LOD. At concentrations near the LOD, RPD is assumed to be much greater than 15%.
- External Laboratory Duplicates: Five rock samples from the MDAG/ALS testing program were re-tested at Maxxam to assess consistency between laboratories. The majority of parameters were reproducible within a 15% RPD with the exception of total carbonate and NP. The difference in carbonate is attributed to order of magnitude higher detection limits used at ALS compared to Maxxam. The difference in NP is attributed to the procedures used. ALS used a version of the Sobek (1978) method that heats hydrochloric acid up to 80°C resulting in dissolution of more silicates compared to the modified Sobek method used by Maxxam, where the acid is kept at room temperature.

Solution Analyses

- Ion balance: solution analyses were assessed with respect to an ion balance target of 15% assuming major anions and cations were greater than ten times analytical detection limits. Solutions not meeting this criterion were submitted for re-analysis.
- Laboratory Duplicates: Duplicates were assessed with respect to a RPD target of 15%. All duplicates had excellent reproducibility at concentrations greater than ten times the LOD. At concentrations near the LOD, RPD is assumed to be much greater than 15%.

4.2 Barren Rock and Mid-Grade Ore

4.2.1 Sulphur Occurrence

Mineralogy

Petrographic descriptions, X-ray diffraction, and electron microprobe results (Appendices A1, A2, and A3, respectively) indicated for the samples tested in humidity cells and barrels, sulphur occurs mainly as pyrite, although often equal portions of pyrrhotite are present. XRD results are summarized in Table 5.

The mid-grade ore sample being tested as a humidity cell had pyrrhotite as the dominant sulphide with only rare pyrite detected. Chalcopyrite, and lesser sphalerite, arsenopyrite and galena were also noted in all samples, also typically at trace amounts. All minerals occurred mainly in disseminated form as free rather than occluded grains, often as interstitial fill between lithic fragments.

Sulphur Abundance and Speciation

Complete sulphur results by rock type are presented in Appendix B1.

Correlation between total sulphur determined by aqua regia/ICP with Leco was excellent (r = 0.99; 99% confidence = 0.2), which indicates that ICP sulphur can be used as a surrogate for total sulphur (Figure 6).

Sulphate as a percentage of total sulphur was on average 6%, although approximately half the samples (49%) had no detectable sulphate. The sodium carbonate extractions produced more sulphate in 40 of the samples, the difference between the two methods was concluded to be the result of analytical limitations, but may also be attributed to calcium sulphate, which was supported by Northcliff geologists observing anhydrite (fluorescence under short wave UV light) in drill core.

Barren rock had an average value of 0.42% total sulphur, with a range (5th to 95th percentile) between 0.1 and 1.1%. By rock type, average total sulphur for felsic tuff (FTQ) rocks was 0.24%, 0.35% for gabbro (IGB), 0.30% for quartz diorite (IQG), 1.1% for mafic tuff (MTF), and 0.7% for biotite wacke (WKB).

Mid-grade ore had an average value of 0.9% and ranged from 0.1 to 2.5% (5th to 95th percentile). Sulphur concentrations were not correlated to ore grade material (i.e. tungsten concentrations) (r = 0.17; 99% confidence = 0.2).

4.2.2 Neutralization Potential Occurrence

Carbonate Mineralogy

Results in Table 5 provide XRD analyses on humidity cell samples for the major rock types. Calcite was determined to be the major carbonate mineral. Minor ankerite and siderite were noted in quartz diorite, mafic tuff and biotite wacke.

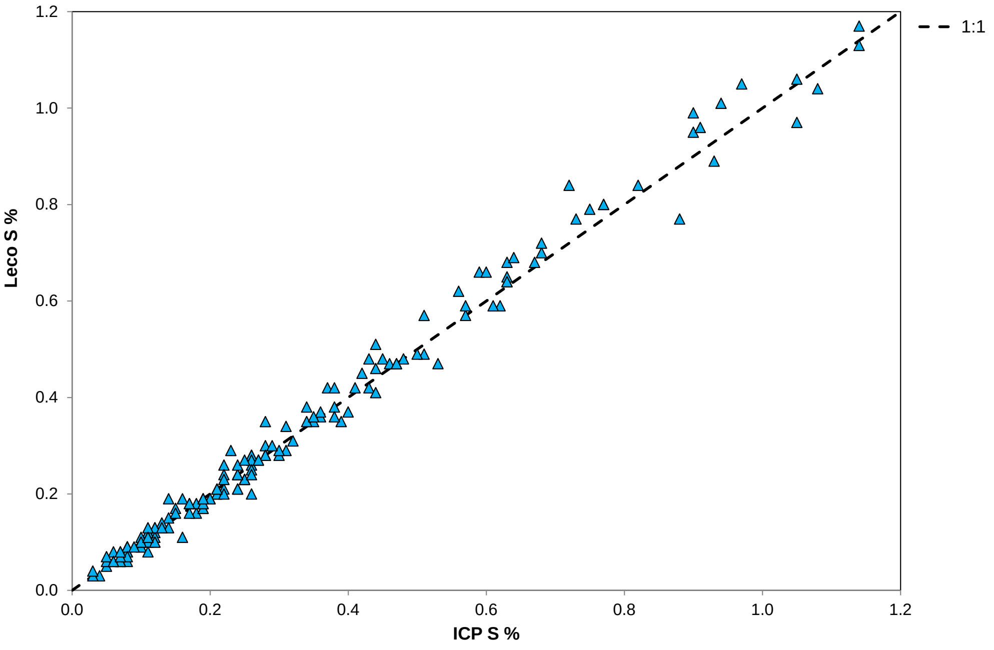

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Figure 6: Comparison of Leco sulphur and ICP sulphur for all barren rock samples.

Table 5: X-ray diffraction results for barren rock and mid-grade ore humidity cell samples.

Cell Description	Rock Code	HC ID	Pyrite	Pyrrhotite	Calcite %	Ankerite %	Siderite %
Gabbro	IGB	HC 1	--	--	--	--	--
Felsic tuff	FT	HC 2	--	0.53	1.5	--	--
Felsic tuff - duplicate	FT - dup	HC 2D	--	0.64	2.0	--	--
Mafic tuff	MTF	HC 3	1.1	--	1.2	--	--
Biotite wacke	WKB	HC 4	0.63	--	0.82	--	0.63
Quartz diorite	IQD	HC 5	--	--	0.30	0.42	--
PAG Gabbro	PAG IGB	HC 6	0.67	--	0.15	--	--
NAG Gabbro	NAG IGB	HC 7	1.7	1.1	7.5	--	--
PAG Mafic tuff	PAG MTF	HC 8	1.9	--	0.72	--	0.28
Uncertain biotite wacke	Uncertain WKB	HC 9	--	--	0.71	--	--
PAG Quartz diorite	PAG IQD	HC 10	--	--	--	--	--
NAG Quartz diorite	NAG IQD	HC 11	0.50	--	3.9	--	--
< 0.1% Gabbro	< 0.1% IGB	HC 12	--	--	--	--	--
< 0.1% Felsic tuff	< 0.1% FT	HC 13	--	--	0.31	--	--
Mid-Grade Ore	LGO	HC 14	--	2.53	0.81	--	--
Quarry Rock	Granodiorite	HC 17	--	--	--	--	--
Quarry Rock	Granite	HC 18	--	--	1.4	--	--

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Neutralization Potential

The majority of samples had greater modified NP when compared to carbonate, as shown in Figure 7. This is an indication that weakly reactive silicates contributed to NP in addition to carbonate and is most evident in gabbro samples. For the few samples plotting above the line, heavy metal carbonates have been identified by Northcliff geologists (i.e. ankerite or ferroan dolomite) and their presence would contribute to carbonate content but not NP as they are net producers of acid due to the hydrolysis of iron. Metal carbonates appear to be enriched primarily in biotite wacke with sericite, which is a relatively minor rock type expected in the barren rock at Sisson.

Given the predominant overestimation of NP by the presence of reactive silicates, carbonate NP was used for calculating the buffering capacity of rock and material types at Sisson. The influence of metal carbonates is likely minor on account of rare detection and as a result, the influence of iron carbonates on NP was not considered further.

Overall, barren rock had an average carbonate NP (NP_{CO3}) of 12 kg $CaCO_3$/t and ranged from 0.9 to 43 kg $CaCO_3$/t (5th percentile to 95th percentile), which was consistent with the absent to moderate fizz ratings observed. By major rock type, average carbonate (in units of kg $CaCO_3$/t) for felsic tuff (FTQ) rocks was 12, 12 for gabbro (IGB), 10 for quartz diorite (IQG), 12 for mafic tuff (MTF), and 8 for biotite wacke (WKB).

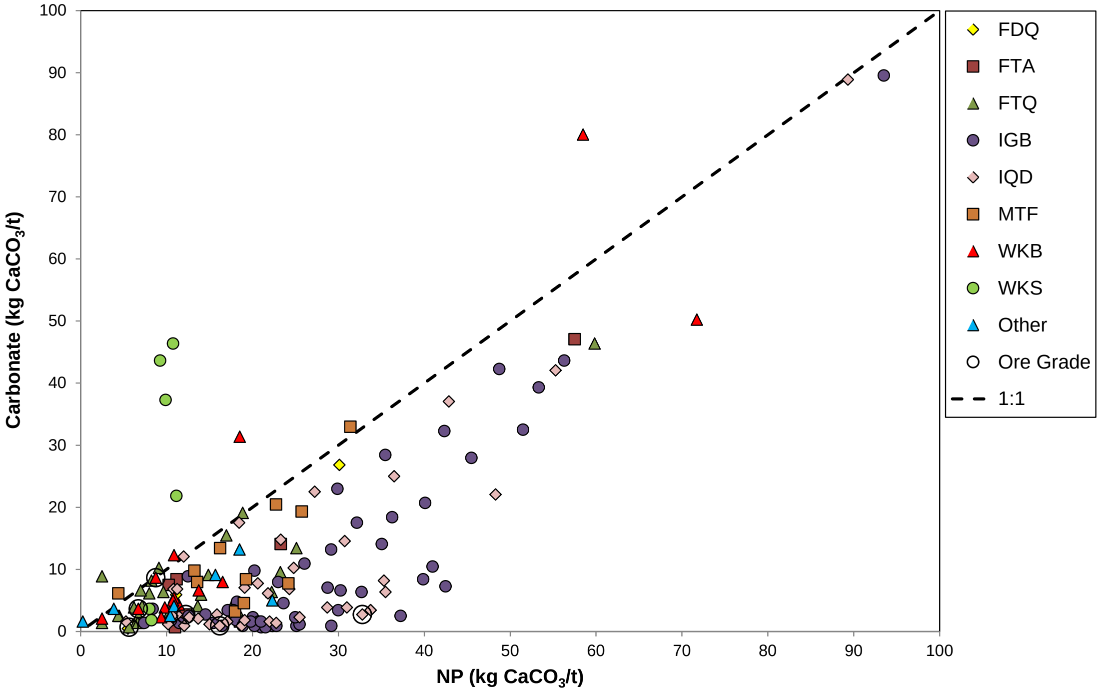

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Figure 7: Comparison of carbonate and modified NP.

NP Surrogate

The exploration database contains calcium and magnesium from ICP analyses and the ability to use a surrogate for NP from an ICP database would permit NP and potentially ARD block modelling throughout the deposit. The elements calcium and magnesium are present in carbonates (i.e. calcite, dolomite, ankerite), but also present in many other minerals (i.e. silicates). There is a correlation (r = 0.73, 99% confidence = 0.2) between NP and calcium plus magnesium, but a weak correlation (r = 0.29, 99% confidence = 0.2) between calcium plus magnesium and carbonate. These correlations, in addition to the overestimation of NP from the modified Sobek test compared to carbonate NP, indicate that calcium and magnesium are primarily from silicates and not from carbonate. As a result, it is not possible to calculate NP from the ICP database.

4.2.3 ARD Potential

ARD potential was assessed using NP/AP ratios (hereafter referred to as neutralization potential ratios (NPR)) with NP determined by NP_{CO3}. Acid potentials (AP) were calculated from total sulphur. This is a conservative approach and will allow for the presence of acid generating sulphate, although this is expected to be negligible at Sisson.

Figure 8 illustrates the classification of the Sisson samples and Table 6 provides a summary of acid base accounting data, including calculated NPR ratios. Complete results are provided in Appendix B1.

Based on the mineralogical characterization of barren rock at Sisson, NPR ratios below 1 indicate potential for ARD (PAG or potentially ARD generating), whereas ratios above 2 indicate low potential for ARD (non-PAG). A ratio of 2 was used as the carbonates at Sisson were determined to be primarily calcite. Ratios between 1 and 2 indicate uncertainty. At low sulphur concentrations, interpretation of ARD potential using NPR ratios may not be meaningful because oxidation of small concentrations of sulphide produces low amounts of acid that are readily neutralized by many rock components in addition to carbonate. A sulphur concentration of 0.1% was selected to represent low sulphur concentrations. Below this level, rock was classified as non-PAG regardless of the NPR. This criterion affected 16 samples (9% of dataset) that were classified as PAG using an NPR ratio but had less than 0.1% sulphur.

Out of all the drill core composites tested from Sisson (184), 54% were classified as PAG, 16% as uncertain, and 30% as non-PAG. It is not possible to determine a weighted mean for the deposit based on the sample information to date; however, based on the samples tested in this study, barren rock had a mean NPR of 0.92 (mean NP divided by mean AP) and ranged from 0.1 to 4.2. By rock type, mafic tuff had the lowest NPR average (0.4) while gabbro had the greatest average (1.1).

ARD potential did not vary significantly between the different rock types and spatial trends were not observed at scales that would be practical by open pit mining methods. As a result, all barren rock was considered PAG and the management strategy of submerging barren rock under water in the TSF, and later in the open pit, prior to the onset of ARD was adopted. Timing to the onset of ARD is discussed in Section 5.1.1.

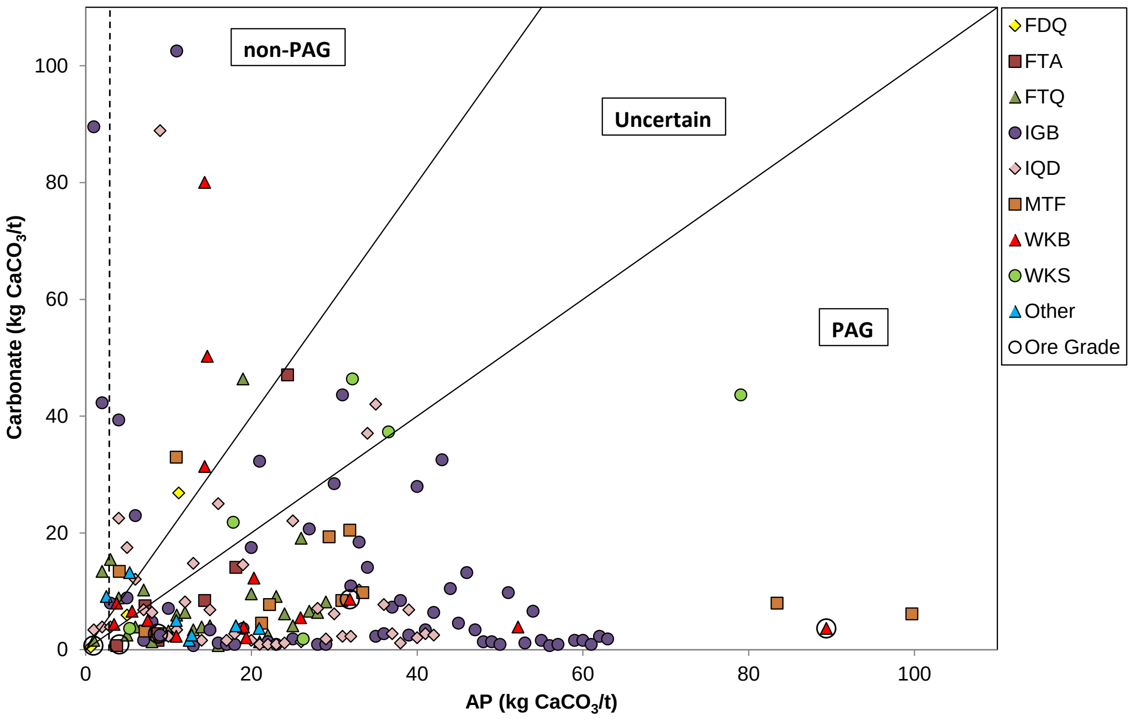

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Figure 8: Carbonate neutralization potential versus acid potential. The dashed line represents 0.1% sulphur. Other refers to material with no lithology information.

4.2.4 Element Leaching Potential

Element concentrations may provide an indication of the leaching potential of the rocks. Elements greater than ten times typical global concentrations (Price 1997) were used to evaluate potential for release under neutral pH conditions. Under acid generating conditions, metal mobility will increase regardless of metal concentrations in the rock.

Element scan data for parameters that are typically regulated or were at notable concentrations is presented in Table 6 and complete results are presented in Appendix B2. The bold numbers in Table 6 indicate values that were greater than ten times the concentration in typical basalt rock. Basalt concentrations were used for all rock types for this screening assessment as it is generally more conservative than typical sedimentary rocks. For barren rock, arsenic, bismuth, molybdenum, selenium and tungsten had mean concentrations that exceeded ten times crustal concentrations. Fluorine was slightly below ten times crustal values, but exceeded average crustal values.

ML potential was also assessed based on associations between elements and possible linkages to mineralogical hosts with the primary intent to ensure that measures to inhibit ARD (i.e. water submergence) would also inhibit leaching. Associations were based on trace element data (Appendix B2), but also electron microprobe analysis of humidity cell samples (Appendix A3). Significant relationships between potential contaminants and sulphide minerals were assessed from a correlation coefficient of 0.2 (1% significance level) but strong correlations were determined from much higher correlation coefficients.

Sulphur concentrations were correlated with many elements expected to occur in sulphide minerals including As, Cu, Fe, Sb, and Zn. While trace amounts of sulphide minerals arsenopyrite, chalcopyrite and sphalerite were noted, electron microprobe indicated that the trace elements are primarily associated with the iron sulphide pyrite. Enrichment of tungsten with sulphur was not expected as the dominant mineral is scheelite ($CaWO_4$), with minor amounts of wolframite ($(Fe,Mn)WO_4$).

Table 6: Summary of acid-base accounting data and element concentrations for Sisson barren rock and mid-grade ore.

Lithology	Rock Type Description	Statistic	Paste pH	Total S	AP	Total Carbonate (TIC)		NPR	PAG/non-PAG	As	Bi	Cd	Cu	F	Pb	Mo	Se	Ag	W	Zn
				S, %	kg CaCO$_3$/t	CO$_2$ %	kg CaCO$_3$/t	(NP$_{CO3}$/AP)		mg/kg	mg/kg	mg/kg	mg/kg	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
FTA	Felsic tuff with augen	P5	8.7	0.15	4.8	0.04	1.0	0.18	PAG	0.4	**1.1**	0.0	61	0.046	1.9	2.1	0.15	30	**38**	46
	(n=7)	Mean	9.3	0.39	12	0.52	12	1.0	PAG	2.9	**2.8**	1.1	140	0.11	28	**130**	0.37	400	**170**	120
		P95	9.8	0.73	23	1.6	37	1.7	Uncertain	7.9	**5.2**	**3.0**	250	0.18	**100**	**560**	0.50	**1300**	**510**	330
FTQ	Felsic tuff with quartz	P5	8.1	0.054	1.2	0.06	1.4	0.23	non-PAG	0.2	**0.4**	0.0	20	0.024	1.8	0.9	0.20	16	5.0	31
	(n=29)	Mean	9.2	0.24	7.3	0.34	7.7	1.1	Uncertain	2.3	**5.5**	0.3	110	0.10	10	**45**	0.41	170	**120**	68
		P95	9.9	0.73	22	0.8	18	7.3	non-PAG	8.6	**15**	1.4	290	0.19	43	**180**	**0.79**	690	**380**	160
IGB	Gabbro intrusion	P5	8.4	0.08	2.2	0.04	0.9	0.07	non-PAG	0.3	**0.2**	0.0	18	0.070	2.2	0.6	0.10	15	5.5	34
	(n=63)	Mean	9.3	0.35	11	0.53	12	1.1	Uncertain	**52**	**4.0**	1.4	130	0.14	**110**	**120**	0.40	860	**120**	170
		P95	9.9	0.89	27	1.9	43	4.5	non-PAG	**170**	**21**	**3.9**	400	0.23	**170**	**720**	**0.70**	**1200**	**350**	420
IQD	Quartz diorite intrusion	P5	8.4	0.06	1.9	0.04	0.9	0.18	non-PAG	0.3	**0.1**	0.0	28	0.020	2.4	1.3	0.10	23	**11**	36
	(n=42)	Mean	9.4	0.30	9.3	0.44	10	1.1	Uncertain	**120**	**2.4**	1.2	110	0.12	25	**44**	0.31	380	**190**	130
		P95	9.9	1.0	29	1.6	37	3.3	non-PAG	**230**	**12**	**6.0**	320	0.19	**120**	**150**	**0.64**	**1700**	**440**	470
MTF	Mafic tuff	P5	7.7	0.2	5.6	0.17	3.9	0.08	PAG	0.8	**2.2**	0.0	52	0.11	1.9	3.1	0.25	37	**35**	53
	(n=11)	Mean	8.6	1.1	34	0.54	12	0.36	PAG	**82**	**19**	**5.9**	340	0.15	**110**	**61**	**0.76**	**1600**	**120**	470
		P95	9.3	3.0	92	1.2	27	3.2	non-PAG	**410**	**44**	**14**	**910**	0.21	**470**	**280**	**1.5**	**6200**	**330**	**1400**
WKB	Biotite wacke	P5	6.2	0.1	3.6	0.10	2.2	0.08	PAG	0.2	**0.4**	0.0	48	0.074	2.3	2.2	0.17	26	3.7	41
	(n=15)	Mean	8.5	0.7	21	0.34	7.8	0.37	PAG	**45**	**72**	0.6	600	0.13	28	**80**	**0.64**	**1000**	**180**	95
		P95	9.4	1.9	58	0.92	21	2.1	Uncertain	**280**	**380**	**2.7**	**2300**	0.19	**110**	**340**	**1.8**	**4100**	**890**	230
WKS	Biotite wacke with sericite	P5	6.1	0.3	8.4	0.10	2.3	0.19	PAG	0.6	**2.5**	0.0	73	0.093	3.2	1.1	0.30	44	5.5	56
	(n=6)	Mean	7.7	1.1	33	1.1	26	0.78	PAG	**200**	**47**	1.6	720	0.11	11	**15**	**0.63**	900	**110**	180
		P95	9.1	2.2	68	2.0	46	1.4	Uncertain	**810**	**160**	**6.4**	**2300**	0.13	21	**56**	**1.3**	**3000**	**380**	570
Mid-grade Ore	All lithologies	P5	7.9	0.1	1.6	0.03	0.7	0.09	non-PAG	0.2	**0.2**	0.0	30	0.10	2.3	9.4	0.12	20	**600**	43
	(n=6)	Mean	8.8	0.9	27	0.1	3	0.12	PAG	0.9	**130**	1.3	**960**	0.17	57	**27**	**0.80**	**2100**	**770**	140
		P95	9.6	2.5	78	0.3	7	3.6	non-PAG	2.2	**550**	**5.0**	**3900**	0.23	**240**	**67**	**2.1**	**9000**	**1100**	430
Barren rock	All lithologies (incl unclassified)	P5	7.7	0.1	1.9	0.04	0.9	0.09	non-PAG	0.3	**0.2**	0.0	24	0.038	2.0	0.7	0.10	23	5.0	32
	(n=178)	Mean	9.1	0.4	13	0.51	12	0.92	PAG	**68**	**8.0**	1.5	170	0.12	57	**77**	0.42	630	**120**	160
		P95	9.9	1.1	34	1.9	44	4.2	non-PAG	**280**	**33**	**8.2**	590	0.20	**180**	**430**	**1.1**	**1900**	**360**	550

bold *numbers are greater than 10x crustal average for each rock type*

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4.2.5 Humidity Cells

Characteristics

Characteristics of samples in humidity cells are provided in Table 7. Complete acid base accounting results and trace element analysis results for the humidity cell material are provided in Appendices B3 and B4, respectively.

Table 7: Summary of acid-base accounting data for Sisson rock humidity cells.

HCT ID	Cell Description	Paste pH	Total S %	SO_4 – S %	AP kg $CaCO_3$/t	TIC kg $CaCO_3$/t	NPR
HC 1	Gabbro	9.4	0.10	<0.01	3.1	4.5	1.5
HC 2	Felsic tuff	8.8	0.41	<0.01	13	15	1.2
HC 2D	Felsic tuff - duplicate	8.9	0.42	0.01	13	16	1.3
HC 3	Mafic tuff	8.3	0.61	0.01	19	14	0.75
HC 4	Biotite wacke	8.8	0.48	0.01	15	19	1.3
HC 5	Quartz diorite	9.4	0.20	<0.01	6.3	2.5	0.40
HC 6	PAG Gabbro	9.3	0.26	<0.01	8.1	1.6	0.20
HC 7	NAG Gabbro	8.4	0.36	<0.01	11	85	7.6
HC 8	PAG Mafic tuff	9.0	0.75	0.01	23	2.7	0.12
HC 9	Uncertain biotite wacke	9.3	0.18	<0.01	5.6	5.7	1.0
HC 10	PAG Quartz diorite	9.5	0.23	<0.01	7.2	0.91	0.13
HC 11	NAG Quartz dirorite	8.7	0.24	<0.01	7.5	37	4.9
HC 12	< 0.1% Gabbro	9.5	0.08	<0.01	2.5	1.1	0.45
HC 13	< 0.1% Felsic tuff	10	0.08	<0.01	2.5	1.8	0.73
HC 14	Mid-grade ore	8.5	1.2	<0.01	36	2.0	0.06
HC 17	Quarry Material	9.2	< 0.02	<0.01	< 0.6	3.2	3.9
HC 18	Quarry Material	9.5	0.045	<0.01	1.5	8.6	14

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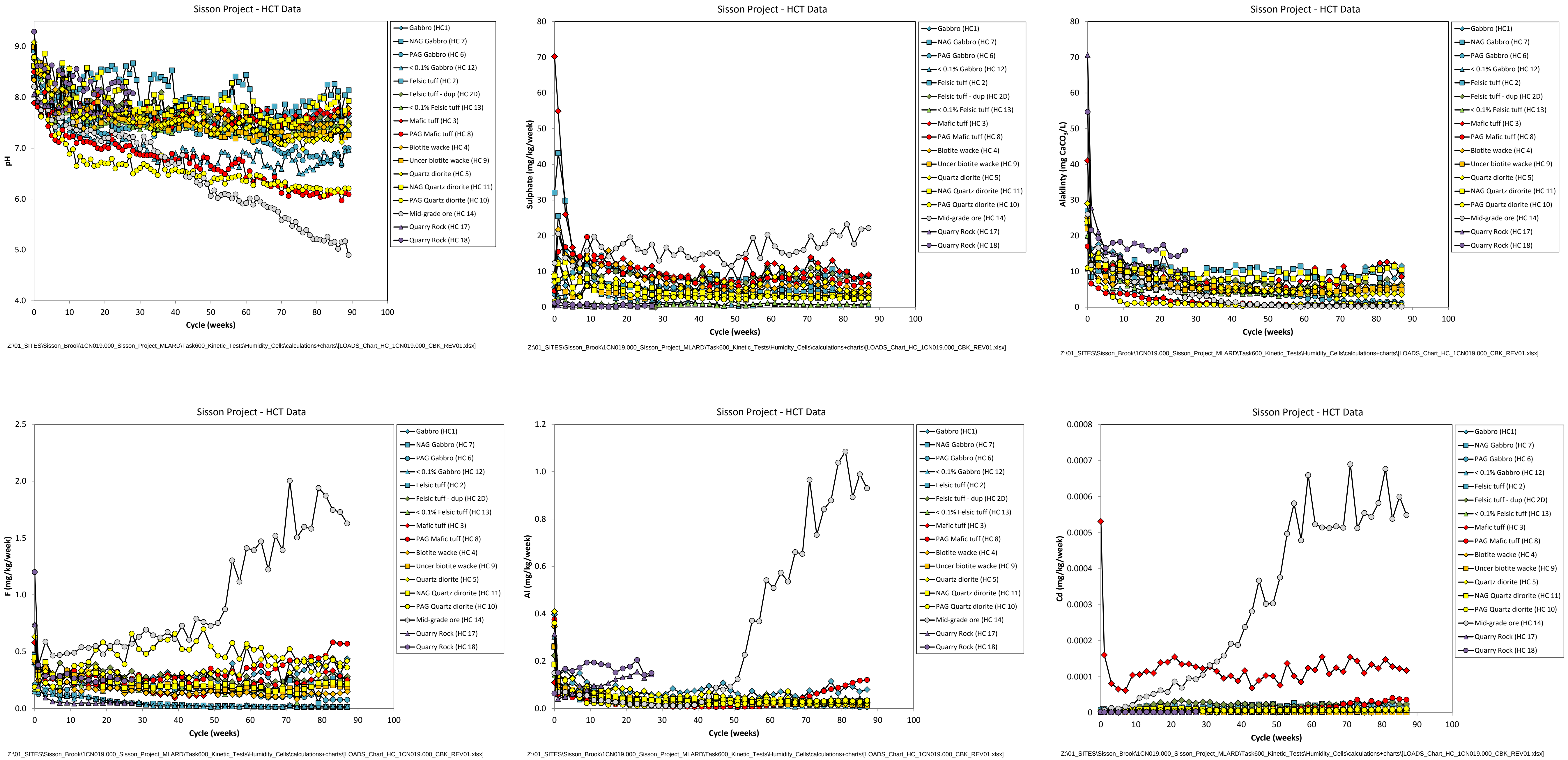
Leachate Chemistry and Trends

Charts illustrating results are provided in Appendix C1. Loading trends for pH, sulphate, alkalinity, fluoride, aluminum and cadmium are provided in Figure 9.

Leachates from the majority of barren rock humidity cells have shown pHs above 7, ranging up to near 8.5. Four humidity cells are now acidic with a pH below 7 but above 5, including PAG gabbro (HC 6), PAG quartz diorite (HC10), PAG mafic tuff (HC 8) and mid-grade ore (HC 14). HC 13 (<0.1% S felsic tuff) is fluctuating above and below pH 7. For the felsic tuff sample, on account of the low amount of sulphur and carbonate in this sample, this is likely a result of deionized water dominating the pH (pH 5.5) with a small amount of alkalinity generation from silicate weathering.

Leachates from the tests are dominated by sulphate, bicarbonate, calcium and lesser amounts of magnesium and potassium. With the exception of the mid-grade ore sample, release rates have generally stabilized and are not trending significantly up or down. Initially elevated sulphate release was observed for most tests in the first few weeks probably reflecting flushing of oxidation products accumulated prior to testing. Trace element leaching has also stabilized for most tests.



Sisson Project - HCT Data

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Figure 9: Leaching trends for barren rock, mid-grade ore and quarry rock.

Gentle downward trends are apparent for all elements in barren rock humidity cell leachate with pHs above 7. Antimony and arsenic are decreasing in all samples.

The four samples with mildly acidic leachate (HC 6, 10, and 8) are showing increasing cadmium, copper and nickel, likely due to decreasing pH. Mid-grade ore is the most acidic (pH at 5) and showing the highest concentrations of the majority of metals. Molybdenum is increasing in sample HC 1 (gabbro), although the leachate is above 7. Evaluation of the onset to acidic conditions is discussed further in Section 5.1.1 due to its relevance to management of barren rock and mid-grade ore in the TSF.

4.2.6 Saturated Columns

Characteristics of rock in saturated columns are provided in Table 8. Charts illustrating results are provided in Appendix C2. At the time of report preparation, 9 weeks of leachate chemistry data had been reported. All tests showed an initial flushing effect with concentrations of many parameters decreasing initially with leachate pH between 7.5 and 8.0.

Table 8: Summary of acid-base accounting data for saturated column tests.

Col ID	Lithology	Paste pH	Total S %	SO_4 - S %	AP kg $CaCO_3$/t	Carbonate kg $CaCO_3$/t	NPR
Col-01	Mid-grade ore	8.9	0.88	0.01	28	1.1	0.040
Col-02	PAG gabbro	9.6	0.28	0.01	8.8	1.1	0.13
Col-03	PAG mafic tuff/quartz diorite	9.6	0.42	0.02	13	0.70	0.053

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4.2.7 On-Site Kinetic Tests

Barren rock samples in barrel tests are the same sample as humidity cells HC1 to HC5 (not including HC2D). At the time of report preparation, data for nearly two complete field seasons had been collected. Charts of concentration results for all parameters are provided in Appendix C3. Loading trends for pH, sulphate, alkalinity, fluoride, aluminum and cadmium are provided in Figure 10.

Leachate pHs were between 7.5 and 8.0. In general ion chemistry was dominated by sulphate, alkalinity, and calcium with lesser (i.e. < 10 mg/L) magnesium, silicon and fluoride. The ion strengths of the first leachates from the tests were the highest, likely reflection flushing of pre-existing oxidation products. Seasonal trends were also apparent, with highest concentration in mid-late July in 2012 and a similar pattern developing in 2013.

Distribution of concentrations in leachates from the two scales of testing (humidity cells and barrels) were compared to evaluate how concentrations varied by scale. For all parameters, concentrations in barrels were greater than humidity cells. Comparison of rates is provided in Section 6.3.2 as part of geochemical scaling factors for source term development.

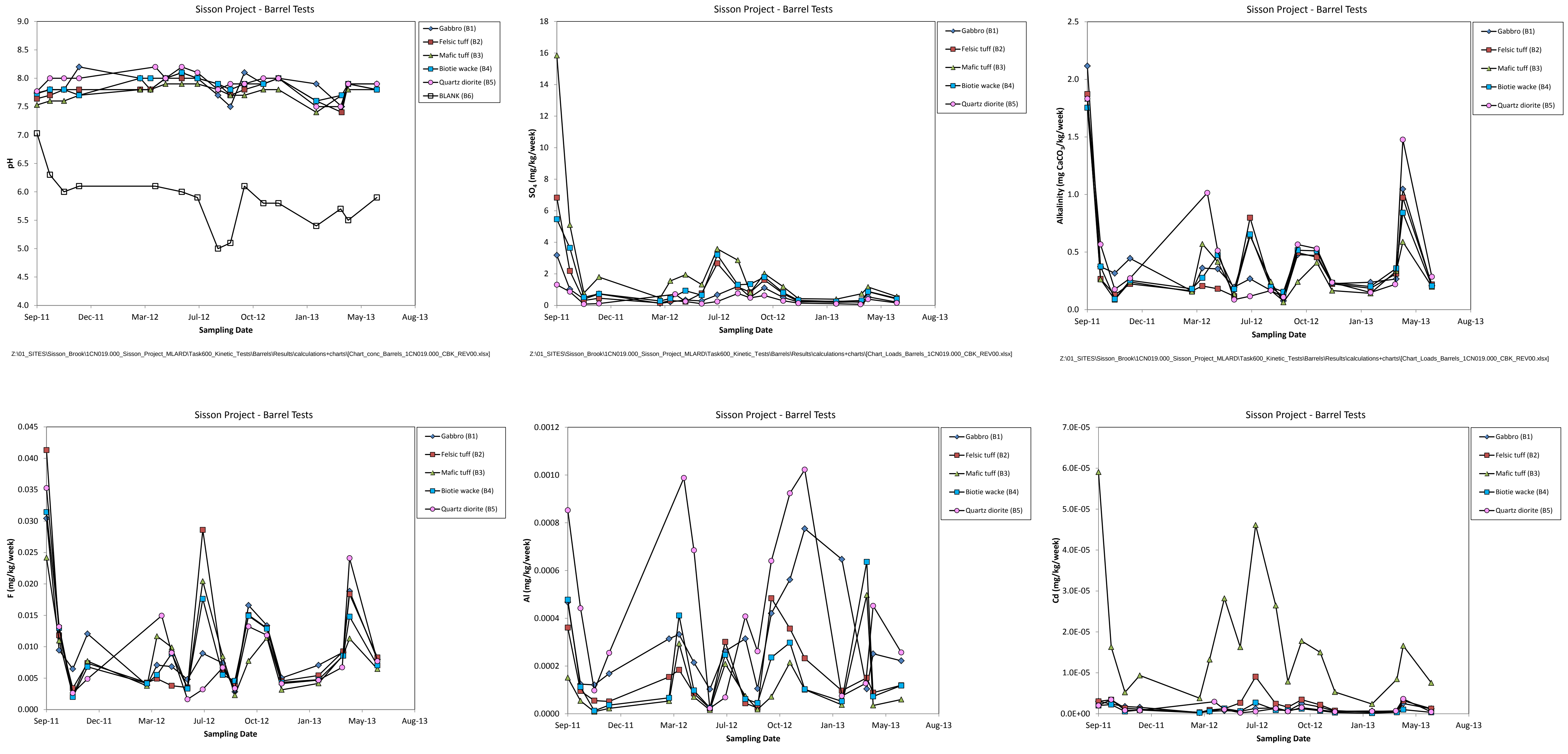

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Figure 10: Leaching trends for Sisson field barrel tests.

4.3 Final Pit Walls

4.3.1 Sulphur Occurrence

Mineralogy

Based on drill core logs provided by Northcliff, the rock types expected to be present in the pit walls were the same as identified in barren rock. As a result, only static geochemical tests were performed and mineralogy findings from the barren rock samples were applied to the pit wall sample. As a result, sulphur occurrence was assumed to primarily sulphide as discussed in Section 4.1.1.

Sulphur Abundance and Speciation

Complete sulphur results by rock type and depth are presented in Appendix D1. Based on analysis results in this study, pit wall rock had an average value of 0.6% sulphur and ranged from 0.1 to 2.3% (5th to 95th percentile, respectively). The high wall (the top 22 m once the pit has filled with water) had an average value of 0.22%, and ranged from 0.19 to 0.26% (5th to 95th percentile, respectively). Sulphate was similar to barren rock and present as a minor component (less that 10% of total sulphur) with half of the samples not containing detectable sulphate.

4.3.2 Neutralization Potential Occurrence

Carbonate Mineralogy

Rock types identified in pit wall drill holes were similar to barren rock throughout the pit and as a result, mineralogical characterization was not performed. Carbonate occurrence was assumed to be the same as barren rock (Section 4.1.2) with buffering provided primarily by calcite.

Carbonate Abundance

Results of pit wall carbonate analysis are provided in Appendix D1. Average carbonate was 11 $CaCO_3$/t, and ranged from 1.4 to 36 kg $CaCO_3$/t (5th to 95th percentile, respectively). The pit high wall had an average value of 4.9 kg $CaCO_3$/t and ranged from 1.9 to 9.8 kg $CaCO_3$/t (5th to 95th percentile, respectively).

4.3.3 ARD Potential

Using the same criteria as barren rock (Section 4.1.3), the average NPR for all pit wall samples was 0.56, with a range from 0.11 to 2.1 (5th to 95th percentile, respectively). By depth in each drill hole tested, no contiguous trends were observed and ARD potential by depth is provided in Figure 11 (the moving average in Figure 11 is the average NPR at each specific depth). The anomalous higher NPRs are mainly attributed to higher carbonate concentrations. The pit high wall had an average NPR of 0.71 and ranged from 0.7 to 1.7 (5th to 95th percentile, respectively).

The pit walls are considered PAG, although submergence of the pit and on-set to delay of ARD is expected to inhibit acidic leaching from the pit walls. Timing to the onset of ARD is discussed in Section 5.1.1.

4.3.4 Metal Leaching Potential

Complete element scans are provided in Appendix D2. The same enrichments as barren rock were noted and water submergence is expected to effectively inhibit ML from pit walls.

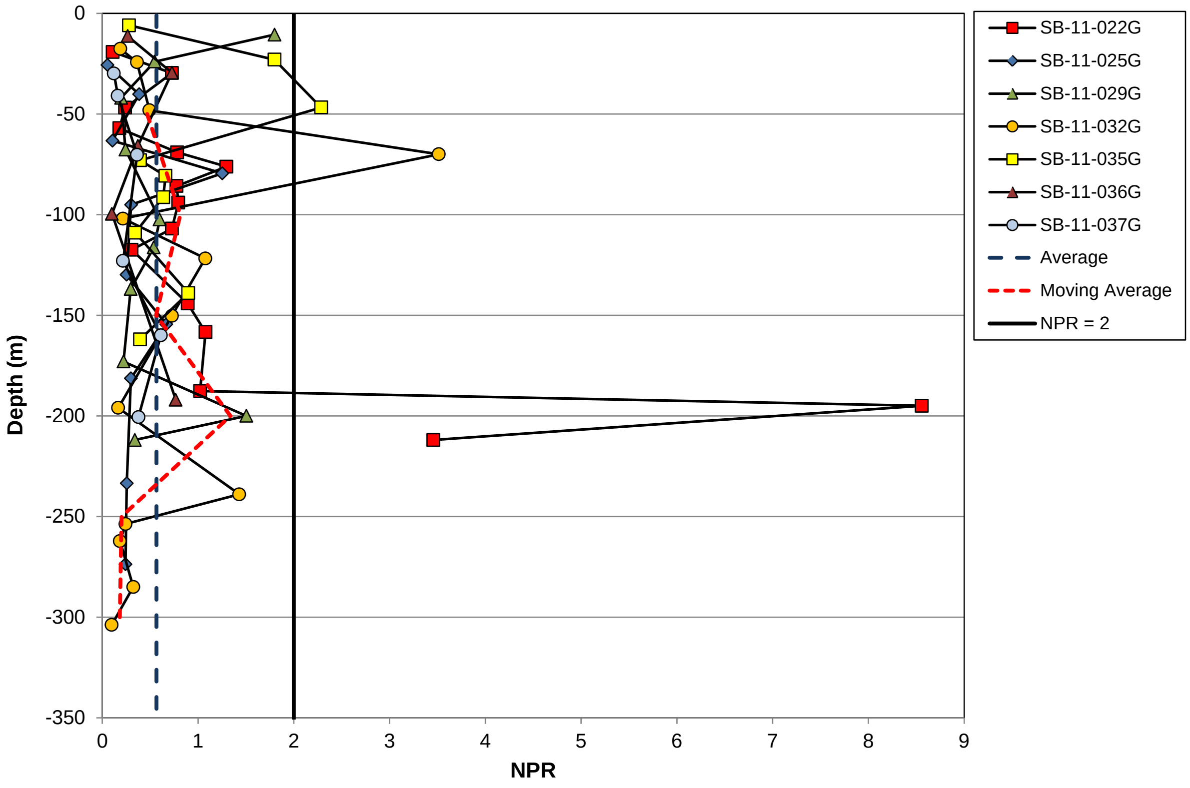

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Figure 11: ARD potential of pit walls by depth.

4.4 Tailings and Process Water

4.4.1 Particle Size

A particle size analysis was performed on each tailings stream and results are provided in Table 9. Tailings were predominantly minus 200 mesh (i.e. less than 74 um). Geochemical characterization results that follow are based on bulk samples; this is because molybdenite tailings will be disposed of subaqueously and tungsten rougher tailings are predominantly minus 200 mesh.

Table 9: Particle size distribution of Sisson tailings.

Tailings Type	Mesh Size		
	>100	<100 to >200	<200
Mo-rougher-tails	20%	40%	39%
Mo-cleaner-tails	3.1%	4%	93%
W-rougher-tails	0.0%	6%	94%
W-cleaner-tails	5.4%	12%	82%

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4.4.2 Sulphur Occurrence

Petrographic descriptions, Rietveld X-ray diffraction, and electron microprobe (presented in Appendix E1, E2, and E3, respectively) indicated for the samples tested in humidity cells (rougher tailings), sulphur occurs mainly as pyrite, although often equal portions of pyrrhotite were present. Chalcopyrite, and lesser sphalerite, arsenopyrite and galena were also noted in all samples, also typically at trace amounts. Molybdenite tailings are by metallurgical processing, design concentrated sulphides and contained pyrite and pyrrhotite amounts as high as 26% by volume.

Complete acid base accounting results are provided in Appendix E4 and trace element analyses in Appendix E5. The tungsten rougher tailings contained relatively low sulphur (i.e. less than 0.1%) and while only four samples were tested, results provided by SGS Lakefield from locked cycle testwork on years 1 to 10 and year 10 plus, indicated that this finding is representative as total sulphur was always less than 0.1%. A sulphur concentration of 0.1% was selected to represent low sulphur concentrations and below this level, samples were classified as non-PAG regardless of the NPR on account of other rock components (i.e. weakly reactive silicates) contributing to neutralization of small amounts of acid generated. Cleaner tungsten tailings only contained slightly more total sulphur at 0.14%.

The molybdenite tailings contained total sulphur values as high as 12 and 13% in the rougher and cleaner tailings, respectively. The ore composite used to generate these tailings contained only 0.45% total sulphur and therefore the molybdenite tailings appear to be capturing the majority of sulphur from the ore when considered from a mass balance perspective (of all tailings generated, only 5% are expected to by molybdenite and the remaining 95% tungsten tailings).

Sulphate content was low as determined by sodium carbonate and hydrochloric acid leaching methods in all samples. As a result, the sulphur form is attributed to sulphide sulphur in the samples assuming that insoluble sulphur (i.e. organic) is absent in these samples. A summary of acid-base accounting data, including sulphur values, is provided in Table 10.

4.4.3 Carbonate Occurrence

Petrographic descriptions and Rietveld X-ray diffraction analyses on ore feed and tailings samples indicated the presence of calcite in all samples (full results are presented in Appendix E1, E2, and E3). Only rare iron carbonate was noted in the petrographic descriptions (based on iron oxide weathering) and was not detected in the X-ray diffraction analysis. Electron microprobe analysis was also performed on tungsten rougher tailings and the results also indicated that calcite was the dominant carbonate mineral with minor (generally less than 1%) iron or manganese in carbonate mineral grains. On account of these results, acid buffering in tailings was assumed to be from calcite and no further refinement of carbonate form was performed.

4.4.4 ARD Potential

The ARD potential of tailings is shown in Figure 12. Based on NPRs and total sulphur, the samples were classified as follows:

- Ore composite – PAG
- Mo-concentrate/rougher tailing – PAG
- Mo-cleaner tailing – PAG
- W-rougher tailing – non-PAG (based on sulphur < 0.1%)
- W-cleaner tailing – non-PAG

Combined tailings would have characteristics similar to the ore feed, which in this case had an NPR of 0.71. These results indicate the benefit of separate disposal of the molybdenite and tungsten tailings.

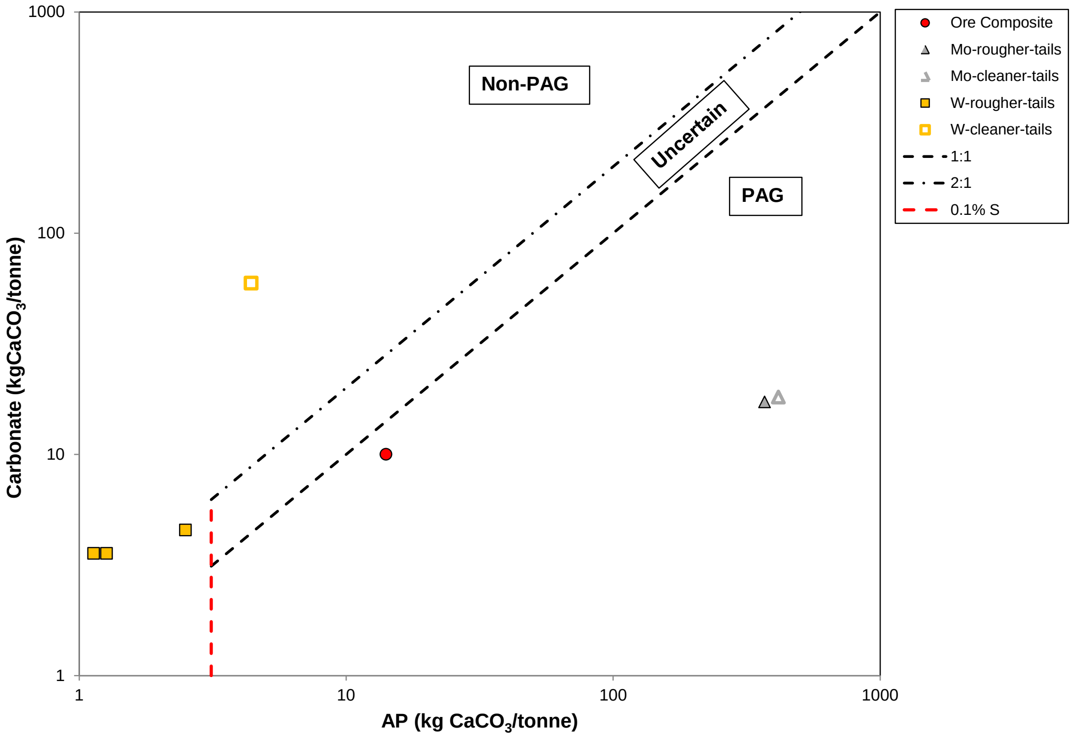

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Figure 12: ARD classification of Sisson tailings.

Table 10: Summary of tailings acid-base accounting data.

Sample ID	Tailings Type	HC ID	Paste pH	Total S %	SO_4 - S %	AP kg $CaCO_3$/t	TIC kg $CaCO_3$/t	NPR
Ore Composite	Feed	--	9.0	0.45	<0.01	14	10	0.71
Mo-S2- Con Tailing	Mo-Rougher	--	7.9	12	0.02	370	17	0.047
Mo-Cleaner Tailing	Mo-Cleaner	--	8.0	13	0.02	420	18	0.044
W-Rougher Tailing	W-Rougher	--	9.5	0.08	<0.01	2.5	4.6	1.8
W-Cleaner Tailing	W-Cleaner	--	9.3	0.14	<0.01	4.4	60	14
SP-Wtail-2011-1	W-Rougher	HC 16	9.5	0.040	0.01	1.3	3.5	2.7
SP-Wtail-2011-2	W-Rougher	HC 16D	9.7	0.031	0.01	0.95	3.3	3.5
FS2	W-Rougher	HC-19	8.1	0.02	0.02	0.63	1.1	1.7

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4.4.5 Metal Leaching Potential

ML potential can be evaluated by comparing concentrations of trace elements in the tailings to global crustal basalt values as described in Section 4.1.4. Complete results are provided in Appendix E5.

Concentrations of several regulated elements in the molybdenite tailings were one to two orders of magnitude above the screening criteria and ML potential is likely high. On account of pre-established relationships for trace elements associated with sulphides, sub-aqueous disposal of molybdenite tailings should be effective at inhibiting ML.

For the tungsten tailings, ML potential is low on account of relative to low trace element concentrations. This is likely a result of pyrite flotation away from the rougher tailings reducing sulphide concentrations and associated trace elements to low concentrations.

4.4.6 Humidity Cells

Characteristics

Characteristics of samples in humidity cells are provided in Table 10. Complete acid base accounting results and trace element analysis results for the humidity cell material are provided in Appendix E4 and E5.

Leachate Chemistry and Trends

Charts illustrating results are provided in Appendix E6.

Leachates from the tailings humidity cells have shown pHs between 7.5 and 8.5. Leachates from the tests are dominated by sulphate, bicarbonate, calcium and lesser amounts of magnesium and potassium. Release rates have generally stabilized and are not trending significantly up or down. Initially elevated release rates for all parameters was observed for most tests in the first few weeks, which probably reflecting flushing of oxidation products accumulated prior to testing, which is supported by Northcliff geologists indicating that the ore composite used to generate the tailings had been stored for up to one year prior to testing.

4.4.7 Process Water (Supernatant) and Ageing Effects

The process water samples were alkaline (pH 10.1) and dominated by sulphate (131 mg/L), thiosalts (145 mg/L), carbonate (453 mg/L), bicarbonate (220 mg/L), sodium (523 mg/L) and potassium (16 mg/L). Carbon disulphide (PAX degradation product) was below analytical detection limits. Complete results are provided in Appendix E7. Results from the ageing test were pending at the time of this report. However, several changes are expected based on first principles as follows:

- pH will decrease as a result of the solution equilibrating with the atmosphere and carbon dioxide forming carbonic acid in solution, thereby consuming alkalinity, and the resulting shift from carbonate to bicarbonate. The expected final pH is likely closer to 8.
- Thiosalts may contribute to a lower pH as they oxidize producing sulphuric acid, but also leading to an increase in sulphate.
- Carbon disulphide may increase slightly as the xanthates degrade, but then is expected to decrease as it breaks down to DOC and sulphate. Incomplete oxidation may result in thiosalts initially in the laboratory test, although it is unlikely to be found in mine tailings because it is subject to rapid atmospheric volatilization from water, soil, and sediment (World Health Organization, 2002). CS_2 can also be biodegraded by a variety of aerobic and anaerobic microorganisms (Smith and Kelly 1988).

4.4.8 Ammonium Paratungstate Residue

The two waste streams that require on-site disposal include a calcium hydroxide residue and acidic raffinate from purification. The current waste management plan involves storage in lined ponds within the TSF. Continued work to further develop storage options is ongoing.

Calcium Hydroxide Residue

Mineralogical, geochemical (acid base accounting and multi-element analysis) and leach test data are provided in Appendix F1, F2, F3, and F4, respectively. Based on Rietveld X-ray diffraction data, the calcium hydroxide residue is 55% apatite ($Ca_5(PO_4)_3(OH,F,Cl)$), with the remainder composed of silicates, calcite, portlandite, villamaninite ($(Cu,Fe)S_2$), scheelite, jarosite, and molybdenite (in relative order of abundance).

The residue contains 1.3% sulphur, with approximately 20% as sulphate sulphur (attributed to jarosite). The remaining sulphur is likely comprised predominantly of villamaninite, although the XRD identification was uncertain. Carbonate content was 70 kg $CaCO_3$/t. If all sulphur was acid generating, the AP would be 41 kg $CaCO_3$/t, with an NPR of 1.7 and would be classified as uncertain PAG. A portion of the sulphur is likely NAG and the sample is likely non-PAG, although further work would be required to refine this. The current disposal strategy is for the residue to be submerged underwater, which would effectively inhibit sulphide oxidation and ARD generation.

ML potential was evaluated by comparing concentrations of trace elements in the tailings to global crustal values as described in Section 4.1.4. While comparing a residue to a crustal average is not necessarily appropriate, it does provide a general level of screening. Based on this approach, molybdenum, lead, silver, arsenic, uranium, thorium, cadmium, antimony, bismuth, phosphorus, and tungsten have ML potential.

Leach extraction testing by the SFE method produced alkaline leachate (pH 12) dominated by sodium (1820 mg/L), chloride (1,800 mg/L), hydroxide (870 mg/L), sulphate (317 mg/L), carbonate (240 mg/L), calcium (445 mg/L), fluoride (5 mg/L) and molybdenum (4 mg/L). Detection limits of many parameters were relatively high because of interference from the ionic strength of the leachate (e.g. potassium and silicon were 25 and 50 mg/L, respectively).

The SFE test uses a large amount of water relative to solid (three-to-one), and porewater concentrations in the storage facility could be higher with lower water-to-solid ratio. This was determined using the equilibrium modelling software package Phreeqc (Parkhurst and Appelo, 1999). The model indicated that while the solution is not in equilibrium with the atmosphere, only calcite and fluorite were at mineral saturation. Other parameters (e.g., sulphate, sodium, and chloride) would likely increase if the water-to-solid ratio was lower. The model also indicated the pH of the solution would decrease to 8.3 as it equilibrates with atmospheric levels of carbon dioxide.

Purification Raffinate

Raffinate from metallurgical testing was not available for environmental testing at the time of reporting. The pH of the solution is expected to be approximately 2.

4.5 Overburden

At the time of reporting, acid-base accounting data was not available. Additional geotechnical investigations are planned for the fall of 2013 and ARD characterization is expected to occur at that time. However, 300 samples of overburden from geotechnical investigations were analysed for trace elements (Appendix G1) and provided to SRK. Sulphur was not included in the analyses, but by comparing concentrations of trace elements in the overburden to global crustal values as described in Section 4.1.4, an evaluation of ML potential is possible. Based on the comparison, the majority of elements did not exceed ten times crustal averages for basalt or sandstone. Assuming the same relationship between sulphides and trace metals in Section 4.1.4, it is likely that sulphides are also low to below detection. Arsenic concentrations did appear to be slightly elevated compared to global basalt values in the samples, which may represent natural accumulation from bedrock weathering in the area and adsorbed to iron oxides. Additional work will be required to understand the mobility of arsenic from overburden. These studies are planned for the fall of 2013.

4.6 Quarry Borrow

Complete mineralogical and static test results are presented in appendices H1, H2, and H3. Drill core logs provided by Northcliff indicated that the rock samples from drill hole SB-11-MW-006D were granodiorite, whereas the samples from SB-11-MWG-016 were granite. Results are summarized below.

4.6.1 Sulphur Occurrence

Chemical analysis indicated the samples had sulphur concentrations, ranging from below detection (0.02%) to 0.05%. Sulphate levels were below the detection limit of 0.01%, indicating sulphide sulphur is the dominant form in these samples. A summary of sulphur data is provided in Table 7.

4.6.2 Carbonate Occurrence

Carbonate mineralogy in the quarry sample was assessed using X-ray diffraction results from the humidity cell samples. Calcite was the only carbonate detected (Table 5), and similar to barren rock, NP was generally greater than TIC in units of kg $CaCO_3$/t. As a result, carbonate was used to assess NP as previously described in Section 4.1.2.

4.6.3 ARD Potential

Based on the very low levels of sulphur in the quarry samples (less than 0.1%), they were classified as non-PAG.

4.6.4 Metal Leaching Potential

ML potential can be evaluated by comparing metal analysis results to global crustal granite averages. When compared to basalt, no element concentrations were elevated in the quarry samples.

4.6.5 Humidity Cells

Characteristics

Characteristics of samples in humidity cells are provided in Table 7. Complete acid base accounting results and trace element analysis results for the humidity cell material are provided in Appendix H2 and H3, respectively.

Leachate Chemistry and Trends

Charts illustrating results are provided in Appendix C1.

Based on 38 weeks of testing, leachates from the quarry borrow humidity cells have shown pHs between 7.5 and 8.5, with the composition dominated by bicarbonate and calcium. Release rates have generally stabilized and are not trending significantly up or down. Initially elevated release rates for all parameters was observed for most tests in the first few weeks, which probably reflecting flushing of oxidation products accumulated prior to testing.

5 Management Plan

5.1 Barren rock and Mid-grade Ore Management Criteria

The decision to store all barren rock and PAG tailings under a water cover in the TSF was made early in the design of the Project. Based on the current mine plan, barren rock will only ever be able to oxidize and weather for two years prior to being submerged under water. Once the barren rock is submerged, oxidation of sulphides (i.e. ARD generation) will effectively be inhibited. Therefore, the main consideration for management is the delay to ARD onset to ensure PAG rock is submerged prior to becoming acidic and to inhibit ML due to acidic conditions.

5.1.1 Delay to ARD Onset

Background

The following method has been used to estimate delay to onset in the absence of tests generating acidic leachate (SRK 2006 for example).

The time or delay to onset of ARD (t_{onset}) depends on both the site-specific availability of reactive neutralization potential (NP* or NP_{CO3}) and the rate at which reactive neutralization potential (R_{NP*}) is depleted:

$$t_{onset} = NP^*/R_{NP^*}$$

However, the rate at which carbonate is depleted is actually a function of the acid generation (sulphide oxidation) rate (R_S). In molar terms, the rate of carbonate depletion to sulphide depletion is the same as the NP/AP criterion for PAG rock ($\{NP^*/AP^*\}_{crit}$).

$$R_{NP^*}/\ R_S = \{NP^*/AP^*\}_{crit}$$

Assuming a direct linear relationship between oxidation rate and sulphur content and conservatively a zero order chemical reaction, then

$$R_S = k.AP^*_0$$

where k is the slope of the line and the rate constant; and AP_0 is the initial sulphur content. The non-zero intercept is not included because if no sulphide is present then the rate of sulphide oxidation is zero.

When these three relationships are combined, the delay to onset is:

$$t_{onset} = \frac{\left(NP^*/AP^*\right)_0}{k.\left(NP^*/AP^*\right)_{crit}}$$

Therefore, the delay to onset is function of NP*/AP* of the sample, the overall rate of oxidation of sulphide (k) and the effectiveness of neutralization ($\{NP^*/AP^*\}_{crit}$). Longer delays are indicated for rock with higher NP*/AP* values assuming constant values for the two other factors.

Calculation for Sisson

A very strong relationship between initial sulphide content (S_0) and sulphate release is apparent (Figure 14). Consideration of rock types did not show any significant differences in sulphide reactivity. As a result, the regression relationship is:

$$\text{Sulphate release } (\text{mgSO}_4/\text{kg/week}) = 1.26\text{x}10^{-3}.S_0 + 1.23 \ (r = 0.89)$$

The non-zero y-axis intercept implies sulphate release in the absence of sulphide. It is suspected that this reflects residual sulphate flushing which adds to the sulphate generated by sulphide oxidation and therefore these relationships might slowly shift downwards with time. The slope of the regression lines in each case is k.

Using these values of k, lag time can be estimated for all rock types using a site specific NP/AP criterion. A site specific NP/AP criterion was developed for Sisson based on kinetic testing of waste rock samples and the relative rates of acid generation and neutralization in the samples as the rate of carbonate generation over sulphate generation approaches 1 (i.e. NP/AP) (Figure 13). In these types of charts, the pattern shown is common (Mattson 2005, Red Chris Development Company 2004, and SRK 2006, as examples). The apparent higher NP/AP at lower oxidation rates reflects preferential dissolution of carbonate minerals which is an artefact of the high water to rock ratio in the tests. At higher oxidation rates, the dissolution of carbonate minerals by acidity from sulphide oxidation allows the ratio to stabilize between 1 and 2 (prior to a sample going acidic, mid-grade ore based on pre-acidic rate). The results show that a site specific NP/AP below 2, and nearer 1, is appropriate. To be suitably conservative, a site specific NP/AP criterion of 1.5 was chosen for Sisson.

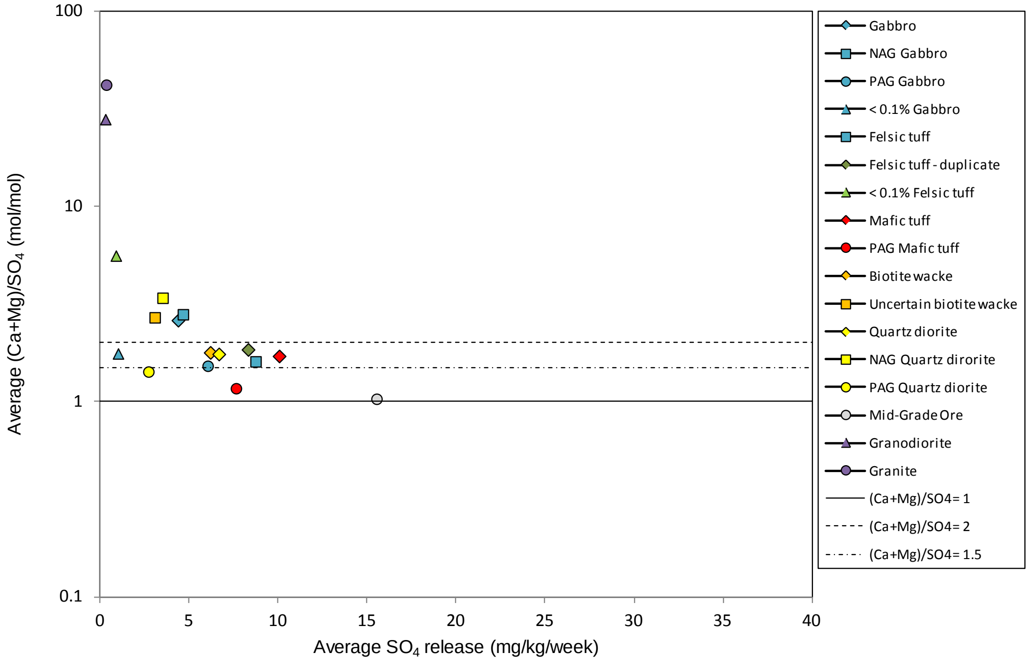

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Figure 13: Relative rate of acid generation compared to sulphide oxidation rate for waste rock samples.

The result of the lag time calculation is shown in Figure 15 for samples equal to or less than an NP/AP of 1.5. When compared to the mid-grade ore sample, the calculation predicts a slightly faster onset to acidic conditions than what was observed in the laboratory. This is interpreted as a result of using a critical NP/AP of 1.5 as a value of 1.0 results in a prediction that is nearly identical to the laboratory. Only one sample is now acidic (defined here as having a pH lower than the pH of humidity cell distilled water (5.5)), and it is not possible to compare the timing to acidic conditions in any other samples. As a result, an NP/AP ratio of 1.5 was used over a less conservative value of 1.0 for all sample type when predicting timing to onset of acidic conditions.

Under site conditions, slower onset can be expected under cooler temperatures where sulphide oxidation rates will be lower. As discussed in Section 6.3.3, the field rate has been predicted based on a scaling factor of 0.07, indicating even mid-grade ore would take nearly a decade before the onset of ARD (i.e. 0.5 years in the lab, 7 years in the field). While only one sample of mid-grade ore was tested as a humidity cell, its total sulphur value was 1.2%, compared to the mean of all low grade ore samples analysed in this study at 0.9%.

The current project design ensures barren rock will be submerged in two years. The fastest time in the laboratory to onset of ARD in the highest sulphur samples is approximately one year, with the majority of samples taking decades. Using the field based scaling factor (Section 6.3.3), delay to onset of ARD is estimated at 16 years for the highest sulphur barren rock samples. Processing of mid-grade ore is currently uncertain in the project plan and it is possible that it may sit exposed for longer than two years. In the event that ARD is produced, the project plan includes placement of this material on the edge of the TSF so that any contact water flows into the TSF and is contained, and as a result, collection of contact water and treatment (if required) would be easily facilitated.

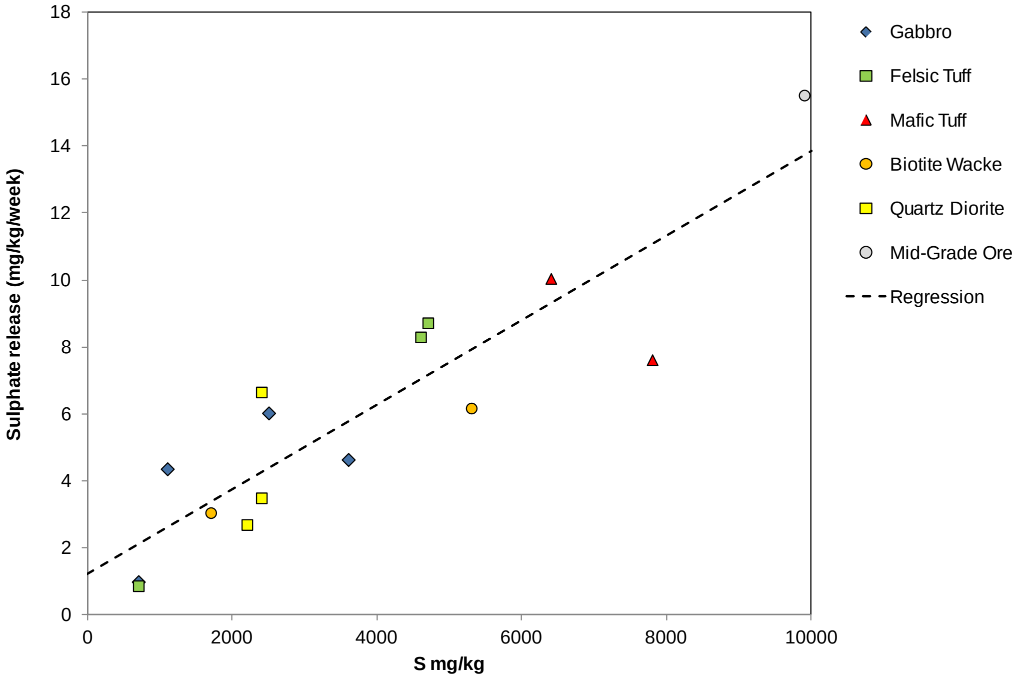

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Figure 14: Relationship between sulphide sulphur content and average sulphate release from humidity cells.

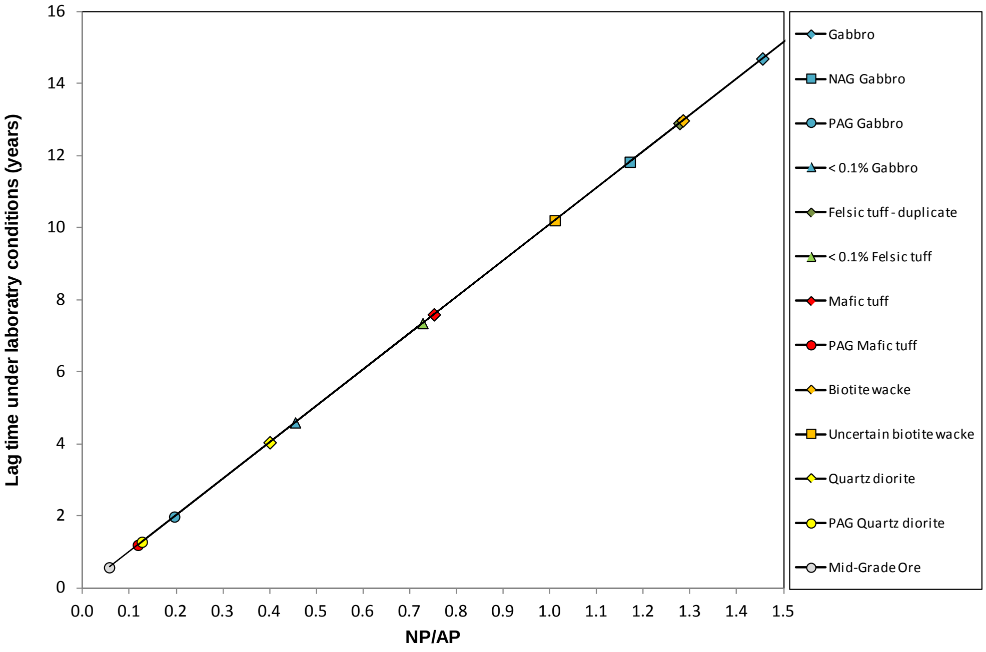

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Figure 15: Calculated lag times for rock samples tested under laboratory conditions as a function site specific NP/AP.

5.2 Pit Wall Management Criteria

The majority of pit wall rock will be submerged at closure and ARD will be inhibited. Submergence is estimated at 12 years, based on current project design and site water balance. A component of the mine design is to direct TSF water into the open pit at closure to facilitate faster filling of the pit. There is a small high wall (average height of 20 m compared to pit depth of 290 m) expected to remain once the pit is full.

Based on the average NPR of the high wall (0.7) and rates provided in Figure 15 scaled to field conditions, it is conservatively estimated that the high wall will not produce ARD for at least 100 years, and at that time, sulphur levels will be lower and likely too low to produce ARD (e.g. near the 0.1% cut-off). The lowest NPR calculated for the high wall was 0.27, and therefore the fastest time to ARD onset would be 28 years (based on laboratory scaled rate of similar NPR). Monitoring of pit sump water chemistry and pit wall oxidation during operations will help refine this prediction and better inform closure options as required.

5.3 Tailings Management Criteria

Characterization of tailings shows that rougher and cleaner tungsten tailings are non-PAG on account of low sulphur or NPR greater than 2. Molybdenite tailings are PAG and will be disposed of separately from tungsten tailings subaqueously in the TSF to inhibit ML/ARD. While it is predicted that tungsten tailings will be non-PAG for the life of the Project, monitoring of tailings in beaches should be performed to confirm the prediction.

5.4 Overburden Management Criteria

Overburden likely has low ML/ARD potential, but testing is yet to confirm. The current plan is to stockpile overburden for reclamation and closure, and as a result, water contacting this material can easily be collected and directed to the water treatment plant if required.

5.5 Quarry Management Criteria

Quarry material has low ML/ARD potential and no specific management criteria are provided. Composite testing of material during excavation and after placement (e.g. contact water sampling) should occur. At closure, the quarry will not have a sump, but instead contact water will be directed towards the TSF through an engineered channel (Samuel 2013). Contact water should be monitored initially to confirm that rock characteristics are not expected to be a source of ML/ARD.

6 Source Term Development

6.1 Introduction

“Source terms” refers to predicted concentrations for waters in contact with various types of geologically-sourced wastes and surfaces under the expected conditions at the site. For example, the source term for a barren rock storage area is the concentration found in pore waters within the facilities. These predictions become inputs (or terms) to the overall site wide water and load balance model used to assess potential effects of the project on the receiving environment. This model has been developed by KP and is not presented here.

Source terms are calculated based on information acquired from various sources including results of laboratory and field testing. As such, the calculations contain uncertainty which needs to be reflected in the subsequent effects assessment for the project and as a result, source term predictions err on the side of conservatism (e.g. laboratory rates used utilized 95th percentile concentrations for sulphur and trace elements wherever possible).

Outputs from source term calculations should be used in a relative rather than absolute sense when drawing conclusions about potential effects on the receiving environment, and should be used primarily to inform project design and the need for effects mitigation measures.

The terms were calculated as annual average dissolved concentrations for the six phases of mining as indicated by Samuel (2013) and do not consider seasonal transient effects such as dilution in contact waters that commonly occurs during snow melt events. Predicted concentrations were calculated on a constant annual basis which is considered conservative.

The resulting source term concentrations are largely developed for input into the water quality model and, therefore, the resulting solution chemistries do not have closed ion balances.

6.2 Source Term Methods

The following sections describe the calculation methods for each term. Inputs for the calculations are described in Section 6.3.

6.2.1 Unsaturated Sources

Unsaturated terms apply to the barren rock and mid-grade ore piles before submergence, soil and overburden stockpiles, unsaturated tailings, tailings embankment dam constructed from quarry borrow, pit walls and quarry walls.

Source terms for unsaturated barren rock sources were calculated using scaling methods to convert laboratory measured weathering rates to field scale using scaling factors followed by calculation of load released and concentrations based on waste scheduling and climatic information supplied by MMTS and KP. For mid-grade ore, laboratory rates for the entirety of testing (including higher release rates under acidic pH) were used.

The steps in the calculation are:

- Obtain input weathering rates (R_P) for each parameter (P) from humidity cells.
- Obtain field scale weathering rates (R_P') to account for lower temperatures at site (k_T), particle size differences and reduced infiltration contact with rock (k_c):

$$R_p' = R_p.k_T.k_p.k_c$$

- Calculate weathering rate ($R''_p(t)$) for mass and composition of the facility (e.g. barren rock dump schedule) for each mining phase t (M(t)):

$$R_p''(t) = R'_P.M(t)$$

- Calculate potential load available from flushing ($L_p(t)$) based on the assumed fraction of rock (k_c) actually flushed by infiltration:

$$L_p(t) = R''_P(t).k_c$$

- Dissolve the load flushed into the infiltration volume (I(t)) to obtain potential concentration in contact water ($C_p(t)$):

$$C_p(t) = L_p(t)/I(t)$$

- Compare $C_p(t)$ to expected solubility limits to generate C_p' for each parameter (p) and use the following rules to calculate the source term at time t for parameter p ($C_p''(t)$):

$$\text{If } C_p(t)>C_p' \text{ then } C_p''(t) = C_p'$$

$$\text{If } C_p(t)<C_p' \text{ then } C_p''(t) = C_p(t)$$

Scaling factors were not varied because they are well-bounded by experience and were found to have limited control on overall predictions when compared to the assigned variation in C_p''.

6.2.2 Flushing Sources

Flushing terms were needed for barren rock and mid-grade ore as it is submerged by the rising water level in the TSF but also for ore as it is processed in the mill. Tailings are assumed to be deposited saturated and the conservatism in the prediction would incorporate any minor additional load accumulated during de-saturation and then submergence as water levels increased. A flushing term was not applied to pit walls as several minerals were at solubility limits and the concentrations associated with these solubility limits were maintained in the pit water. This was assumed to be a conservative approach.

Weathering minerals accumulated in barren rock not flushed by infiltrating waters, or by ore before it is processed in the mill, will be dissolved in the water contacting the material and was calculated as follows:

- Load generated by rock before flushing ($\sum L_f$) was calculated from the field weathering rate (R_p'), the quantity of material to be flushed ($M(t).(1-k_c)$), and total time ($\sum t$) before flushing by inundating or mill contact water:

$$\sum L_f = R_p'.M(t).(1-k_c).\sum t$$

Assuming all rock contributes a load during flushing incorporates any input from solubility controlled minerals that may accumulate, but is also assumed to be conservative as it is expected that the majority of rock will be flushed with infiltration prior to submerging.

The resulting total load (L_f) is then dissolved in the volume of contact water (V) in the pore spaces of the rock (30%) or the amount of mill water to be used and compared to solubility limits to obtain the concentration in the flushing water:

$$C_p(t) = (L_f)/V$$

$$\text{If } C_p(t)>C_p' \text{ then } C_p''(t) = C_p'$$

$$\text{If } C_p(t)<C_p' \text{ then } C_p''(t) = C_p(t)$$

6.2.3 Saturated (Subaqueous) Sources

Subaqueous terms were needed primarily for molybdenite tailings deposited sub-aqueous in the TSF. However, these materials were assumed to be water saturated during processing and sulphide oxidation was assumed to be negligible. As a result, the flushing term for ore material was assumed to incorporate sources from these wastes and no specific term for tailings deposited sub-aqueous was calculated.

6.2.4 Mill Process Water Term

A reagent parameter list was provided by Bolu Consulting (Samuel 2013) and provided to KP to dissolve into the appropriate water volumes expected in the process.

6.2.5 Explosive Residue Terms

Explosive residue terms refer to loadings derived from explosives use. Leaching of explosive residues to yield soluble nitrate, nitrite and ammonia was calculated using the Ferguson and Leask (1988) method.

6.2.6 Water Treatment Plant

Predicted water quality for a small number of parameters was expected to exceed the Canadian Council of Ministers of the Environment (CCME) water guidelines for the protection of freshwater aquatic life. As a result, a scoping level study for a water treatment plant to treat surface water with a prediction of resultant effluent water quality was performed by SRK. Details are provided in Appendix I.

6.2.7 Consideration of Uncertainty

Consideration for uncertainty was incorporated by using conservative inputs into calculations and professional best practice. As an example, average weathering rates from laboratory humidity cells were used, although the humidity cell rate chosen for each rock type from the proportions provided by MMTS was the 95th percentile in terms of sulphur content and/or metals concentration. For example, where the rock type by MMTS indicated gabbro was the main rock type, the PAG gabbro humidity cell rate was used.

6.3 Inputs

6.3.1 Summary

Table 11 summarizes input terms. In the development of the project plan, several terms were removed but for consistency among the consulting team, numbering remained the same (i.e. waste rock outside the TSF was removed). As a result, the numbering of the source terms is not sequential. The following sections describe the source of each input.

6.3.2 Rates

Inputs were calculated as averages from humidity cells. Humidity cell rates were calculated following the initial flush of soluble weathering products accumulated prior to testing of the sample. Barrel rates loading rates were calculated in the same manner as humidity cell rates, except that the timing for volume of leachate was changed based on measurements in the field (Table 12). The barrel rate was primarily used to correct for temperature. The resulting rates for selected parameters (parameters above analytical detection in laboratory analysis of leachate) for humidity cells and barrels are shown in Table 13 and Table 14, respectively. The quarry rate was used for overburden, the plant site, soil stockpiles and haul roads.

Table 11: Summary of source inputs by term.

Term	Term Location	Material Type	Term Type	Rate Type		Solubility Control	Infiltration	Rate Scaling		Reporting Units
				Type	Statistic		mm/year	Temperature	Particle Size	
1	Operational Pit Sump	Pit rock	Unsaturated	Waste Rock	Mean	phreeqc	1350	0.14	0.5	mg/day
2	Milled Ore	Pit rock	Flushing	Low Grade Ore	Mean	phreeqc	--	0.14	0.5	mg/L
5	Low grade ore stockpile	Pit rock	Unsaturated	Low Grade Ore	Mean	phreeqc	1200	0.14	0.5	mg/L
6	Waste rock dump in TSF	Pit rock	Unsaturated	Waste Rock	Mean	phreeqc	1200	0.14	0.5	mg/L
7	Waste rock dump in TSF	Pit rock	Flushing	Waste Rock	Mean	phreeqc	1200	0.14	0.5	mg/tonne rock
8	TSF beaches - run-off	Tailings	Run-off	Tailings	Mean	phreeqc	--	0.2	--	mg/m^2/week
9	TSF beaches - infiltration	Tailings	Unsaturated	Tailings	Mean	phreeqc	150	0.2	--	mg/L
13	TSF dam embankment - quarry material	Quarry rock	Unsaturated	Quarry Rock	Mean	None	1200	0.14	0.5	mg/L
14	Quarry	Quarry rock	Unsaturated	Quarry Rock	Mean	None	1200	0.14	0.5	mg/L
17	Plant site	Quarry rock	Unsaturated	Quarry Rock	Mean	None	1200	0.14	0.5	mg/L
18	Overburden	Quarry rock	Unsaturated	Quarry Rock	Mean	None	1200	0.14	0.5	mg/L
19	Soil stockpiles	Quarry rock	Unsaturated	Quarry Rock	Mean	None	1200	0.14	0.5	mg/L
20	Dams for water management ponds	Quarry rock	Unsaturated	Quarry Rock	Mean	None	1200	0.14	0.5	mg/L
21	Haul roads	Quarry rock	Unsaturated	Quarry Rock	Mean	None	1200	0.14	0.5	mg/L
23	Pit walls	Pit rock	Unsaturated	Waste Rock	Mean	phreeqc	1350	0.14	0.5	mg/L
24	Water treatment plant	--	--	--	--	--	--	--	--	mg/L

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Notes: "--" is Not Applicable

Table 12: Summary of barrel collection period for field leachate volumes used in loading rate calculations.

Date	Collection Period (weeks)	Barrel 1 Vol. L	Barrel 2 Vol. L	Barrel 3 Vol. L	Barrel 4 Vol. L	Barrel 5 Vol. L	Barrel 6 Vol. L
13-Sep-11	3.4	20	20	20	20	20	20
7-Oct-11	3.4	6.3	6.9	7.8	9.5	8.9	10
2-Nov-11	3.7	5.1	2.2	1.9	1.7	2.3	2.0
30-Nov-11	4.0	12	10	8.8	11	5.1	6.8
22-Mar-12	16	19	20	18	19	--	--
10-Apr-12	2.7	5.7	2.8	7.4	3.4	--	--
19-Apr-12	1.3	--	--	--	--	5.1	4.5
8-May-12	2.7	4.6	2.3	7.1	6.0	6.0	0.2
7-Jun-12	4.3	4.2	2.8	3.3	3.2	1.4	5.6
6-Jul-12	4.1	7.0	18	18	15	2.5	19
13-Aug-12	5.4	8.8	6.4	10	6.2	7.6	7.5
5-Sep-12	3.3	1.9	2.4	1.6	3.1	2.4	4.5
1-Oct-12	3.7	12	12	7.1	12	12	12
5-Nov-12	5.0	15	15	15	16	15	14
3-Dec-12	4.0	6.1	5.3	4.4	5.5	5.7	6.0
11-Feb-13	10	22	22	22	22	22	22
28-Mar-13	6.4	22	22	22	22	22	22
11-Apr-13	2.0	12	10	6.8	8.6	18	16
3-Jun-13	7.6	11	11	11	11	12	12

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Notes:
-- indicates that a sample was not available

Table 13: Humidity cell rates (mg/kg/week).

HCT ID	Rock/Sample Type	SO_4	Alkalinity	Cl	F	Al	Sb	As	Cd	Ca	Cr	Cu	Fe	Pb	Mg	Mn	Mo	K	Se	Na	W	U	Zn
HC 1	Gabbro	4.4	7.5	0.17	0.3	0.072	0.00079	0.0012	0.0000092	4.4	0.00027	0.0003	0.0049	0.000029	0.22	0.0082	0.015	0.81	0.000014	0.11	0.0019	0.00034	0.00041
HC 2	Felsic tuff	8.7	5.2	0.17	0.2	0.031	0.0003	0.00043	0.00002	5.5	0.00099	0.0006	0.0027	0.000043	0.22	0.055	0.0025	0.35	0.000072	0.088	0.00037	0.00074	0.00084
HC 2D	Felsic tuff - duplicate	8.3	6.9	0.14	0.27	0.034	0.00038	0.00043	0.000025	6.1	0.0011	0.00078	0.0042	0.000058	0.21	0.063	0.0043	0.34	0.000083	0.079	0.00042	0.00087	0.001
HC 3	Mafic tuff	10	7.3	0.18	0.19	0.023	0.00029	0.0013	0.00012	6.7	0.00058	0.00076	0.0035	0.000094	0.3	0.11	0.0034	0.46	0.00011	0.073	0.00055	0.00025	0.002
HC 4	Biotite wacke	6.2	5	0.18	0.14	0.027	0.00026	0.00057	0.0000048	3.6	0.00082	0.00051	0.0037	0.000021	0.63	0.024	0.0022	0.55	0.000097	0.081	0.00031	0.00011	0.00038
HC 5	Quartz diorite	6.7	4.9	0.16	0.33	0.042	0.00011	0.0007	0.0000065	4.6	0.00039	0.00028	0.0036	0.000023	0.18	0.014	0.013	0.57	0.000022	0.1	0.0018	0.00027	0.00046
HC 6	PAG Gabbro	6	3.2	0.23	0.15	0.028	0.000019	0.000048	0.0000018	2.4	0.00033	0.00036	0.0021	0.000016	0.85	0.00097	0.00019	0.58	0.000015	0.097	0.00089	0.000029	0.00044
HC 7	NAG Gabbro	4.6	9.9	0.15	0.026	0.029	0.00044	0.0037	0.0000017	5.0	0.0021	0.00034	0.0036	0.000015	0.25	0.033	0.0012	0.55	0.000092	0.064	0.00015	0.00022	0.00037
HC 8	PAG Mafic tuff	7.6	0.9	0.16	0.35	0.034	0.000012	0.000086	0.000015	3.3	0.00064	0.0012	0.0022	0.000039	0.28	0.016	0.00008	0.4	0.000024	0.11	0.00018	0.000014	0.0037
HC 9	Uncertain biotite wacke	3.1	5.1	0.18	0.19	0.023	0.000015	0.00002	0.0000018	3.2	0.0013	0.00034	0.0023	0.000013	0.14	0.017	0.000057	0.35	0.000059	0.019	0.000048	0.000064	0.00035
HC 10	PAG Quartz diorite	2.7	0.63	0.26	0.5	0.025	0.0000051	0.0000085	0.000007	1.3	0.00043	0.00031	0.0025	0.000014	0.17	0.005	0.000056	0.49	0.000015	0.12	0.00083	0.000008	0.0015
HC 11	NAG Quartz dirorite	3.5	9.2	0.15	0.2	0.034	0.0065	0.0061	0.0000082	4.6	0.0013	0.00032	0.0033	0.00006	0.25	0.019	0.0017	0.38	0.000024	0.068	0.00031	0.00048	0.00035
HC 12	< 0.1% Gabbro	0.99	1.2	0.29	0.027	0.019	0.000024	0.000094	0.0000015	0.58	0.000076	0.00022	0.0023	0.000022	0.092	0.00045	0.00025	0.48	0.000011	0.081	0.0012	0.0000087	0.0003
HC 13	< 0.1% Felsic tuff	0.87	4.1	0.17	0.16	0.037	0.0000067	0.000036	0.0000017	2.0	0.00024	0.00023	0.0021	0.000037	0.015	0.00034	0.00025	0.077	0.0000096	0.088	0.000083	0.0024	0.00033
HC 14	Mid-grade ore	17	1.2	0.22	1.1	0.4	0.00016	0.000028	0.00039	6.0	0.00028	0.0092	0.20	0.00055	0.45	0.29	0.00004	1.3	0.00064	0.18	0.00037	0.00025	0.035
HC 17	Quarry Material	0.28	9.1	0.21	0.047	0.16	0.000026	0.00085	0.0000016	3.1	0.00005	0.00018	0.0061	0.000027	0.11	0.001	0.0004	0.52	0.000011	0.17	0.000051	0.00088	0.00033
HC 18	Quarry Material	0.32	15	0.27	0.26	0.17	0.00003	0.0018	0.0000014	5.5	0.00042	0.00012	0.0047	0.000024	0.15	0.0045	0.00018	0.69	0.0000096	0.14	0.000035	0.003	0.00039
HC 16	Rougher Tails	2.7	16	0.2	0.67	0.091	0.00058	0.0047	0.0000042	7.0	0.00019	0.00057	0.0065	0.000033	0.26	0.0078	0.0062	0.77	0.000024	0.1	0.00058	0.00035	0.00029
HC 16D	Rougher Tails	2.6	15	0.16	0.52	0.066	0.00055	0.0071	0.0000016	6.3	0.00018	0.00052	0.0067	0.000041	0.25	0.0083	0.0035	0.85	0.000022	0.1	0.00049	0.00034	0.00029
HC-19	Rougher Tails	5.5	15	0.24	0.4	0.044	0.00033	0.0059	0.000004	6.4	0.00016	0.00043	0.04	0.000064	0.37	0.022	0.0065	2.4	0.000066	0.36	0.02	0.00058	0.00067

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Table 14: Barrel rates (mg/kg/week).

Barrel ID	Lithology	Corresponding Humidity Cell	SO_4	Alkalinity	Cl	F	Al	Sb	As	Cd	Ca	Cr	Cu	Fe	Pb	Mg	Mn	Mo	K	Se	Na	W	U	Zn
1	Gabbro	HC 1	0.75	0.43	0.023	0.0097	0.00031	0.000025	0.00002	0.0000014	0.35	0.0000029	0.000014	0.00022	0.00000041	0.038	0.002	0.0012	0.069	0.000014	0.063	0.00017	0.000064	0.000025
2	Felsic Tuff	HC 2	1.3	0.39	0.021	0.011	0.00018	0.000064	0.000038	0.0000024	0.57	0.0000028	0.000024	0.00013	0.00000092	0.04	0.0048	0.0012	0.075	0.000016	0.077	0.00046	0.0002	0.0001
3	Mafic Tuff	HC 3	2.8	0.39	0.017	0.0091	0.000097	0.00004	0.000067	0.000019	1.0	0.0000032	0.000077	0.00011	0.0000027	0.12	0.022	0.00057	0.11	0.000042	0.057	0.000087	0.000044	0.00035
4	Biotite Wacke	HC 4	1.5	0.42	0.013	0.0096	0.00016	0.000053	0.000034	0.0000011	0.56	0.0000031	0.000052	0.00007	0.00000033	0.092	0.0046	0.00056	0.099	0.000029	0.086	0.000039	0.000031	0.000041
5	Quartz Diorite	HC 5	0.46	0.48	0.02	0.0095	0.00051	0.000035	0.00003	0.0000013	0.27	0.0000036	0.00002	0.00026	0.00000052	0.021	0.00065	0.0017	0.08	4.3E-06	0.061	0.0002	0.00012	0.000025

Source:Z:\01_SITES\Sisson_Brook\1CN019.000_Sisson_Project_MLARD\Task1300_EIA\1.Draft_Report\Tables\[Sisson_EIA_CompiledTables_1CN019.000_CBK_REV00.xlsx]

6.3.3 Scaling Factors

As indicated in Section 6.2.1, scaling factors are used to translate laboratory-calculated weathering rates to field conditions by accounting for the differences in temperatures, particle size and water contact. The product of these three factors is the total bulk factor.

Discussion of the scaling factors for the Project is provided below. The first principles basis for the factors is provided initially followed by the basis for selection of the bulk factor for the Project.

Temperature Scaling Factor - k_T

Using the Arrhenius Equation and assuming pyrite is the dominant sulphide mineral, the average temperature scaling factor (k_T) for the site would be about 0.1 and 0.3 depending on how seasonal variations in temperature are factored into the calculation.

Particle Size Factor - k_p

Since rock weathering is dependent on particle size surface area, the particle size factor for waste rock reflects the difference between surface area in laboratory-based tests and open pit waste rock. Experience indicates that k_p is close to 0.2 which reflects the presence of large rock fragments having high mass but relatively small surface area.

For tailings, k_p is 1, because laboratory testing was performed on samples of tailings generated from metallurgical testing with a particle size distribution that is very close to eventual production values.

Contact Factor - k_c

The contact factor allows for differences in the degree to which rock fragments are wetted by infiltrating waters. In a humidity cell, k_c is 1 because the sample is deliberately thoroughly leached as part of the procedure. In waste rock, k_c is less than 1 because preferential flow paths develop as the flow path length increases. k_c can be expected to be near 1 for short flow paths. Since waste rock at the Project will be placed to allow continuous flooding, flow paths will be short and k_c close to 1.

For tailings, preferential flow paths are not expected to develop and k_c is 1.

Bulk Factor

The theoretical bulk factor for waste rock is therefore 0.1 x 0.2 x 1 to 0.3 x 0.2 x 1 or 0.02 to 0.06. For tailings, the factor is 0.1 to 0.3.

For all rock samples (e.g. barren rock, mid-grade ore, quarry, pit walls), comparison of rates for humidity cells and field barrels indicated a total field scaling factor of 0.14 (Table 11). This rate reduction reflects temperature and particle size differences but with little effect due to development of preferential flow paths. The particle size difference does not reflect run-of-mine rock because the barrel test was performed on rock crushed to minus 1-inch and would therefore have greater particle areas compared to run-of-mine.

For the purpose of this project, SRK selected a bulk scaling factor of 0.07 which is 50% of the factor indicated by the field and laboratory test. This value is higher than the high end of the theoretical range (0.06) and a scaling factor of 0.03 developed as part of a rigorously designed scaling study. (Kennedy et al. 2012). The latter was obtained from a colder site for which the difference between 0.03 and 0.07 can in part be explained by temperature differences.

In summary, the scaling factors used were:

- 0.07 for barren rock; and
- 0.2 for tailings.

6.3.4 Waste Quantities and Geometry

Waste quantities were provided by KP on an annual basis. For the purpose of source terms, scaled rates indicated in Table 11 were applied to all wastes above the water table.

6.3.5 Infiltration

Average annual infiltration values were provided by KP and are tabulated in Table 11.

6.3.6 Solubility Controls

Basis

Solubility control input is based on the assumption that each parameter is contained in one or more mineral phases and that mineral phases have finite solubility under the prevailing disposal conditions defined by pH, redox conditions temperature and bulk ion chemistry. Understanding of solubility controls can be derived from first principles (i.e. mineral-water equilibria and thermodynamics), experimental data and monitoring data from analogous sites.

First Principles

For the Sisson Project, only first principles were applied as a suitable analogue site was not identified. Solubility control for source terms involved taking the initial calculated source term concentrations and using the equilibrium modelling software package Phreeqc (Parkhurst and Appelo 1999) to determine what secondary minerals were oversaturated. Based on experience at other mine sites, certain minerals were selected to precipitate under atmospheric conditions. The resulting change in concentrations was then used for the source terms, as dictated by the relationships in Section 6.2.1 and 6.2.2. The minerals that were routinely identified as oversaturated and the parameter they affected were as follows:

- Calcite: alkalinity and calcium
- Fluorite: calcium and fluoride
- Ferrihdyrite: iron
- Alunite: aluminium, sulphate, and potassium

- Silica gel: silicon in source term 9 only
- Magnesite: magnesium in source term 9 only
- Barite: barium and a small amount of sulphate in source term 9 only

All other parameters were unchanged from initial calculations.

6.3.7 Tailings Oxygen Diffusion Considerations

The mass of tailings that were considered reactive in source term 9 was less than the total mass of tailings expected to be unsaturated below the beach. This reflects experience at other sites where oxygen is not expected to diffuse through the entire unsaturated wedge. Tailings in the upper portion of the wedge will consume oxygen and the degree of water saturation of the tailings will also inhibit oxygen diffusion. To quantify this effect, oxygen diffusion was modelled in the Sisson tailings based on a physical configuration provided by KP and geochemical characteristics determined as part of this ML/ARD assessment. Details of the modelling are provided in Appendix J.

The result of the modelling was that oxygen was not expected to diffuse deeper than 10 m. This depth was provided to KP and the mass of tailings to this depth was then provided to SRK for source term calculation for unsaturated tailings.

6.3.8 Nitrogen Leaching

Nitrogen leaching from blasted rock (barren rock, low grade ore, pit walls) was calculated based on powder factors provided by MMTS and leachable nitrogen forms based on the Ferguson and Leask method (Ferguson and Leask 1988). Calculations were based on the following:

- Average powder factor for all rock of 0.16 kg/t.
- Emulsion is assumed to be is 6% fuel oil by weight and 94% ammonium nitrate.

Based on 1% of the ANFO being lost as nitrate, a calculated value of $5x10^{-4}$ kgN/tonne was used to predict nitrogen leaching from blasted rock.

6.4 Results

A summary of outputs are provided in Appendix K and were provided to KP for use in the water quality modelling.

7 Conclusions

The ML/ARD baseline characterization and prediction program indicates:

- Barren rock and mid-grade ore are dominantly PAG. Low level sulphur is present throughout the deposit with insufficient carbonate to offset ARD over the long term.
- PAG rock will be managed by submergence in the TSF. Based on kinetic rates of oxidation, timing to onset of ARD is expected to be longer than the time it will take for submergence in the TSF. ML from sulphides will also be effectively inhibited over the long term by submergence.
- Pit wall rock is PAG. Low level sulphur is present throughout the walls with insufficient carbonate to offset ARD over the long term. Filling of the pit is expected to occur in 12 years, which is much faster than the 100 years expected for the wall to produce acid, if they will at all. Filling of the pit will also inhibit ML over the long term.
- Quarry rock has low ML/ARD potential and is suitable for construction from a geochemical standpoint.
- Overburden ARD potential is expected to be low, although still needs to be confirmed. ML potential is low.
- Tungsten tailings are non-PAG with low ML potential. Molybdenite tailings are PAG and will be disposed subaqueously to effectively inhibit sulphide oxidation and associated ML.
- Geochemical characterization data were used to develop contact water chemistry predictions for 16 individual sources in the water quality model for the project and provided to KP for site wide predictive water quality modelling.

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Appendix A: Rock Mineralogy

A1: Petrographic descriptions

REPORT NO. MSC11/042R

PETROGRAPHY OF TWENTY TWO DRILL CORE AND HUMIDITY CELL SAMPLES FROM THE SISSON (W, Mo) PROJECT (N.B.)

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PETROGRAPHY OF TWENTY TWO
DRILL CORE AND HUMIDITY CELL SAMPLES
FROM THE SISSON (W, Mo) PROJECT (N.B.)

1. INTRODUCTION

This report presents the results of petrographic analyses of twenty three samples received from Chris Kennedy of SRK Consulting. Fifteen of the samples comprise drill core and eight are humidity cell samples. Thin sections and offcuts were submitted. The aim of the study was to characterize the mineralogy of the samples, focusing on the presence of carbonates and sulphides. Preparation of the samples for microprobe analyses of carbonates and sulphides was also requested. The samples examined in this study are listed in Table 1.

Table 1: List of samples examined as part of this investigation.

MSC Sample #	Sample ID	Sample Type
1	#1	drill core
2	#2	drill core
2D	#2D	drill core
3	#3	drill core
4	#4	drill core
5	#5	drill core
6	185748	drill core
7	163760	drill core
8	161540	drill core
9	267616	drill core
10	162363	drill core
11	163128	drill core
12	162251	drill core
13	918618	drill core
14	162352, 6814, 82973	drill core
15	1-Sample A	humidity cell
16	2-Sample B	humidity cell
17	3-Sample C	humidity cell
18	4-Sample D	humidity cell
19	5-Sample E	humidity cell
20	6-Sample F	humidity cell
21	7-Sample G	humidity cell
22	7D-Sample G	humidity cell

2. METHODS

Petrographic descriptions were performed in the office of Mineral Services Canada Inc. using a Nikon Eclipse E400 microscope equipped with transmitted and reflected light. The microscopic characteristics of the samples are described in Appendix A and illustrated in a series of representative photomicrographs presented in Appendix B. All modal abundance percentages in the descriptions are approximate. For each sample, up to six carbonate grains and six sulphide grains were selected, marked on the thin section and photographed. In order to obtain reliable electron microprobe results, carbonate grains have to be at least 15 µm in size. Only grains satisfying this condition were selected. Maps allowing easy navigation during microprobe work from one location to another in the thin sections were prepared and forwarded with the thin sections to the Earth and Ocean Sciences department of the University of British Columbia for microprobe analysis.

3. RESULTS

The drill core samples 1 to 14 comprise lithic fragments of gabbro/diorite, metamorphosed volcanic and sedimentary rocks, quartz and carbonate veins as well as a possible marble fragment. Minor amounts of fragments of the minerals forming the lithic fragments are typically also present and include quartz, feldspars (plagioclase and K-feldspar), biotite, sericite, chlorite, amphibole, rutile and magnetite/ilmenite (variably rimmed by titanite), minor epidote, apatite, zircon, scheelite, wolframite and various sulphides and native elements. The grain size of the mineral and lithic fragments in samples 1 to 14 ranges from 2 µm to 8 mm.

The humidity cell samples 15 to 22 are characterized by a finer fragment size (less than 0.3 mm) and by extensive oxidation. In all samples, fragments comprise liberated mineral grains of quartz, feldspars (plagioclase and K-feldspar), biotite, sericite, chlorite, amphibole, rutile and magnetite/ ilmenite (variably rimmed by titanite). Liberated mineral grains of epidote, apatite, zircon, scheelite, wolframite and various sulphides and native elements are variably present in the humidity cell samples. Lesser lithic fragments also occur in the samples and include fragments of gabbro/diorite, metavolcanics/sediments and quartz veins that cannot reliably be quantified. Liberated clusters of clay also occur in samples 17 and 18.

The following table (Table 2) and descriptions outline the main characteristics of the samples and of each type of fragment as well as the occurrences and types of carbonates and opaque minerals. Only the main sulphides present in the samples are included in Table 2.

The lithology, mineralogy, carbonate content and sulphide/oxide content of each sample are summarised in Appendix A. Photographs highlighting these features are presented in Appendix B.

Table 2: Summary of results (All abundances in modal %).

MSC Sample #	Lithology	Carbonate	Pyrite	Chalcopyrite	Pyrrhotite
1	Gabbro/diorite	tr	tr	tr	tr
2	Meta-volcanics/-sediments	2	tr	tr-1	tr
2D	95% meta-volcanics/-sediments; 5% quartz	1	tr	tr-1	tr-1
3	90% meta-volcanics/-sediments; 5% quartz ; 5% carbonate	2	tr-1	tr	tr
4	95% meta-volcanics/-sediments; 5% quartz	2	1	tr-1	tr
5	95% gabbro/diorite; 5% quartz	tr	tr-1	tr	tr-1
6	Gabbro/diorite	0	tr-1	tr	tr
7	90% meta-volcanics/-sediments; 5% quartz; 5% carbonate	10	1	tr	tr
8	Meta-volcanics/-sediments	tr	1	tr	tr
9	85% meta-volcanics/-sediments; 15% quartz	tr-1	tr	1	tr-1
10	Gabbro/diorite	0	1	tr-1	tr
11	Gabbro/diorite	3	tr-1	tr	tr
12	Gabbro/diorite	0	tr	0	tr
13	Meta-volcanics/-sediments	tr	tr	tr-1	tr
14	60% meta-volcanics/-sediments; 30% gabbro/diorite, 10% quartz (vein)	tr	tr	3	tr-1
15	N/A	0	tr	0	tr
16	N/A	0	tr	0	tr-1
17	N/A	0	tr	tr	tr
18	N/A	0	tr	0	tr
19	N/A	0	tr	0	0
20	N/A	0	tr	0	0
21	N/A	0	tr	0	tr
22	N/A	0	tr	0	tr

3.1 LITHIC FRAGMENTS

3.1.1 GABBRO/DIORITE

Gabbro/diorite fragments occur in half of the drill core samples (samples 1, 5, 6, 10 to 12 and 14). They typically form most of the lithic fragments, except in sample 14 in which their abundance is 30%. The gabbro/diorite is fine- to medium-grained, made up of anhedral to subhedral tabular, commonly twinned plagioclase, fine- to very fine-grained platy brown biotite and anhedral to subhedral tabular, commonly poikilitic green amphibole (likely actinolite). Small grains of magnetite, variably intergrown with ilmenite are scattered in the fragments and are commonly rimmed by a thin corona of titanite. Biotite commonly occurs in clusters replacing amphibole and K-feldspar mostly occurs as cloudy alteration of plagioclase, suggesting a phase of potassic alteration. Quartz occurs in variable amounts in the gabbro/diorite fragments, typically interstitial to plagioclase and mafic phases. Chlorite also occurs in all the samples, mostly as small sheaves and clusters of sheaves associated with small grains and granular aggregates of titanite (all samples), rutile (samples 1, 5, 10, 11, 12 and 14) and/or carbonate (samples 1, 5 and 11 only), likely as alteration of mafic phases (biotite and amphibole).

Zircon (sample 1) and apatite (all samples) are variably disseminated. Trace oxidation is observed in some fragments in samples 1, 12 and 14.

3.1.2 METAVOLCANICS/METASEDIMENT

Fragments of metavolcanics/metasediments occur in drill core samples 2 to 4, 7 to 9, 13 and 14. Their abundance varies from 60% in sample 14 to 85-100% in all the other samples.

The metavolcanics/metasediments fragments include a variety of slates and metagreywacke rocks.

The slates are made up of ill- to well-defined bands of aligned biotite ± actinolite ± sericite ± chlorite that either alternate with bands of felsic minerals (quartz and lesser amounts of feldspars, dominantly plagioclase) or wrap around grains and clusters of felsic minerals. All minerals are typically fine- to extremely fine-grained. The bands of amphibole and phyllosilicates vary in composition throughout the samples and throughout the fragments. In sample 8 for example, the slates consist mainly of amphibole-biotite, while in sample 9 they are essentially made up of biotite-sericite. Alteration of the various mafic phases also results in fragments with mixed bands of biotite, amphibole and chlorite. Where present, chlorite is typically associated with very fine-grained carbonate and microcrystalline rutile. Flattened clusters of magnetite/ilmenite are variably scattered in the slates.

Metagreywacke fragments are most common in samples 2, 2D and 13. They are essentially made up of fine-grained anhedral quartz and feldspars with lesser biotite and amphibole that mostly occur as very fine-grained interstitial infill between felsic grains. Alteration is marked by variably developed replacement of plagioclase by secondary K-feldspar, sericite or carbonate. Quartz is locally internally deformed and / or recrystallized and a faint foliation is marked in some fragments by the flattening of felsic minerals.

3.1.3 QUARTZ VEIN

Quartz vein fragments are observed in samples 2D, 3, 4, 5, 7, 9 and 14. They form 5% of the lithic fragments in all samples except samples 9 (15%) and sample 14 (10%). The quartz fragments are typically monomineralic (in contrast to the metagreywacke fragments) and much coarser-grained than the slate fragments. They are typically granular and made up of anhedral quartz that is only weakly internally deformed. Attachments of lithic fragments (mostly slates) and interstitial infill of carbonate or of pyrrhotite also occur in a few samples.

3.1.4 CARBONATE VEIN/MARBLE

One monomineralic and layered calcite fragment, 3 mm in size, occurs in sample 3 and fine-grained liberated grains and clusters of calcite are observed in sample 7. In sample 3, the carbonate is microcrystalline to fine-grained, with the grain size variations defining the layers, suggesting the fragment is marble. Coarser-grained subhedral calcite lines one side of the fragment. No other fragment/attachment to lithic fragments similar to this example is observed in the other samples. In sample 7, the liberated grains and clusters of calcite are fine-grained and anhedral, and similar in size and texture to those occurring in carbonate veins that cut slates and metagreywacke fragments or are attached to them.

3.2 CARBONATE

Carbonate is present in all the drill core samples, except in samples 6, 10 and 12. Its abundance is typically below 1% but reaches 2% in samples 2, 3 and 4, 3% in sample 11 and 10% in sample 7. Two types of carbonate are recognized in the sample suite: the most common variety is colourless to cloudy with variably well-defined relief variation and is interpreted as calcite; the other is darker in colour (likely Fe-bearing) and is only observed in trace amounts in samples 2, 2D and 4.

In the gabbro/diorite samples, calcite is typically rare (samples 1 and 5) or absent (samples 6, 10 and 12), except in sample 11, in which its abundance reaches 3%. It occurs as rare liberated grains (samples 1, 5 and 11) or as small anhedral grains associated with chlorite, titanite or rutile as alteration of mafic phases (samples 1, 5 and 11) or in sample 11 as alteration of feldspars.

In the more felsic metavolcanics/metasediments samples, calcite typically occurs as small anhedral grains altering feldspars (samples 2, 2D, 3, 4, 7, 8 and 9) or associated with chlorite altering biotite (samples 2, 2D, 3 and 13). It also occurs as rare liberated grains (samples 2, 2D, 3 and 4), in thin veinlets in lithic fragments (samples 2D, 3, 7 and 8) or as interstitial infill in quartz vein fragments in sample 9. In samples 3 and 7, granular carbonate fragments are interpreted as possible vein (sample 7) and marble (sample 3) fragments.

The darker carbonate type occurs in very thin bands in slates (sample 4) and in small and very fine-grained foliated clusters associated with biotite in samples 2 and 2D or with sericite in sample 4.

No carbonate is observed in the oxidized humidity cell samples.

3.3 OPAQUE MINERALS

Sulphides, native elements and Fe-oxyhydroxides/hematite are variably present throughout the samples. The maximum abundance of sulphides/native elements is estimated at 4% (sample 14) but their abundance is typically less than 2%. The abundance of Fe-oxyhydroxides/hematite is below 1% in the drill core samples but reaches up to 11% in the humidity cell samples. Sulphides/native elements essentially consist of pyrite, pyrrhotite and chalcopyrite, with marcasite, arsenopyrite, sphalerite, galena, bismuthinite, native bismuth and molybdenite variably occurring throughout the samples.

3.3.1 PYRITE

Pyrite occurs in all the samples, with a maximum abundance of 1% in samples 4, 7, 8 and 10. With the exception of sample 19, pyrite occurs as anhedral or subhedral typically cubic grains, either scattered in lithic fragments, in clusters in lithic fragments or liberated. In sample 19, no liberated pyrite is observed. Pyrite grain size is less than 400 µm in most samples, but reaches 500 µm in sample 6, 600 µm in sample 22, 700 µm in sample 5 and 800 µm in samples 2, 4 and 9.

Pyrite additionally occurs in bands, seams and veinlets in lithic fragments in samples 3, 4 and 7, as interstitial infill between gangue minerals in sample 4 or as inclusions in quartz in samples 15 and 19.

Pyrite is intergrown with possible marcasite (whitish with bluish tint, faint bireflectance and strong anisotropy) in a few grains in samples 3, 4, 7, 8, 10 and 12. It is also associated with pyrrhotite in samples 9 and 10, and with chalcopyrite in samples 9 and 12. It contains inclusions of chalcopyrite in samples 3 and 7.

Pyrite is typically unaltered in the drill core samples, except in samples 1, 12 and 14, in which a few grains are partially rimmed by hematite. In the humidity cell samples, pyrite is variably replaced by hematite (samples 15, 17, 18, 20, 21 and 22). Pyrite is unaltered in sample 16.

3.3.2 PYRRHOTITE

Pyrrhotite occurs in most drill core samples (all except sample 12) but is only observed in humidity cell sample 17. When present, its abundance is below 1%, except in sample 14 where its abundance reaches 3%. Pyrrhotite typically occurs as anhedral to acicular grains, locally poikilitic, either scattered in lithic fragments and/or liberated. It also forms veinlets and seams in sample 5, occurs as interstitial infill in quartz fragments in sample 14 or as inclusions in quartz in sample 17. In most samples, pyrrhotite grain size is less than 500 µm. Coarser grains are observed in samples 2 and 14, in which they reach 700 µm and 900 µm, respectively.

Association of pyrrhotite with chalcopyrite is observed in samples 2, 2D, 3, 4, 8, 9, 10 and 14 with chalcopyrite occurring as inclusions in pyrrhotite or as attachments to pyrrhotite. Pyrrhotite is also intergrown with pyrite in sample 10 and with galena and native bismuth in sample 2.

Pyrrhotite is unaltered, but slightly corroded in samples 5 and 17. In sample 17, it is also observed as possible remnant cores (<5 µm in size) in masses of Fe-oxyhydroxides.

3.3.3 CHALCOPYRITE

Trace chalcopyrite occurs in all samples except in samples 19 and 20. Chalcopyrite typically occurs as anhedral grains set in lithic fragments (all samples) or less commonly as liberated anhedral to subangular grains (all samples except samples 5, 10 and 11). Its grain size is less than 300 µm in most samples but reaches 400 µm in samples 4, 5, 8 and 9 and 700 µm in sample 15.

Chalcopyrite is intergrown with and/or attached to pyrrhotite (± galena in sample 2) in samples 2, 2D, 3, 4, 8, 9, 10 and 14 and occurs as inclusions in pyrrhotite in sample 3. Chalcopyrite forms inclusions in pyrite (samples 3 and 7) and attachments to pyrite in sample12. It also occurs as inclusions in sphalerite in sample 11.

Chalcopyrite is unaltered in all drill core samples and in humidity cell samples 18 and 21, but is replaced to variable extents by Fe-oxyhydroxides in samples 15, 16, 17 and 22.

3.3.4 SULPHIDES/NATIVE ELEMENTS

Other sulphides and native elements occur in the sample suite and include marcasite (samples 3, 4, 7, 8, 10 and 12), galena (samples 2, 11 and 16), sphalerite (samples 2, 11 and 14), arsenopyrite (samples 3, 4, 11, 21 and 22), bismuthinite (sample 14), molybdenite (samples 2D, 4, 15, 16 and 18), native bismuth (samples 2 and 14) and native iron (sample 18). Only a few grains (typically less than 3) of these are recognized in each sample.

Most of the sulphides/native elements occur as anhedral to sub- and euhedral grains set in lithic fragments or as liberated acicular (molybdenite mainly) or anhedral to subangular grains, except for marcasite that is only observed in intergrowths with pyrite. Other intergrowths include intergrowths of galena, native bismuth, chalcopyrite and pyrrhotite in sample 2 and of native bismuth + chalcopyrite + pyrrhotite ± bismuthinite ± sphalerite in sample 14. Sphalerite with chalcopyrite inclusions occurs in sample 11.

Most of the sulphides/native elements are unaltered but native bismuth is corroded in sample 2 and arsenopyrite is coated by hematite in sample 22.

3.3.5 FE-OXYHYDROXIDES / HEMATITE

In drill core samples 1, 2, 12 and 14, hematite occurs in trace amounts, mostly as thin rims around pyrite grains set in lithic fragments or liberated, except in sample 2, in which a few hematite grains are observed set in lithic fragments and liberated, possibly as pseudomorphs after Fe-sulphides.

The humidity cell samples 15 to 22 are variably oxidized with the abundance of hematite and Fe-oxyhydroxides ranging from 1% in samples 17 and 20 to 11% in sample 15. Fe-oxyhydroxides are more common than hematite in samples 15, 16, 17, 21 and 22 (ratio up to 10:1) while hematite is more common than Fe-oxyhydroxides in samples 18, 19 and 20 (maximum ratio 2:1).

Fe-oxyhydroxides essentially occur as orange stain throughout lithic fragments and as rims around lithic and mineral fragments, including chalcopyrite in samples 15, 16, 17 and 22 and pyrrhotite in sample 17. They additionally line cleavages of biotite in samples 21 and 22. In the most oxidized samples 15 and 16, botryoidal Fe-oxyhydroxides are observed as infill and massive grains that are locally associated with hematite or jarosite.

Hematite occurs in samples 15, 17, 18, and 20 to 22 as rims and replacement of pyrite and in sample 22 as rims around arsenopyrite. Cubic to tabular (likely) pyrite pseudomorphs are observed in samples 17 and 19 to 22. Anhedral, variably botryoidal masses of hematite also occur in the more oxidized samples 15, 16, 21 and 22.

3.4 SULPHATES

Minor amounts (1-2%) of jarosite are observed in samples 15 and 16. Jarosite occurs as microcrystalline clusters that are either liberated or form clusters in lithic fragments and are variably associated with Fe-oxyhydroxides.

4. SUMMARY AND CONCLUSION

The results of petrographic analyses of twenty two drill core and humidity cell samples from the Sisson (W, Mo) project are presented in this report. The purpose of the study was to characterize the mineralogy of the samples with particular emphasis on the carbonates, sulphides, sulphates and secondary oxides present. The main conclusions are summarized below.

- Drill core samples 1 to 14 comprise lithic fragments of gabbro/diorite, metamorphosed volcanic and sedimentary rocks, quartz and carbonate veins, possible marble (single fragment) as well as liberated mineral fragments.
- Humidity cell samples 15 to 22 comprise liberated mineral grains and lesser fragments of gabbro/diorite and metavolcanics/sediments.
- The mineralogy essentially consists of quartz, feldspars (plagioclase and K-feldspar), biotite, sericite, chlorite, amphibole, rutile, magnetite/ilmenite and minor titanite, epidote, apatite, zircon, scheelite, wolframite and various sulphides and native elements.
- Carbonate is present in all but three of the drill core samples in amounts varying from trace to 10%. The most common carbonate is colourless to cloudy with relief variation (calcite). A dark brown (likely Fe-bearing) carbonate occurs in trace amounts in a few samples.
- Calcite variably occurs as small anhedral grains associated with chlorite, titanite or rutile as alteration of mafic phases or as alteration of feldspars. It forms thin veinlets in lithic fragments or occurs as late interstitial infill in quartz vein fragments, and additionally occurs as liberated grains or monomineralic granular fragments (veins and possible marble).
- The darker carbonate occurs in very thin bands and as small and very fine-grained clusters associated with biotite or sericite in lithic fragments.
- No carbonate is observed in the humidity cell samples.
- Sulphides and native elements are variably present throughout the samples. Their abundance varies from trace to 4%. Sulphides/native elements consist of pyrite, pyrrhotite, chalcopyrite and minor arsenopyrite, marcasite, sphalerite, galena, bismuthinite, native bismuth and molybdenite.
- Pyrite occurs in all the samples, with a maximum abundance of 1%. Pyrrhotite occurs in most core samples but only in one humidity cell sample. Its abundance is typically < 1% but reaches 3% in one sample. Trace amounts of chalcopyrite occur in most samples.
- Pyrite, pyrrhotite and chalcopyrite mostly occur as anhedral or subhedral grains, either scattered in lithic fragments or liberated.
- Pyrite additionally occurs in bands, seams and veinlets in lithic fragments, as interstitial infill between gangue minerals or as inclusions in quartz and is locally intergrown with marcasite. Pyrrhotite is locally poikilitic and also forms veinlets and seams in lithic fragments, occurs as interstitial infill in metavolcanic fragments or as inclusions in quartz. Chalcopyrite also occurs as inclusions in pyrrhotite and as “chalcopyrite disease” in sphalerite.

- Other sulphides and native elements include galena, marcasite, sphalerite, arsenopyrite, bismuthinite, molybdenite, native bismuth and native iron.
- Only a few grains of these sulphides/native elements are recognized in each sample, where they occur as anhedral to sub- and euhedral grains set in lithic fragments or as liberated acicular or anhedral to subangular grains.
- Intergrowths of various sulphides/native elements are observed in some samples, the most common one being of pyrite/marcasite.
- In the drill core samples, oxidation is rare and limited to thin hematite rims around pyrite, sporadic pseudomorphs after Fe-sulphides and local corrosion of pyrrhotite and native bismuth.
- The humidity cell samples are variably oxidized with the abundance of hematite and Fe-oxyhydroxides ranging from 1% to 11%.
- Fe-oxyhydroxides essentially occur as orange stain throughout lithic fragments, as rims around lithic and mineral fragments and as variable replacement of pyrite, pyrrhotite and chalcopyrite. Botryoidal Fe-oxyhydroxides are observed as infill and massive grains that are locally associated with hematite or jarosite.
- Hematite occurs as rims and replacement of pyrite and rims around arsenopyrite. Cubic to tabular (likely) pyrite pseudomorphs are also observed as well as anhedral, variably botryoidal masses of hematite.
- Minor amounts (<2%) of jarosite are observed in the most oxidized humidity cell samples. Jarosite occurs as microcrystalline clusters that are either liberated or form clusters in lithic fragments and are variably associated with Fe-oxyhydroxides.

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APPENDIX A1: INDIVIDUAL SAMPLE DESCRIPTIONS

MSC Sample #	Sample ID	Lithology	Lithic fragments	Carbonate	Pyrite	Pyrrhotite	Chalcopyrite	Other	Hematite/Fe-oxyhydroxides
1	#1	Gabbro/diorite	Fragments of altered fine- to medium-grained gabbro/diorite, essentially made up of plagioclase, biotite, amphibole, quartz and K-feldspar; plagioclase anhedral to subhedral, variably twinned, zoned and pitted by sericite or altered by secondary K-feldspar; amphibole anhedral to subhedral, replaced to variable extent by very fine-grained sheaves of shreddy biotite; some coarser-grained, green flakes of primary biotite in some fragments; quartz anhedral to interstitial, locally recrystallized to a finer grain size; few pervasively altered lithic fragments made up of quartz + sericite + chlorite and few clusters of anhedral rutile scattered in lithic fragments; magnetite/ilmenite with common corona of titanite scattered in lithic fragments; titanite, zircon, apatite, hematite and sulphides also present	One liberated colourless grain and clusters of acicular colourless grains in a chlorite/carbonate fragment	Anhedral grains (5-150 µm in size) in lithic fragments or less commonly liberated; on one occasion with a corona of hematite in a lithic fragment; also few extremely corroded grains (50-200 µm in size), interstitial in lithic fragments or along cleavages of amphibole	Acicular to anhedral grains (50-400 µm in size), liberated or associated with chlorite and carbonate in lithic fragments	Anhedral grains (2-25 µm in size) set in lithic fragments or liberated	N/A	Hematite rim around one pyrite grain in a lithic fragment
2	#2	Meta-volcanics/-sediments	Fragments of variably altered and internally deformed, fine- and rarely medium-grained metagreywacke and slates essentially made up of quartz, plagioclase, K-feldspar and of lesser biotite, amphibole and chlorite; well-defined cleavage marked in most lithic fragments by flattened quartz grains and/or alternating felsic/mafic bands; plagioclase anhedral to subhedral, variably twinned, zoned, pitted by sericite, secondary cloudy K-feldspar and/or carbonate; quartz anhedral to interstitial, commonly flattened or recrystallized to a finer grain size; K-feldspar anhedral, weakly zoned, variably cloudy and pitted by sericite ± carbonate; amphibole subhedral tabular grains, variably replaced by very fine-grained sheaves of brown shreddy biotite, lithic fragments variably replaced by chlorite + carbonate + titanite; variably scattered sulphides, rutile, titanite, hematite, magnetite/ilmenite (with common corona of titanite) in lithic fragments	Fine-grained, typically colourless, rarely brownish; as anhedral grains and clusters after feldspars or biotite in lithic fragments; rarely as liberated grains	Anhedral grains (50-800 µm in size), unaltered, liberated or set in lithic fragments	Anhedral grains (10-700 µm in size) set in lithic fragments or liberated; locally intergrown with chalcopyrite or associated with galena and native bismuth in clusters in lithic fragments	Anhedral grains (5-100 µm in size) set in lithic fragments or rarely liberated, locally intergrown with pyrrhotite, galena and associated with native bismuth	Corroded masses of native bismuth, 5-20 µm in size, occurring as intergrowths and attachments in/with chalcopyrite, pyrrhotite and galena (5-80 µm in size); masses of sphalerite (20-80 µm in size), interstitial to gangue minerals	Few anhedral grains of hematite, liberated and in lithic fragments
2D	#2D	95% meta-volcanics/-sediments; 5% quartz	Sample similar to the previous one; foliated fragments essentially made up of quartz, plagioclase and K-feldspar, with lesser biotite, amphibole, sericite and chlorite; plagioclase anhedral to subhedral, variably twinned, zoned, pitted by sericite, secondary cloudy K-feldspar and/or carbonate; quartz anhedral to interstitial, commonly flattened and/or recrystallized to a finer grain size; K-feldspar anhedral, weakly zoned, variably cloudy and pitted by sericite ± carbonate; biotite very fine-grained in clusters; sericite as alteration of feldspars but also as clusters of sheaves scattered in lithic fragments; rare amphibole tabular grains, extensively replaced by very fine-grained sheaves of shreddy biotite + titanite; chlorite in patches and veins, typically associated with rutile; variably scattered sulphides and titanite in lithic fragments; fine-grained quartz veins in lithic fragments and monomineralic granular fine-grained quartz fragments (vein material) present	Fine-grained, colourless to brownish; occurs as disseminated anhedral patches, acicular grains and clusters of grains and possible thin veinlets in lithic fragments, variably associated with chlorite, biotite or sericite	Anhedral grains (5-100 µm in size) in lithic fragments or less commonly liberated	Anhedral grains (5-500 µm in size), commonly poikilitic and/or intergrown with chalcopyrite in lithic fragments and liberated	Anhedral grains (5-300 µm in size), locally intergrown with pyrrhotite in lithic fragments and liberated	Few acicular grains and sheaves (25-300 µm in size) of molybdenite in lithic fragments and liberated	N/A
3	#3	90% meta-volcanics/-sediments; 5% quartz; 5% carbonate	Sample essentially made up of fragments of metagreywacke and slates; one pervasively altered fine-grained and patchy carbonate-chlorite-pyrite fragment also present as well as one microcrystalline monomineralic carbonate fragment and monomineralic granular fine-grained quartz fragments (vein material); metagreywacke fragments made up of fine-grained subhedral tabular plagioclase and anhedral quartz, mantled by interstitial very fine-grained clusters of flaky brown biotite; plagioclase weakly twinned, colourless to cloudy and locally pitted by secondary K-feldspar and microcrystalline sericite or carbonate; slates made up of alternating layers of fine-grained anhedral quartz and varying amounts of plagioclase and K-feldspar and layers of very fine-grained brown shreddy biotite and sericite; feldspars clear to cloudy, variably twinned and pitted by sericite/carbonate; sulphides, apatite, rutile and magnetite/ilmenite locally set in lithic fragments	Typically colourless, occurring as very fine-grained replacement of feldspar, thin veinlets in schist clasts, as anhedral grains in a pervasively carbonate-chlorite altered lithic fragment and as a monomineralic carbonate fragment, microcrystalline to fine-grained, locally lined by carbonate veins	Anhedral grains and clusters (5-400 µm in size) in lithic fragments of all types as well as seams and veinlets in schist fragments; rarely as liberated grains; locally with chalcopyrite inclusions or intergrown with marcasite	Anhedral grains (5-150 µm in size), set in lithic fragments and liberated; locally with inclusions or attachments of chalcopyrite	Anhedral grains (5-150 µm in size), set in lithic fragments and liberated; inclusions (5-25 µmin size) in pyrite and pyrrhotite and attachments to pyrrhotite	Anhedral to subhedral arsenopyrite grains (5-25 µm in size) scattered in lithic fragments Marcasite in intergrowths with pyrite	N/A
4	#4	95% meta-volcanics/-sediments; 5% quartz	Fragments of slates made up of microcrystalline to fine-grained anhedral quartz and locally preserved plagioclase and K-feldspar and alternating discontinuous bands of very fine-grained flakes of biotite, sericite ± amphibole ± chlorite; some patches and bands of colourless carbonate also present in lithic fragments as well as scattered sulphides, epidote, rutile, titanite and magnetite/ilmenite; monomineralic fine-grained quartz fragments present, locally with attachments of gangue minerals, suggesting vein material	Colourless to cloudy, occurring as small anhedral grains and clusters of grains in bands in lithic clasts; also as liberated grains and as one microcrystalline monomineralic lithic fragment; bands of darker carbonate in lithic fragments	Anhedral grains and clusters (5-800 µm in size) scattered in lithic fragments or less commonly liberated; grains also occurring in thin bands or as interstitial infill between gangue minerals in lithic fragments; locally intergrown with marcasite	Anhedral, subrounded to oblong grains (5-200 µm in size) scattered in lithic fragments or liberated; locally intergrown with chalcopyrite	Anhedral grains (5-400 µm in size), scattered in lithic fragments or liberated; locally intergrown with pyrrhotite	Anhedral arsenopyrite grains (5-400 µm in size) scattered in lithic fragments Marcasite in intergrowths with pyrite	N/A
5	#5	95% gabbro/diorite; 5% quartz	Fragments of fine- to medium-grained gabbro/diorite essentially made up of plagioclase, amphibole, biotite and lesser quartz; plagioclase subhedral tabular, twinned and zoned, locally pitted by very fine-grained flakes of sericite; amphibole anhedral to subhedral, zoned with composition variations from core to rim; biotite as subhedral fine- to medium-grained flakes and as local very fine-grained alteration of amphibole; quartz very fine-grained, interstitial; K-feldspar as cloudy local alteration of plagioclase; few patches of chlorite + carbonate after biotite observed in some lithic fragments; sulphides, apatite, rutile and titanite-rimmed magnetite/ilmenite grains scattered in lithic fragments; possible quartz vein fragments also present	Colourless to cloudy small anhedral grains, associated with chlorite in lithic fragments as alteration of mafic phases; rarely liberated	Anhedral grains (10-700 µm in size) scattered in lithic fragments or liberated, locally extremely corroded	Few anhedral grains (5-150 µm in size) scattered in lithic fragments or liberated; thin seams and veinlets in lithic fragments; locally slightly corroded	Anhedral grains (5-400 µm in size) scattered in lithic fragments	N/A	N/A
6	185748	Gabbro/diorite	Sample similar to the previous one; fragments of fine- to medium-grained gabbro/diorite essentially made up of plagioclase, amphibole, biotite and minor quartz; plagioclase subhedral tabular, twinned and zoned, locally pitted by very fine-grained flakes of sericite; amphibole anhedral to subhedral; biotite as subhedral fine- to medium-grained flakes and as local very fine-grained alteration of amphibole; quartz very fine-grained, interstitial; K-feldspar as weak localized alteration of feldspar and as microveinlets throughout lithic fragments; sulphides and titanite-rimmed magnetite/ilmenite grains scattered in lithic fragments	N/A	Anhedral grains (10-500 µm in size) scattered in lithic fragments or liberated; locally corroded	Few anhedral grains (20-300 µm in size) set in lithic fragments or liberated	Anhedral grains (10-300 µm in size) scattered in lithic fragments or liberated	N/A	N/A
7	163760	90% meta-volcanics/-sediments; 5% quartz; 5% carbonate	Fragments of metagreywacke and lesser slates with metagreywacke fine- to medium-grained, made up of anhedral quartz and granular clusters, variably altered feldspars and interstitial to patchy clusters of shreddy biotite (± chlorite ± rutile ± preserved amphibole); slates made up of alternating bands of very fine-grained alteration minerals (chlorite, sericite, carbonate and shreddy biotite) and bands of quartz and variably preserved plagioclase and K-feldspar; plagioclase and K-feldspar variably replaced by flakes of sericite and anhedral grains of carbonate; polysynthetic twins locally preserved; quartz also present in fine- to medium-grained vein fragments; liberated clusters of carbonate present as well as carbonate ± chlorite ± pyrite veinlets in lithic fragments; disseminated apatite, rutile and sulphides in lithic fragments	Colourless to cloudy grains, microcrystalline to fine-grained disseminated in lithic fragments as alteration of feldspars; also in veins throughout lithic fragments and as monomineralic granular fragments; in some fragments distinct colour variations between groundmass carbonate (cloudy to brownish) and vein carbonate (colourless)	Anhedral grains (10-400 µm in size) scattered in lithic fragments or liberated; thin veinlets in lithic fragments and one larger mass (2.5 mm in size) in a pervasively altered lithic fragments, locally corroded, with chalcopyrite inclusions or intergrown with marcasite	Anhedral to lath-like grains, (5-200 µm in size) scattered in a few lithic fragments	Anhedral grains (2-40 µm in size); set in lithic fragments, as inclusions in pyrite or liberated	Marcasite in intergrowths with pyrite	N/A

APPENDIX A1: INDIVIDUAL SAMPLE DESCRIPTIONS (Continued)

MSC Sample #	Sample ID	Lithology	Lithic fragments	Carbonate	Pyrite	Pyrrhotite	Chalcopyrite	Other	Hematite/Fe-oxyhydroxides
8	161540	Meta-volcanics/-sediments	Slate fragments essentially made up of alternating very fine-grained felsic bands and bands of elongated green amphibole and/or brown biotite with minor chlorite and sericite; quartz and plagioclase extremely fine-grained, distinction between the two unreliable; elongated clusters and discontinuous bands of opaque minerals (magnetite/ilmenite and minor sulphides) typically scattered parallel to banding and cleavage defined by amphibole/biotite alignment; coarser-grained plagioclase and K-feldspar porphyroblasts locally set in slate fragments as well as patches of carbonate; rutile scattered in slate fragments; Few clusters/bands of coarser-grained granular quartz set in slates or liberated; Few fine-grained granular metagreywacke fragments made up of quartz + plagioclase + K-feldspar and interstitial brown biotite	Colourless, with varying relief, rarely cloudy, fine-grained, anhedral; occurs as grains, clusters of grains and veins in schist clasts	Few anhedral grains (5-200 µm in size), set in lithic fragments or liberated and locally intergrown with marcasite	Anhedral grains (5-400 µm in size), set in lithic fragments or liberated; sporadically intergrown with chalcopyrite	Anhedral grains (5-400 µm in size), set in lithic fragments or liberated; sporadically intergrown with pyrrhotite	Marcasite in intergrowths with pyrite	N/A
9	267616	85% meta-volcanics/-sediments; 15% quartz	Slate fragments essentially made up of very fine-grained layers of quartz (?and plagioclase), scattered bands of elongated brown biotite and lesser colourless sericite that define an irregular and wavy slaty cleavage; grain size range of felsic minerals wider than in previous sample; apatite, titanite, microgranular rutile and magnetite/ilmenite as well as sulphides set in slate fragments; coarser-grained granular quartz veins set in slates or liberated also present, locally associated with sulphides or with interstitial chlorite and/or carbonate	Colourless to cloudy, fine-grained to microcrystalline; occurs as anhedral grains and clusters after feldspar in schist clasts or as interstitial infill in granular quartz (-carbonate-chlorite-sulphides) fragments	Anhedral to subhedral cubic grains (5-800 µm in size) in lithic fragments or liberated, variably associated with pyrrhotite and chalcopyrite	Grains, 5-500 µm in size, anhedral in lithic fragments and subhedral liberated; locally intergrown with or with attachments of chalcopyrite	Grains, 5-400 µm in size, anhedral in lithic fragments and subhedral liberated; locally intergrown with or with attachments of pyrrhotite	N/A	N/A
10	162363	Gabbro/diorite	Fine- to medium-grained gabbro/diorite fragments essentially made up of plagioclase and amphibole with lesser quartz and biotite; plagioclase anhedral to euhedral tabular, zoned and twinned, variably pitted by very fine-grained sericite and replaced by K-feldspar along rims; amphibole anhedral to subhedral, acicular to tabular, twinned and locally poikilitic; unaltered to replaced by brown biotite or chlorite ± rutile along grain boundaries; biotite typically as fine-grained secondary sheaves but locally as possible primary platy grains with inclusions of apatite and/or titanite; apatite, magnetite/ilmenite present as well as rare sulphides	N/A	Anhedral to subhedral cubic grains (5-300 µm in size) in lithic fragments or liberated, locally associated with pyrrhotite or intergrown with marcasite	Grains, 5-400 µm in size, anhedral in lithic fragments and subhedral liberated; locally intergrown with pyrite and arsenopyrite or with attachments of chalcopyrite	Anhedral grains (2-150 µm in size) set in lithic fragments; intergrowths and attachments to pyrrhotite	Marcasite in intergrowths with pyrite	N/A
11	163128	Gabbro/diorite	Fine- to medium-grained fragments of gabbro/diorite essentially made up of plagioclase and amphibole and lesser biotite and quartz; plagioclase anhedral to euhedral tabular, zoned and twinned, variably pitted by very fine-grained sericite and replaced by K-feldspar or carbonate; some possible primary anhedral K-feldspar grains also present throughout fragments; amphibole anhedral to subhedral, acicular to tabular, twinned and variably replaced by fine-grained biotite sheaves or by very fine-grained chlorite + carbonate + rutile ± titanite; biotite as fine-grained secondary sheaves and primary platy grains enclosing magnetite/ilmenite; biotite variably altered to chlorite + carbonate + rutile ± titanite; anhedral magnetite/ilmenite scattered in lithic fragments	Fine-grained to microcrystalline, colourless; occurs 1) as alteration of feldspars in lithic clasts, 2) associated/intergrown with chlorite as alteration of biotite and amphibole in lithic clasts and 3) as liberated grains	Anhedral to subhedral grains in lithic fragments and rare liberated subangular grains; grain size 5-300 µm	Anhedral to subhedral grains in lithic fragments and rare liberated subangular grains; grain size 5-150 µm	Anhedral grains (2-200 µm in size) in lithic fragments and chalcopyrite inclusions in sphalerite	Anhedral to subhedral cubic to diamond-shaped arsenopyrite grains (5-20 µm in size) in lithic fragments; one liberated grain of sphalerite (100 µm in size) with chalcopyrite inclusions; one galena lath, 75 µm in length in a lithic fragment	N/A
12	162251	Gabbro/diorite	Fragments of gabbro/diorite, made up of fine-grained plagioclase, amphibole, biotite, quartz and minor titanite; plagioclase anhedral or rarely subhedral tabular, locally zoned, extensively twinned; pitted by microcrystalline sericite and sporadically altered to secondary K-feldspar in its rims; amphibole anhedral and poikilitic, variably replaced by secondary biotite along grain boundaries; biotite anhedral to subhedral tabular flakes, unaltered; quartz interstitial, anhedral; titanite fine- to medium-grained, anhedral, scattered in fragments; chlorite, apatite, hematite, sulphides and magnetite variably set throughout fragments	N/A	Anhedral to subhedral grains in lithic fragments and rare liberated subangular grains; grain size 5-400 µm; locally intergrown with marcasite or with a corona of hematite; in one clast, attached to chalcopyrite	N/A	Anhedral grains in lithic fragments and subhedral liberated grains, locally attached to pyrite; 10-100 µm in size	Marcasite in intergrowths with pyrite	Thin hematite rims around pyrite
13	918618	Meta-volcanics/-sediments	Fragments of metagreywacke, essentially made up of fine-grained plagioclase, quartz and K-feldspar; fragments virtually devoid of mafic phases; plagioclase anhedral to subhedral tabular, variably zoned and twinned; variably pitted by microcrystalline sericite and replaced by secondary K-feldspar; quartz fine- to very fine-grained, anhedral with sutured grain boundaries and variably recrystallized; K-feldspar secondary as alteration of primary feldspars but also likely primary, anhedral untwinned grains; small patches of chlorite + rutile (± carbonate ± biotite ± amphibole) set in fragments; one microgranular veinlet of possible albite in one fragment; trace carbonate and sulphides disseminated throughout fragments	One small interstitial grain in a lithic fragment and one microcrystalline cluster associated with chlorite and rutile in a lithic fragment	Anhedral to subhedral grains in lithic fragments and rare liberated subangular grains; grain size 5-200 µm	Anhedral to subhedral grains in lithic fragments and rare liberated subangular grains; grain size 5-200 µm	Anhedral or subangular grains (2-100 µm in size) in lithic fragments or liberated	N/A	N/A
14	162352, 6814, 82973	60% meta-volcanics/-sediments; 30% gabbro/diorite; 10% quartz	Sample made up of a variety of lithic fragments including 1) gabbro/diorite fragments essentially made up of fine-grained anhedral plagioclase and sheaves of biotite with lesser anhedral quartz, amphibole and K-feldspar, 2) slate fragments essentially made up of very fine-grained sericite (± biotite and quartz, 3) metagreywacke fragments made up of anhedral plagioclase, K-feldspars and quartz with interstitial ribbons of very fine-grained biotite and 4) monomineralic, medium- to coarse-grained granular quartz; patches of chlorite, apatite, titanite, rutile, carbonate, magnetite/ilmenite and sulphides variably set in lithic fragments	One small grain attached to sulphides in a slate fragment and one grain in a metagreywacke fragment	Anhedral grains (5-300 µm in size) in lithic fragments or less commonly liberated; few rims of hematite along grain boundaries and fractures recognized	Anhedral grains and clusters of grains (5-900 µm in size) set in lithic fragments; also as interstitial infill to quartz in granular quartz fragments; locally intergrown with chalcopyrite	Anhedral grains (5-300 µm in size), locally intergrown with pyrrhotite in lithic fragments and liberated	Anhedral to acicular masses (2-40 µm in size) of bismuthinite set in lithic fragments; corroded masses of native bismuth, 5-20 µm in size, occurring as intergrowths and attachments in/with chalcopyrite, pyrrhotite and bismuthinite; Anhedral grains (2-30 µm in size) of sphalerite set in lithic fragments and associated with chalcopyrite, pyrrhotite and native bismuth	Thin hematite rims around pyrite

APPENDIX A-1: INDIVIDUAL SAMPLE DESCRIPTIONS (Continued)

MSC Sample #	Sample ID	Lithology	Lithic fragments	Pyrite	Pyrrhotite	Chalcopyrite	Other	Fe-oxyhydroxides	Hematite
15	1-Sample A	N/A	Mineral and lesser lithic fragments, less than 2 mm in size and variably oxidized; mineral fragments are subangular and include quartz, plagioclase, K-feldspar, amphibole as well as sheaves of sericite, biotite and chlorite; lithic fragments are of variably altered metavolcanics/-sediments (made up of quartz, plagioclase, K-feldspar, amphibole, biotite, sericite and/or chlorite); mineral and lithic fragments variably rimmed and stained by orange Fe-oxyhydroxides; Fe-oxyhydroxides also in botryoidal masses, locally associated with hematite and/or jarosite; Few microcrystalline clusters of possible jarosite present, liberated or associated with Fe-oxyhydroxides in lithic fragments; rutile, wolframite, magnetite, titanite and apatite locally set in lithic fragments or liberated; sulphides locally preserved; no carbonate observed	Few anhedral grains (5-300 µm in size), variably corroded and partially preserved from hematite replacement in lithic fragments and inclusions in quartz	N/A	Grains and masses, 2-700 µm in size, occurring liberated or set in lithic fragments; Typically unaltered but locally rimmed by Fe-oxyhydroxides	Molybdenite as one acicular grain, 50 µm in length and one anhedral mass (50 µm in size) in a lithic fragment	Stain, rims around lithic and mineral fragments, botryoidal infill and massive grains, locally associated with hematite or jarosite	Rims and partial replacement of pyrite; botryoidal masses associated with Fe-oxyhydroxides
16	2-Sample B	N/A	Sample similar to the previous one, made up of variably oxidized mineral and lithic fragments; mineral fragments are subangular and include quartz, plagioclase, K-feldspar, amphibole as well as sheaves of sericite, biotite and chlorite; lithic fragments are of variably altered metavolcanics/-sediments (made up of quartz, plagioclase, K-feldspar, amphibole, biotite, sericite and/or chlorite); microcrystalline clusters of possible jarosite present, liberated or as clusters in lithic fragments, associated with Fe-oxyhydroxides; Mineral and lithic fragments variably rimmed, replaced and/or stained by orange Fe-oxyhydroxides; Fe-oxyhydroxides also botryoidal, locally associated with hematite and/or jarosite; rutile, magnetite and apatite locally set in lithic fragments; sulphides locally present; no carbonate observed	Few unaltered grains (40-100 µm in size) occurring liberated or set in lithic fragments	N/A	Grains, 2-300 µm in size, occurring subangular and liberated or anhedral set in lithic fragments; Typically unaltered but locally rimmed by or partially replaced by Fe-oxyhydroxides	Few anhedral grains (5-200 µm in size) of galena in lithic fragments; one liberated foliated mass of molybdenite, 900 µm in size	Stain, rims around lithic and mineral fragments, botryoidal infill and massive grains, locally associated with hematite	botryoidal masses associated with Fe-oxyhydroxides
17	3-Sample C	N/A	Mineral and lithic fragments fragments present; mineral fragments are subangular and include quartz, plagioclase, K-feldspar, amphibole as well as sheaves of sericite, biotite and chlorite; lithic fragments are of variably altered metavolcanics/-sediments (made up up of quartz, plagioclase, biotite ± K-feldspar ± amphibole ± sericite) with biotite-rich slate fragments; patches of micro- to cryptocrystalline clay locally set in fragments or occurring as fragments; clastic textures locally observed in some lithic fragments; epidote and rutile, magnetite (rimmed by titanite) set in lithic fragments; mineral and lithic fragments locally stained or rimmed by orange Fe-oxyhydroxides; Fe-oxyhydroxides mostly occurring as liberated botryoidal fragments and patches within lithic fragments, commonly with preserved cores of ?pyrrhotite (<5 µm in size); hematite present as pseudomorphs after pyrite; sulphides very rare, no carbonate	Grains (5-80 µm in size) occurring liberated or set in lithic fragments; variably unaltered or rimmed by hematite	Few inclusions in quartz , <25 µm in size, also as possible preserved cores (5 µm in size) in botryoidal Fe-oxyhydroxides; one tabular liberated grain, 200 µm in length	Grains (5-50 µm in size) occurring liberated or set in lithic fragments; variably unaltered or rimmed by Fe-oxyhydroxides	N/A	Local stain and rims around mineral and lithic fragments; anhedral to subhedral patches in lithic fragments, locally preserving cores (<5 µm in size) of possible pyrrhotite	Anhedral to subhedral cubic patches in lithic fragments or liberated suggesting pyrite pseudomorphs
18	4-Sample D	N/A	Sample made up of mineral and small lithic fragments; mineral fragments subangular, dominated by quartz fragments with lesser plagioclase, K-feldspar, amphibole as well as sheaves of sericite, biotite and chlorite; lithic fragments are of fine-grained monomineralic granular quartz, variably altered fine-grained possible gabbro/diorite, made up of biotite, amphibole, plagioclase and minor quartz ± K-feldspar ± sericite (as alteration of feldspars) and lesser sericite-rich slates (essentially made up of quartz and sericite ± plagioclase); patches of micro- to cryptocrystalline clay locally set in fragments or occurring as fragments; rutile, titanite, magnetite (rimmed by titanite) and scheelite/wolframite intergrowths set in lithic fragments; mineral and lithic fragments variably stained or rimmed by orange Fe-oxyhydroxides; hematite and trace sulphides also present, no carbonate	Liberated grains and clusters of grains 5-200 µm in size, rimmed by hematite or preserved cores in masses of hematite	N/A	One anhedral grain, 25 µm in size, in a schist fragment and one liberated grain, 10 µm in size	Two clusters of molybdenite sheaves: one 500 µm in size in a lithic fragment and one 100 µm in size, liberated; one liberated grain of native iron, 50 µm in size	Stain and rims around mineral and lithic fragments	Rims around pyrite, liberated grain fragments, attachments to lithic fragments and anhedral patches in lithic fragments
19	5-Sample E	N/A	Sample similar to the previous ones, made up of mineral and lithic fragments; mineral fragments , essentially made up of sheaves of biotite and subangular grains and clusters of plagioclase, with lesser quartz, amphibole and K-feldspar fragments; liberated sheaves of chlorite and sericite also present; lithic fragments dominated by variably altered fine-grained possible gabbro/diorite, made up of biotite, amphibole, plagioclase and lesser quartz ± K-feldspar ± sericite (sericite as alteration of feldspars); very rare slate fragments observed, essentially made up of quartz and sericite ± rutile; rutile, titanite, zircon and magnetite (rimmed by titanite) set in lithic fragments; mineral and lithic fragments variably stained or rimmed by orange Fe-oxyhydroxides; hematite as patches and pseudomorphs in lithic fragments and liberated; pyrite as only sulphide, no carbonate	One anhedral grain, 200 µm in size, set in a lithic fragment; also as inclusions (<10 µm in size) in quartz	N/A	N/A	N/A	Stain and rims around mineral and lithic fragments, intergrowths with hematite	Liberated grain fragments, anhedral patches and subhedral tabular pseudomorphs in lithic fragments
20	6-Sample F	N/A	Sample made up of mineral and lithic fragments; Mineral fragments essentially consisting of sheaves of biotite and grains of quartz and plagioclase with minor sheaves of chlorite and sericite and grains of K-feldspar, amphibole and rare possible scheelite; lithic fragments essentially consisting of variably biotite-altered gabbro/diorite, made up of biotite and plagioclase with minor quartz, amphibole, chlorite, titanite and sericite; monomineralic fine-grained and granular quartz fragments scattered throughout the sample as well as some possibly metavolcanic fragments made up of microcrystalline quartz and various phyllosilicates; rutile, titanite, possible scheelite, magnetite/ilmenite, hematite variably present in the mafic fragments; rims and stain of Fe-oxyhydroxides locally observed; very rare pyrite preserved; no carbonate	Anhedral grains (5-100 µm in size), liberated or set in lithic fragments; unaltered or with a rim of hematite; one grain partially corroded	N/A	N/A	N/A	Stain in lithic fragments, rims around mineral and lithic fragments	Anhedral patches and subhedral tabular pseudomorphs, in lithic fragments or liberated; rims around pyrite
21	7-Sample G	N/A	Sample characterized by the presence of more common felsic mineral and lithic fragments: mineral fragments essentially of quartz with lesser plagioclase, K-feldspar, amphibole as well as sericite, biotite and chlorite; lithic fragments of sericite and/or biotite and/or chlorite-bearing slates; Small granular monomineralic quartz fragments also present as well as granular, locally microcrystalline quartz + feldspars fragments of possible metavolcanics; mineral and lithic fragments commonly stained and/or rimmed by Fe-oxyhydroxides or less commonly by hematite; rutile and magnetite set in some clasts as well as patches and subhedral pseudomorphs made up of hematite; pyrite, arsenopyrite and chalcopyrite rarely preserved; no carbonate	Anhedral grains (5-150 µm in size), typically set in lithic fragments and rarely liberated; typically with a rim of hematite	N/A	Rare anhedral grains (10-100 µm in size), typically liberated, rarely in lithic fragments; unaltered	Rare anhedral grains (10-50 µm in size) of arsenopyrite set in lithic fragments	Stain in lithic fragments, rims around mineral and lithic fragments; coating along cleavages of biotite	Liberated grain fragments, anhedral botryoidal patches, subhedral tabular pseudomorphs in lithic fragments and rims around pyrite
22	7D-Sample G	N/A	Sample similar to the previous one; made up of mineral fragments (quartz, plagioclase, K-feldspar, amphibole as well as sericite, biotite and chlorite) and of slates and gabbro (plagioclase + amphibole ± quartz ± titanite) fragments; Small granular monomineralic quartz fragments also present as well as granular, locally microcrystalline quartz + feldspars fragments; mineral and lithic fragments commonly stained and/or rimmed by Fe-oxyhydroxides or less commonly by hematite; rutile, titanite and magnetite set in some clasts as well as patches and subhedral pseudomorphs made up of hematite; few preserved grains of pyrite, chalcopyrite and arsenopyrite preserved; no carbonate	Anhedral grains (2-600 µm in size), set in lithic fragments, commonly fractured and coated by hematite	N/A	Anhedral grains (5-75 µm in size), liberated or set in lithic fragments; variably unaltered or rimmed by Fe-oxyhydroxides	Several anhedral grains (2-150 µm in size) of arsenopyrite vaguely anisotropic set in lithic fragments; locally coated by hematite	Stain in lithic fragments, rims around mineral and lithic fragments; coating along cleavages of biotite	Liberated grain fragments, anhedral botryoidal patches and rims around pyrite and arsenopyrite

APPENDIX A2: MINERAL MODAL ABUNDANCE ESTIMATES

All mineral abundances in modal %

MSC Sample ID	Sample ID	Quartz	Plagioclase	K-feldspar	Amphibole	Biotite	Chlorite	Sericite	Carbonate	Clay	Titanite	Epidote	Apatite	Zircon	Rutile	Magnetite/ ilmenite	Scheelite	Wolframite	Pyrite	Marcasite	Pyrrhotite	Chalcopyrite	Arsenopyrite	Sphalerite	Galena	Bismuthinite	Native Bismuth	Native Iron	Molybdenite	Hematite	Fe-oxyhydroxides	Jarosite
1	**#1**	15	50	5	7	15	3	3	tr	0	1	0	tr	tr	1	tr-1	0	0	tr	0	tr	tr	0	0	0	0	0	0	0	tr	0	0
2	**#2**	35	25	15	3	7	3	10	2	0	tr-1	0	0	0	tr	tr	0	0	tr	0	tr-1	tr	0	tr	tr	0	tr	0	0	tr	0	0
2D	**#2D**	35	25	15	1	7	5	10	1	0	tr	0	0	0	tr	0	0	0	tr	0	tr-1	tr-1	0	0	0	0	0	0	tr	0	0	0
3	**#3**	35	20	7	2	15	5	10	2	0	tr	0	tr	0	1	tr	0	0	tr-1	tr	tr	tr	tr	0	0	0	0	0	0	0	0	0
4	**#4**	40	10	5	3	15	1	20	2	0	tr	tr	0	0	1	tr	0	0	1	tr	tr-1	tr	tr	0	0	0	0	0	tr	0	0	0
5	**#5**	7	50	1	20	15	1	2	tr	0	tr	0	tr-1	0	tr	2	0	0	tr-1	0	tr	tr-1	0	0	0	0	0	0	0	0	0	0
6	**185748**	5	65	tr	15	10	tr	1	0	0	tr	0	0	0	0	1	0	0	tr-1	0	tr	tr	0	0	0	0	0	0	0	0	0	0
7	**163760**	25	15	5	tr	5	20	15	10	0	0	0	tr	0	2	0	0	0	1	tr	tr	tr	0	0	0	0	0	0	0	0	0	0
8	**161540**	60		3	5	20	5	2	tr	0	0	0	0	0	tr	3	0	0	1	tr	tr	tr	0	0	0	0	0	0	0	0	0	0
9	**267616**	55	?2	1	1	15	3	20	tr-1	0	tr	0	tr	0	tr	tr	0	0	tr	0	1	tr-1	0	0	0	0	0	0	0	0	0	0
10	**162363**	7	45	tr	20	12	3	3	0	0	tr-1	0	tr	0	tr	5	0	0	1	tr	tr-1	tr	0	0	0	0	0	0	0	0	0	0
11	**163128**	10	30	12	7	10	10	10	3	0	2	0	tr	0	tr	3	0	0	tr-1	0	tr	tr	tr	tr	tr	0	0	0	0	0	0	0
12	**162251**	20	40	2	12	15	2	2	0	0	3	0	tr	0	tr	tr	0	0	tr	tr	0	tr	0	0	0	0	0	0	0	tr	0	0
13	**918618**	45	35	15	tr	tr	2	2	tr	0	0	0	0	0	tr	0	0	0	tr	0	tr-1	tr	0	0	0	0	0	0	0	0	0	0
14	**162352, 6814, 82973**	25	35	7	5	10	3	15	tr	0	tr	0	tr	0	tr	tr	0	0	tr	0	3	tr-1	0	tr	0	tr	tr	0	0	tr	0	0
15	**1-Sample A**	45	10	1	2	10	5	12	0	0	tr	0	tr	0	tr	tr	0	tr	tr	0	0	tr	0	0	0	0	0	0	tr	1	10	1
16	**2-Sample B**	45	10	2	2	3	10	15	0	0	0	0	0	0	tr	tr	0	0	tr	0	0	tr-1	0	0	tr	0	0	0	tr	1	8	2
17	**3-Sample C**	30	25	5	tr	20	8	8	0	2	tr	tr	0	0	tr	tr-1	0	0	tr	0	tr	tr	0	0	0	0	0	0	0	tr	tr-1	0
18	**4-Sample D**	30	20	2	7	20	5	10	0	2	tr	0	0	0	tr	tr-1	tr	tr	tr	0	0	tr	0	0	0	0	0	tr	tr	2	1	0
19	**5-Sample E**	20	25	5	7	25	5	7	0	0	tr	0	0	tr	tr	tr	0	0	tr	0	0	0	0	0	0	0	0	0	0	2	1	0
20	**6-Sample F**	35	25	5	3	20	5	5	0	0	tr	0	0	0	tr	tr	?tr	0	tr	0	0	0	0	0	0	0	0	0	0	tr-1	tr	0
21	**7-Sample G**	45	15	5	2	7	5	12	0	0	0	0	0	0	tr-1	tr	0	0	tr	0	0	tr	tr	0	0	0	0	0	0	2	5	0
22	**7D-Sample G**	40	15	5	5	5	5	15	0	0	tr	0	0	0	tr	tr	0	0	tr	0	0	tr	tr	0	0	0	0	0	0	2	5	0

APPENDIX B: REPRESENTATIVE PHOTOMICROGRAPHS

List of abbreviations used in the description of photomicrographs:

FOV: Field of view – defined for the long dimension of photomicrographs
PPL: Plane polarized light
XPL: Crossed polars
RL: Plane polarized reflected light

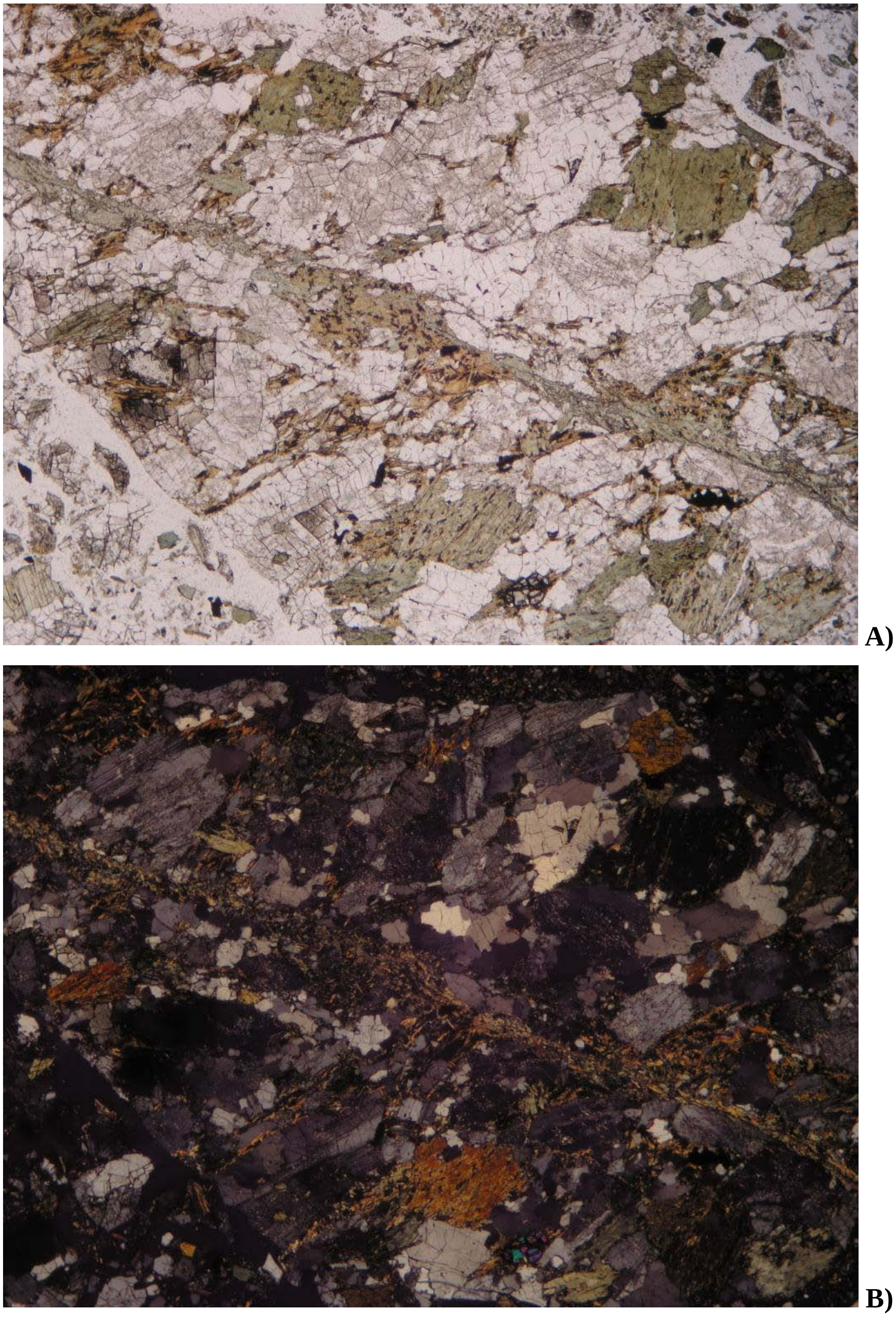

Figure B1: *Photomicrographs of a gabbro/diorite fragment in sample 1. The fragment essentially consists of plagioclase and green amphibole that is partially replaced by brown shreddy biotite. A) PPL, B) XPL, FOV = ~ 7 mm.*

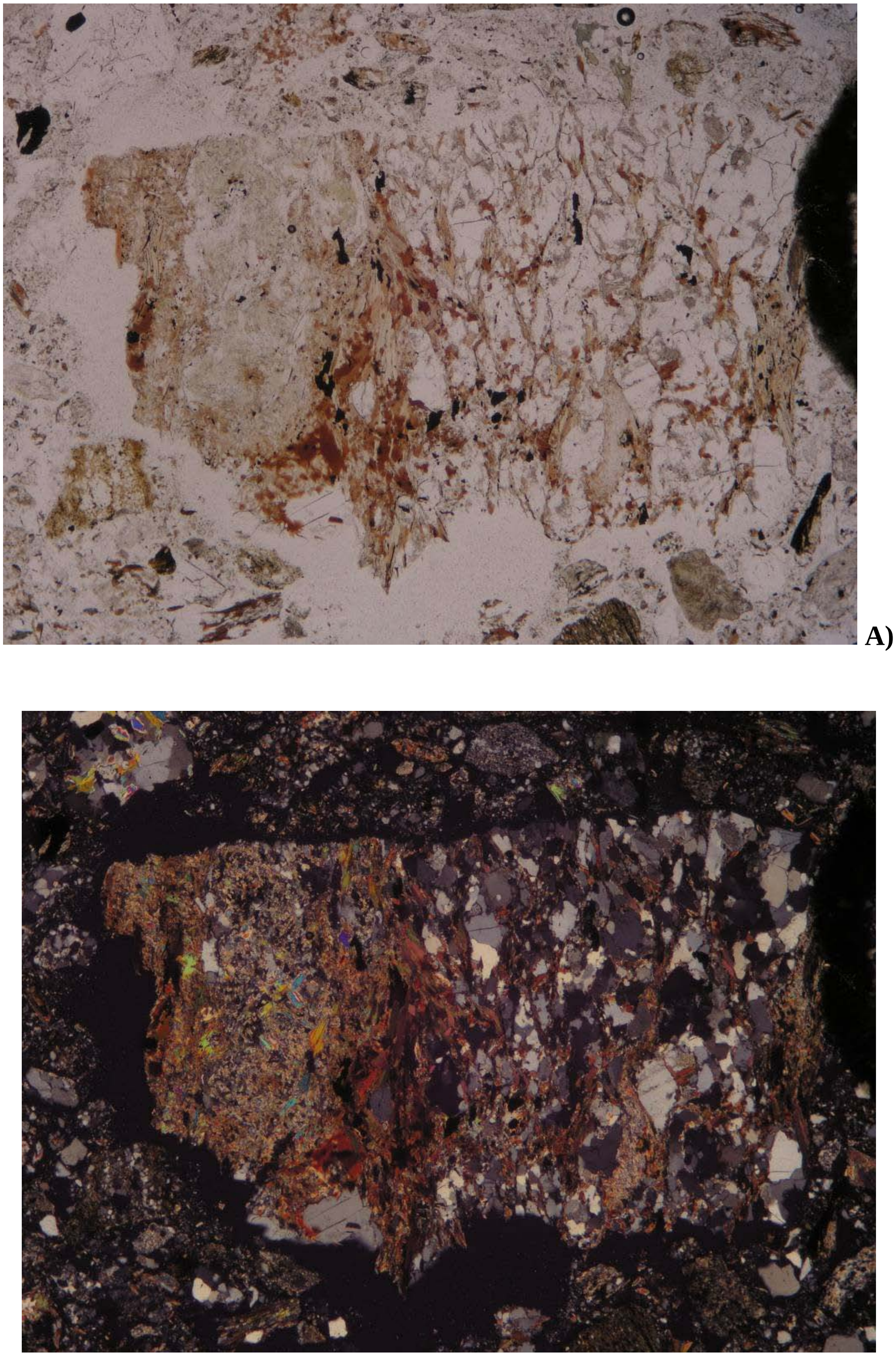

Figure B2: *Photomicrographs of a metasediment (metagreywacke) fragment in sample 3 showing wavy cleavage marked by the alignment of flakes of brown biotite, greenish chlorite and colourless sericite and the wrapping of these around variably flattened quartz and feldspar grains. A) PPL, B) XPL, FOV = ~ 7 mm.*

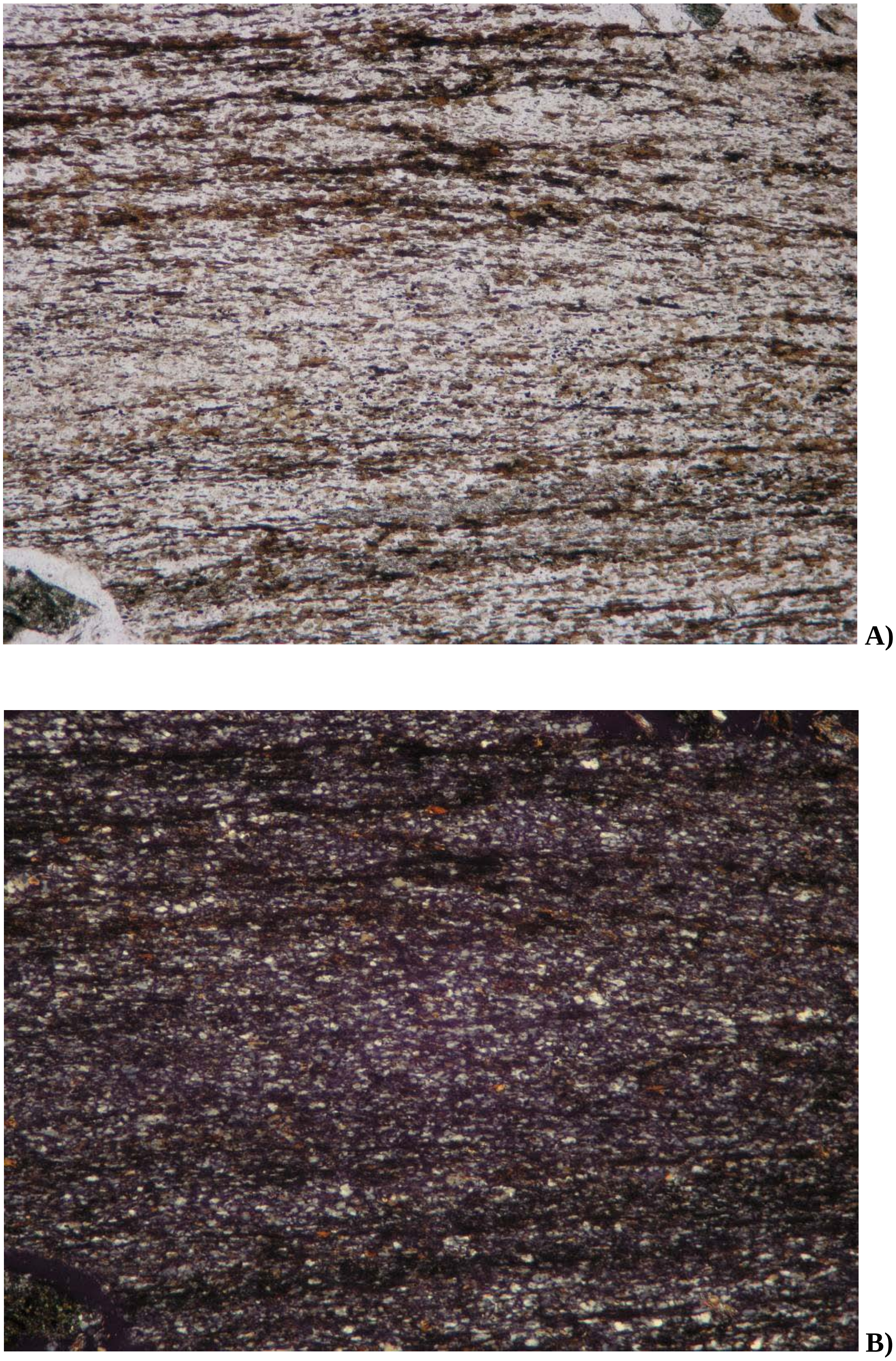

Figure B3: *Photomicrographs of a metasediment (slate) fragment in sample 9, showing a well-defined straight slaty cleavage and extremely fine grain size. A) PPL, B) XPL, FOV = ~2.7 mm.*

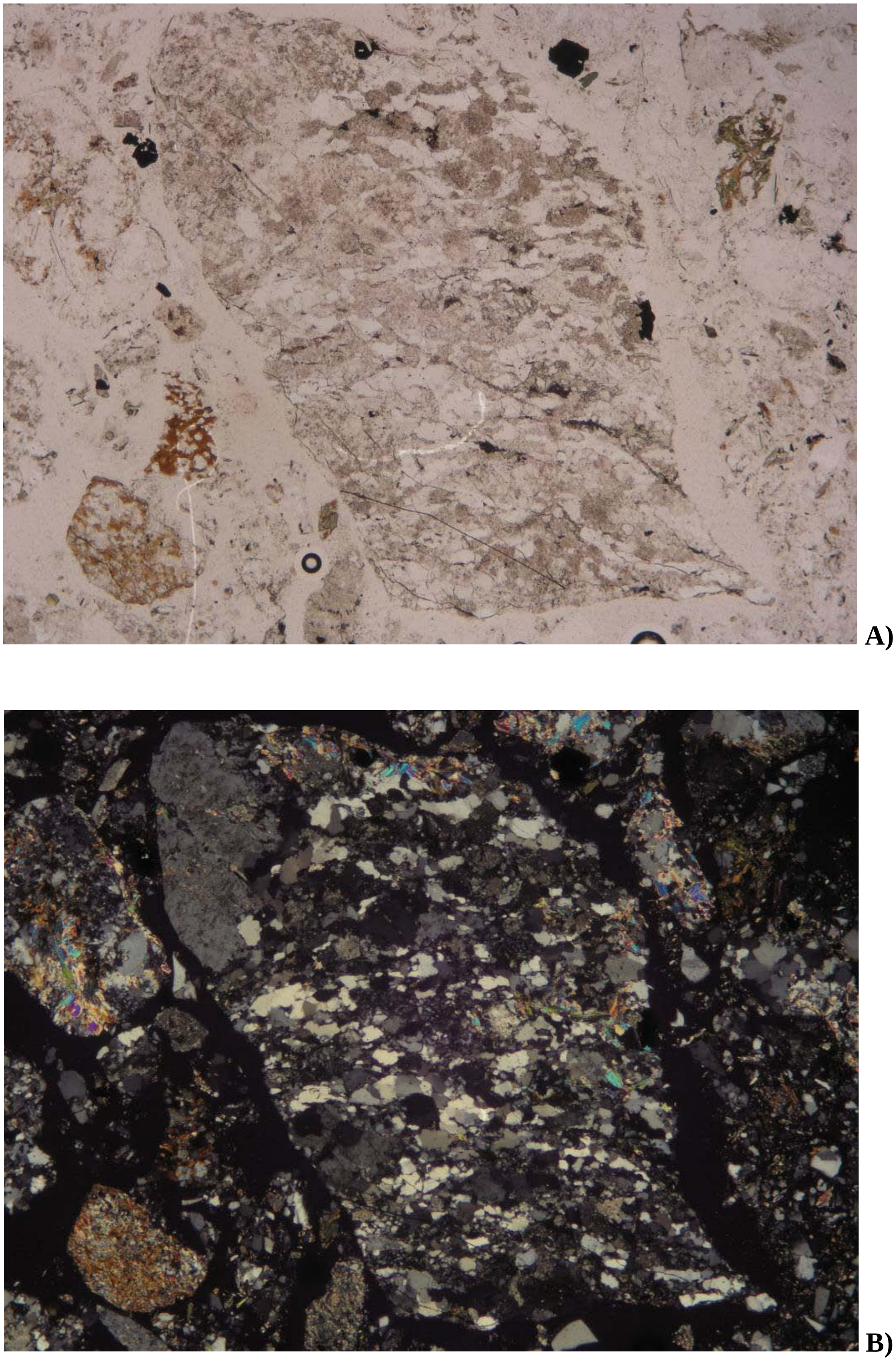

Figure B4: *Photomicrographs of a metagreywacke fragment in sample 2D. Quartz and feldspars are of various sizes and shapes with phyllosilicates occurring interstitial to the felsic phases. A) PPL, B) XPL, FOV = ~ 7 mm.*

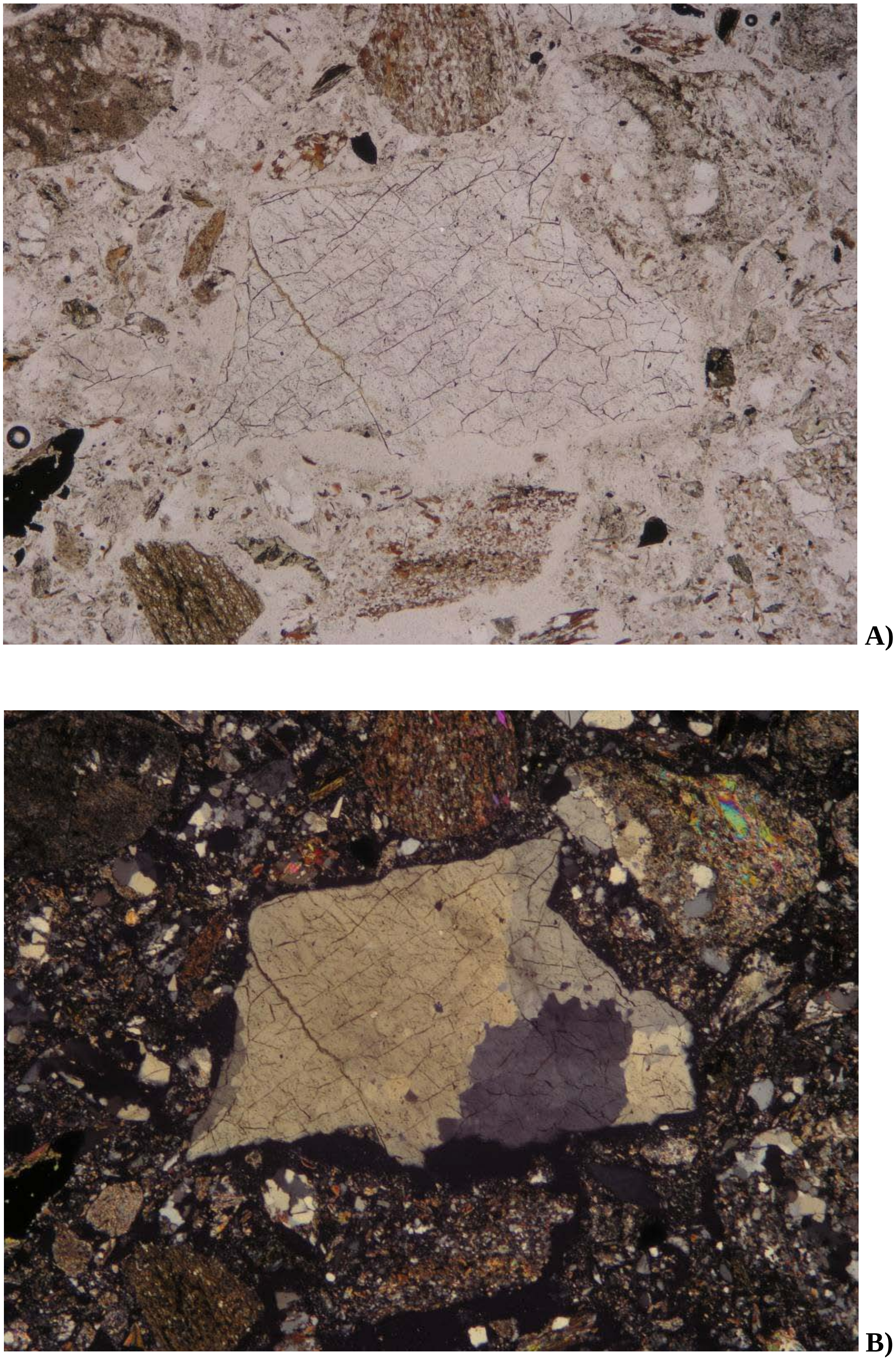

Figure B5: *Photomicrographs of a granular quartz vein fragment in sample 3. A) PPL, B) XPL, FOV = ~ 7 mm.*

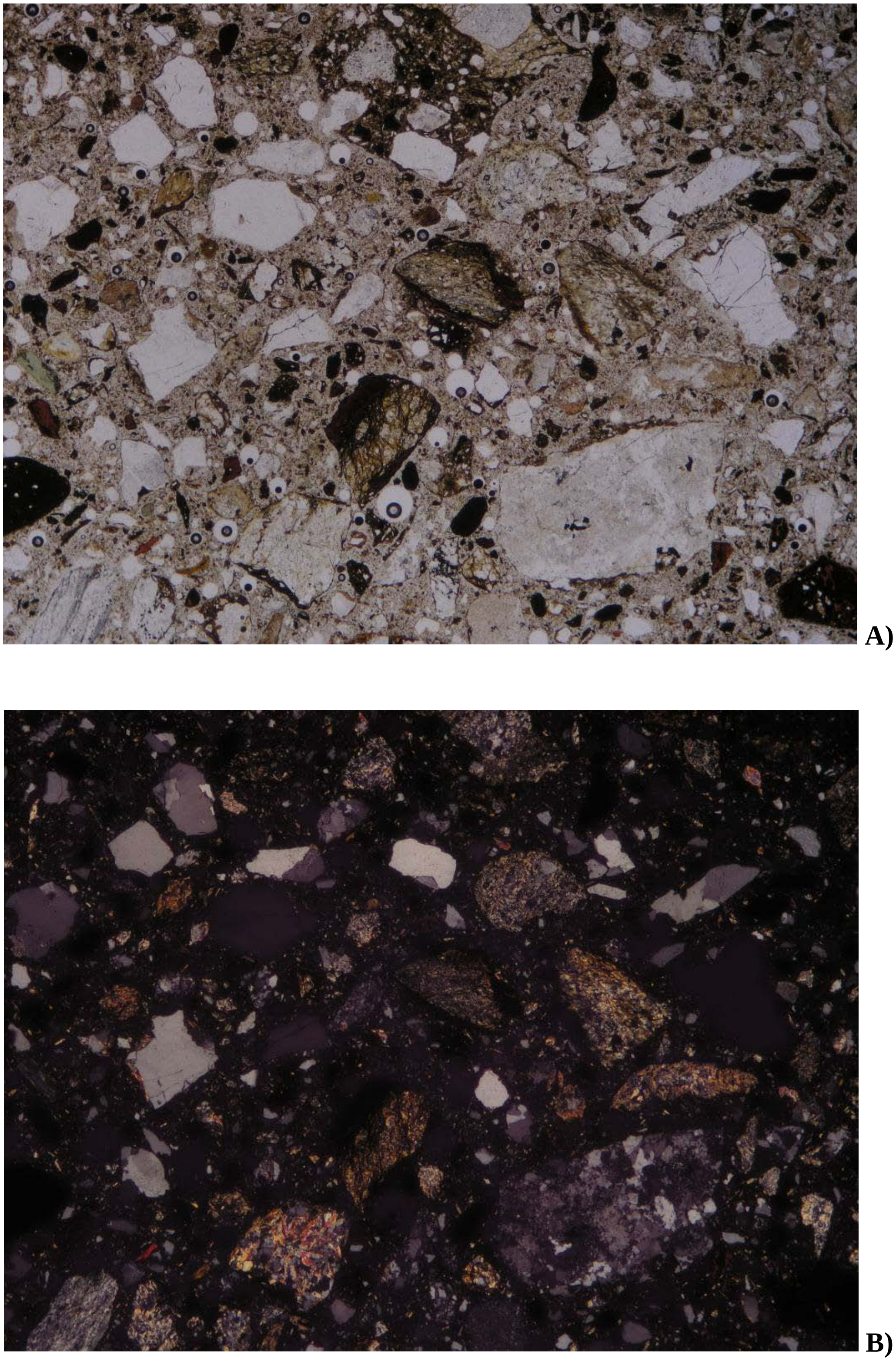

Figure B6: *Photomicrographs of humidity cell sample 15, showing that it consists essentially of mineral grain and granular fragments (mostly quartz) and of lithic fragments (schists and granofels). Opaque minerals are scattered throughout and red to black rims of hematite/Fe-oxyhydroxides variably coat the fragments. A) PPL, B) XPL, FOV = ~ 7 mm.*

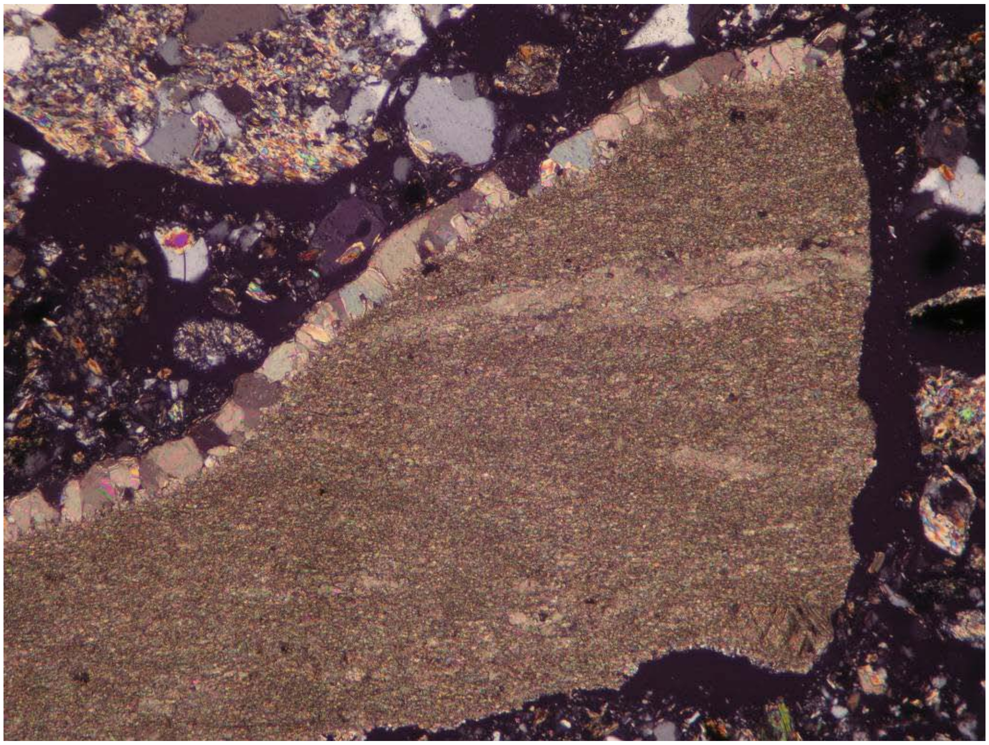

Figure B7: *Photomicrograph of a liberated possible marble fragment in sample 3. XPL, FOV = ~ 2.7 mm.*

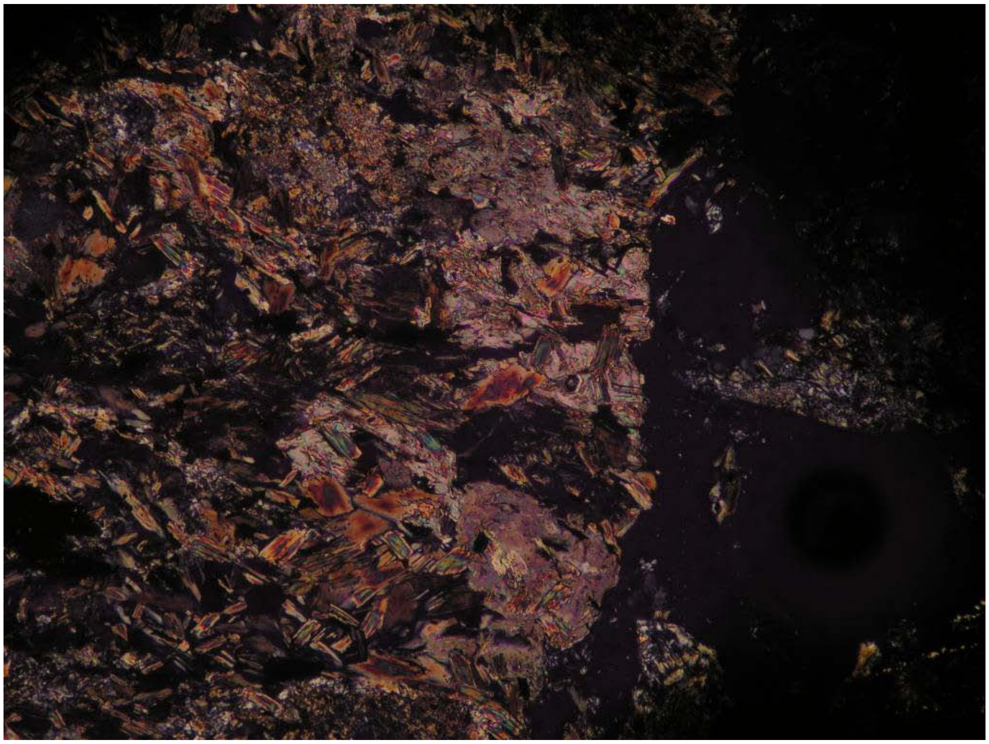

Figure B8: *Photomicrograph of a slate fragment in sample 7, showing complete replacement of feldspars by colourless carbonate (calcite) associated with shreddy biotite and chlorite. XPL, FOV = ~ 1.4 mm.*

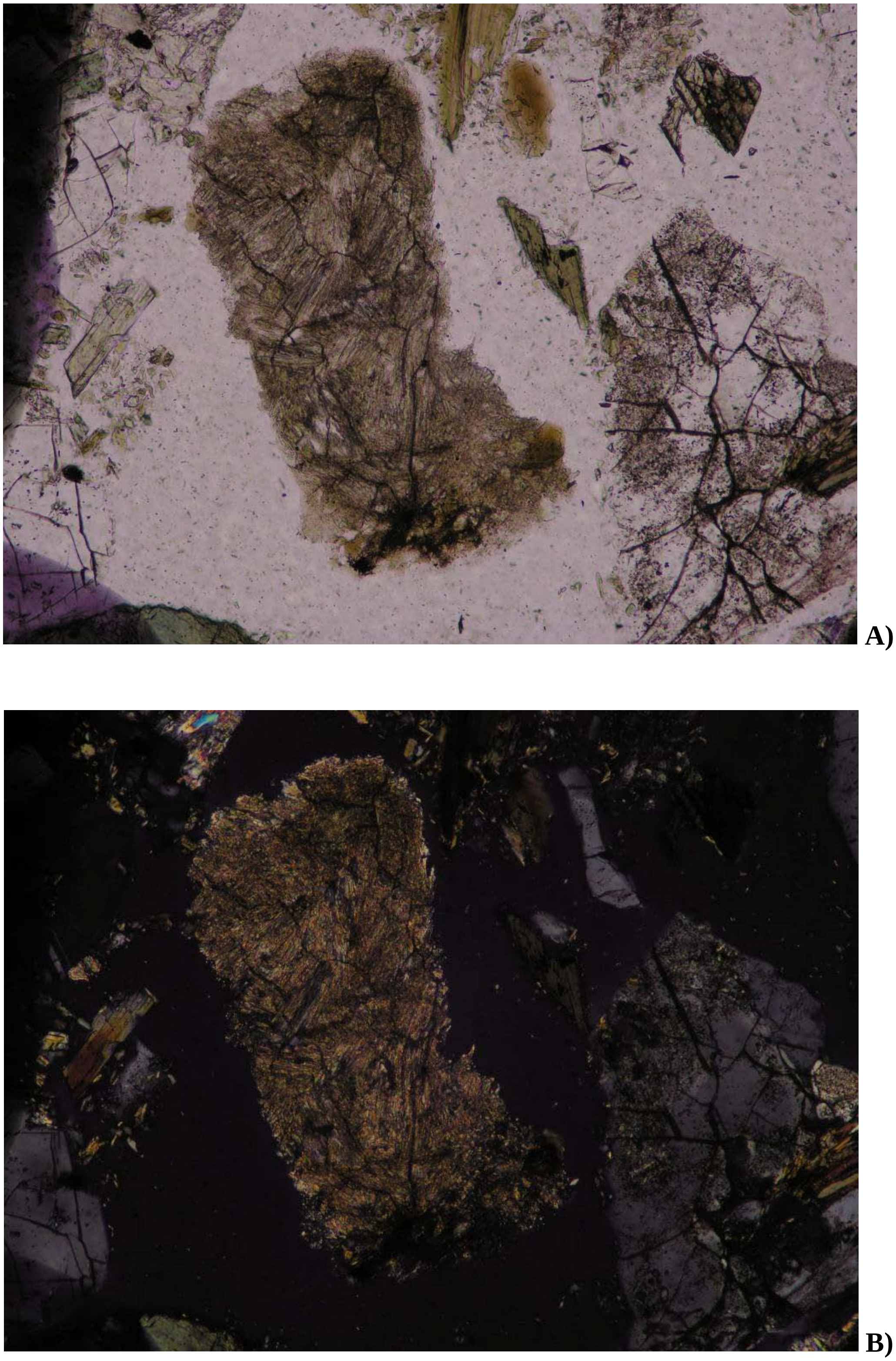

Figure B9: *Photomicrograph of a chlorite-carbonate fragment (altered gabbro/diorite) in sample 1. The carbonate is colourless and occurs as acicular grains intergrown with green chlorite. A) PPL, B) XPL, FOV = ~ 1.4 mm.*

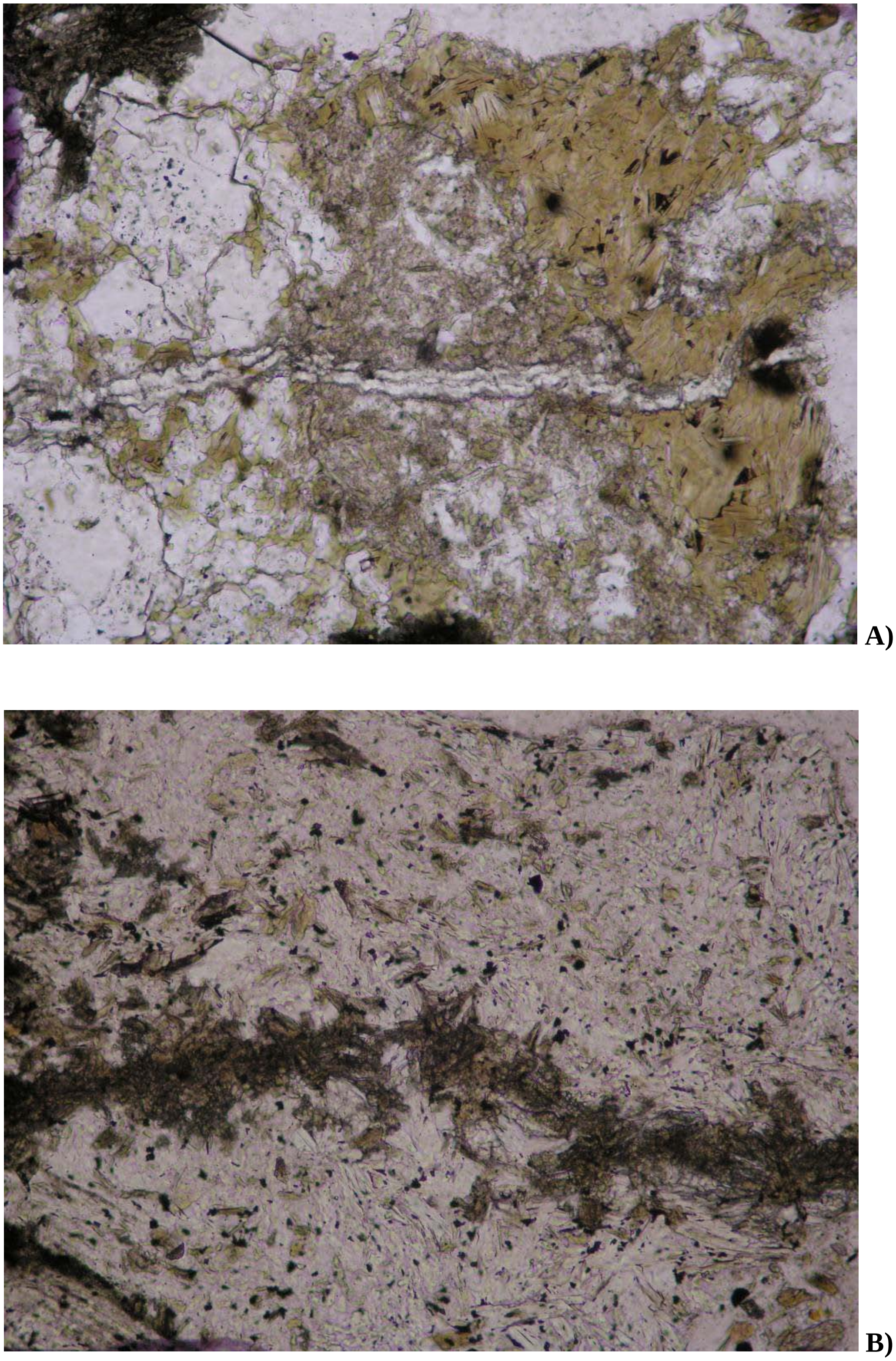

Figure B10: *Photomicrographs of A) a veinlet of colourless carbonate (likely calcite) in a metagreywacke fragment in sample 8 and B) a band of dark (likely Fe-bearing) carbonate in a slate fragment in sample 4. PPL, A) FOV = ~ 1.4 mm, B) FOV = ~ 2.8 mm.*

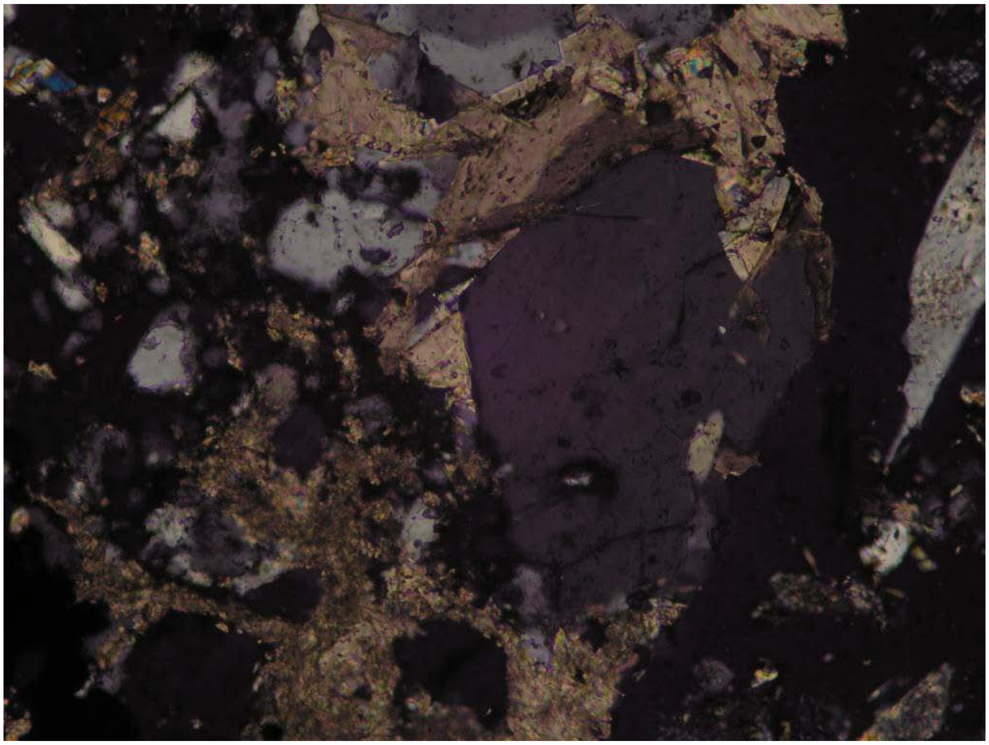

Figure B11: *Photomicrograph of a metagraywacke fragment in sample 11 showing interstitial infill of carbonate between quartz grains. XPL, FOV = ~ 1.4 mm.*

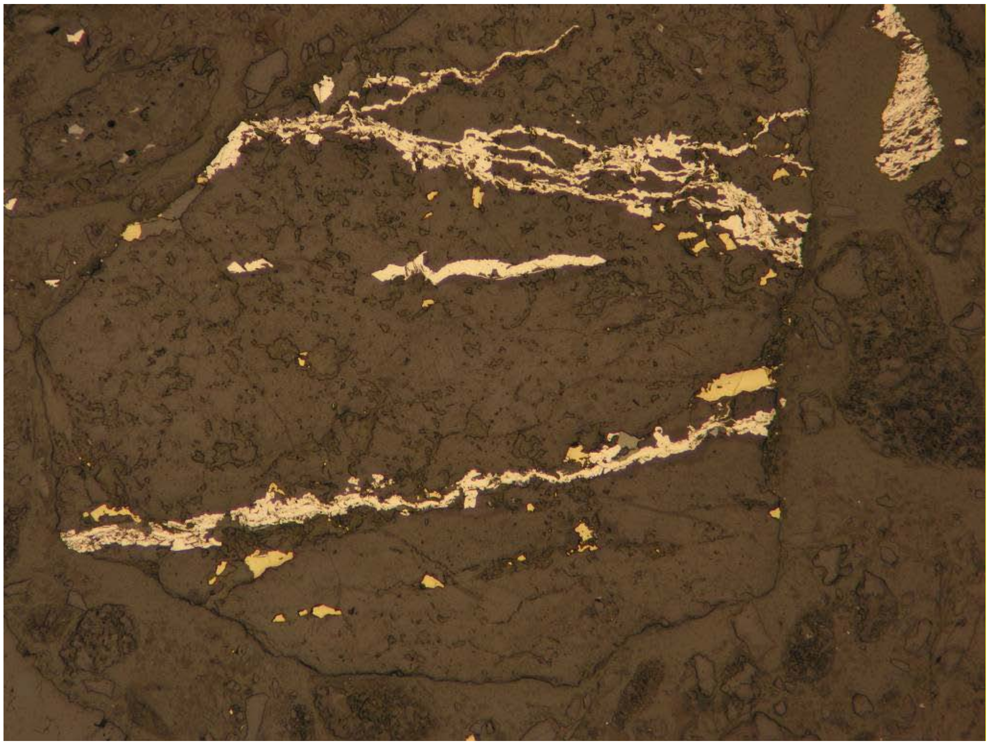

Figure B12: *Photomicrographs of a metagraywacke fragment in sample 3 showing thin pyrite veinlets and scattered chalcopyrite (brassy yellow). RL, FOV = ~ 2.7 mm.*

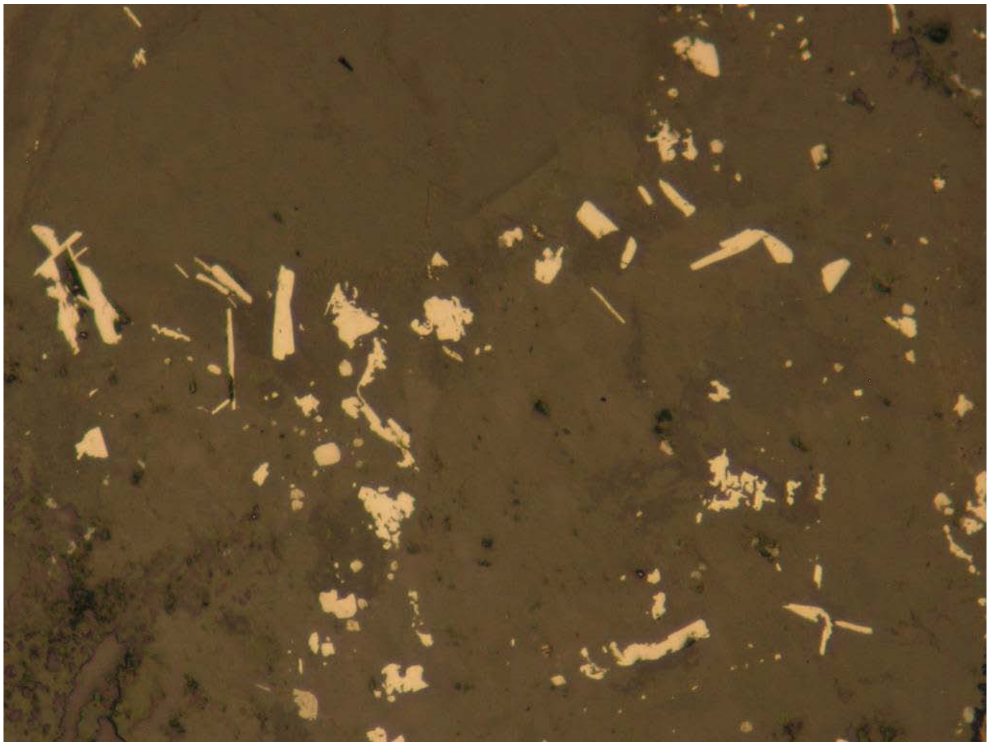

Figure B13: *Photomicrograph of an altered metagreywacke fragment in sample 7 showing disseminated anhedral to subhedral grains of pyrrhotite. RL, FOV = ~ 1.4 mm.*

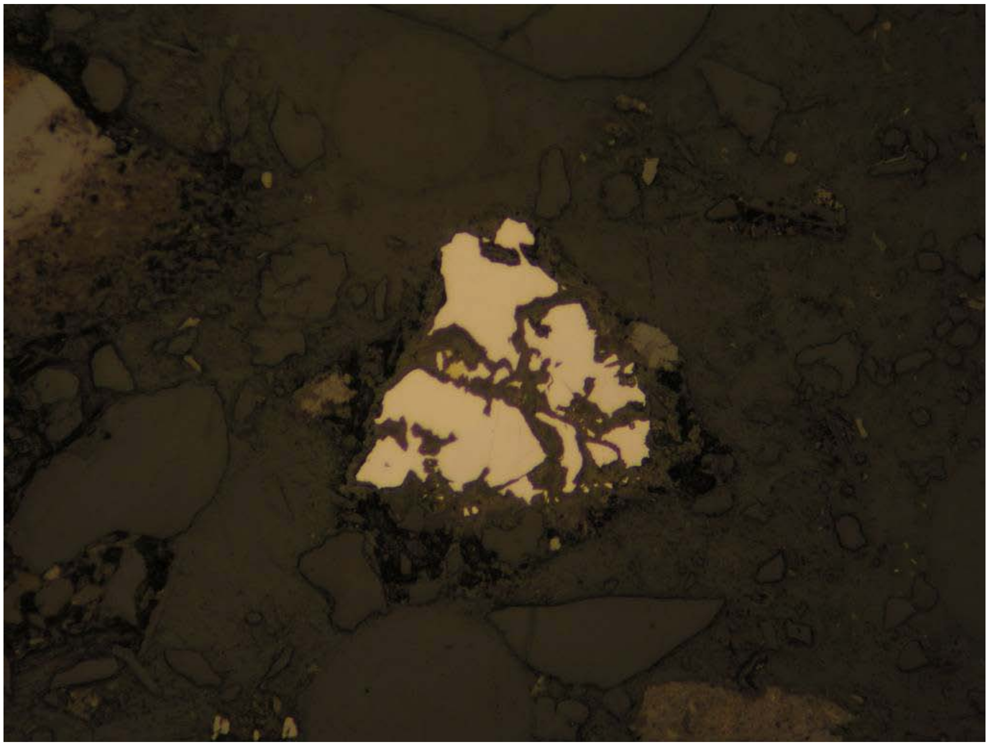

Figure B14: *Photomicrograph showing the occurrence of arsenopyrite associated with phyllosilicates in a lithic fragment in sample 22. RL, FOV = ~ 0.7 mm.*

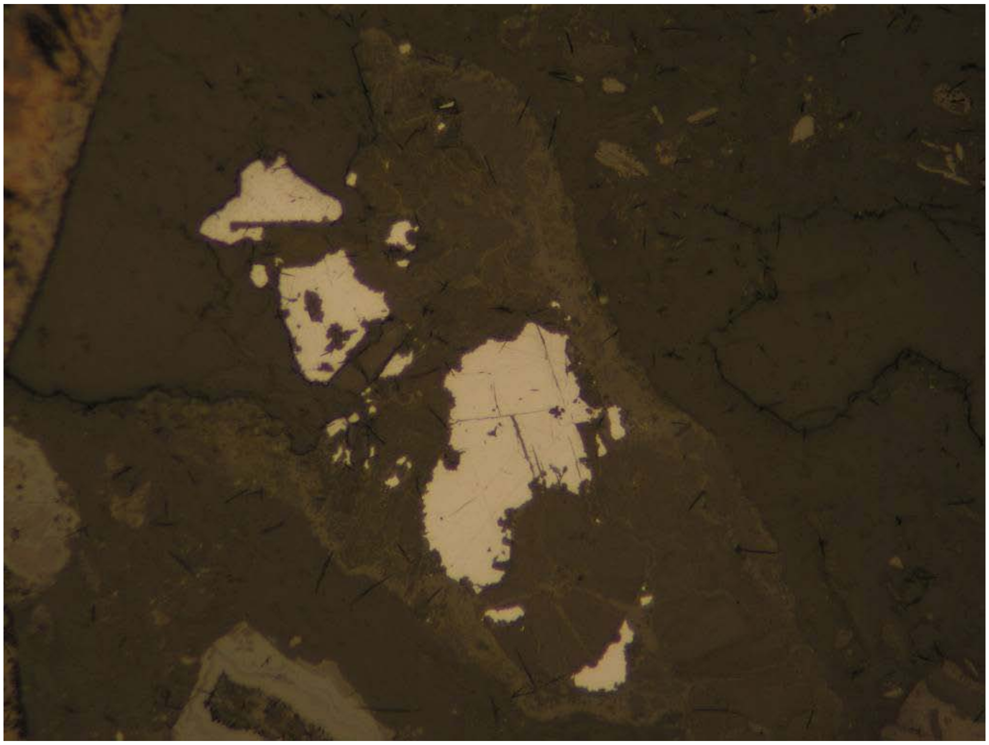

Figure B15: Photomicrograph showing anhedral masses of galena in a slate fragment in sample 16. RL, FOV = ~ 0.7 mm.

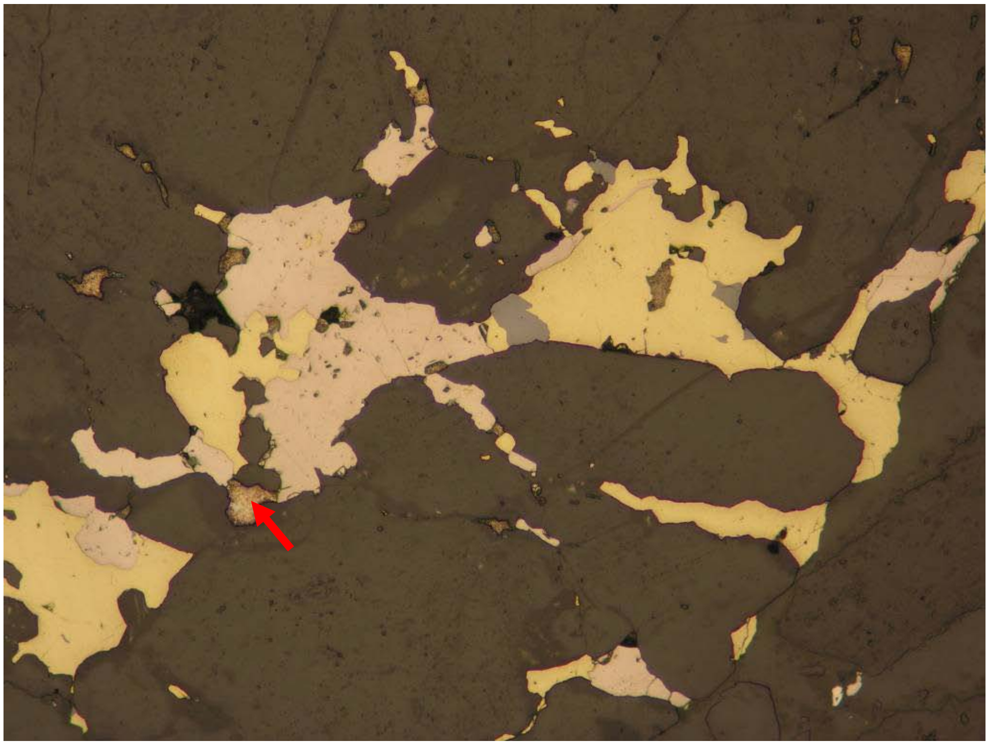

Figure B16: Photomicrograph showing anhedral interstitial masses of chalcopyrite (yellow), pyrrhotite (light brown), sphalerite (grey) and native bismuth (corroded, indicated by arrow) in sample 14. RL, FOV = ~ 0.7 mm.

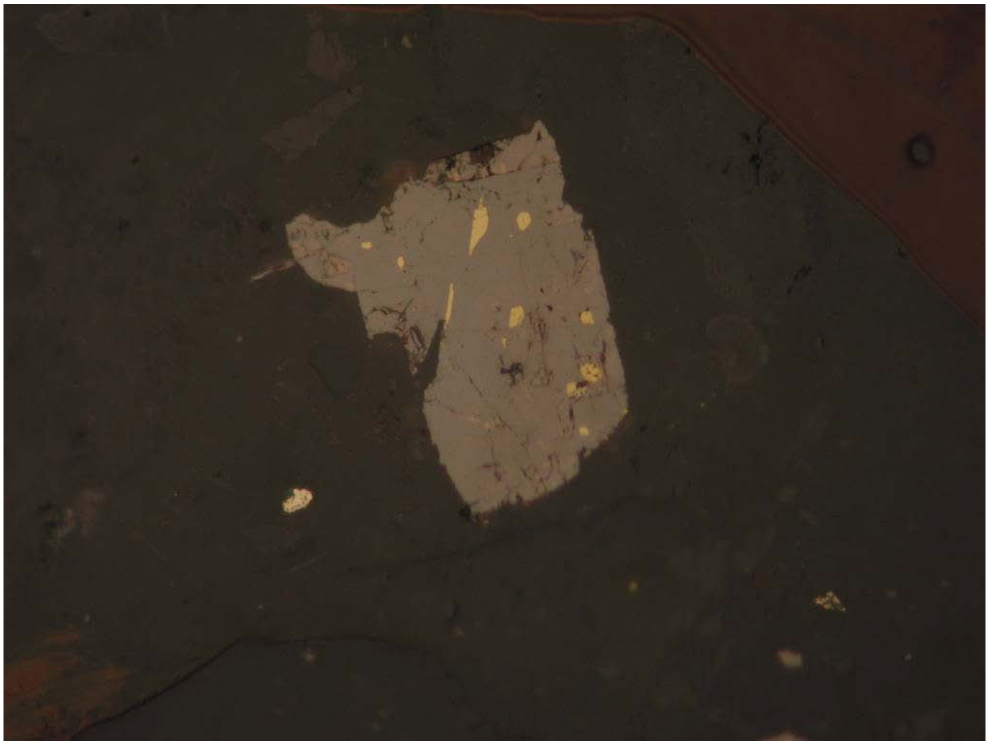

Figure B17: *Photomicrograph of a liberated grain of sphalerite with inclusions of chalcopyrite in sample 11. RL, FOV = ~ 0.28 mm.*

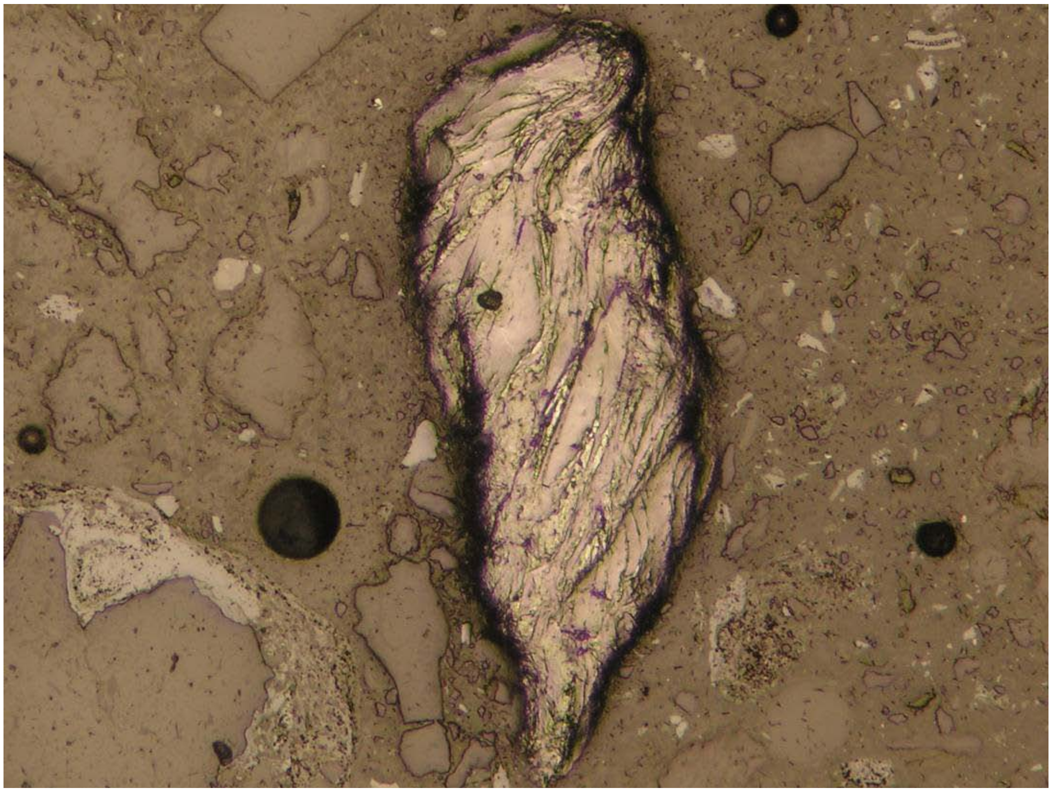

Figure B18: *Photomicrograph of a liberated mass of molybdenite in sample 16. RL, FOV = ~ 1.4 mm.*

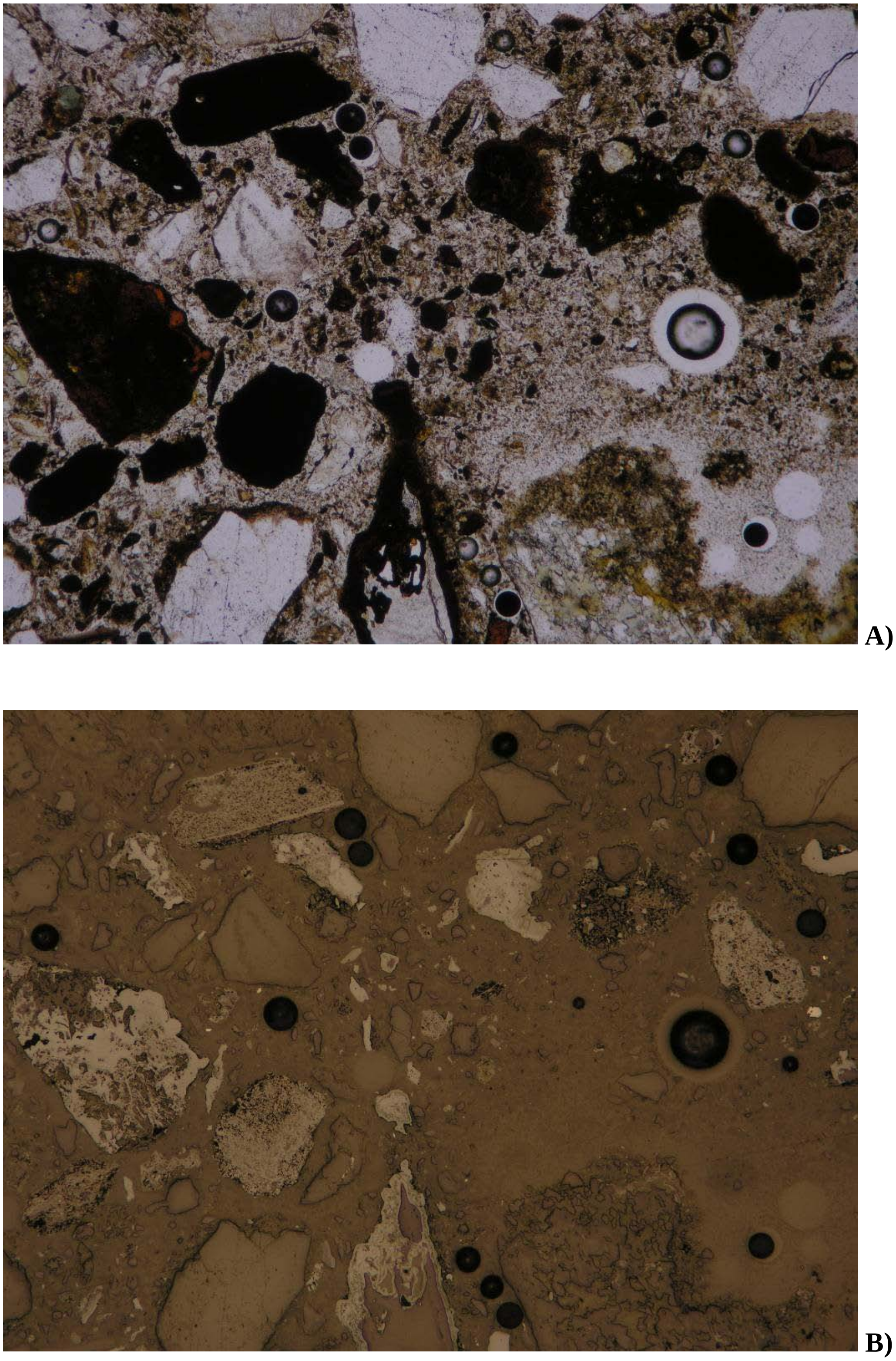

Figure B19: *Photomicrographs of mineral and lithic fragments in sample 15 showing a variety of occurrences of Fe-oxyhydroxides/hematite including rims around fragments, botryoidal masses in fragments and liberated fragments. A) PPL, B) RL, FOV = ~ 2.7 mm.*

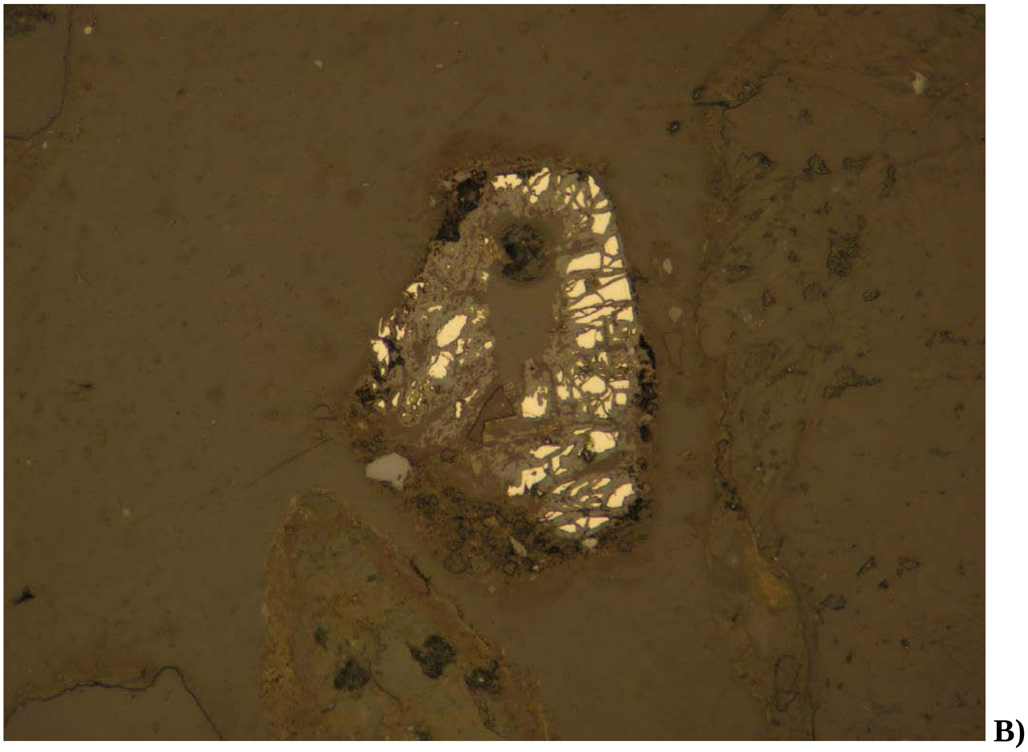

Figure B20: *Photomicrographs showing examples of pyrite oxidation A) corona of hematite on a pyrite grain in sample 12; RL, FOV = ~ 0.27 mm and B) preserved multiple pyrite cores in a mass of hematite in sample 18; RL, FOV = ~ 0.7 mm.*

A2: XRD Results

Results of quantitative phase analysis (wt.%) XRD-Rietveld - Maxxam Analytics Project SRK NorthCliff - Sisson

	HC #1		**HC#2**		**HC#2D**		**HC#3**		**HC#4**		**HC#5**		**HC#6**		**HC#7**
	1 - #1-Gabbro		**2 - # 2- FT**		**2D- #2 - FT (Dup)**		**3- #3 - MTF**		**4- #4 - WKB**		**5- #5 - IQD**		**6- 185748**		**7- 163760**
Quartz	13.0	Quartz	38.3	Quartz	37.5	Quartz	43.3	Quartz	40.1	Quartz	15.0	Quartz	9.7	Quartz	27.9
Clinochlore	4.9	Plagioclase	23.5	Plagioclase	24.1	Plagioclase	15.9	Plagioclase	12.6	Biotite	8.6	Biotite	7.2	Clinochlore	21.3
Actinolite	14.4	Biotite	6.4	Biotite	6.4	Biotite	6.8	Biotite	9.0	Clinochlore	3.9	Clinochlore	2.9	Muscovite	18.0
Biotite	9.1	Clinochlore	3.5	Clinochlore	3.6	Clinochlore	5.3	Clinochlore	4.3	Actinolite	14.7	Actinolite	16.0	Calcite	7.5
Grossular	1.0	K-feldspar	16.5	K-feldspar	16.0	K-feldspar	8.7	K-feldspar	4.2	K-feldspar	4.8	K-feldspar	3.4	Pyrite	1.7
Augite	2.4	Muscovite	8.4	Muscovite	8.4	Muscovite	15.8	Muscovite	25.2	Augite	1.2	Augite	0.9	Anatase	2.2
Prehnite	2.9	Calcite	1.5	Calcite	2.0	Calcite	1.2	Actinolite	1.9	Prehnite	3.0	Prehnite	1.8	Plagioclase	16.0
Plagioclase	48.0	Actinolite	1.3	Actinolite	1.3	Actinolite	1.9	Pyrite	0.6	Plagioclase	48.1	Pyrite	0.7	K-feldspar	4.3
K-feldspar	4.4	Pyrrhotite	0.5	Pyrrhotite	0.6	Pyrite	1.1	Siderite	0.6	Calcite ?	0.3	Plagioclase	56.0	Pyrrhotite	1.1
								Anatase	0.4	Ankerite	0.4	Calcite ?	0.1		
								Smithsonite ?	0.2			Ilmenite	1.3		
								Calcite ?	0.8						
Total	100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0

	HC#8		**HC#9**		**HC#10**		**HC#11**		**HC#12**		**HC#13**		**#14**
	8- 161540		**9- 267616**		**10- 162363**		**11- 163128**		**12- 162251**		**13- 918618**		**14- 162352, 6814, 82973**
Quartz	25.5	Quartz	58.1	Quartz	9.5	Quartz	17.2	Quartz	18.7	Quartz	39.3	Quartz	37.6
Biotite	16.9	Clinochlore	3.0	Biotite	7.5	Clinochlore	13.9	Clinochlore	3.1	Clinochlore	0.9	Clinochlore	2.7
Clinochlore	8.3	Calcite ?	0.7	Clinochlore	3.1	K-feldspar	13.8	Plagioclase	50.5	K-feldspar	11.5	Plagioclase	25.9
K-feldspar	4.3	Biotite	7.7	Actinolite	22.1	Prehnite	1.5	Biotite	9.1	Plagioclase	46.3	Biotite	7.5
Plagioclase	33.8	Muscovite	24.6	K-feldspar	3.5	Plagioclase	27.6	Actinolite	11.5	Biotite	1.0	Actinolite	5.9
Calcite ?	0.7	Ilmenite	0.4	Prehnite	1.6	Calcite	3.9	K-feldspar	4.5	Calcite	0.3	Prehnite	1.7
Pyrite	1.9	Plagioclase	2.1	Plagioclase	49.5	Biotite	4.6	Prehnite	2.6	Prehnite	0.7	Muscovite	7.1
Ilmenite	2.8	K-feldspar	3.4	Ilmenite	2.2	Actinolite	8.0					Calcite	0.8
Actinolite	5.7			Augite	1.0	Grossular	0.2					Pyrrhotite	2.5
Siderite	0.3					Pyrite	0.5					K-feldspar	8.0
						Illite-Muscovite	8.4					Powellite	0.3
						Anatase ?	0.4						
Total	100.0		100.0		100.0		100.0		100.0		100.0		100.0

A3: Electron Microprobe Results

Sample ID (MSC)	Humidity Cell	S	Mn	Fe	Ni	Cu	Zn	As	Ag	Sb	Pb	Total
1-S1	**1**	53.49	0.00	46.21	0.56	0.01	0.00	0.10	0.10	0.05	0.00	100.52
1-S2	**1**	39.18	0.00	59.33	0.07	0.00	0.00	0.07	0.05	0.00	0.00	98.69
1-S3	**1**	0.00	0.01	0.04	0.00	0.00	0.04	0.03	0.08	0.01	0.01	0.22
1-S4	**1**	37.03	0.00	35.89	0.04	0.41	0.00	0.05	0.01	0.02	0.00	73.46
1-S5	**1**	34.57	0.00	30.31	0.06	35.44	0.00	0.00	0.03	0.00	0.00	100.42
1-S6	**1**	47.87	0.02	40.14	0.59	10.99	0.00	0.08	0.07	0.00	0.00	99.76
2-S1	**2**	12.88	0.00	0.05	0.00	0.04	0.08	0.00	0.45	0.00	86.05	99.54
2-S2	**2**	0.00	0.00	0.06	0.00	0.11	0.02	0.00	0.03	0.23	0.00	0.45
2-S2m	**2**	0.03	0.02	0.07	0.12	0.00	0.20	0.00	0.10	0.14	0.04	0.72
2-S3	**2**	53.33	0.00	47.15	0.10	0.00	0.00	0.02	0.00	0.00	0.00	100.60
2-S4	**2**	34.71	0.01	29.41	0.00	35.02	0.00	0.07	0.17	0.01	0.00	99.40
2-S5	**2**	39.07	0.00	59.90	0.00	0.02	0.02	0.12	0.00	0.00	0.00	99.13
2-S6		33.67	1.22	10.64	0.00	0.02	54.01	0.00	0.00	0.00	0.00	99.57
2D-S1	**2D**	39.20	0.00	59.45	0.07	0.00	0.02	0.05	0.05	0.00	0.00	98.85
2D-S2	**2D**	34.26	0.00	29.76	0.00	35.13	0.00	0.10	0.00	0.00	0.00	99.25
2D-S3	**2D**	45.94	0.00	0.00	0.00	0.11	0.00	0.00	0.07	0.00	0.00	46.13
2D-S4	**2D**	53.48	0.02	44.40	0.01	0.00	0.01	0.12	0.05	0.00	0.00	98.08
3-S1	**3**	53.70	0.00	47.23	0.02	0.01	0.00	0.05	0.03	0.00	0.00	101.05
3-S2	**3**	53.36	0.00	46.91	0.00	0.05	0.00	0.04	0.00	0.00	0.00	100.37
3-S3	**3**	39.62	0.02	60.80	0.00	0.01	0.00	0.06	0.07	0.00	0.00	100.58
3-S4	**3**	34.73	0.01	29.59	0.02	35.06	0.04	0.00	0.06	0.03	0.00	99.55
3-S5	**3**	52.87	0.02	46.63	0.06	0.05	0.02	0.06	0.00	0.00	0.00	99.71
4-S1	**4**	53.89	0.00	46.34	0.03	0.00	0.00	0.00	0.00	0.03	0.00	100.29
4-S2	**4**	53.12	0.02	46.72	0.00	0.01	0.00	0.07	0.00	0.04	0.00	99.96
4-S3	**4**	45.98	0.01	0.03	0.00	0.00	0.00	0.01	0.00	0.00	0.00	46.03
4-S4	**4**	39.15	0.02	59.76	0.11	0.01	0.00	0.06	0.00	0.02	0.00	99.12
4-S5	**4**	34.54	0.03	29.69	0.05	34.78	0.09	0.03	0.09	0.01	0.00	99.32
5-S1	**5**	38.58	0.00	59.09	0.25	0.00	0.00	0.07	0.03	0.00	0.00	98.03
5-S2	**5**	53.65	0.01	46.78	0.10	0.01	0.01	0.00	0.00	0.01	0.00	100.57
5-S3	**5**	47.31	0.05	46.26	0.02	0.00	0.03	0.07	0.00	0.00	0.00	93.74
5-S4	**5**	34.67	0.00	29.76	0.03	35.24	0.02	0.05	0.00	0.00	0.00	99.78
6-185748-S1	**6**	39.22	0.02	58.44	0.31	0.00	0.02	0.11	0.04	0.01	0.00	98.17
6-185748-S2	**6**	53.33	0.00	46.95	0.00	0.00	0.02	0.04	0.03	0.01	0.00	100.39
6-185748-S3	**6**	53.60	0.00	46.37	0.00	0.04	0.03	0.10	0.00	0.03	0.00	100.18
6-185748-S4	**6**	53.74	0.03	47.18	0.01	0.01	0.00	0.06	0.12	0.00	0.00	101.14
6-185748-S5	**6**	34.83	0.00	29.88	0.04	35.30	0.04	0.02	0.03	0.00	0.00	100.15

Sample ID (MSC)	Humidity Cell	S	Mn	Fe	Ni	Cu	Zn	As	Ag	Sb	Pb	Total
7-163760-S1	**7**	53.41	0.00	46.74	0.00	0.00	0.11	0.05	0.09	0.00	0.00	100.40
7-163760-S2	**7**	53.33	0.02	46.34	0.06	0.03	0.01	0.04	0.00	0.02	0.00	99.86
7-163760-S3	**7**	38.52	0.03	60.00	0.03	0.02	0.05	0.06	0.00	0.00	0.00	98.71
7-163760-S4	**7**	34.71	0.05	29.21	0.00	35.30	0.00	0.04	0.02	0.00	0.00	99.34
8-161540-S1	**8**	52.85	0.00	45.93	0.36	0.05	0.08	0.06	0.05	0.01	0.00	99.39
8-161540-S2	**8**	53.86	0.00	47.18	0.02	0.02	0.00	0.03	0.00	0.04	0.00	101.15
8-161540-S3	**8**	39.13	0.01	59.29	0.08	0.07	0.00	0.09	0.01	0.00	0.00	98.68
8-161540-S4	**8**	34.44	0.02	29.60	0.00	35.55	0.04	0.02	0.01	0.00	0.00	99.67
9-267616-S1	**9**	34.63	0.01	30.09	0.10	35.38	0.00	0.09	0.00	0.00	0.00	100.31
9-267616-S2	**9**	38.90	0.01	59.70	0.23	0.00	0.15	0.09	0.12	0.02	0.00	99.21
9-267616-S3	**9**	53.43	0.00	46.51	0.00	0.00	0.00	0.10	0.06	0.00	0.00	100.10
9-267616-S4	**9**	34.38	0.00	29.86	0.00	35.70	0.10	0.07	0.00	0.00	0.00	100.10
9-267616-S5	**9**	38.71	0.01	59.66	0.09	0.02	0.10	0.07	0.00	0.02	0.00	98.68
10-162363-S1	**10**	37.94	0.00	59.91	0.21	0.00	0.11	0.12	0.00	0.07	0.00	98.37
10-162363-S2	**10**	34.53	0.00	29.97	0.02	34.96	0.01	0.04	0.10	0.00	0.00	99.63
10-162363-S3	**10**	53.57	0.00	47.04	0.03	0.00	0.05	0.07	0.04	0.00	0.00	100.80
10-162363-S4	**10**	53.23	0.00	47.02	0.00	0.00	0.01	0.08	0.07	0.04	0.00	100.45
11-163128-S1	**11**	10.46	0.23	1.88	0.00	0.03	0.10	0.00	0.33	0.04	70.36	83.44
11-163128-S2	**11**	32.86	0.32	9.22	0.00	0.00	54.88	0.14	0.00	0.03	0.00	97.43
11-163128-S3	**11**	39.15	0.02	59.22	0.01	0.01	0.00	0.08	0.05	0.04	0.00	98.57
11-163128-S4	**11**	53.41	0.00	46.69	0.00	0.08	0.00	0.00	0.01	0.00	0.00	100.18
11-163128-S5	**11**	22.11	0.02	35.27	0.03	0.07	0.05	39.40	0.09	0.67	0.00	97.70
12-162251-S1	**12**	54.04	0.00	46.63	0.63	0.02	0.00	0.07	0.00	0.00	0.00	101.40
12-162251-S2	**12**	53.75	0.00	46.81	0.00	0.00	0.02	0.09	0.07	0.00	0.00	100.75
12-162251-S3	**12**	51.85	0.04	46.46	0.00	0.04	0.02	0.06	0.00	0.01	0.00	98.48
12-162251-S4	**12**	34.96	0.03	29.56	0.06	35.19	0.00	0.08	0.00	0.03	0.00	99.91
13-918618-S1	**13**	54.21	0.00	46.06	0.02	0.00	0.00	0.05	0.00	0.00	0.00	100.33
13-918618-S2	**13**	35.08	0.00	29.76	0.02	35.89	0.02	0.05	0.00	0.02	0.00	100.85
13-918618-S3	**13**	39.26	0.00	60.41	0.03	0.05	0.06	0.00	0.01	0.03	0.00	99.84
13-918618-S4	**13**	0.01	0.83	83.00	0.19	0.03	0.03	0.14	0.02	0.00	0.07	84.31
14-162352-S1	**14**	54.00	0.00	46.70	0.01	0.08	0.02	0.08	0.00	0.00	0.00	100.89
14-162352-S2	**14**	24.10	0.04	0.05	0.17	0.03	0.16	0.00	0.01	0.01	0.00	24.57
14-162352-S2 center	**14**	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
14-162352-S3	**14**	0.00	0.01	0.05	0.10	0.06	0.12	0.00	0.00	0.05	0.00	0.39

Sample ID (MSC)	Humidity Cell	S	Mn	Fe	Ni	Cu	Zn	As	Ag	Sb	Pb	Total
14-162352-S4	**14**	22.96	0.02	0.33	0.00	0.00	0.00	0.00	0.00	0.01	0.00	23.32
14-162352-S5	**14**	34.68	0.02	29.36	0.00	35.70	0.00	0.02	0.10	0.00	0.00	99.88
14-162352-S6	**14**	33.31	0.49	9.78	0.03	0.80	55.71	0.05	0.00	0.02	0.00	100.19
14-162352-S7	**14**	0.00	0.01	0.08	0.00	0.02	0.06	0.00	0.02	0.12	0.08	0.39
14-162352-S8	**14**	38.94	0.02	60.00	0.07	0.02	0.00	0.07	0.00	0.00	0.00	99.12

MSC Sample ID	Humidity Cell ID	MGO	CAO	MNO	FEO	CO2 *	TOTAL	MG2+	CA2+	MN2+	FE2+	C4+
1-C1-1	**1**	0.01	56.67	0.05	0.05	44.55	101.33	0.00	2.00	0.00	0.00	2.00
1-C2-1	**1**	0.49	52.08	0.92	2.55	43.54	99.58	0.03	1.88	0.03	0.07	2.00
1-C2-2	**1**	0.66	49.32	1.26	2.76	41.90	95.90	0.03	1.85	0.04	0.08	2.00
2-C1-2	**2**	10.18	30.27	0.98	15.07	44.71	101.21	0.50	1.06	0.03	0.41	2.00
2-C2-1	**2**	0.13	55.24	1.01	0.16	44.22	100.76	0.01	1.96	0.03	0.00	2.00
2-C3-1	**2**	0.46	51.28	1.61	2.25	43.12	98.72	0.02	1.87	0.05	0.06	2.00
2-C4-2	**2**	0.35	51.00	2.06	1.90	42.85	98.16	0.02	1.87	0.06	0.05	2.00
2-C5-1	**2**	0.00	53.08	3.04	0.27	43.71	100.10	0.00	1.91	0.09	0.01	2.00
2D-C4-1	**2D**	9.21	29.33	1.19	16.99	44.22	100.94	0.46	1.04	0.03	0.47	2.00
2D-C4-2	**2D**	8.45	29.62	1.40	17.94	44.33	101.74	0.42	1.05	0.04	0.50	2.00
3-C1-1	**3**	0.40	48.80	3.36	2.59	42.41	97.56	0.02	1.81	0.10	0.08	2.00
3-C2-2	**3**	0.21	54.15	0.47	1.55	43.97	100.35	0.01	1.93	0.01	0.04	2.00
3-C3-1	**3**	0.04	55.63	0.70	0.30	44.32	100.99	0.00	1.97	0.02	0.01	2.00
3-C4-2	**3**	0.20	56.66	0.04	0.01	44.72	101.63	0.01	1.99	0.00	0.00	2.00
3-C5-1	**3**	0.02	57.07	0.00	0.03	44.83	101.95	0.00	2.00	0.00	0.00	2.00
4-C1-3	**4**	6.96	2.37	3.10	47.30	40.36	100.09	0.38	0.09	0.10	1.44	2.00
4-C2-2	**4**	5.85	2.94	4.57	46.92	40.27	100.55	0.32	0.12	0.14	1.43	2.00
4-C3-1	**4**	0.08	54.55	1.38	0.47	44.04	100.52	0.00	1.94	0.04	0.01	2.00
4-C4-2	**4**	0.24	53.82	0.50	0.26	42.97	97.79	0.01	1.97	0.01	0.01	2.00
4-C5-2	**4**	0.23	52.04	3.48	0.53	43.58	99.86	0.01	1.87	0.10	0.02	2.00
4-C6-2	**4**	0.04	55.01	0.67	0.73	44.08	100.53	0.00	1.96	0.02	0.02	2.00
5-C2-1	**5**	0.03	52.52	2.58	0.05	42.88	98.06	0.00	1.92	0.08	0.00	2.00
5-C2-2	**5**	0.06	53.12	2.94	0.37	43.80	100.29	0.00	1.90	0.08	0.01	2.00
5-C4-1	**5**	0.11	51.37	4.29	0.29	43.27	99.33	0.01	1.86	0.12	0.01	2.00
5-C4-2	**5**	0.20	51.54	4.09	0.32	43.40	99.55	0.01	1.86	0.12	0.01	2.00
7-163760-C1-1	**7**	0.08	50.48	5.83	0.12	43.39	99.90	0.00	1.83	0.17	0.00	2.00
7-163760-C2-2	**7**	0.84	50.70	3.74	0.64	43.42	99.34	0.04	1.83	0.11	0.02	2.00
7-163760-C3-2	**7**	0.40	53.95	0.84	0.67	43.71	99.57	0.02	1.94	0.02	0.02	2.00
7-163760-C4-1	**7**	0.19	54.95	0.65	0.55	44.07	100.41	0.01	1.96	0.02	0.02	2.00
7-163760-C5-2	**7**	0.16	53.78	0.87	1.36	43.75	99.92	0.01	1.93	0.03	0.04	2.00
7-163760-C6-1	**7**	0.16	52.35	2.62	1.02	43.51	99.66	0.01	1.89	0.08	0.03	2.00
8-161540-C1-1	**8**	0.14	53.39	1.81	0.81	43.67	99.82	0.01	1.92	0.05	0.02	2.00
8-161540-C2-1	**8**	0.11	53.21	1.98	0.68	43.52	99.50	0.01	1.92	0.06	0.02	2.00
8-161540-C3-2	**8**	0.06	55.95	0.27	0.20	44.27	100.75	0.00	1.98	0.01	0.01	2.00

MSC Sample ID	Humidity Cell ID	MGO	CAO	MNO	FEO	CO2 *	TOTAL	MG2+	CA2+	MN2+	FE2+	C4+
9-267616-C2-1	**9**	0.16	53.45	2.15	0.65	43.85	100.26	0.01	1.91	0.06	0.02	2.00
9-267616-C3-1	**9**	0.26	52.46	3.38	0.28	43.72	100.10	0.01	1.88	0.10	0.01	2.00
9-267616-C4-2	**9**	0.71	51.66	2.63	1.53	43.89	100.42	0.04	1.85	0.07	0.04	2.00
11-163128-C1-1	**11**	0.02	55.43	0.67	0.01	43.95	100.08	0.00	1.98	0.02	0.00	2.00
11-163128-C2-2	**11**	0.04	55.85	0.89	0.17	44.53	101.48	0.00	1.97	0.03	0.01	2.00
11-163128-C3-2	**11**	0.10	53.93	2.73	0.16	44.23	101.15	0.01	1.91	0.08	0.00	2.00
11-163128-C4-2	**11**	0.30	51.98	3.68	0.35	43.62	99.93	0.02	1.87	0.11	0.01	2.00
11-163128-C5-1	**11**	0.14	52.97	3.03	0.35	43.82	100.31	0.01	1.90	0.09	0.01	2.00
13-918618-C1-2	**13**	0.00	56.81	0.05	0.08	44.66	101.60	0.00	2.00	0.00	0.00	2.00
13-918618-C2-2	**13**	0.00	55.50	0.29	0.14	43.82	99.75	0.00	1.99	0.01	0.00	2.00
14-162352-C1-1	**14**	2.64	43.81	6.65	2.76	43.08	98.94	0.13	1.60	0.19	0.08	2.00
14-162352-C2-2	**14**	0.27	50.78	3.28	0.69	42.60	97.62	0.01	1.87	0.10	0.02	2.00
14-162352-C3-1	**14**	0.69	47.95	3.74	1.37	41.54	95.29	0.04	1.81	0.11	0.04	2.00
14-162352-C4-1	**14**	0.50	48.83	3.91	3.16	43.23	99.63	0.03	1.77	0.11	0.09	2.00

Appendix B: Barren rock Static Test Results

B1: Acid Base Accounting Results

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Northcliff Resources-Sisson (ML/ARD) Project, 5-Apr-2011

						Acme		Acme					Mod. ABA NP			
S. No.	Sample ID	Lithocode	Rock Type	Paste pH (pH Units)	Paste EC (µS/cm)	CO2 (Wt.%)	CaCO3 Equivalents* (Kg CaCO3/tonne)	Total Sulphur (Wt.%)	Sulphate Sulphur (HCl; Wt.%)	Sulphate Sulphur (Na2CO3; Wt. %)	Sulphide Sulphur** (Wt.%)	Maximum Potential Acidity*** (Kg CaCO3/tonne)	Neutralization Potential (Kg CaCO3/Tonne)	Net Neutralization Potential**** (Kg CaCO3/tonne)	Neutralization Potential Ratio (NPR)***** (dimensionless; no unit)	Fizz Rating
1	157849	FDQ	Felsic dykes - granitic	8.8	243	0.02	0.5	0.03	0.01	0.02	0.02	0.6	5.5	4.9	8.8	None
2	157853	FDQ	Felsic dykes - granitic	7.2	1168	0.07	1.6	0.97	0.04	0.07	0.93	29.1	6.5	-22.5	0.2	None
3	157872	IQD	Quartz diorite intrusion	9.8	363	0.15	3.4	0.19	0.01	0.02	0.18	5.6	33.8	28.1	6.0	None
4	157883	IQD	Quartz diorite intrusion	9.8	301	0.17	3.9	0.10	0.01	0.01	0.09	2.8	31.0	28.2	11.0	None
5	157886	IQD	Quartz diorite intrusion	9.7	354	0.17	3.9	0.09	0.01	0.01	0.08	2.5	28.7	26.2	11.5	None
6	157899	IQD	Quartz diorite intrusion	9.3	490	0.99	22.5	0.29	0.01	0.03	0.28	8.8	27.3	18.5	3.1	Moderate
7	157906	IQD	Quartz diorite intrusion	9.1	705	0.77	17.5	0.41	0.01	0.03	0.40	12.5	18.5	6.0	1.5	Slight
8	157910	IQD	Quartz diorite intrusion	9.7	315	0.53	12.0	0.08	<0.01	0.01	0.08	2.5	12.0	9.5	4.8	Slight
9	157915	IQD	Quartz diorite intrusion	9.5	526	0.30	6.8	0.20	0.02	0.02	0.18	5.6	10.8	5.2	1.9	None
10	157919	IQD	Quartz diorite intrusion	9.3	363	0.28	6.4	0.31	0.01	0.02	0.30	9.4	35.5	26.1	3.8	None
11	157924	IQD	Quartz diorite intrusion	8.2	857	3.91	88.9	2.80	0.04	0.04	2.76	86.3	89.3	3.1	1.0	Strong
12	157931	IQD	Quartz diorite intrusion	9.9	340	0.10	2.3	0.18	0.01	0.01	0.17	5.3	25.5	20.2	4.8	None
13	157939	IQD	Quartz diorite intrusion	9.4	324	0.15	3.4	0.17	0.01	<0.01	0.16	5.0	33.8	28.8	6.8	None
14	157946	IQD	Quartz diorite intrusion	9.5	347	0.36	8.2	0.14	<0.01	0.01	0.14	4.4	35.3	30.9	8.1	None
15	159254	IQD	Quartz diorite intrusion	8.6	402	0.65	14.8	0.47	0.01	0.04	0.46	14.4	23.3	8.9	1.6	Slight
16	163746	MTF	Mafic tuff	8.4	747	0.85	19.3	0.96	0.02	0.03	0.94	29.4	25.8	-3.6	0.9	Slight
17	163754	MTF	Mafic tuff	8.9	378	1.45	33.0	0.36	0.01	0.02	0.35	10.9	31.4	20.5	2.9	Strong
18	163760	IGB	Gabbro intrusion	8.5	423	3.94	89.5	0.64	0.01	0.02	0.63	19.7	93.5	73.8	4.7	Strong
19	163765	IGB	Gabbro intrusion	8.5	542	1.86	42.3	0.89	0.02	0.02	0.87	27.2	48.8	21.6	1.8	Strong
20	163770	IGB	Gabbro intrusion	9.3	325	0.35	8.0	0.23	<0.01	0.01	0.23	7.2	23.0	15.8	3.2	None
21	163776	IGB	Gabbro intrusion	9.1	277	1.73	39.3	0.20	0.01	0.01	0.19	5.9	53.3	47.4	9.0	Strong
22	163781	IGB	Gabbro intrusion	9.7	284	0.39	8.9	0.10	0.01	<0.01	0.09	2.8	12.5	9.7	4.4	None
23	163789	IGB	Gabbro intrusion	9.0	360	1.01	23.0	0.35	0.01	0.01	0.34	10.6	29.9	19.3	2.8	Strong
24	163802	IGB	Gabbro intrusion	9.7	283	0.07	1.6	0.21	<0.01	<0.01	0.21	6.6	20.3	13.7	3.1	Slight
25	163806	IGB	Gabbro intrusion	9.2	336	0.21	4.8	0.24	0.01	0.01	0.23	7.2	18.2	11.0	2.5	None
26	163815	WKB	Biotite wacke	8.8	293	2.21	50.2	0.48	0.01	0.02	0.47	14.7	71.7	57.0	4.9	Strong
27	163818	FDQ	Felsic dykes - granitic	9.3	287	0.26	5.9	0.16	<0.01	0.01	0.16	5.0	11.1	6.1	2.2	Slight
28	267584	WKB	Biotite wacke	4.3	1990	0.17	3.9	1.78	0.11	0.12	1.67	52.2	-2.4	-54.6	0.0	None
29	267610	WKS	sericite	8.9	358	0.16	3.6	0.18	0.01	0.01	0.17	5.3	8.0	2.7	1.5	None
30	267616	WKB	Biotite wacke	9.1	328	0.29	6.6	0.19	0.01	0.01	0.18	5.6	13.8	8.1	2.4	None
31	82337	IQD	Quartz diorite intrusion	8.6	110	0.07	1.6	0.06	<0.01	<0.01	0.06	1.9	5.3	3.4	2.8	None
32	82601	FTQ	Felsic tuff w/quartz	8.8	194	0.07	1.6	0.19	<0.01	<0.01	0.19	5.9	6.5	0.6	1.1	None
33	162251	IGB	Gabbro intrusion	9.4	217	0.11	2.5	0.08	<0.01	<0.01	0.08	2.5	12.6	10.1	5.0	None
34	162265	IGB	Gabbro intrusion	9.0	244	0.31	7.0	0.42	0.01	0.02	0.41	12.8	28.8	15.9	2.2	Slight
35	162273	IGB	Gabbro intrusion	8.4	328	4.51	102.5	0.29	<0.01	0.01	0.29	9.1	99.8	90.7	11.0	Strong
36	162286	IQD	Quartz diorite intrusion	9.2	238	0.30	6.8	0.10	<0.01	<0.01	0.10	3.1	24.3	21.2	7.8	Slight
37	162293	IQD	Quartz diorite intrusion	8.3	540	1.10	25.0	0.95	0.02	0.03	0.93	29.1	36.5	7.4	1.3	Moderate
38	162308	IQD	Quartz diorite intrusion	9.5	285	0.07	1.6	0.06	<0.01	<0.01	0.06	1.9	17.1	15.2	9.1	None
39	162315	IQD	Quartz diorite intrusion	9.7	386	0.12	2.7	<0.02	<0.01	<0.01	<0.02	<0.6	32.8	32.8	#N/A	None
40	162332	IQD	Quartz diorite intrusion	9.1	241	0.64	14.5	0.21	<0.01	<0.01	0.21	6.6	30.8	24.2	4.7	Moderate
41	162340	IQD	Quartz diorite intrusion	9.3	260	0.07	1.6	0.11	<0.01	0.02	0.11	3.4	22.0	18.6	6.4	None
42	162352	IQD	Quartz diorite intrusion	9.6	255	0.04	0.9	0.13	<0.01	0.01	0.13	4.1	16.2	12.1	4.0	None

						Acme		Acme					Mod. ABA NP			
S. No.	Sample ID	Lithocode	Rock Type	Paste pH (pH Units)	Paste EC (µS/cm)	CO2 (Wt.%)	CaCO3 Equivalents* (Kg CaCO3/tonne)	Total Sulphur (Wt.%)	Sulphate Sulphur (HCl; Wt.%)	Sulphate Sulphur (Na2CO3; Wt. %)	Sulphide Sulphur** (Wt.%)	Maximum Potential Acidity*** (Kg CaCO3/tonne)	Neutralization Potential (Kg CaCO3/Tonne)	Net Neutralization Potential**** (Kg CaCO3/tonne)	Neutralization Potential Ratio (NPR)***** (dimensionless; no unit)	Fizz Rating
43	162363	IQD	Quartz diorite intrusion	9.6	257	0.04	0.9	0.16	<0.01	0.01	0.16	5.0	18.8	13.8	3.8	None
44	162379	IQD	Quartz diorite intrusion	9.5	232	0.04	0.9	0.10	<0.01	<0.01	0.10	3.1	12.1	8.9	3.9	None
45	162387	IQD	Quartz diorite intrusion	9.4	262	0.05	1.1	0.19	0.01	0.01	0.18	5.6	15.0	9.4	2.7	None
46	162394	IQD	Quartz diorite intrusion	8.6	337	0.97	22.0	0.34	0.01	0.02	0.33	10.3	48.3	38.0	4.7	Slight
47	162406	IQD	Quartz diorite intrusion	9.6	394	0.06	1.4	0.30	0.01	0.03	0.29	9.1	22.8	13.7	2.5	None
48	162421	IQD	Quartz diorite intrusion	9.7	291	<0.02	<0.5	0.13	<0.01	0.02	0.13	4.1	16.6	12.5	4.1	None
49	185738	IGB	Gabbro intrusion	8.8	400	<0.02	<0.5	0.08	0.01	0.01	0.07	2.2	20.0	17.8	9.2	None
50	185748	IGB	Gabbro intrusion	9.3	430	0.03	0.7	0.26	0.01	0.01	0.25	7.8	21.0	13.2	2.7	None
51	185763	IGB	Gabbro intrusion	8.8	496	<0.02	<0.5	0.38	0.01	0.02	0.37	11.6	38.0	26.4	3.3	Moderate
52	185776	IGB	Gabbro intrusion	8.6	270	0.15	3.4	0.12	<0.01	<0.01	0.12	3.8	17.8	14.0	4.7	None
53	185788	IGB	Gabbro intrusion	9.0	680	0.05	1.1	0.59	0.02	0.03	0.57	17.8	20.3	2.5	1.1	None
54	185789	IGB	Gabbro intrusion	9.7	365	0.04	0.9	0.27	0.01	0.01	0.26	8.1	25.1	17.0	3.1	None
55	185795	IGB	Gabbro intrusion	9.5	347	0.04	0.9	0.13	0.01	0.01	0.12	3.8	29.2	25.4	7.8	None
56	296670	OBA	#N/A	8.7	192	0.40	9.1	0.08	<0.01	<0.01	0.08	2.5	15.7	13.2	6.3	Slight
57	296679	FTQ	Felsic tuff w/quartz	9.6	201	0.59	13.4	0.05	<0.01	<0.01	0.05	1.6	25.1	23.6	16.1	Moderate
58	296687	MTF	Mafic tuff	7.5	1300	0.27	6.1	3.24	0.05	0.06	3.19	99.7	4.4	-95.3	0.0	None
59	296696	MTF	Mafic tuff	8.3	835	0.90	20.5	1.04	0.02	0.04	1.02	31.9	22.7	-9.1	0.7	Moderate
60	296706	IGB	Gabbro intrusion	8.7	313	0.16	3.6	0.70	0.01	0.02	0.69	21.6	8.4	-13.2	0.4	None
61	296711	IGB	Gabbro intrusion	9.2	243	0.77	17.5	0.48	0.01	0.02	0.47	14.7	32.2	17.5	2.2	Slight
62	296720	IGB	Gabbro intrusion	8.7	339	1.42	32.3	0.77	0.01	0.02	0.76	23.8	42.4	18.6	1.8	Strong
63	296733	IGB	Gabbro intrusion	7.6	1378	0.06	1.4	1.26	0.03	0.05	1.23	38.4	15.5	-23.0	0.4	None
64	296740	IGB	Gabbro intrusion	9.9	254	0.04	0.9	0.12	<0.01	0.01	0.12	3.8	22.4	18.6	6.0	None
65	165252	IGB	Gabbro intrusion	9.7	189	<0.02	<0.5	0.13	<0.01	<0.01	0.13	4.1	13.1	9.0	3.2	None
66	165261	IGB	Gabbro intrusion	9.7	276	0.08	1.8	0.09	<0.01	<0.01	0.09	2.8	18.1	15.3	6.4	None
67	165267	IGB	Gabbro intrusion	9.9	245	<0.02	<0.5	0.06	<0.01	<0.01	0.06	1.9	23.1	21.2	12.3	None
68	165277	IGB	Gabbro intrusion	8.9	317	0.91	20.7	0.68	0.01	0.02	0.67	20.9	40.1	19.2	1.9	Strong
69	165283	IGB	Gabbro intrusion	9.9	245	0.04	0.9	0.28	<0.01	0.01	0.28	8.8	16.5	7.7	1.9	None
70	165291	IGB	Gabbro intrusion	9.8	230	0.04	0.9	0.27	<0.01	0.01	0.27	8.4	18.9	10.4	2.2	None
71	165304	IGB	Gabbro intrusion	8.3	1036	1.25	28.4	1.54	0.03	0.05	1.51	47.2	35.5	-11.7	0.8	Moderate
72	294268	FTA	Felsic tuff with augen	9.2	381	0.37	8.4	0.47	0.01	0.02	0.46	14.4	11.2	-3.2	0.8	Slight
73	294277	FTA	Felsic tuff with augen	8.7	372	2.07	47.0	0.79	0.01	0.02	0.78	24.4	57.5	33.1	2.4	Strong
74	294292	MTF	Mafic tuff	8.0	1349	0.35	8.0	2.71	0.04	0.07	2.67	83.4	13.6	-69.9	0.2	Slight
75	294302	IGB	Gabbro intrusion	9.0	267	1.92	43.6	0.20	<0.01	0.01	0.20	6.3	56.3	50.0	9.0	Strong
76	294309	IGB	Gabbro intrusion	9.8	288	0.48	10.9	0.21	<0.01	0.01	0.21	6.6	26.1	19.5	4.0	Slight
77	294336	IGB	Gabbro intrusion	9.5	296	0.81	18.4	0.48	0.01	0.01	0.47	14.7	36.3	21.6	2.5	Moderate
78	294368	IGB	Gabbro intrusion	8.9	209	0.62	14.1	0.11	<0.01	<0.01	0.11	3.4	35.1	31.6	10.2	Moderate
79	294407	IGB	Gabbro intrusion	9.6	259	0.10	2.3	0.46	<0.01	0.02	0.46	14.4	20.1	5.7	1.4	None
80	294427	IGB	Gabbro intrusion	9.6	166	0.12	2.7	0.18	<0.01	0.01	0.18	5.6	14.5	8.9	2.6	None
81	267679	IQD	Quartz diorite intrusion	9.6	286	0.31	7.0	0.27	<0.01	0.01	0.27	8.4	19.1	10.7	2.3	Slight
82	267691	FDQ	Felsic dykes - granitic	9.2	449	1.18	26.8	0.37	0.01	0.02	0.36	11.3	30.1	18.9	2.7	Strong
83	267709	IQD	Quartz diorite intrusion	9.5	265	0.08	1.8	0.27	<0.01	0.01	0.27	8.4	19.1	10.7	2.3	None
84	267729	IQD	Quartz diorite intrusion	9.5	285	0.27	6.1	0.19	0.01	<0.01	0.18	5.6	21.8	16.2	3.9	None

Northcliff Resources-Sisson (ML/ARD) Project, 5-Apr-2011

						Acme		Acme					Mod. ABA NP			
S. No.	**Sample ID**	**Lithocode**	**Rock Type**	**Paste pH (pH Units)**	**Paste EC (µS/cm)**	**CO2 (Wt.%)**	**CaCO3 Equivalents* (Kg CaCO3/tonne)**	**Total Sulphur (Wt.%)**	**Sulphate Sulphur (HCl; Wt.%)**	**Sulphate Sulphur (Na2CO3; Wt. %)**	**Sulphide Sulphur** (Wt.%)**	**Maximum Potential Acidity*** (Kg CaCO3/tonne)**	**Neutralization Potential (Kg CaCO3/Tonne)**	**Net Neutralization Potential**** (Kg CaCO3/tonne)**	**Neutralization Potential Ratio (NPR)***** (dimensionless; no unit)**	**Fizz Rating**
85	267745	IQD	Quartz diorite intrusion	9.6	200	0.10	2.3	0.11	<0.01	0.02	0.11	3.4	10.8	7.4	3.1	None
86	267764	IQD	Quartz diorite intrusion	9.5	160	0.10	2.3	0.09	<0.01	0.01	0.09	2.8	12.7	9.8	4.5	None
87	159466	NOCODE	#N/A	5.3	2080	0.07	1.6	0.49	0.09	0.08	0.40	12.5	0.3	-12.2	0.0	None
88	159492	WKB	Biotite wacke	8.9	430	0.35	8.0	0.13	0.01	0.01	0.12	3.8	16.5	12.8	4.4	Slight
89	159498	WKB	Biotite wacke	9.1	392	0.19	4.3	0.11	<0.01	0.01	0.11	3.4	11.4	8.0	3.3	None
90	159504	WKB	Biotite wacke	8.7	676	0.17	3.9	0.64	0.03	0.02	0.61	19.1	9.8	-9.3	0.5	None
91	159583	SST	Siltstone	9.6	376	0.22	5.0	0.36	0.01	0.01	0.35	10.9	22.3	11.4	2.0	None
92	159591	WKB	Biotite wacke	8.6	438	3.52	80.0	0.47	0.01	0.02	0.46	14.4	58.5	44.1	4.1	Strong
93	159617	MTF	Mafic tuff	9.5	451	0.34	7.7	0.72	0.01	0.03	0.71	22.2	24.2	2.0	1.1	None
94	161507	MTF	Mafic tuff	8.9	640	0.37	8.4	1.01	0.02	0.03	0.99	30.9	19.3	-11.7	0.6	None
95	161517	MTF	Mafic tuff	8.9	484	0.14	3.2	0.23	<0.01	0.01	0.23	7.2	18.0	10.8	2.5	None
96	161540	MTF	Mafic tuff	8.6	716	0.20	4.5	0.69	0.01	0.03	0.68	21.3	19.0	-2.3	0.9	None
97	166379	IGB	Gabbro intrusion	9.3	349	0.32	7.3	0.51	0.01	0.02	0.50	15.6	42.5	26.9	2.7	Slight
98	166387	IGB	Gabbro intrusion	9.4	439	0.37	8.4	0.30	0.01	0.01	0.29	9.1	39.9	30.8	4.4	None
99	166398	IGB	Gabbro intrusion	9.9	380	0.11	2.5	0.19	<0.01	<0.01	0.19	5.9	37.3	31.3	6.3	None
100	166436	IGB	Gabbro intrusion	8.9	595	1.23	28.0	0.80	0.02	0.02	0.78	24.4	45.5	21.1	1.9	Strong
101	166453	IGB	Gabbro intrusion	9.9	344	0.15	3.4	0.17	<0.01	<0.01	0.17	5.3	30.0	24.7	5.6	None
102	166466	IGB	Gabbro intrusion	9.0	411	0.28	6.4	0.65	0.01	0.03	0.64	20.0	32.7	12.7	1.6	Slight
103	166485	IGB	Gabbro intrusion	9.3	291	1.43	32.5	0.42	0.01	0.02	0.41	12.8	51.5	38.7	4.0	Strong
104	184002	IGB	Gabbro intrusion	9.9	454	0.46	10.5	0.09	<0.01	0.01	0.09	2.8	41.0	38.2	14.6	None
105	184039	FTA	Felsic tuff with augen	9.5	357	0.33	7.5	0.23	<0.01	0.01	0.23	7.2	10.3	3.1	1.4	None
106	6803	WKB	Biotite wacke	4.1	1220	0.09	2.0	1.13	0.51	0.55	0.62	19.4	2.5	-16.9	0.1	None
107	6808	WKB	Biotite wacke	8.1	905	0.38	8.6	1.05	0.03	0.04	1.02	31.9	8.8	-23.1	0.3	None
108	6814	WKB	Biotite wacke	7.9	1750	0.16	3.6	2.92	0.06	0.08	2.86	89.4	6.7	-82.7	0.1	None
109	6917	WKB	Biotite wacke	9.2	396	0.24	5.5	0.84	0.01	0.02	0.83	25.9	10.9	-15.1	0.4	None
110	6923	WKB	Biotite wacke	8.8	497	1.38	31.4	0.47	0.01	0.03	0.46	14.4	18.5	4.2	1.3	None
111	63207	WKB	Biotite wacke	9.0	416	0.54	12.3	0.66	0.01	0.02	0.65	20.3	10.9	-9.4	0.5	None
112	63212	WKB	Biotite wacke	9.6	311	0.22	5.0	0.24	<0.01	<0.01	0.24	7.5	10.8	3.3	1.4	None
113	63221	FTQ	Felsic tuff w/quartz	8.3	717	0.68	15.5	0.80	0.01	0.03	0.79	24.7	17.0	-7.7	0.7	Slight
114	63230	NOCODE	#N/A	8.2	448	0.16	3.6	0.68	0.01	0.02	0.67	20.9	3.9	-17.1	0.2	None
115	63237	NOCODE	#N/A	8.4	366	0.11	2.5	0.42	0.01	0.01	0.41	12.8	10.4	-2.4	0.8	None
116	63248	NOCODE	#N/A	8.6	458	0.18	4.1	0.59	0.01	0.02	0.58	18.1	10.9	-7.3	0.6	None
117	163102	IQD	Quartz diorite intrusion	9.4	268	0.45	10.2	0.25	0.01	0.01	0.24	7.5	24.8	17.3	3.3	None
118	163128	IQD	Quartz diorite intrusion	8.5	313	1.63	37.0	0.36	<0.01	0.01	0.36	11.3	42.9	31.6	3.8	Moderate
119	163139	IQD	Quartz diorite intrusion	8.4	533	1.85	42.0	1.32	0.01	0.03	1.31	40.9	55.3	14.3	1.4	Strong
120	163158	IQD	Quartz diorite intrusion	9.1	324	0.34	7.7	0.49	0.01	0.02	0.48	15.0	20.6	5.6	1.4	None
121	163178	IQD	Quartz diorite intrusion	9.9	253	0.12	2.7	0.07	<0.01	<0.01	0.07	2.2	15.9	13.7	7.3	None
122	163204	IQD	Quartz diorite intrusion	9.7	272	0.05	1.1	0.09	<0.01	0.01	0.09	2.8	10.2	7.4	3.6	None
123	163205	IQD	Quartz diorite intrusion	9.3	381	0.30	6.8	0.37	0.01	0.02	0.36	11.3	11.3	0.0	1.0	None
124	163224	IQD	Quartz diorite intrusion	10.1	238	0.09	2.0	0.04	<0.01	<0.01	0.04	1.3	13.7	12.4	10.9	None
125	163241	IQD	Quartz diorite intrusion	9.6	255	0.12	2.7	0.17	<0.01	<0.01	0.17	5.3	11.3	5.9	2.1	None
126	163253	IQD	Quartz diorite intrusion	9.6	142	0.11	2.5	0.07	<0.01	<0.01	0.07	2.2	10.7	8.5	4.9	None

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Northcliff Resources-Sisson (ML/ARD) Project, 5-Apr-2011

						Acme		Acme					Mod. ABA NP			
S. No.	Sample ID	Lithocode	Rock Type	Paste pH (pH Units)	Paste EC (µS/cm)	CO2 (Wt.%)	CaCO3 Equivalents* (Kg CaCO3/tonne)	Total Sulphur (Wt.%)	Sulphate Sulphur (HCl; Wt.%)	Sulphate Sulphur (Na2CO3; Wt. %)	Sulphide Sulphur** (Wt.%)	Maximum Potential Acidity*** (Kg CaCO3/tonne)	Neutralization Potential (Kg CaCO3/Tonne)	Net Neutralization Potential**** (Kg CaCO3/tonne)	Neutralization Potential Ratio (NPR)***** (dimensionless; no unit)	Fizz Rating
127	163272	IGB	Gabbro intrusion	9.5	263	0.20	4.5	0.23	<0.01	<0.01	0.23	7.2	23.6	16.4	3.3	None
128	163278	IGB	Gabbro intrusion	9.3	272	0.58	13.2	0.28	<0.01	<0.01	0.28	8.8	29.2	20.4	3.3	Slight
129	5395	FTQ	Felsic tuff w/quartz	8.0	1099	0.39	8.9	0.57	0.07	0.07	0.50	15.6	2.5	-13.1	0.2	None
130	5407	FTQ	Felsic tuff w/quartz	7.7	831	0.11	2.5	0.24	0.02	0.03	0.22	6.9	6.8	-0.1	1.0	None
131	5423	FTQ	Felsic tuff w/quartz	8.8	382	0.17	3.9	0.35	<0.01	0.02	0.35	10.9	6.2	-4.7	0.6	None
132	5434	FTQ	Felsic tuff w/quartz	9.1	244	0.45	10.2	0.06	<0.01	<0.01	0.06	1.9	9.1	7.3	4.9	Slight
133	5448	FTQ	Felsic tuff w/quartz	9.3	110	0.06	1.4	0.06	<0.01	<0.01	0.06	1.9	2.5	0.6	1.3	None
134	5461	FTQ	Felsic tuff w/quartz	9.7	203	0.11	2.5	0.06	<0.01	<0.01	0.06	1.9	4.5	2.6	2.4	None
135	5472	FTQ	Felsic tuff w/quartz	9.4	206	0.14	3.2	0.35	<0.01	0.02	0.35	10.9	10.4	-0.6	0.9	None
136	5487	FTQ	Felsic tuff w/quartz	9.8	318	0.26	5.9	0.19	<0.01	0.02	0.19	5.9	14.0	8.1	2.4	None
137	5499	FTQ	Felsic tuff w/quartz	9.6	230	0.28	6.4	0.11	<0.01	0.01	0.11	3.4	22.3	18.8	6.5	Slight
138	5508	FTA	Felsic tuff with augen	8.7	475	0.62	14.1	0.59	0.01	0.02	0.58	18.1	23.3	5.2	1.3	Slight
139	5523	FTQ	Felsic tuff w/quartz	9.7	363	0.15	3.4	0.29	0.01	0.01	0.28	8.8	18.3	9.5	2.1	None
140	5539	FTQ	Felsic tuff w/quartz	9.6	388	0.17	3.9	0.21	0.01	0.01	0.20	6.3	17.5	11.3	2.8	None
141	5546	FTQ	Felsic tuff w/quartz	9.9	315	0.18	4.1	0.10	<0.01	0.01	0.10	3.1	13.6	10.5	4.4	None
142	5560	NOCODE	#N/A	9.1	308	0.58	13.2	0.18	0.01	0.02	0.17	5.3	18.5	13.2	3.5	Slight
143	82973	FTQ	Felsic tuff w/quartz	8.3	113	0.03	0.7	0.03	<0.01	<0.01	0.03	0.9	5.6	4.7	6.0	None
144	82982	FTQ	Felsic tuff w/quartz	9.2	105	<0.02	<0.5	0.08	<0.01	<0.01	0.08	2.5	8.5	6.0	3.4	None
145	82983	FTQ	Felsic tuff w/quartz	9.2	81	<0.02	<0.5	<0.02	<0.01	<0.01	<0.02	<0.6	5.1	5.1	#N/A	None
146	83007	FTA	Felsic tuff with augen	9.1	208	0.12	2.7	0.28	<0.01	0.01	0.28	8.8	12.3	3.5	1.4	None
147	83018	FTQ	Felsic tuff w/quartz	8.4	546	2.04	46.4	0.66	0.08	0.02	0.58	18.1	59.8	41.7	3.3	Strong
148	83027	FTQ	Felsic tuff w/quartz	8.8	258	0.42	9.5	0.26	<0.01	0.01	0.26	8.1	23.3	15.1	2.9	Slight
149	83037	IGB	Gabbro intrusion	8.4	654	0.15	3.4	0.62	0.01	0.02	0.61	19.1	17.1	-1.9	0.9	None
150	83060	IGB	Gabbro intrusion	9.0	255	0.06	1.4	0.18	<0.01	0.01	0.18	5.6	7.4	1.8	1.3	None
151	83079	IGB	Gabbro intrusion	9.2	134	0.06	1.4	0.09	<0.01	<0.01	0.09	2.8	11.5	8.7	4.1	None
152	923631	IGB	Gabbro intrusion	10.1	450	0.04	0.9	0.15	0.12	<0.01	0.03	0.9	22.3	21.4	23.8	None
153	923641	IGB	Gabbro intrusion	9.3	183	0.43	9.8	0.45	<0.01	0.01	0.45	14.1	20.3	6.2	1.4	Slight
154	923651	IGB	Gabbro intrusion	9.9	259	<0.02	<0.5	<0.02	<0.01	<0.01	<0.02	<0.6	15.1	15.1	#N/A	None
155	923659	IGB	Gabbro intrusion	9.9	336	0.05	1.1	0.07	0.05	0.01	0.02	0.6	25.5	24.9	40.8	None
156	923669	IGB	Gabbro intrusion	9.3	262	0.29	6.6	0.38	<0.01	0.01	0.38	11.9	30.3	18.4	2.5	Slight
157	923686	IGB	Gabbro intrusion	9.9	368	0.07	1.6	0.16	<0.01	<0.01	0.16	5.0	20.8	15.8	4.2	None
158	918501	IGB	Gabbro intrusion	9.6	333	0.03	0.7	0.09	<0.01	0.01	0.09	2.8	21.5	18.7	7.7	None
159	918505	IGB	Gabbro intrusion	9.7	444	0.04	0.9	0.28	0.01	0.02	0.27	8.4	20.3	11.8	2.4	None
160	918509	IGB	Gabbro intrusion	9.4	388	<0.02	<0.5	0.24	<0.01	0.01	0.24	7.5	17.8	10.3	2.4	None
161	918517	IGB	Gabbro intrusion	9.9	388	0.07	1.6	0.08	<0.01	<0.01	0.08	2.5	19.8	17.3	7.9	None
162	918522	IGB	Gabbro intrusion	9.9	458	0.07	1.6	0.26	0.01	0.01	0.25	7.8	21.0	13.2	2.7	None
163	918529	IGB	Gabbro intrusion	9.9	366	0.04	0.9	0.07	<0.01	0.01	0.07	2.2	22.8	20.6	10.4	None
164	918540	IGB	Gabbro intrusion	9.5	418	0.10	2.3	0.99	0.01	0.01	0.98	30.6	25.0	-5.6	0.8	None
165	918555	FTA	Felsic tuff with augen	9.7	346	0.07	1.6	0.28	<0.01	<0.01	0.28	8.8	18.5	9.8	2.1	None
166	918613	FTA	Felsic tuff with augen	9.9	308	0.03	0.7	0.12	<0.01	<0.01	0.12	3.8	11.0	7.3	2.9	None
167	918618	FTQ	Felsic tuff w/quartz	9.9	287	0.06	1.4	0.08	<0.01	<0.01	0.08	2.5	6.6	4.1	2.7	None
168	918625	WKS	sericite	9.2	298	0.08	1.8	0.84	<0.01	0.01	0.84	26.3	8.3	-18.0	0.3	None

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Northcliff Resources-Sisson (ML/ARD) Project, 5-Apr-2011

						Acme		Acme					Mod. ABA NP			
S. No.	**Sample ID**	**Lithocode**	**Rock Type**	**Paste pH (pH Units)**	**Paste EC (µS/cm)**	**CO2 (Wt.%)**	**CaCO3 Equivalents* (Kg CaCO3/tonne)**	**Total Sulphur (Wt.%)**	**Sulphate Sulphur (HCl; Wt.%)**	**Sulphate Sulphur (Na2CO3; Wt. %)**	**Sulphide Sulphur** (Wt.%)**	**Maximum Potential Acidity*** (Kg CaCO3/tonne)**	**Neutralization Potential (Kg CaCO3/Tonne)**	**Net Neutralization Potential**** (Kg CaCO3/tonne)**	**Neutralization Potential Ratio (NPR)***** (dimensionless; no unit)**	**Fizz Rating**
169	918629	FTQ	Felsic tuff w/quartz	9.9	283	0.11	2.5	0.12	<0.01	<0.01	0.12	3.8	4.4	0.6	1.2	None
170	81541	WKB	Biotite wacke	9.1	117	0.10	2.3	0.35	<0.01	<0.01	0.35	10.9	9.4	-1.5	0.9	Slight
171	81584	MTF	Mafic tuff	9.0	123	0.59	13.4	0.13	<0.01	<0.01	0.13	4.1	16.3	12.2	4.0	Moderate
172	81627	IGB	Gabbro intrusion	9.4	116	0.08	1.8	<0.02	<0.01	<0.01	<0.02	<0.6	10.5	10.5	#N/A	None
173	125848	WKS	sericite	5.9	1090	2.04	46.4	1.06	0.03	0.05	1.03	32.2	10.8	-21.4	0.3	None
174	125856	WKS	sericite	8.3	297	0.96	21.8	0.57	<0.01	<0.01	0.57	17.8	11.2	-6.7	0.6	Slight
175	125859	WKS	sericite	6.9	870	1.92	43.6	2.55	0.02	0.03	2.53	79.1	9.3	-69.8	0.1	None
176	125869	WKS	sericite	7.3	373	1.64	37.3	1.17	<0.01	0.01	1.17	36.6	9.9	-26.7	0.3	None
177	119932	MTF	Mafic tuff	8.4	987	0.43	9.8	1.09	0.02	0.03	1.07	33.4	13.3	-20.2	0.4	Slight
178	119938	FTQ	Felsic tuff w/quartz	9.4	302	0.40	9.1	0.11	<0.01	<0.01	0.11	3.4	14.9	11.4	4.3	Slight
179	119943	FTQ	Felsic tuff w/quartz	9.1	366	0.27	6.1	0.21	<0.01	0.01	0.21	6.6	8.0	1.4	1.2	None
180	295917	FTQ	Felsic tuff w/quartz	9.0	149	0.18	4.1	0.77	<0.01	<0.01	0.77	24.1	7.1	-16.9	0.3	Slight
181	295921	FTQ	Felsic tuff w/quartz	8.8	160	0.84	19.1	0.42	<0.01	<0.01	0.42	13.1	18.9	5.7	1.4	Moderate
182	295926	FTQ	Felsic tuff w/quartz	9.2	120	0.29	6.6	0.10	0.08	<0.01	0.02	0.6	7.0	6.4	11.2	Slight
183	295938	FTQ	Felsic tuff w/quartz	9.8	139	0.28	6.4	0.11	<0.01	0.02	0.11	3.4	9.6	6.2	2.8	Slight
184	295958	FTQ	Felsic tuff w/quartz	9.3	162	0.36	8.2	0.20	<0.01	0.01	0.20	6.3	8.3	2.0	1.3	Slight
Detection Limits				*0.5*	*1.0*	*0.02*	*0.5*	*0.02*	*0.01*	*0.01*	*0.02*	*0.6*				
Maxxam SOP No:				*7160*		*LECO*	*Calculation*	*LECO*	*7410*	*Na2CO3 Leach Method*	*Calculation*	*Calculation*	*7150*	*Calculation*	*Calculation*	*7150*

Notes:

Total sulphur and carbonate carbon (CO2; HCl direct method) by Leco done at Acme Labs.

Paste pH & Paste EC were conducted on the same slurry sample.

CO2 Analysis: A 0.2g pf pulp sample is digested with 6 ml of 1.8N HCl in a hot water bath of 70 ˚C for 30 minutes. The CO2 that evolves is trapped in a gas chamber that is controled with a stopcock, once the stopcock is is opened the CO2 gas is swept into the Leco analyser with a oxygen carrier gas. Leco then determines the CO2 as total-carbon which is calculated to total CO2.

Calculations:

*CaCO3 Equivalent is based on Carbonate carbon (CO2).

**Sulphide sulphur is based on difference between total sulphur and sulphate sulphur (by HCl leach).

***MPA (Maximum Potential Acidity) is based on sulphide sulphur .

**** Net Neutralization Potential (NNP) is based on difference between Neutralization Potential (NP) and Maximum Potential Acidity (MPA).

***** Neutralization Potential Ratio (NPR) is based on NP divided by MPA.

References:

Reference for Mod ABA NP method (Maxxam SOP No. 7150): MEND Acid Rock Drainage Prediction Manual, MEND Project 1.16.1b (pages 6.2-11 to 17), March 1991.

B2: Trace Element Analysis Results

Maxxam

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Northcliff Resources-Sisson (ML/ARD) Project, 5-Apr-2011

S. No.	Sample	Lithocode	Rock Type	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Au	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	B	Al	Na	K	W	Sc	Tl	S	Hg	Se	Te	Ga	Maxxam Hg
	ID			PPM	PPM	PPM	PPM	PPB	PPM	PPM	PPM	%	PPM	PPM	PPB	PPM	PPM	PPM	PPM	PPM	PPM	%	%	PPM	PPM	%	PPM	%	PPM	%	%	%	PPM	PPM	PPM	%	PPB	PPM	PPM	PPM	mg/kg
1	157849	FDQ	Felsic dykes - granitic	8.27	98.2	86.26	115.2	1078	3.5	3.6	436	1.11	55.2	1.7	0.5	13.8	10.7	0.72	0.15	3.28	9	0.1	0.012	18	9.6	0.16	21.8	0.024	<20	1	0.079	0.45	4.8	1.5	0.38	0.04	<5	0.3	<0.02	3.6	<0.01
2	157853	FDQ	Felsic dykes - granitic	41.6	191.02	375.76	2032.3	4757	9.9	8.8	1167	2.56	883.6	2.1	6.9	11.8	18.7	24.3	0.88	9.52	26	0.18	0.025	13.8	17.4	0.46	23.1	0.018	<20	1.47	0.046	0.57	42.8	2.6	0.84	1.05	11	0.2	0.05	5	<0.01
3	157872	IQD	Quartz diorite intrusion	1.79	110.28	5.96	50	138	34.8	21.3	526	3.3	16.5	1.3	0.6	5.4	163.4	0.06	0.03	0.54	99	1.9	0.071	22.7	41	1.69	214.5	0.309	<20	3.34	0.515	0.96	10.1	7.2	0.85	0.2	<5	0.2	<0.02	9.9	<0.01
4	157883	IQD	Quartz diorite intrusion	0.65	49.4	3.3	40.7	35	34.9	20	329	2.76	1.1	1.3	1.5	5.2	123.7	0.02	<0.02	0.23	93	1.82	0.046	16.9	34.3	1.47	150.5	0.268	<20	2.79	0.401	0.72	16.8	6	0.53	0.12	<5	<0.1	<0.02	7.9	<0.01
5	157886	IQD	Quartz diorite intrusion	11.48	47.35	36.6	92.6	104	39.4	20.8	643	3.1	2	1.3	0.3	5.6	126.8	0.48	0.02	0.34	101	1.91	0.044	18.3	39.4	1.74	161.4	0.303	<20	3.26	0.41	0.95	17.8	7.4	0.9	0.1	<5	<0.1	<0.02	9.9	<0.01
6	157899	IQD	Quartz diorite intrusion	87.19	135.15	53.7	59.3	508	7.5	7.3	814	1.59	4	4.5	<0.2	16.2	33.8	0.39	0.07	2.34	24	0.99	0.009	20.5	13.5	0.44	19.8	0.048	<20	1.18	0.094	0.4	>100.0	2.5	0.48	0.3	25	0.3	0.06	5.2	<0.01
7	157906	IQD	Quartz diorite intrusion	3.03	81.22	51.97	126.1	469	2.5	5	381	1.12	30.9	3	0.5	16.8	24.2	1.29	0.19	1.42	9	0.73	0.006	21.3	7.5	0.1	19.7	0.018	<20	0.84	0.103	0.45	19	1.2	0.51	0.44	<5	0.2	<0.02	4.1	<0.01
8	157910	IQD	Quartz diorite intrusion	3.5	40.32	15.77	16.6	153	1.3	1.7	264	0.69	2.3	1.8	<0.2	13.2	19.8	0.11	0.16	0.32	5	0.45	0.003	16.6	8.1	0.09	12.8	0.016	<20	0.66	0.103	0.31	1.7	1	0.2	0.11	<5	0.3	<0.02	3.1	<0.01
9	157915	IQD	Quartz diorite intrusion	4.07	88.09	10.76	19.2	135	5.8	5.1	204	1.23	2.1	2.4	<0.2	15.7	43.9	0.08	0.03	0.49	15	0.77	0.012	20	12.3	0.27	22.1	0.063	<20	1.23	0.193	0.37	10	2.3	0.19	0.22	<5	0.3	<0.02	5.4	<0.01
10	157919	IQD	Quartz diorite intrusion	1.32	185.95	27.05	117.1	311	40	21.6	649	3.31	0.7	1.3	<0.2	4.5	140.8	0.68	<0.02	1.5	90	1.9	0.06	18.6	38.8	1.73	155	0.284	<20	3.19	0.345	0.77	23.5	7.2	0.75	0.32	<5	<0.1	<0.02	9.8	0.05
11	157924	IQD	Quartz diorite intrusion	604.75	581.6	120.38	487.8	4295	32.6	32.9	5618	9.2	1330.2	1.5	8.6	5.3	38.3	5.29	3.66	32.17	84	3.61	0.074	15.6	35.3	1.87	22.4	0.071	<20	4.02	0.01	0.5	10.1	6.4	1.31	2.62	6	1.1	0.66	17.9	<0.01
12	157931	IQD	Quartz diorite intrusion	1.73	49.21	3.35	51.6	35	19.8	17.1	395	3.49	0.4	1.3	0.2	6.5	88.2	0.01	<0.02	0.62	102	1.34	0.108	31.2	23.3	1.45	268.4	0.323	<20	2.47	0.293	1.03	1.9	5.3	0.38	0.18	<5	<0.1	<0.02	8.7	0.03
13	157939	IQD	Quartz diorite intrusion	8.35	125.91	3.69	64	97	18.3	12.9	584	3.31	1.2	1	0.6	9.3	115.7	0.02	0.03	1.6	84	2.18	0.094	35	19.4	1.39	160	0.312	<20	3.3	0.28	0.87	58.5	5.8	1	0.19	<5	<0.1	<0.02	11.2	<0.01
14	157946	IQD	Quartz diorite intrusion	3.59	59.66	3.48	54.7	38	46.2	21.2	544	3.11	20.5	1.7	1.1	6	147.6	0.04	0.08	0.34	87	2.31	0.046	20.1	55.3	1.94	125.7	0.318	<20	3.69	0.401	0.98	34.9	7.5	1.16	0.13	<5	0.2	<0.02	11	<0.01
15	159254	IQD	Quartz diorite intrusion	106.53	262.24	57.76	111.2	1520	27.6	20.7	1012	3.65	2917.6	1	41.7	4.4	79	0.6	19.47	11.58	81	1.49	0.064	17.8	21.5	1.28	124.9	0.165	<20	2.57	0.158	0.69	40.8	4.5	1.08	0.46	13	0.9	0.26	10.3	<0.01
16	163746	MTF	Mafic tuff	6.13	341.42	11.34	521.9	606	29.4	19.7	2345	5.51	20.2	2.2	2.2	10.2	22.5	6.26	0.63	6.4	121	0.8	0.073	29.6	45.9	1.51	111.4	0.174	<20	3.02	0.027	1.2	4.5	9.5	1.97	0.91	<5	0.6	0.17	12.5	<0.01
17	163754	MTF	Mafic tuff	53.16	71.25	75.63	358.4	686	14.6	10.2	1895	2.68	64.6	3.7	1.1	13.6	28.8	3.39	0.24	4.17	55	1.29	0.049	30.3	24	0.86	28.4	0.038	<20	1.71	0.046	0.44	10.4	4.1	0.61	0.38	<5	0.3	0.07	7.2	<0.01
18	163760	IGB	Gabbro intrusion	13.62	44.68	6.22	86.8	78	45.6	25	2664	5.37	24.6	1.2	0.7	5.7	93.4	0.09	1.08	0.61	102	3.37	0.087	22.3	67.8	1.77	23.9	0.042	<20	3.21	0.016	0.53	0.5	8.7	0.87	0.63	<5	0.3	0.02	10.9	<0.01
19	163765	IGB	Gabbro intrusion	168.08	523.44	78.14	295.1	1898	32	20.4	1877	4.67	176	1.7	3.5	7.2	59.5	2.46	4.24	29.56	88	1.91	0.106	21.9	40.8	1.31	54.6	0.126	<20	2.39	0.073	0.63	40.8	8	1.23	0.93	<5	0.3	0.18	9.5	<0.01
20	163770	IGB	Gabbro intrusion	159.17	86.42	11.54	142.6	184	37.4	23.3	891	4.26	59	3.1	0.7	10.8	86.4	0.64	0.1	8.49	133	1.28	0.074	21.1	56.1	1.99	178.7	0.403	<20	3.23	0.233	1.47	>100.0	9.2	1.58	0.25	*	0.3	0.03	12.6	<0.01
21	163776	IGB	Gabbro intrusion	101.15	63.96	7.82	149.1	157	41.6	24.5	1647	5.16	4.1	1.1	<0.2	5.4	99.1	0.24	0.08	0.42	166	2.53	0.123	15.1	70	2.57	122.3	0.342	<20	4.44	0.278	1.52	4.2	15.5	1.43	0.21	<5	0.2	0.05	14.3	<0.01
22	163781	IGB	Gabbro intrusion	46.61	55.46	3.25	33.7	77	10.9	6.6	297	1.84	5.8	5.2	<0.2	7.3	48.6	<0.01	0.05	0.6	41	1.05	0.029	13.3	19.3	0.66	47	0.162	<20	1.67	0.163	0.54	>100.0	5.2	0.55	0.11	<5	0.2	<0.02	7.2	<0.01
23	163789	IGB	Gabbro intrusion	115.45	172.18	94.1	128.1	1064	14.7	11.7	1151	2.92	54.9	5	0.6	10.7	49.4	0.74	0.57	2.95	65	1.3	0.078	22.8	25	1.03	85.1	0.192	<20	1.89	0.086	0.6	>100.0	5.2	0.84	0.34	<5	0.2	0.07	8.2	<0.01
24	163802	IGB	Gabbro intrusion	25.21	54.81	3.06	44.1	31	40.4	28.5	301	3.46	1.4	1.4	<0.2	3.8	312.5	<0.01	<0.02	0.26	144	2.51	0.071	14.3	50.1	1.7	175.5	0.29	<20	4.27	0.504	1.13	37.8	5.9	1.02	0.22	<5	0.2	<0.02	10.9	<0.01
25	163806	IGB	Gabbro intrusion	1320.1	72.24	2.3	54.9	44	80.2	28.9	394	3.43	1.3	2.7	<0.2	3.6	138	<0.01	0.04	0.35	102	1.39	0.1	14.7	80.3	2.11	89.2	0.337	<20	3.3	0.319	1.38	48.5	5.5	1.58	0.22	<5	0.6	0.03	9.5	<0.01
26	163815	WKB	Biotite wacke	10.3	141.3	9.45	64.4	300	23.6	21.9	1631	4.81	6.4	0.8	<0.2	2.9	255	0.07	0.09	0.39	154	3.9	0.175	16.4	33.7	1.69	41.7	0.194	<20	4.45	0.387	0.53	19.8	9.2	0.6	0.43	<5	0.1	0.02	13.5	<0.01
27	163818	FDQ	Felsic dykes - granitic	103.75	71.3	8.11	21.1	214	4.3	4.4	336	1.44	2.1	4.2	<0.2	34.7	23	<0.01	0.06	0.46	21	0.47	0.03	40.7	9.9	0.43	23.9	0.091	<20	0.98	0.106	0.15	13.7	3.2	0.17	0.18	<5	0.1	<0.02	5.5	<0.01
28	267584	WKB	Biotite wacke	19.83	994.8	14.91	64.2	824	27.1	11.9	98	3.08	286.5	3.3	2.7	9	6.2	0.48	6.73	47.05	21	0.08	0.033	15	16.2	0.11	43.6	0.002	<20	0.98	0.011	0.35	6.8	2.4	1.48	1.76	60	1.1	0.21	2.9	0.06
29	267610	WKS	Biotite wacke with sericite	0.87	82.8	9.44	66	42	27.3	12.8	393	3.21	3.4	1.1	1.6	8	7.3	0.14	0.04	12.28	35	0.18	0.046	23.1	31.2	0.84	93.8	0.132	<20	1.99	0.033	1.03	1.3	3.2	1.38	0.17	<5	0.3	0.11	6.5	<0.01
30	267616	WKB	Biotite wacke	0.91	219.06	3.92	40.7	76	29.9	13.7	453	3.19	2.4	1.3	2.2	9.7	11.2	0.04	0.06	8.66	33	0.38	0.072	27.3	31.3	0.86	88	0.115	<20	2.18	0.022	1.13	3.9	3.4	1.66	0.19	<5	0.3	0.06	6.2	<0.01
31	82337	IQD	Quartz diorite intrusion	4.42	35.16	3.27	46.3	23	5.2	6.6	347	2.36	1.5	0.9	<0.2	9.3	14.3	0.09	0.06	0.41	32	0.56	0.063	20.7	14	0.57	37.1	0.208	<20	1.43	0.046	0.51	51.7	5	0.49	0.07	<5	0.1	<0.02	8.2	<0.01
32	82601	FTQ	Felsic tuff w/quartz	1.33	71.37	2.49	29.9	27	5	9.7	317	2.22	0.9	4.9	0.6	8.6	6.4	0.02	0.04	0.4	65	0.44	0.043	5.4	14.3	0.54	34	0.195	<20	1.1	0.047	0.52	5.5	6.9	0.62	0.14	<5	0.4	<0.02	6.9	<0.01
33	162251	IGB	Gabbro intrusion	3.89	43.89	3.84	51.8	56	16.7	15.7	518	3.23	1.3	0.9	0.3	6.7	47	0.06	0.02	0.56	88	1.06	0.091	26.7	23.8	1.44	262.2	0.354	<20	2.3	0.175	1.09	21.6	5.3	0.48	0.06	<5	0.2	<0.02	8	<0.01
34	162265	IGB	Gabbro intrusion	42.74	143.75	3.57	54.4	202	22.9	19.2	583	4.14	9.5	2.6	0.6	5.2	67.3	0.02	0.05	0.37	127	1.55	0.117	19.7	25.4	1.58	103.1	0.284	<20	2.7	0.194	0.73	>100.0	8.3	0.49	0.41	13	0.3	<0.02	10.5	<0.01
35	162273	IGB	Gabbro intrusion	13.5	39.04	11.15	68.1	130	24.7	14.9	1350	3.59	385.7	1	6.6	11.2	30.6	0.03	2.94	0.27	53	3.99	0.062	19.1	41	0.99	13	0.08	<20	2.09	0.006	0.32	0.9	6.6	0.5	0.23	<5	0.5	<0.02	7.7	<0.01
36	162286	IQD	Quartz diorite intrusion	27.75	43.58	12.41	72.8	119	30.7	15.7	938	3.39	1.3	1.4	3.9	5.3	63.5	0.14	0.08	0.23	104	1.07	0.082	18.1	34.4	1.7	116.6	0.263	<20	2.45	0.191	0.87	>100.0	5.8	0.98	0.1	<5	0.4	<0.02	9.7	<0.01
37	162293	IQD	Quartz diorite intrusion	16.65	165.27	251.59	847.1	1663	31.1	21.5	4488	4.89	33.7	1.5	1.9	6.8	32.8	7.97	0.65	3.08	120	1.4	0.1	25.1	26.2	1.96	68.2	0.195	<20	2.67	0.06	0.36	92.3	7.3	0.6	0.9	<5	0.4	0.04	11.2	<0.01
38	162308	IQD	Quartz diorite intrusion	3.31	28.05	3.52	37.1	24	18.4	13.7	371	2.82	1.6	2.2	1.2	4.9	48.4	0.03	0.03	0.24	79	1.36	0.079	14.3	11.8	1.13	104.6	0.226	<20	2.17	0.164	0.7	>100.0	5.9	0.81	0.06	<5	0.2	<0.02	9	<0.01
39	162315	IQD	Quartz diorite intrusion	17.24	19.14	2.87	51.7	16	32.4	18	515	3.45	0.3	1.3	1.1	5.6	62.8	0.02	<0.02	0.19	91	1.38	0.061	15.4	21.2	1.84	156	0.287	<20	2.86	0.198	1.25	>100.0	5.2	1.56	<0.02	<5	0.3	0.03	10.7	<0.01
40	162332	IQD	Quartz diorite intrusion	2.94	42.71	4.16	52.9	60	22.2	16	528	3.26	3.1	2	<0.2	7.5	58.4	0.03	0.12	0.33	102	1.63	0.08	19.4	17.9	1.34	50	0.226	<20	2.23	0.153	0.39	>100.0	5.7	0.47	0.21	<5	0.3	0.02	9.1	<0.01
41	162340	IQD	Quartz diorite intrusion	2.38	38.54	2.37	52.4	24	30.3	18.3	452	3.41	0.5	1.1	<0.2	5.8	74.5	0.02	0.05	0.13	106	1.31	0.146	23.3	29.6	1.49	133	0.263	<20	2.42	0.212	0.79	>100.0	4.3	0.8	0.11	<5	0.4	0.02	9.2	<0.01
42	162352	IQD	Quartz diorite intrusion	24.11	62.86	2.59	50	50	31.2	18.4	423	3.48	0.2	1.1	0.4	6.8	61.9	0.01	<0.02	0.19	99	1.2	0.101	28.1	30.2	1.55	242.4	0.302	<20	2.44	0.188	1.07	>100.0	5.2	1.08	0.12	<5	0.2	<0.02	9.5	<0.01
43	162363	IQD	Quartz diorite intrusion	3.41	75.93	2.5	48.3	72	16.4	17.3	345	3.66	0.3	1.5	<0.2	6.9	84	0.03	<0.02	0.42	112	1.35	0.173	24.5	16.1	1.24	169.2	0.234	<20	2.34	0.245	0.9	69.8	4.9	0.91	0.17	<5	0.4	0.08	9.1	<0.01
44	162379	IQD	Quartz diorite intrusion	22.97	53.25	2.34	44.5	31	42.8	16.9	374	2.91	0.3	1.2	0.3	5.9	61.3	<0.01	<0.02	0.22	89	1.14	0.063	22.3	52.2	1.45	208.8	0.268	<20	2.37	0.201	0.93	56.5	4.9	0.93	0.1	<5	0.3	0.04	8.6	<0.01
45	162387	IQD	Quartz diorite intrusion	4.63	59.2	2.69	45.6	41	38	17.6	370	2.81	<0.1	1.2	<0.2	6.9	69.2	0.03	0.02	0.2	82	1.16	0.063	25.7	44.2	1.34	209.2	0.253	<20	2.17	0.191	0.76	52.2	4	0.72	0.2	<5	0.3	<0.02	7.5	<0.01
46	162394	IQD	Quartz diorite intrusion	10.48	86.47	4.88	66	146	33	19	940	3.98	229.3	0.7	5.9	5.6	68.1	0.06	2	0.29	104	2.23	0.094	24.4	38.8	1.67	60.1	0.237	<20	3.15	0.121	0.52	31.6	8.5	0.69	0.31	<5	0.5	<0.02	13.8	<0.01
47	162406	IQD	Quartz diorite intrusion	23.13	327.66	2.55	71.8	286	31.5	18.6	604	4.23	0.5	1.1	1.3	4.7	90.8	0.11	0.03	3.62	126	1.33	0.101	17.3	41.6	1.86	207.5	0.342	<20	3.32	0.253	1.51	53.4	8.3	2.02	0.29	<5	0.2	0.05	11.7	<0.01
48	162421	IQD	Quartz diorite intrusion	2.38	92.38	3.35	59.4	168	40.8	18.7	681	3.16	1.1	2.1	<0.2	6.6	82.2	0.06	0.03	0.3	81	1.15	0.063	20	47.5	1.77	228.9	0.282	<20	2.73	0.255	1.18	>100.0	5.1	1.35	0.14	<5	0.3	0.04	9.9	<0.01
49	185738	IGB	Gabbro intrusion	404.55	75.7	5.78	81.5	131	17.1	15.2	721	3.88	14.7	2.3	1.1	8	57	0.12	0.29	1.48	94	0.94	0.107	23	19.8	1.5	105.4	0.278	<20	2.68	0.192	0.85	>100.0	5.7	1.06	0.08	<5	0.4	0.12	11.2	<0.01
50	185748	IGB	Gabbro intrusion	1.38	87.46	2.39	44.9	55	16	17.3	371	3.57	0.7	1.2	<0.2	4.1	89.4	0.04	0.05	0.44	106	1.3	0.112	20.3	17.1	1.3	184.7	0.269	<20	2.47	0.311	0.88	14.5	6.2	0.73	0.26	<5	0.4	0.04	8.5	<0.01
51	185763	IGB	Gabbro intrusion	2.46	54.83	37.47	131.9	514	16.7	17.8	1530	3.74	6.7	0.9	1	4.3	67.4	0.66	0.13	0.87	115	1.71	0.122	21.8	18.7	1.42	111.9	0.215	<20	2.46	0.194	0.52	11.2	5.8	0.53	0.38	<5	0.4	0.05	9.6	<0.01
52	185776	IGB	Gabbro intrusion	3.79	394.9	32.97	308.3	1241	15.8	15.4	1937	4.57	21.8	1.1	0.9	5.8	29.5	1.1	0.17	1.54	105	0.82	0.094	15.5	15.4	1.69	35	0.274	<20	2.8	0.08	0.42	>100.0	7.6	0.62	0.11	<5	0.3	0.14	12.3	<0.01
53	185788	IGB	Gabbro intrusion	1381.1	353.96	3.1	61.9	231	21.7	20.6	466	4.3	2	1.6	1	6.4	73.6	<0.01	0.04	1.19	125	1.18	0.134	26.6	28.7	1.57	139.5	0.306	<20	2.85	0.259	1.2	90.4	7.7	1.67	0.57	<5	0.7	0.26	11.6	<0.01
54	185789	IGB	Gabbro intrusion	9.77	103.2	2.27	57.7	45	19.8	17.2	403	3.83	2.5	1.5	<0.2	5	74.6	0.02	0.04	0.36	117	1.28	0.13	21.4	29.7	1.47	187.9	0.306	<20	2.65	0.245	1.05	48.6	6	1.29	0.27	<5	0.4	0.06	10.4	<0.01
55	185795	IGB	Gabbro intrusion	175.77	123.28	2.84	52.8	90	19.5	16.8	385	3.41	0.7	2.3	<0.2	7.1	75.8	<0.01	0.04	0.24	101	1.54	0.125	23.4	29.5	1.37	122.9	0.253	<20	2.55	0.257	0.67	53.8	5.2	0.64	0.13	<5	0.4	<0.02	9.6	<0.01
56	296670	OBA	#N/A	2.55	64.49	4.51	132.6	60	23.5	12	729	4.19	5.7	2.3	0.7	7.6	34.6	0.28	0.25	0.5	90	0.64	0.093	18.8	30.2	1.15	24.9	0.087	<20	2.1	0.041	0.29	1	6.9	0.41	0.07	<5	0.3	0.02	10.1	<0.01
57	296679	FTQ	Felsic tuff w/quartz	0.59	20.71	7.85	113.5	31	29.3	13.1	686	2.47	3	1.1	<0.2	5.6	54.7	0.3	0.15	0.78	72	1.31	0.063	16.5	48.1	1.22	54.9	0.211	<20	2.02	0.177	0.66	1.9	4.7	0.77	0.05	<5	0.3	0.02	8.1	<0.01
58	296687	MTF	Mafic tuff	20.67	920.72	574.61	1229.6	6620	11	19.9	759	4.1	23.4	1.8	0.9	8.6	5.1	14.47	4.41	25.6	18	0.24	0.037	5.8	5.3	0.29	21.7	0.002	<20	0.87	0.006	0.26	5.2	1.3	1.02	3.26	7	1.8	1.08	3.4	0.01
59	296696	MTF	Mafic tuff	9.49	241.89	187.13	1495	2808	6.1	7.6	882	2.31	19.2	3.6	1	13.3	21.1	14.49	0.37	8.04	13	0.94	0.034	17.2	5.5	0.33	17.2	0.002	<20	0.98	0.008	0.31	11.1	1.3	0.59	1.08	<5	0.9	0.2	3.2	<0.01
60	296706	IGB	Gabbro intrusion	134.87	309.96	4.08	79.8	578	37.9	17.4	567	4.01	5.8	2.8	0.6	14.2	7.7	0.33	0.41	4.26	46	0.23	0.027	17.2	35.6	0.99	54.8	0.085	<20	2.16	0.015	0.66	1.7	2.5	0.85	0.68	<5	0.5	1.54	6	<0.01
61	296711	IGB	Gabbro intrusion	9.19	76.29	50.52	166.3	364	47.1	22.7	1063	4.87	5.1	0.7	0.6	8.4	52.5	0.97	0.36	0.99	131	1.3	0.095	15.3	74.5	2.3	198	0.269	<20	3.31	0.094	1.26	2.8	8.8	1.37	0.48	<5	0.4	0.05	12.7	<0.01
62	296720	IGB	Gabbro intrusion	176.31	399.38	13.67	93	718	54.2	21.3	959	3.99	11.7	1.2	0.9	9.1	144.5	0.24	0.62	1.61	91	1.91	0.242	45.7	47.5	1.88	161.9	0.208	<20	2.26	0.078	0.45	>100.0	5.5	0.79	0.73	<5	0.5	0.11	10.4	<0.01
63	296733	IGB	Gabbro intrusion	>2000.0	55.93	2.69	54	51	28.7	20.2	235	3.61	0.3	1.1	0.5	4	98.5	<0.01	0.09	0.62	133	1.43	0.132	19.4	60.5	1.45	135.1	0.275	<20	2.89	0.268	0.98	46.5	4.3	1.35	1.18	<5	3.4	0.24	9.8	<0.01
64	296740	IGB	Gabbro intrusion	21.82	72.33	1.94	64.3	38	21	24.2	430	4.76	1.2	0.8	<0.2	3.2	70.5	0.02	0.03	0.27	181	1.23	0.254	12.2	26.6	2.46	197.2	0.425	<20	4.04	0.211	2.4	30.2	17.9	2.51	0.11	<5	0.5	0.08	14.4	<0.01
65	165252	IGB	Gabbro intrusion	8.04	35.67	2.42	47.1	24	29.6	20	273	3.42	0.7	0.8	0.4	3.7	176.8	<0.01	0.04	0.18	136	1.69	0.113	16.3	42.7	1.54	125.7	0.266	<20	3.33	0.355	1.07	>100.0	4.4	1.18	0.12	<5	0.3	0.06	10	<0.01

Maxxam

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Northcliff Resources-Sisson (ML/ARD) Project, 5-Apr-2011

S. No.	Sample ID	Lithocode	Rock Type	Mo PPM	Cu PPM	Pb PPM	Zn PPM	Ag PPB	Ni PPM	Co PPM	Mn PPM	Fe %	As PPM	U PPM	Au PPB	Th PPM	Sr PPM	Cd PPM	Sb PPM	Bi PPM	V PPM	Ca %	P %	La PPM	Cr PPM	Mg %	Ba PPM	Ti %	B PPM	Al %	Na %	K %	W PPM	Sc PPM	Tl PPM	S %	Hg PPB	Se PPM	Te PPM	Ga PPM	Maxxam Hg mg/kg
66	165261	IGB	Gabbro intrusion	853.88	11.06	2.41	84.5	13	57.9	22	570	4.07	0.6	2.1	0.2	5.4	133.4	<0.01	0.05	0.13	121	1.87	0.065	13.1	65.7	2.43	197.4	0.384	<20	4.69	0.414	2	>100.0	9.3	2.31	0.08	<5	0.4	0.03	14.4	<0.01
67	165267	IGB	Gabbro intrusion	23.81	21.66	2.31	64	14	66.6	27.3	363	3.72	0.9	2.3	0.3	2.1	172.3	<0.01	0.03	0.14	123	2.55	0.112	8.7	130.8	2.38	162.1	0.321	<20	5.19	0.441	1.78	48.9	7.5	1.97	0.05	<5	0.2	<0.02	13.7	<0.01
68	165277	IGB	Gabbro intrusion	11.64	243.18	6.08	58.9	408	82.5	30.6	2276	4.31	21.9	0.6	0.5	2.1	149.8	0.12	1.63	0.65	125	2.26	0.11	10.7	74.8	2.16	80	0.113	<20	3.78	0.29	0.86	25.9	5.8	1.28	0.63	<5	0.5	0.04	11	<0.01
69	165283	IGB	Gabbro intrusion	119.62	158.94	2.55	49.7	81	76	33.2	259	3.51	0.5	0.7	0.7	3.8	274.6	<0.01	0.02	0.76	98	2.57	0.06	9.4	96.1	2.11	144.5	0.253	<20	5.36	0.53	1.49	61.1	2.6	1.92	0.26	<5	0.4	0.31	12	<0.01
70	165291	IGB	Gabbro intrusion	0.62	99.39	2.71	43	46	35.5	23.4	245	3.57	0.3	0.5	<0.2	2.4	230.5	0.02	<0.02	0.35	116	2.36	0.179	10	47.2	1.54	133.3	0.216	<20	4.43	0.484	1.14	2.1	3.4	1.57	0.26	<5	0.4	0.04	11	<0.01
71	165304	IGB	Gabbro intrusion	168.08	819.12	5417.7	4170.1	37639	59	28.9	1249	4.1	1457.5	0.9	26.9	3.4	178.5	38.32	3.26	66.01	79	2.23	0.029	10	68.2	1.97	80.5	0.146	<20	3.78	0.299	1.02	>100.0	5.9	2.39	1.5	<5	1.9	1.78	10.9	<0.01
72	294268	FTA	Felsic tuff with augen	1.91	155.4	9.34	48.6	296	9.8	13.3	582	2.74	2.6	2	0.6	16.4	17.2	0.25	0.12	1.29	57	0.54	0.044	27.7	19.2	0.67	36.3	0.13	<20	1.28	0.067	0.48	2.6	4.9	0.56	0.53	<5	0.4	0.05	6.4	<0.01
73	294277	FTA	Felsic tuff with augen	2.4	163.97	124.11	377.7	1511	5.5	17.7	2651	5.85	9.6	1.1	0.4	8.3	48.2	3.36	0.22	3.32	170	2.17	0.133	23.8	13.2	1.24	32.8	0.193	<20	2.61	0.056	0.66	19	13.6	0.99	0.75	<5	0.3	0.06	11.1	<0.01
74	294292	MTF	Mafic tuff	73.82	893.51	372.97	1237	5780	13.9	14.5	895	3.99	748.9	2.9	6.7	9.8	33.6	14.49	2.74	44.28	14	0.67	0.041	10.5	6.8	0.24	17.4	0.004	<20	1.18	0.008	0.43	16	1.3	1.01	2.82	17	1	1.58	3.6	0.01
75	294302	IGB	Gabbro intrusion	3.1	23.95	211.63	420.5	597	33.9	18.5	1567	3.96	9.6	2.6	<0.2	8.9	67.7	4.04	0.45	1.58	98	2.22	0.077	20.9	61.2	2.14	142.2	0.213	<20	3.11	0.142	1.07	14	10.4	1.04	0.21	<5	<0.1	0.02	10.6	<0.01
76	294309	IGB	Gabbro intrusion	7.47	47.77	3.48	82.4	52	24.8	18.1	732	4.1	1.9	1.6	0.9	8.6	72.1	0.02	0.03	0.85	138	1.22	0.089	22.6	33.1	2	218.6	0.385	<20	3.25	0.238	1.64	14.3	8.9	1.51	0.21	<5	<0.1	0.05	11.1	0.01
77	294336	IGB	Gabbro intrusion	2.97	134.11	11.01	76.5	194	36.9	28.8	923	5.08	8.2	0.9	<0.2	4.6	75.4	0.05	0.15	0.44	193	1.38	0.114	9.8	46.7	2.66	218.8	0.378	<20	3.99	0.158	1.98	1.5	17.5	1.96	0.45	<5	0.1	0.1	12.7	<0.01
78	294368	IGB	Gabbro intrusion	5.2	30.12	3.11	63.2	32	76.3	22.4	658	3.94	5.7	1.4	<0.2	4.4	148.3	0.02	0.14	0.21	99	1.86	0.086	14.1	71.8	2.41	85.8	0.336	<20	3.36	0.199	0.7	34.8	5.8	0.73	0.1	<5	<0.1	0.02	10.8	<0.01
79	294407	IGB	Gabbro intrusion	77.11	152.78	3.14	57.3	54	34.6	24.6	386	4.45	0.9	0.6	<0.2	1.6	281.2	<0.01	0.03	1.88	166	2.38	0.137	12.7	56.3	1.71	120.7	0.305	<20	5.05	0.566	1.49	95.5	7.1	2.02	0.44	<5	0.2	0.15	14.1	<0.01
80	294427	IGB	Gabbro intrusion	1.92	80.97	2.18	28.9	60	167	24	249	1.87	0.7	1.2	<0.2	6	186.2	0.03	<0.02	0.48	30	1.64	0.046	14.8	165.4	1.71	88.2	0.152	<20	2.57	0.206	0.63	3	3.5	0.9	0.17	<5	0.2	0.05	5.3	<0.01
81	267679	IQD	Quartz diorite intrusion	68.31	107.83	3.05	47.9	82	19.1	18.9	651	3.69	2.1	1.9	<0.2	5.1	78.2	<0.01	0.04	1.37	108	1.55	0.116	19.6	18.8	1.32	107.5	0.256	<20	2.53	0.23	0.92	80.3	8.2	1.07	0.27	<5	0.2	0.07	10.4	<0.01
82	267691	FDQ	Felsic dykes - granitic	9.27	99.84	8.83	22.9	268	5	5.8	360	1.53	3.9	2.1	<0.2	13.7	18.4	0.12	0.4	1.86	15	1.29	0.019	19.2	11.8	0.37	13.1	0.078	<20	0.86	0.106	0.27	9.8	2.2	0.29	0.4	<5	0.4	0.04	4.4	<0.01
83	267709	IQD	Quartz diorite intrusion	9.14	153.97	2.51	72.6	67	28.3	20.6	664	4.6	0.9	1.3	<0.2	5.7	98.8	0.03	<0.02	11.87	136	1.71	0.11	21.7	26.8	1.86	137.8	0.386	<20	3.59	0.26	1.39	>100.0	7.9	1.82	0.25	<5	0.1	0.04	13.8	<0.01
84	267729	IQD	Quartz diorite intrusion	39.6	400.85	2.68	65	338	38.8	19.7	544	4.01	1	1.3	<0.2	5.5	90.2	0.18	<0.02	0.98	116	1.62	0.103	21.3	51.7	1.84	134.8	0.316	<20	3.15	0.242	1.18	90.8	8.2	1.42	0.19	<5	0.3	0.13	11.5	<0.01
85	267745	IQD	Quartz diorite intrusion	40.57	45.94	2.4	47.9	32	39.2	18.8	428	3.06	0.4	1.1	<0.2	5	65.8	0.01	<0.02	0.26	92	1.19	0.073	28.7	52.7	1.57	228.1	0.286	<20	2.34	0.187	1.07	>100.0	5.6	0.99	0.11	<5	0.2	0.02	8	<0.01
86	267764	IQD	Quartz diorite intrusion	2.57	48.22	1.99	49.3	25	51.5	17.8	462	3.44	0.8	0.6	<0.2	3.5	63.9	<0.01	<0.02	0.03	93	1.25	0.088	21.7	64.2	1.72	205.2	0.319	<20	2.62	0.16	1.29	>100.0	6.1	1.31	0.08	<5	0.1	<0.02	9.7	<0.01
87	159466	NOCODE	#N/A	184.91	239.59	21.25	85.3	536	4.1	4.7	147	1.67	4.4	3.6	<0.2	9.7	3.4	0.6	0.32	10.07	7	0.07	0.022	14	11.7	0.18	21.9	0.002	<20	0.87	0.055	0.34	>100.0	1.2	0.34	0.5	9	0.4	0.19	3.3	<0.01
88	159492	WKB	Biotite wacke	20.49	100.09	17.22	60.2	288	32	13.8	670	3.66	5.7	1.1	<0.2	7.1	10.7	0.06	0.21	15.38	71	0.45	0.05	19.9	71.6	1.52	79.7	0.206	<20	2.58	0.05	1.39	1.8	6.7	1.84	0.13	<5	0.2	0.21	8.8	<0.01
89	159498	WKB	Biotite wacke	32.25	42.06	14.92	88.7	285	32.3	14.6	549	3.82	0.8	1.4	<0.2	7.4	5.8	0.22	0.07	2.58	69	0.16	0.047	20.8	57	1.6	88.5	0.223	<20	2.96	0.05	1.69	5.7	5.7	1.86	0.11	<5	0.2	0.03	9.1	<0.01
90	159504	WKB	Biotite wacke	970.33	135.35	2.42	75.1	52	37.7	18.8	590	4.91	0.7	1.1	<0.2	6.2	6.8	<0.01	0.04	4.49	89	0.2	0.04	16.8	61.7	1.28	120.1	0.259	<20	2.99	0.05	1.77	4.9	7.5	1.89	0.63	<5	0.5	0.1	9.3	<0.01
91	159583	SST	Siltstone	44.45	98.07	2.18	59.1	42	38.4	18.7	521	4.35	1.8	0.8	0.8	6.4	28.1	<0.01	0.07	29.99	127	0.74	0.079	17.8	58	1.43	157.7	0.295	<20	3.08	0.165	1.49	16.6	11	1.59	0.35	<5	0.2	0.09	11.7	<0.01
92	159591	WKB	Biotite wacke	4.55	77.49	6.38	70.7	114	24.6	19.4	1092	3.43	274.8	0.8	4.4	5.8	30.6	0.03	4.48	5.83	46	2.02	0.07	20.9	30.2	0.6	37.8	0.009	<20	1.74	0.015	0.53	21.9	9.2	0.64	0.47	<5	0.3	0.04	6	0.02
93	159617	MTF	Mafic tuff	8.19	147.92	1.83	66.7	72	39.1	23.2	602	5.23	17.2	1.6	2.9	6.3	34.4	0.01	0.16	44.25	162	0.99	0.068	17.3	91.8	1.88	198.1	0.329	<20	3.55	0.248	1.57	21.3	13.7	1.71	0.68	<5	0.6	0.21	13.5	<0.01
94	161507	MTF	Mafic tuff	477.55	367.44	11.2	68.4	375	32.7	18.4	598	4.81	1.2	3	1.8	5.6	12	<0.01	0.1	18.19	113	0.63	0.083	16.3	60.2	1.39	126.3	0.24	<20	2.71	0.08	1.26	>100.0	11.3	1.8	0.94	<5	0.6	0.12	12.4	<0.01
95	161517	MTF	Mafic tuff	3.98	91.77	2.08	61.6	42	33.1	18.3	743	4.42	1.4	0.9	2.7	6.4	12.5	0.01	0.05	4.87	93	0.47	0.055	15.5	63.8	1.67	130.1	0.288	<20	3.13	0.115	1.72	28.9	9.3	1.92	0.22	<5	<0.1	<0.02	11.7	<0.01
96	161540	MTF	Mafic tuff	2.17	235.63	1.97	66.6	65	23.2	22.2	600	5.19	1.8	1.7	2.6	5.8	45.9	0.02	0.03	17.13	161	1.32	0.093	16.1	42.4	1.49	148.4	0.27	<20	3.73	0.287	1.33	52.6	15.2	1.8	0.64	<5	0.4	0.24	14.7	<0.01
97	166379	IGB	Gabbro intrusion	2.04	209.62	6.05	62.5	186	52.7	30.9	396	4.22	8.7	0.3	<0.2	0.9	337.9	0.2	0.13	0.63	190	3.12	0.1	9.6	114.5	1.72	63.1	0.179	<20	6.19	0.589	0.86	2.7	5.5	1.01	0.44	<5	0.2	0.06	15.3	<0.01
98	166387	IGB	Gabbro intrusion	560.7	79.34	4.19	36.4	61	64.2	23.3	380	2.63	2.1	0.7	<0.2	3.2	381.7	<0.01	0.86	0.41	79	3.14	0.032	11	73.9	1.91	108.7	0.2	<20	5.65	0.664	1.07	7.7	6.6	1.15	0.28	<5	0.2	0.11	12.2	<0.01
99	166398	IGB	Gabbro intrusion	3.7	55.28	3.23	51.5	28	60	25.6	331	3.27	1	0.7	<0.2	2.7	285.8	0.01	<0.02	0.53	139	2.7	0.074	11.6	77.3	1.78	102.4	0.297	<20	5.21	0.592	1.22	13.9	6.8	1.19	0.16	<5	0.2	0.02	12.1	<0.01
100	166436	IGB	Gabbro intrusion	57.52	184.03	173.15	466	958	23.2	22.5	1687	4.38	759.9	0.9	6.4	2.9	122	3.62	1.27	1.33	134	2.08	0.158	15.6	28.9	1.52	56.7	0.218	<20	3.09	0.227	0.81	48.8	6.6	1.08	0.77	<5	0.4	0.1	9.8	<0.01
101	166453	IGB	Gabbro intrusion	4.11	33.08	3.41	57.9	24	24.9	24.4	359	4.78	1.4	0.7	0.3	2.6	245.9	0.01	<0.02	0.18	183	2.48	0.171	14.5	41.1	1.95	118.8	0.41	<20	5.11	0.583	1.65	14.2	7.3	1.16	0.15	<5	<0.1	<0.02	13.9	<0.01
102	166466	IGB	Gabbro intrusion	728.71	104.37	8.18	94.8	205	25.9	26.4	728	4.63	4.3	0.7	<0.2	4	192.3	0.06	0.08	0.68	238	2.27	0.107	14.9	30.8	1.67	65.5	0.393	<20	4.06	0.4	0.72	22.2	6.1	0.77	0.63	<5	0.4	<0.02	11.1	<0.01
103	166485	IGB	Gabbro intrusion	4.78	64.64	28.99	183	350	33.8	22.6	1518	4.62	5.1	0.8	<0.2	5.1	96.6	0.87	0.05	1.39	149	2.48	0.125	18.1	53.5	2.07	67.5	0.31	<20	4.15	0.269	0.93	32.6	9.4	0.92	0.37	<5	0.2	0.05	13.5	<0.01
104	184002	IGB	Gabbro intrusion	119.43	31.17	3.16	81.7	41	24.2	19	900	4.07	2.1	1.6	<0.2	6.8	82.3	<0.01	0.02	0.36	133	1.43	0.106	19.7	30.4	1.96	140.6	0.448	<20	3.55	0.331	1.71	55.5	11	1.54	0.08	<5	<0.1	0.04	11.4	<0.01
105	184039	FTA	Felsic tuff with augen	765.88	53.91	10.73	47.7	140	4.6	4.3	626	1.54	3.1	4.6	<0.2	20	12.4	<0.01	0.05	1	25	0.47	0.028	29.5	10.1	0.36	20.4	0.078	<20	0.91	0.102	0.26	55.8	3.5	0.22	0.25	<5	0.5	0.06	5.1	<0.01
106	6803	WKB	Biotite wacke	11.31	1216.1	4.13	60.5	722	24.8	19.5	237	2.69	2.1	3.5	36.1	6.5	25.1	0.5	0.34	231.77	50	0.23	0.033	13.5	77.1	0.57	88.5	0.081	<20	1.39	0.08	0.62	52.2	2.3	0.6	1.14	6	1.6	5.35	4.5	0.01
107	6808	WKB	Biotite wacke	14.69	535.29	14.89	91.4	886	26.3	15.6	752	4.6	2.2	2.2	11.8	10.3	4.3	0.51	0.32	21.63	52	0.4	0.048	30.6	61.2	0.84	47.9	0.054	<20	2.09	0.012	0.58	>100.0	5.3	0.96	0.97	<5	1.1	0.32	7.9	<0.01
108	6814	WKB	Biotite wacke	16.11	4986.1	319.24	546.5	11688	23.2	15.3	452	4.93	2	1.8	81.2	4.4	3.9	6.09	1.3	722.55	34	0.28	0.024	7.9	62.7	0.6	47.9	0.043	<20	1.45	0.01	0.77	>100.0	2.9	1.14	2.34	<5	2.3	3.01	6.8	<0.01
109	6917	WKB	Biotite wacke	66.19	170.5	5.44	41.7	68	35.3	15	383	3.82	0.1	1.4	4.2	5.2	11.4	<0.01	0.09	9.84	43	0.23	0.035	13.7	56.7	0.85	82	0.114	<20	2.09	0.032	0.95	2.7	2.6	1.15	0.82	<5	0.7	0.19	5.8	<0.01
110	6923	WKB	Biotite wacke	18.34	176.82	5.54	71.7	144	24.7	10.8	689	2.97	83.7	1.2	2	8.9	17.3	0.08	3.36	6.06	21	0.45	0.049	19.1	50.1	0.54	53.8	0.028	<20	1.43	0.014	0.55	1.3	2	0.65	0.47	<5	0.2	0.09	4	<0.01
111	63207	WKB	Biotite wacke	4.4	108.56	2.72	60.6	67	37.7	17	495	4.31	4.7	1.1	1.8	4.1	17	0.02	0.25	2.16	61	0.25	0.035	13	56	1.04	98.2	0.172	<20	2.47	0.035	1.22	34.1	4.5	1.67	0.6	<5	0.2	0.12	7.6	<0.01
112	63212	WKB	Biotite wacke	3.22	68.1	2.11	40.1	24	33.8	13.8	516	3.3	0.2	0.8	1.2	5.3	13.6	0.02	0.04	2.64	57	0.19	0.034	14.4	69.8	1.09	97	0.165	<20	2.41	0.056	1.2	0.8	4.6	1.24	0.26	<5	<0.1	0.06	7.9	<0.01
113	63221	FTQ	Felsic tuff w/quartz	12.13	583.3	15.18	91.4	589	5.9	8.4	535	2.49	9.8	4.3	0.9	14.9	13.1	0.83	0.44	16.6	12	0.7	0.028	36.7	48.5	0.27	27.8	0.009	<20	1.01	0.037	0.34	>100.0	2.7	0.26	0.77	<5	1.4	0.43	6.1	<0.01
114	63230	NOCODE	#N/A	6.56	465.31	11.13	79	670	2.9	7.3	247	1.84	<0.1	3.3	2.5	11.1	4.3	0.75	0.16	10.19	12	0.21	0.02	18.2	7.4	0.23	19.7	0.043	<20	0.59	0.026	0.17	32.2	2	0.19	0.67	6	0.8	0.34	4.3	0.01
115	63237	NOCODE	#N/A	0.62	831.45	2.5	66.2	491	20.8	16.1	508	3.33	0.2	2.5	4.4	8.7	35.8	0.22	<0.02	4.88	78	0.86	0.111	29.2	31.1	1.3	165.3	0.274	<20	2.09	0.112	1	>100.0	4.9	1.24	0.38	<5	0.5	0.19	8.7	2.32
116	63248	NOCODE	#N/A	2.45	282.94	1.43	88.9	190	45	21.2	655	4.26	0.1	0.9	1.4	3.1	29.5	0.14	0.11	5.5	106	0.87	0.056	11	95.9	1.94	92.1	0.34	<20	2.8	0.173	1.55	77.5	8.9	2.64	0.61	<5	0.4	0.09	10.7	0.06
117	163102	IQD	Quartz diorite intrusion	2.25	102.65	14.04	85.3	303	21.6	17.1	807	3.76	7	1.1	0.6	5.2	109.5	0.39	18.18	2.53	119	1.44	0.134	24.1	21.9	1.47	151.2	0.25	<20	2.53	0.216	0.84	25	5.1	1.18	0.26	<5	0.2	0.03	9.2	0.01
118	163128	IQD	Quartz diorite intrusion	7.39	98.07	48.43	126.6	785	42.3	21.4	2764	4.44	188.5	1.4	6.1	4.9	38.9	0.63	3.19	2.48	105	1.79	0.05	16.8	51.5	2.41	71.8	0.13	<20	3.21	0.05	0.59	>100.0	7.4	0.77	0.36	<5	0.2	0.06	11.4	0.01
119	163139	IQD	Quartz diorite intrusion	65.98	257	232.34	1623.6	2712	30.7	23.1	5212	5.88	188.3	2.9	1.7	3.7	43.7	21.87	0.45	4.15	133	1.99	0.088	20.9	28.9	2.32	68.8	0.104	<20	3.37	0.053	0.81	>100.0	9.9	1.25	1.27	<5	0.5	0.05	13.2	0.01
120	163158	IQD	Quartz diorite intrusion	7.85	214.75	7.78	111.3	449	18.9	20.2	784	3.62	2.8	4.5	1.2	5.1	125.6	1.02	0.12	11.06	107	1.52	0.104	19.5	18.6	1.43	132.6	0.256	<20	2.88	0.312	0.76	>100.0	5.7	1.17	0.51	<5	0.3	0.33	9.9	<0.01
121	163178	IQD	Quartz diorite intrusion	1.85	29.74	2.58	39	23	41.6	16.3	388	2.41	0.6	1.5	<0.2	4.4	74.6	0.02	0.34	0.08	62	1.27	0.033	13.9	52.6	1.54	186	0.277	<20	2.38	0.251	0.89	30.6	4.2	0.47	0.08	<5	<0.1	<0.02	7.3	0.01
122	163204	IQD	Quartz diorite intrusion	119.2	40.77	3.94	35.7	71	9.2	8.4	428	2.52	0.5	2.9	<0.2	13.3	26.7	<0.01	0.07	0.19	60	0.86	0.055	30.4	10.4	0.86	84.5	0.231	<20	1.78	0.14	0.7	>100.0	5.6	0.73	0.09	<5	<0.1	<0.02	7.7	<0.01
123	163205	IQD	Quartz diorite intrusion	147.53	128.95	12.73	39.6	377	8.2	9	811	2.51	1.7	3.6	<0.2	15.8	20.7	0.07	0.05	0.5	51	0.82	0.05	30.5	8.6	0.79	36.6	0.178	<20	1.54	0.093	0.47	67.5	4.6	0.4	0.36	<5	0.3	0.05	7.1	<0.01
124	163224	IQD	Quartz diorite intrusion	0.78	11.64	3.01	42.2	19	11.8	11.3	354	2.88	0.3	2.5	<0.2	7.3	63.7	<0.01	0.02	0.09	69	0.98	0.098	27	14.6	1.21	163.1	0.249	<20	2.09	0.212	0.9	6.1	1	0.38	0.03	<5	<0.1	<0.02	6.6	0.01
125	163241	IQD	Quartz diorite intrusion	348.64	146.86	2.74	47	148	11.6	11.9	409	3	0.4	1	<0.2	5.9	36.8	<0.01	0.03	0.33	77	0.81	0.074	24.5	12.8	1.13	242.4	0.276	<20	1.99	0.157	0.83	>100.0	5.8	0.67	0.19	<5	0.3	0.13	7.8	<0.01
126	163253	IQD	Quartz diorite intrusion	1.52	33.48	7.45	38.2	45	9.1	9.3	456	2.57	0.3	1.8	<0.2	14.2	23.7	0.03	0.03	0.12	57	1.35	0.062	32.8	10.8	0.88	42.6	0.248	<20	1.78	0.111	0.45	20.8	4.1	0.24	0.07	<5	0.1	<0.02	7.5	<0.01
127	163272	IGB	Gabbro intrusion	4.32	50.41	21.27	70.8	152	34.9	20.1	1003	3.12	3.6	0.6	0.3	2.9	218.3	0.25	0.07	0.15	109	2.5	0.075	14.7	22.4	1.63	66.5	0.237	<20	3.88	0.475	0.47	86.3	6.9	0.47	0.25	<5	0.2	<0.02	10.5	<0.01
128	163278	IGB	Gabbro intrusion	11.68	72.32	31.54	99.3	333	40.5	19.7	806	3.22	153.1	0.6	0.9	2.3	201.5	0.57	0.26	0.69	110	2.42	0.045	11.3	43.7	1.81	66.6	0.225	<20	3.73	0.41	0.65	>100.0	7.9	0.8	0.28	<5	<0.1	0.09	11	<0.01
129	5395	FTQ	Felsic tuff w/quartz	11.51	334.21	58.97	188.5	1422	29	12.9	673	3.48	2.8	1.8	0.9	6.1	4.2	1.53	0.22	6.3	29	0.11	0.041	15.6	25.9	0.64	42.9	0.083	<20	1.49	0.011	0.66	2.4	1.9	0.91	0.57	<5	0.5	0.52	4.3	<0.01
130	5407	FTQ	Felsic tuff w/quartz	17.29	73.02	8.06	86.6	111	45.7	15.7	725	4.25	6.5	1.5	0.2	6	6.8	0.31	0.65	0.73	74	0.2	0.047	17.2	94.2	1.32	104	0.202	<20	2.61	0.046	1.23	7.1	7.4	1.39	0.24	<5	0.2	0.03	9.3	<0.01

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Northcliff Resources-Sisson (ML/ARD) Project, 5-Apr-2011

S. No.	Sample ID	Lithocode	Rock Type	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Au	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	B	Al	Na	K	W	Sc	Tl	S	Hg	Se	Te	Ga	Maxxam Hg
				PPM	PPM	PPM	PPM	PPB	PPM	PPM	PPM	%	PPM	PPM	PPB	PPM	PPM	PPM	PPM	PPM	PPM	%	%	PPM	PPM	%	PPM	%	PPM	%	%	%	PPM	PPM	PPM	%	PPB	PPM	PPM	PPM	mg/kg
131	5423	FTQ	Felsic tuff w/quartz	166.15	230.74	4.01	43.3	211	2.5	4.2	217	1.37	0.4	4	0.8	12.8	5.1	0.27	0.03	1.57	5	0.24	0.003	20.3	7.1	0.21	21.8	0.024	<20	0.55	0.051	0.22	>100.0	2.8	0.12	0.39	<5	0.4	0.2	4.1	<0.01
132	5434	FTQ	Felsic tuff w/quartz	38.81	53.93	6.51	38.1	92	1.5	1.7	180	0.79	2.3	4.2	<0.2	15.6	6.2	0.21	0.08	2.73	4	0.38	0.003	26.1	21.3	0.14	10.4	0.004	<20	0.42	0.031	0.16	14.1	2.2	0.12	0.08	7	0.3	0.22	3	<0.01
133	5448	FTQ	Felsic tuff w/quartz	421.58	18.9	2.98	34.4	16	1.3	1.3	161	0.8	0.5	3.9	0.4	13.2	1.4	<0.01	0.03	1.18	6	0.1	0.003	14.7	19.6	0.21	4	0.053	<20	0.36	0.01	0.08	13.1	3.8	0.06	0.06	<5	0.5	0.02	4.9	<0.01
134	5461	FTQ	Felsic tuff w/quartz	26.02	54.55	3.69	47.8	83	20.4	8.7	521	2.86	0.6	2.7	0.5	12.6	3.7	0.07	0.04	1.41	61	0.16	0.015	17.5	52.8	0.89	67.3	0.276	<20	1.73	0.044	1.03	2.1	10.7	1.45	0.07	<5	0.2	0.06	10.7	<0.01
135	5472	FTQ	Felsic tuff w/quartz	16.99	61.63	2.09	52	32	32	16.5	389	3.63	0.9	1.4	<0.2	6.6	40.7	<0.01	0.04	0.48	85	0.68	0.057	14.7	60.7	1.25	129.1	0.267	<20	2.62	0.142	1.28	24.5	6.3	1.26	0.35	<5	0.4	0.02	8.4	<0.01
136	5487	FTQ	Felsic tuff w/quartz	18.76	63.56	2.02	58.7	30	21.5	15.1	454	3.87	0.5	1	0.6	6.4	30.2	0.01	0.02	1.44	110	0.8	0.102	23.3	50.2	1.38	200.9	0.331	<20	2.6	0.112	1.51	>100.0	7.7	1.71	0.19	<5	0.2	0.09	10.5	<0.01
137	5499	FTQ	Felsic tuff w/quartz	94.66	29.92	12.57	54.3	70	15.2	11.9	843	3.74	0.9	2.3	0.2	11	23.2	0.03	0.05	1.42	101	0.82	0.091	22.3	45.1	1.64	106.7	0.306	<20	2.57	0.119	1.16	1.6	10	1.27	0.11	<5	0.5	0.07	11.6	0.01
138	5508	FTA	Felsic tuff with augen	32.14	293.55	45.68	212.8	756	26	13.6	1862	3.8	4	2.8	0.7	14.2	12.6	1.8	0.15	4.19	70	0.77	0.054	34	51.5	1.3	42.2	0.128	<20	1.98	0.043	0.68	69.3	5.6	0.86	0.62	<5	0.5	0.18	9.1	<0.01
139	5523	FTQ	Felsic tuff w/quartz	2.84	98.67	1.81	102.5	56	16.9	18.6	841	4.2	0.8	0.4	<0.2	1.7	18.7	0.1	<0.02	0.38	152	1.34	0.126	11.7	26.4	1.37	57	0.378	<20	1.96	0.16	1.02	97.7	9.1	1.12	0.31	<5	0.2	<0.02	10.1	<0.01
140	5539	FTQ	Felsic tuff w/quartz	71.52	76.74	7.93	80.9	185	27.1	17.5	1267	4.56	0.4	5.7	0.5	8.7	14.9	0.12	0.07	1.34	142	0.71	0.064	19.3	63.8	1.49	98.9	0.444	<20	2.53	0.111	1.38	>100.0	13.8	1.84	0.24	<5	0.6	0.05	15.2	<0.01
141	5546	FTQ	Felsic tuff w/quartz	53.08	36.45	18.74	47.2	125	14.2	7.3	569	1.9	0.2	10.1	1	11	18.5	0.14	0.04	0.4	47	0.87	0.056	8.3	27.5	0.66	27.6	0.175	<20	1.47	0.126	0.58	>100.0	5.6	0.58	0.11	16	<0.1	<0.02	8.4	<0.01
142	5560	NOCODE	#N/A	114.45	57.46	21.56	61.1	200	7.6	8.7	925	2.65	2.6	1.8	0.4	16.6	11.7	0.22	0.17	0.23	59	0.75	0.045	24.9	41.4	0.65	33.4	0.151	<20	1.38	0.071	0.54	>100.0	6.8	0.55	0.19	14	0.3	<0.02	8.2	<0.01
143	82973	FTQ	Felsic tuff w/quartz	7.57	66.29	2.65	40.2	33	7.7	9.2	381	2.44	0.5	6.6	0.9	12	12.2	0.06	0.05	2.75	56	0.24	0.05	20.5	9.5	0.74	74.8	0.218	<20	1.34	0.035	0.73	>100.0	6	0.97	0.03	*	<0.1	0.05	7.2	<0.01
144	82982	FTQ	Felsic tuff w/quartz	185	32.96	1.41	49.4	16	26.9	18.5	546	4.25	<0.1	1.6	0.6	8.8	10.3	<0.01	<0.02	1.64	133	0.59	0.113	21.9	54.2	1.3	134.7	0.411	<20	2.15	0.051	1.54	>100.0	10.7	1.76	0.07	13	0.3	0.05	11.8	<0.01
145	82983	FTQ	Felsic tuff w/quartz	5.61	11.15	2.06	34	9	25.1	12.5	371	2.97	0.4	1.2	<0.2	9	8.3	0.02	0.02	0.54	80	0.29	0.028	16.5	57	0.92	81.3	0.32	<20	1.79	0.039	1.08	4.4	7.9	1.41	<0.02	<5	<0.1	<0.02	9.3	<0.01
146	83007	FTA	Felsic tuff with augen	81.65	113.66	2.15	55.1	37	19.2	15.3	663	4	0.4	2.4	0.9	11.6	20.9	<0.01	0.04	2.73	91	0.95	0.091	37.6	23.5	1.35	98.9	0.33	<20	2.04	0.075	0.9	>100.0	5.4	1.22	0.26	*	0.1	<0.02	10.2	<0.01
147	83018	FTQ	Felsic tuff w/quartz	16.45	221.37	88.01	250.1	762	29.7	21.9	1771	5.4	22.9	1.5	3.1	10.5	21.5	1.84	2.06	76.11	131	2.42	0.101	31.7	59.8	1.76	3.5	0.273	<20	2.76	0.035	0.12	75.8	7.9	0.6	0.59	<5	0.6	0.44	13.8	<0.01
148	83027	FTQ	Felsic tuff w/quartz	0.59	117.76	7.68	93.6	200	48	23.7	699	3.13	4.1	0.4	0.7	3.2	77.4	0.4	0.07	1.91	82	2.24	0.071	9.5	58.4	1.58	17.1	0.253	<20	3.28	0.268	0.16	8.3	3.9	0.27	0.22	<5	<0.1	<0.02	10.5	<0.01
149	83037	IGB	Gabbro intrusion	2.52	106.59	244.41	855.8	1919	91.7	22.4	1472	4.04	1.7	1.3	0.8	8	65.4	8.48	0.11	11.57	76	1.5	0.133	21.3	276.6	1.93	54.6	0.213	<20	3.09	0.184	0.78	>100.0	6.7	2.08	0.56	<5	0.2	0.03	11.1	<0.01
150	83060	IGB	Gabbro intrusion	1.4	90.27	5.24	28.7	77	9.3	8.9	304	2.01	0.2	2.1	1.7	12	38	0.02	0.03	12.24	48	0.88	0.054	17.3	16.2	0.69	35.1	0.155	<20	1.52	0.119	0.49	20.1	3.6	0.52	0.19	5	0.2	<0.02	6.2	<0.01
151	83079	IGB	Gabbro intrusion	122.05	28.55	6.09	61.9	59	22.2	12.6	595	3.04	0.1	1.4	0.2	10.4	39.8	<0.01	0.03	0.86	91	1.17	0.103	19.5	33.3	1.34	43.9	0.274	<20	2.56	0.154	0.9	30	9.5	1.06	0.1	<5	<0.1	<0.02	10.6	<0.01
152	923631	IGB	Gabbro intrusion	0.17	79.34	2.29	58.2	27	62.9	25.9	565	4.09	0.7	0.4	<0.2	2.4	183.2	0.01	<0.02	0.45	129	3.03	0.08	6.7	103.5	2.31	100.7	0.358	<20	6.14	0.457	2.07	5.1	8.2	1.49	0.14	<5	0.1	<0.02	14.4	<0.01
153	923641	IGB	Gabbro intrusion	9.01	188.75	56.85	366.2	956	27.9	20.6	933	3.65	1.6	0.7	0.7	3.2	136.3	3.28	0.15	4.22	116	2.38	0.05	11.2	25.2	1.81	31.4	0.26	<20	3.83	0.225	0.4	18.1	6.1	0.65	0.42	<5	<0.1	0.05	10.5	<0.01
154	923651	IGB	Gabbro intrusion	0.65	11.2	2.14	63.5	12	32.3	18.7	441	2.95	0.5	0.6	<0.2	2.9	97.9	0.01	0.02	0.37	97	2.1	0.102	10.3	45.6	1.53	56.4	0.274	<20	3.38	0.257	0.97	0.5	5.1	0.62	<0.02	<5	<0.1	<0.02	9.8	<0.01
155	923659	IGB	Gabbro intrusion	0.49	17.59	6.03	70.8	48	23.8	16.6	581	2.89	1.4	0.6	<0.2	4	173.5	0.06	0.04	0.63	84	2.76	0.117	10.5	45.8	1.49	62	0.255	<20	4.39	0.394	0.96	8.8	5.6	0.7	0.07	<5	<0.1	<0.02	11.1	<0.01
156	923669	IGB	Gabbro intrusion	3.98	97.62	6.39	92	345	35.7	25.1	743	3.34	0.9	0.5	<0.2	1.8	188.8	0.46	0.22	1.06	87	2.47	0.108	8.4	33.3	1.67	29.4	0.237	<20	3.75	0.298	0.36	4.1	4.4	0.48	0.34	<5	0.2	<0.02	9.3	<0.01
157	923686	IGB	Gabbro intrusion	0.21	98.08	2.22	42.4	37	22.7	19.4	278	3.77	0.4	0.5	<0.2	2.7	234.9	0.03	<0.02	0.52	134	2.33	0.127	9.8	22.7	1.29	74.3	0.233	<20	3.56	0.404	0.69	9.9	3.8	0.67	0.15	<5	<0.1	<0.02	10	<0.01
158	918501	IGB	Gabbro intrusion	8.86	58.14	3.18	42.2	49	24.2	16.7	441	2.79	11.7	0.8	0.4	3.9	88.5	0.06	0.03	9.48	80	2.08	0.138	21.9	29.9	1.03	59.2	0.224	<20	3.03	0.312	0.72	>100.0	5.1	0.75	0.1	<5	0.1	0.03	9.7	<0.01
159	918505	IGB	Gabbro intrusion	7.85	180.33	5.45	50.8	118	33.3	28.8	595	4.01	3.8	0.7	1.4	3	67.9	0.04	0.03	21.7	111	1.65	0.112	17	46	1.53	70.3	0.321	<20	3.09	0.221	1.21	>100.0	8	1.19	0.3	<5	0.3	0.19	11.4	<0.01
160	918509	IGB	Gabbro intrusion	9.13	154.25	3.13	37.5	58	19.9	16.7	413	2.96	2	0.8	3.7	3.8	79.9	0.02	<0.02	30.64	77	1.93	0.113	17	26.8	1.04	43	0.22	<20	3.05	0.304	0.74	83.6	5.7	0.72	0.24	<5	0.3	1.05	9.5	<0.01
161	918517	IGB	Gabbro intrusion	3.88	43.57	2.67	41.7	21	26.6	15.1	436	2.79	5.5	0.8	<0.2	3.8	83.4	0.02	<0.02	1.59	84	2	0.123	15.7	56.5	1.13	60	0.258	<20	3.13	0.325	0.93	11.7	6.5	0.84	0.08	<5	<0.1	<0.02	10.3	<0.01
162	918522	IGB	Gabbro intrusion	37.83	200.34	3.64	61.1	274	37.2	17.3	575	3.99	0.6	1.2	0.6	4.8	64.6	0.09	0.04	7.68	122	1.33	0.098	14.1	81	1.68	107.2	0.354	<20	3.7	0.27	1.71	>100.0	9.7	1.97	0.24	<5	0.1	0.14	13.1	<0.01
163	918529	IGB	Gabbro intrusion	3.09	24.55	4.28	39.9	47	22.6	14.8	509	3.08	1.8	1.2	<0.2	5	85.6	0.02	<0.02	2.8	90	1.77	0.175	23.2	41.3	1.33	124.3	0.26	<20	3.01	0.287	1.11	10.1	6.3	0.98	0.05	<5	0.1	<0.02	10.2	<0.01
164	918540	IGB	Gabbro intrusion	0.64	608.24	6.58	90	593	31.6	26.2	711	5.56	0.9	0.7	1.8	2.8	94.8	0.36	0.08	9.28	152	1.99	0.123	11	45.6	2.22	108.5	0.356	<20	5.02	0.425	1.73	26.6	12.8	3.02	0.9	<5	0.7	0.06	15.5	<0.01
165	918555	FTA	Felsic tuff with augen	11.73	113.62	1.77	54.7	37	10.1	19	686	4.39	0.4	1.4	0.2	7.1	20	0.01	0.04	5.58	148	1.05	0.099	19.8	46.5	1.21	86.7	0.417	<20	2.08	0.111	1.05	>100.0	8.6	1.29	0.28	<5	0.4	<0.02	10.4	<0.01
166	918613	FTA	Felsic tuff with augen	7.65	78.45	2.74	45.9	27	9.5	12.6	532	3.24	0.4	1.3	0.5	9.9	16.5	0.02	<0.02	1.38	101	0.9	0.084	22.6	19.2	0.9	61.7	0.326	<20	1.68	0.108	0.84	>100.0	7.1	0.7	0.11	<5	<0.1	<0.02	8.1	<0.01
167	918618	FTQ	Felsic tuff w/quartz	4.11	30.27	3.92	32.2	27	9.4	6.4	352	1.86	0.8	9.7	<0.2	10.6	6.5	0.01	0.03	0.18	46	0.45	0.032	5.8	94.5	0.5	12.6	0.159	<20	1.06	0.106	0.37	4.2	7.4	0.35	0.08	<5	0.1	<0.02	6.6	<0.01
168	918625	WKS	Biotite wacke with sericite	72.61	69.39	3.18	60.3	51	47.5	19.2	270	4.25	<0.1	1.1	0.3	5.1	8.4	0.01	0.13	0.78	51	0.16	0.018	11.7	85.4	0.98	63.3	0.131	<20	2.44	0.032	0.95	0.6	3.2	0.68	0.72	<5	0.5	<0.02	6.9	<0.01
169	918629	FTQ	Felsic tuff w/quartz	9.25	113.41	5.82	18.5	274	1	1.8	145	0.96	0.5	4.7	1.1	13.1	5.1	0.07	0.04	12.96	4	0.16	0.005	19.9	5.8	0.09	18.6	0.041	<20	0.44	0.07	0.16	1.1	2.8	0.06	0.12	<5	0.4	0.46	3.5	<0.01
170	81541	WKB	Biotite wacke	2.73	50.29	2.75	47.7	27	33	18.5	450	4.21	1.8	1	0.3	6	7.3	0.01	0.05	0.42	99	0.36	0.065	7.7	54.7	1.13	53.8	0.249	<20	2.35	0.021	1.08	0.8	8.2	1.03	0.28	<5	0.2	<0.02	9	<0.01
171	81584	MTF	Mafic tuff	9.28	33.49	2.57	45.2	32	22.8	12.2	471	3.08	7.8	1.6	0.3	10.8	9.2	<0.01	0.53	0.21	71	0.71	0.033	17.7	61.4	0.94	44.7	0.217	<20	1.58	0.017	0.4	29.2	6.7	0.42	0.11	<5	0.2	<0.02	8.3	<0.01
172	81627	IGB	Gabbro intrusion	2.22	1.61	2.03	30.8	11	16.2	10.8	349	2.25	0.4	0.7	<0.2	4.9	40.7	0.02	0.02	0.08	67	1.41	0.121	13.6	24.6	1.07	22.3	0.179	<20	2	0.136	0.35	>100.0	4.4	0.28	<0.02	<5	0.1	<0.02	7.1	<0.01
173	125848	WKS	Biotite wacke with sericite	3.49	226.78	3.39	53.9	216	36.9	14.4	1021	4.07	1.6	1.8	1.9	6.9	6.8	0.17	1.86	7.58	17	0.2	0.044	8.8	20.6	0.59	20.7	0.016	<20	0.62	0.003	0.19	20.3	1.1	0.26	1.05	<5	0.4	0.03	1.7	<0.01
174	125856	WKS	Biotite wacke with sericite	1.69	164.96	22.11	105.9	354	25	12.5	746	3.19	0.3	1.1	1.4	4.7	16.2	0.68	0.45	8.44	34	0.37	0.053	13.3	29.9	0.79	76.4	0.071	<20	1.22	0.011	0.43	5.4	2.4	0.4	0.51	<5	0.3	0.02	3.4	<0.01
175	125859	WKS	Biotite wacke with sericite	7.5	2621.1	16.39	724	3549	25.5	16.6	436	4.34	1007.2	1.2	14.1	3.9	6.2	8.27	1.83	200.89	9	0.19	0.026	3.2	18.4	0.36	10.9	0.013	<20	0.38	0.002	0.12	>100.0	0.4	0.85	2.32	43	1.5	4.19	1.2	0.07
176	125869	WKS	Biotite wacke with sericite	2.46	1137.7	11.91	76.2	1185	28.8	13.2	637	3.68	4.8	1.1	5.7	2.8	4.9	0.53	4.03	51.98	13	0.18	0.031	6.6	25.2	0.42	11	0.013	<20	0.53	0.001	0.11	1.1	0.7	0.24	1.14	7	0.8	0.16	1.6	<0.01
177	119932	MTF	Mafic tuff	6.29	405.35	7.46	62.2	418	16.8	19.9	729	4.37	0.3	3.5	6.2	12.4	9.9	0.21	0.33	35.7	74	0.59	0.027	16	28.7	1.09	48.8	0.183	<20	2.01	0.063	0.79	>100.0	8.2	1.34	1.25	<5	1.2	0.3	9.7	<0.01
178	119938	FTQ	Felsic tuff w/quartz	1.97	56.97	9.2	64.1	91	13.6	10.3	788	3.12	0.4	3	1.3	14.2	21.7	0.12	0.16	4.46	48	0.8	0.043	22.4	28.2	1.18	42.3	0.214	<20	2.22	0.104	0.75	14.9	5.9	0.72	0.12	<5	<0.1	0.05	9.8	<0.01
179	119943	FTQ	Felsic tuff w/quartz	27.19	178.64	5.79	53.9	188	6.5	7.2	451	2.54	0.9	4.2	1.2	16.1	12.8	0.19	0.35	8.55	34	0.47	0.03	21	16	0.71	35.5	0.155	<20	1.5	0.106	0.47	>100.0	5.2	0.54	0.24	<5	<0.1	0.1	7.4	<0.01
180	295917	FTQ	Felsic tuff w/quartz	26.61	222.2	2.07	49.7	58	54.3	19	471	4.39	0.2	3.3	0.9	3.1	4.4	<0.01	0.03	1.12	112	0.22	0.04	6.9	62.6	1.39	51	0.22	<20	2.23	0.022	1.44	0.6	4.9	1.59	0.88	<5	0.8	0.08	6.7	<0.01
181	295921	FTQ	Felsic tuff w/quartz	6.28	141.57	3.77	74.2	78	37.3	16.3	836	4.26	1	1.1	0.2	4.6	7.3	0.06	0.22	2.06	89	0.69	0.042	8.7	77	1.34	55.2	0.248	<20	2.38	0.015	1.45	1.1	7	1.94	0.43	<5	0.4	0.04	8.5	<0.01
182	295926	FTQ	Felsic tuff w/quartz	9.04	52.8	4.19	50.8	44	8.6	6.5	473	2.71	0.9	2.2	<0.2	10.5	3.9	0.02	0.08	1.96	35	0.3	0.048	16.6	37.4	0.93	28.7	0.133	<20	1.45	0.015	0.68	18.8	7	0.73	0.12	<5	0.2	0.05	8.7	<0.01
183	295938	FTQ	Felsic tuff w/quartz	21.33	63.93	1.74	40.8	36	8.1	9	492	3	0.3	2.3	0.5	11.8	6.8	<0.01	0.04	3.16	118	0.41	0.088	30.4	39.7	1.56	150.8	0.352	<20	1.75	0.041	1.43	46.1	14.3	1.51	0.16	<5	0.2	0.07	9.2	<0.01
184	295958	FTQ	Felsic tuff w/quartz	33.64	74.14	4.74	57	124	8.1	7.7	607	2.9	1.1	2.1	1.3	11.1	4.2	0.19	0.12	3.67	41	0.33	0.034	15.1	26.6	0.84	20.5	0.127	<20	1.42	0.015	0.63	1.9	5.4	0.68	0.26	<5	<0.1	0.11	8.8	<0.01
Duplicates (1DX)																																									
60	296706			127.54	303.38	4.11	86.4	476	38.7	17.1	566	3.94	5.8	2.8	0.7	14.1	7.6	0.3	0.41	3.81	45	0.23	0.026	16.4	34.7	0.97	51.9	0.084	<20	2.15	0.016	0.66	1.9	2.4	0.78	0.67	<5	0.5	1.44	5.9	
117	163102			2.26	103.86	14.07	85.5	301	21.5	17	783	3.7	6.8	1.1	1.1	5.7	111	0.4	18.18	2.57	118	1.43	0.134	24.7	21.7	1.45	151.8	0.244	<20	2.48	0.224	0.83	26.6	5.1	1.24	0.25	<5	0.2	0.05	9.2	
26	163815			9.06	139.4	9.98	62.2	284	22.5	22.1	1655	4.8	6.1	0.8	0.2	2.8	260.4	0.05	0.09	0.62	151	3.77	0.17	16.4	34.5	1.68	41.9	0.189	<20	4.51	0.402	0.53	19.5	9	0.57	0.44	<5	<0.1	0.04	13.2	
74	294292			75.35	912.68	378.35	1261.9	5881	14.2	15.7	905	4.06	777.7	2.8	6.8	9.4	35	15.06	2.85	45.45	15	0.7	0.037	11	6.5	0.27	19.3	0.004	<20	1.24	0.008	0.45	16.1	1.5	1.06	2.86	6	0.9	1.6	3.9	
162	918522			38.43	202.86	3.87	61.1	317	36.5	17.1	592	4.05	1.1	1.2	0.5	4.6	67.8	0.11	0.03	7.83	126	1.39	0.099	14.3	84.1	1.72	107.1	0.363	<20	3.82	0.299	1.75	>100.0	9.9	1.98	0.25	<5	0.2	0.12	13.2	
Duplicates (Hg)																																									
1	157849																																								<0.01
2	157853																																								<0.01
41	162340																																								<0.01
81	267679																																								<0.01

Northcliff Resources-Sisson (ML/ARD) Project, 5-Apr-2011

																																									Maxxam
S. No.	**Sample**	**Lithocode**	**Rock Type**	**Mo**	**Cu**	**Pb**	**Zn**	**Ag**	**Ni**	**Co**	**Mn**	**Fe**	**As**	**U**	**Au**	**Th**	**Sr**	**Cd**	**Sb**	**Bi**	**V**	**Ca**	**P**	**La**	**Cr**	**Mg**	**Ba**	**Ti**	**B**	**Al**	**Na**	**K**	**W**	**Sc**	**Tl**	**S**	**Hg**	**Se**	**Te**	**Ga**	**Hg**
	ID			**PPM**	**PPM**	**PPM**	**PPM**	**PPB**	**PPM**	**PPM**	**PPM**	**%**	**PPM**	**PPM**	**PPB**	**PPM**	**PPM**	**PPM**	**PPM**	**PPM**	**PPM**	**%**	**%**	**PPM**	**PPM**	**%**	**PPM**	**%**	**PPM**	**%**	**%**	**%**	**PPM**	**PPM**	**PPM**	**%**	**PPB**	**PPM**	**PPM**	**PPM**	**mg/kg**
82	267691																																								<0.01
121	163178																																								0.01
122	163204																																								<0.01
153	923641																																								<0.01
154	923651																																								<0.01
184	295958																																								<0.01
QA/QC																																									
Method Blank (1)				<0.01	<0.01	<0.01	<0.1	<2	<0.1	<0.1	<1	<0.01	<0.1	<0.1	<0.2	<0.1	<0.5	<0.01	<0.02	<0.02	<2	<0.01	<0.001	<0.5	<0.5	<0.01	<0.5	<0.001	<20	<0.01	<0.001	<0.01	<0.1	<0.1	<0.02	<0.02	<5	<0.1	<0.02	<0.1	<0.01
Method Blank (2)				<0.01	<0.01	<0.01	<0.1	<2	<0.1	<0.1	<1	<0.01	<0.1	<0.1	<0.2	<0.1	<0.5	<0.01	<0.02	<0.02	<2	<0.01	<0.001	<0.5	<0.5	<0.01	<0.5	<0.001	<20	<0.01	<0.001	<0.01	<0.1	<0.1	<0.02	<0.02	<5	<0.1	<0.02	<0.1	<0.01
Method Blank (3)				<0.01	<0.01	<0.01	<0.1	<2	<0.1	<0.1	<1	<0.01	<0.1	<0.1	<0.2	<0.1	<0.5	<0.01	<0.02	<0.02	<2	<0.01	<0.001	<0.5	<0.5	<0.01	<0.5	<0.001	<20	<0.01	<0.001	<0.01	<0.1	<0.1	<0.02	<0.02	<5	<0.1	<0.02	<0.1	<0.01
Method Blank (4)				<0.01	<0.01	<0.01	<0.1	<2	<0.1	<0.1	<1	<0.01	<0.1	<0.1	<0.2	<0.1	<0.5	<0.01	<0.02	<0.02	<2	<0.01	<0.001	<0.5	<0.5	<0.01	<0.5	<0.001	<20	<0.01	<0.001	<0.01	<0.1	<0.1	<0.02	<0.02	<5	<0.1	<0.02	<0.1	<0.01
Method Blank (5)				<0.01	<0.01	<0.01	<0.1	<2	<0.1	<0.1	<1	<0.01	<0.1	<0.1	<0.2	<0.1	<0.5	<0.01	<0.02	<0.02	<2	<0.01	<0.001	<0.5	<0.5	<0.01	<0.5	<0.001	<20	<0.01	<0.001	<0.01	<0.1	<0.1	<0.02	<0.02	<5	<0.1	<0.02	<0.1	<0.01
Method Blank (6)				<0.01	<0.01	<0.01	<0.1	<2	<0.1	<0.1	<1	<0.01	<0.1	<0.1	<0.2	<0.1	<0.5	<0.01	<0.02	<0.02	<2	<0.01	<0.001	<0.5	<0.5	<0.01	<0.5	<0.001	<20	<0.01	<0.001	<0.01	<0.1	<0.1	<0.02	<0.02	<5	<0.1	<0.02	<0.1	
Reference Materi																																									
STD OREAS45CA (1)				0.93	506.32	20.04	55.7	268	234.1	91.7	933	15.29	3.3	1.1	37.2	6.6	14.3	0.09	0.15	0.16	222	0.43	0.036	14.7	743.5	0.13	162.8	0.119	<20	3.39	0.011	0.08	<0.1	36.8	0.07	0.02	31	0.5	0.06	17.3	
STD OREAS45CA (2)				1.18	488.93	18.9	58.7	260	232.2	90.8	888	14.9	3.4	1.1	33.7	6.4	13.8	0.1	0.17	0.14	206	0.43	0.036	15	674.4	0.13	157.8	0.117	<20	3.3	0.012	0.06	0.1	36.5	0.06	<0.02	20	0.8	0.06	18.9	
STD OREAS45CA (3)				0.93	507.08	20.17	59.2	247	257.2	88.8	888	15.5	3.3	1.1	33.6	6.8	15.1	0.1	0.11	0.23	210	0.4	0.033	15.8	689.2	0.12	158	0.124	<20	3.78	0.01	0.07	<0.1	38.7	0.07	0.02	28	0.4	0.05	18.5	
STD OREAS45CA (4)				0.97	502.63	18.96	60.1	243	243.9	92.6	882	15.25	3.6	1.1	32.7	6.5	15.1	0.06	0.13	0.18	215	0.4	0.037	15.6	693.8	0.13	156.2	0.125	<20	3.55	0.009	0.07	0.1	36.4	0.06	<0.02	9	0.6	0.05	17.6	
STD OREAS45CA (5)				0.95	500.45	18.93	57.8	253	236.9	89.4	899	15.5	4.3	1.1	38.3	6.6	14.9	0.1	0.13	0.17	208	0.42	0.034	15	692.4	0.12	149.9	0.125	<20	3.25	0.01	0.07	<0.1	38.1	0.05	0.02	21	0.3	0.04	17.5	
STD OREAS45CA (6)				0.95	463.09	17.84	52.2	221	217.8	83.6	825	13.87	3.3	1	29.4	6.1	13.7	0.08	0.16	0.14	193	0.37	0.03	14	610.5	0.1	135.7	0.105	<20	3.04	0.008	0.06	0.4	32.3	0.04	<0.02	21	0.4	0.03	15.9	
True Value STD C				**1**	**494**	**20**	**60**	**275**	**240**	**92**	**943**	**15.690**	**2.8**	**1.2**	**43**	**7**	**15**	**0.10**	**0.13**	**0.19**	**215**	**0.4265**	**0.0385**	**15.9**	**709**	**0.1358**	**164**	**0.128**		**3.592**	**0.0075**	**0.0717**		**39.7**	**0.07**	**0.021**	**30**	**0.5**	**0.06**	**18.4**	
Percent Difference (1)				-7.0	2.5	0.2	-7.2	-2.5	-2.5	-0.3	-1.1	-2.5	17.9	-8.3	-13.5	-5.7	-4.7	-10.0	15.4	-15.8	3.3	0.8	-6.5	-7.5	4.9	-4.3	-0.7	-7.0		-5.6	46.7	11.6		-7.3	0.0	-4.8	3.3	0.0	0.0	-6.0	
Percent Difference (2)				18.0	-1.0	-5.5	-2.2	-5.5	-3.3	-1.3	-5.8	-5.0	21.4	-8.3	-21.6	-8.6	-8.0	0.0	30.8	-26.3	-4.2	0.8	-6.5	-5.7	-4.9	-4.3	-3.8	-8.6		-8.1	60.0	-16.3		-8.1	-14.3		-33.3	60.0	0.0	2.7	
Percent Difference (3)				-7.0	2.6	0.9	-1.3	-10.2	7.2	-3.5	-5.8	-1.2	17.9	-8.3	-21.9	-2.9	0.7	0.0	-15.4	21.1	-2.3	-6.2	-14.3	-0.6	-2.8	-11.6	-3.7	-3.1		5.2	33.3	-2.4		-2.5	0.0	-4.8	-6.7	-20.0	-16.7	0.5	
Percent Difference (4)				-3.0	1.7	-5.2	0.2	-11.6	1.6	0.7	-6.5	-2.8	28.6	-8.3	-24.0	-7.1	0.7	-40.0	0.0	-5.3	0.0	-6.2	-3.9	-1.9	-2.1	-4.3	-4.8	-2.3		-1.2	20.0	-2.4		-8.3	-14.3		-70.0	20.0	-16.7	-4.3	
Percent Difference (5)				-5.0	1.3	-5.4	-3.7	-8.0	-1.3	-2.8	-4.7	-1.2	53.6	-8.3	-10.9	-5.7	-0.7	0.0	0.0	-10.5	-3.3	-1.5	-11.7	-5.7	-2.3	-11.6	-8.6	-2.3		-9.5	33.3	-2.4		-4.0	-28.6	-4.8	-30.0	-40.0	-33.3	-4.9	
Percent Difference (6)				-5.0	-6.3	-10.8	-13.0	-19.6	-9.3	-9.1	-12.5	-11.6	17.9	-16.7	-31.6	-12.9	-8.7	-20.0	23.1	-26.3	-10.2	-13.2	-22.1	-11.9	-13.9	-26.4	-17.3	-18.0		-15.4	6.7	-16.3		-18.6	-42.9		-30.0	-20.0	-50.0	-13.6	
Reference Material (2)																																									
STD DS8 (1)				12.06	111.87	126.32	325.2	1653	37.3	7.6	617	2.47	25.5	2.5	117.2	5.6	56.7	2.27	4.81	6	40	0.67	0.08	10.3	119.5	0.61	290.3	0.101	<20	0.87	0.075	0.41	3.3	1.9	5.83	0.16	204	5.8	4.88	4.6	
STD DS8 (2)				12.29	105.35	126.75	315.9	1684	38.7	7.2	590	2.37	22.4	2.3	112.3	5.5	57.3	2.18	4.66	6.45	40	0.66	0.077	11.7	114.6	0.59	281.4	0.101	<20	0.87	0.077	0.39	2.7	1.9	5.88	0.16	204	4.8	4.99	4.6	
STD DS8 (3)				13.08	110.06	121.29	303.7	1546	38	7.6	581	2.37	24.2	2.6	98.1	6.8	65	2.3	4.11	7.01	39	0.69	0.071	14.8	112.2	0.6	274.8	0.114	<20	0.89	0.077	0.4	2.6	2	5.32	0.16	176	4.8	4.62	4.6	
STD DS8 (4)				12.22	110.77	120.21	319	1904	38.7	7.6	600	2.42	24.6	2.6	105	6.9	61.9	2.23	4.62	6.77	40	0.69	0.076	13.6	117.9	0.6	281.2	0.113	<20	0.9	0.077	0.41	2.4	2	5.37	0.16	178	5	4.38	4.4	
STD DS8 (5)				12.34	118.75	109.36	301.2	1583	40	8.2	606	2.55	24.1	2.5	141	5.8	58.7	2.07	4.21	5.79	40	0.7	0.083	11.7	123	0.62	260.5	0.113	<20	0.9	0.084	0.43	2.3	1.8	4.74	0.17	146	4.9	4.35	4.3	
STD DS8 (6)				12.2	114.47	109.82	293.9	1584	39.9	8.2	570	2.38	23.4	2.3	83.4	5.6	56.2	2.16	4.33	5.98	39	0.67	0.073	11.4	120.1	0.6	252.9	0.112	<20	0.87	0.073	0.4	2.8	1.9	4.62	0.16	163	4.9	4.14	4.1	
True Value STD DS8				**13.44**	**110**	**123**	**312**	**1690**	**38.1**	**7.5**	**615**	**2.46**	**26.0**	**2.8**	**107**	**6.89**	**67.7**	**2.38**	**4.8**	**6.67**	**41.1**	**0.7**	**0.08**	**14.6**	**115**	**0.6045**	**279**	**0.113**	**2.6**	**0.93**	**0.0883**	**0.41**	**3.0**	**2.3**	**5.4**	**0.2**	**192**	**5.23**	**5.00**	**4.7**	
Percent Difference (1)				-10.3	1.7	2.7	4.2	-2.2	-2.1	1.3	0.3	0.4	-1.9	-10.7	9.5	-18.7	-16.2	-4.6	0.2	-10.0	-2.7	-4.3	0.0	-29.5	3.9	0.9	4.1	-10.6		-6.5	-15.1	0.0	10.0	-17.4	8.0	-4.7	6.3	10.9	-2.4	-2.1	
Percent Difference (2)				-8.6	-4.2	3.0	1.2	-0.4	1.6	-4.0	-4.1	-3.7	-13.8	-17.9	5.0	-20.2	-15.4	-8.4	-2.9	-3.3	-2.7	-5.7	-3.8	-19.9	-0.3	-2.4	0.9	-10.6		-6.5	-12.8	-4.9	-10.0	-17.4	8.9	-4.7	6.3	-8.2	-0.2	-2.1	
Percent Difference (3)				-2.7	0.1	-1.4	-2.7	-8.5	-0.3	1.3	-5.5	-3.7	-6.9	-7.1	-8.3	-1.3	-4.0	-3.4	-14.4	5.1	-5.1	-1.4	-11.3	1.4	-2.4	-0.7	-1.5	0.9		-4.3	-12.8	-2.4	-13.3	-13.0	-1.5	-4.7	-8.3	-8.2	-7.6	-2.1	
Percent Difference (4)				-9.1	0.7	-2.3	2.2	12.7	1.6	1.3	-2.4	-1.6	-5.4	-7.1	-1.9	0.1	-8.6	-6.3	-3.7	1.5	-2.7	-1.4	-5.0	-6.8	2.5	-0.7	0.8	0.0		-3.2	-12.8	0.0	-20.0	-13.0	-0.6	-4.7	-7.3	-4.4	-12.4	-6.4	
Percent Difference (5)				-8.2	8.0	-11.1	-3.5	-6.3	5.0	9.3	-1.5	3.7	-7.3	-10.7	31.8	-15.8	-13.3	-13.0	-12.3	-13.2	-2.7	0.0	3.8	-19.9	7.0	2.6	-6.6	0.0		-3.2	-4.9	4.9	-23.3	-21.7	-12.2	1.3	-24.0	-6.3	-13.0	-8.5	
Percent Difference (6)				-9.2	4.1	-10.7	-5.8	-6.3	4.7	9.3	-7.3	-3.3	-10.0	-17.9	-22.1	-18.7	-17.0	-9.2	-9.8	-10.3	-5.1	-4.3	-8.8	-21.9	4.4	-0.7	-9.4	-0.9		-6.5	-17.3	-2.4	-6.7	-17.4	-14.4	-4.7	-15.1	-6.3	-17.2	-12.8	
Detection Limits				*0.01*	*0.01*	*0.01*	*0.1*	*2*	*0.1*	*0.1*	*1*	*0.01*	*0.1*	*0.1*	*0.2*	*0.1*	*0.5*	*0.01*	*0.02*	*0.02*	*2*	*0.01*	*0.001*	*0.5*	*0.5*	*0.01*	*0.5*	*0.001*	*20*	*0.01*	*0.001*	*0.01*	*0.1*	*0.1*	*0.02*	*0.02*	*5*	*0.1*	*0.02*	*0.1*	*0.01*
Acme Group No.				*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*CVAF Method*

Notes:

Trace metals by aqua regia digestion followed by ICP-MS: Group 1F-MS analysis done at Acme Labs.

Acme Analytical Methods:

Group 1DX by ICP-MS package: 0.5g of pulp sample is digested in hot reverse aqua regia (soil, silt) or hot aqua regia (for rocks).

* Refractory and graphitic samples can potentially limit Au solubility.

Northcliff Resources-Sisson (ML/ARD) Project, 5-Apr-2011

S. No:	Sample ID	Lithocode	Rock Type	Ba (on solids by WRA; PPM)		F (on solids by fusion method; %)	
				Reported	***Duplicate***	***Reported***	***Duplicate***
1	157849	FDQ	Felsic dykes - granitic	189		0.03	
2	157853	FDQ	Felsic dykes - granitic	183		0.08	
3	157872	IQD	Quartz diorite intrusion	378		0.09	
4	157883	IQD	Quartz diorite intrusion	293		0.09	
5	157886	IQD	Quartz diorite intrusion	289		0.12	
6	157899	IQD	Quartz diorite intrusion	189		0.05	
7	157906	IQD	Quartz diorite intrusion	229		0.02	
8	157910	IQD	Quartz diorite intrusion	196		<0.01	
9	157915	IQD	Quartz diorite intrusion	135		0.02	
10	157919	IQD	Quartz diorite intrusion	298		0.10	
11	157924	IQD	Quartz diorite intrusion	123		0.17	
12	157931	IQD	Quartz diorite intrusion	426		0.07	
13	157939	IQD	Quartz diorite intrusion	390		0.12	
14	157946	IQD	Quartz diorite intrusion	274		0.14	
15	159254	IQD	Quartz diorite intrusion	286	287	0.14	
16	163746	MTF	Mafic tuff	457		0.20	
17	163754	MTF	Mafic tuff	366		0.15	0.15
18	163760	IGB	Gabbro intrusion	156		0.16	
19	163765	IGB	Gabbro intrusion	173		0.17	
20	163770	IGB	Gabbro intrusion	436		0.15	
21	163776	IGB	Gabbro intrusion	273		0.19	
22	163781	IGB	Gabbro intrusion	157		0.07	
23	163789	IGB	Gabbro intrusion	497		0.12	
24	163802	IGB	Gabbro intrusion	259		0.11	
25	163806	IGB	Gabbro intrusion	195		0.14	
26	163815	WKB	Biotite wacke	142		0.12	
27	163818	FDQ	Felsic dykes - granitic	484		0.07	
28	267584	WKB	Biotite wacke	474		0.15	
29	267610	WKS	Biotite wacke with sericite	565		0.12	
30	267616	WKB	Biotite wacke	484		0.13	
31	82337	IQD	Quartz diorite intrusion	562		0.05	
32	82601	FTQ	Felsic tuff w/quartz	294		0.07	
33	162251	IGB	Gabbro intrusion	496		0.08	
34	162265	IGB	Gabbro intrusion	374		0.13	
35	162273	IGB	Gabbro intrusion	200		0.06	
36	162286	IQD	Quartz diorite intrusion	358		0.15	
37	162293	IQD	Quartz diorite intrusion	390		0.17	
38	162308	IQD	Quartz diorite intrusion	209		0.14	
39	162315	IQD	Quartz diorite intrusion	294		0.17	
40	162332	IQD	Quartz diorite intrusion	261		0.12	
41	162340	IQD	Quartz diorite intrusion	292		0.12	
42	162352	IQD	Quartz diorite intrusion	418		0.15	
43	162363	IQD	Quartz diorite intrusion	261		0.13	
44	162379	IQD	Quartz diorite intrusion	360		0.13	
45	162387	IQD	Quartz diorite intrusion	427		0.10	
46	162394	IQD	Quartz diorite intrusion	242		0.16	
47	162406	IQD	Quartz diorite intrusion	334		0.15	
48	162421	IQD	Quartz diorite intrusion	360		0.19	
49	185738	IGB	Gabbro intrusion	254		0.15	

50	185748	IGB	Gabbro intrusion	324		0.13	
51	185763	IGB	Gabbro intrusion	420		0.11	
52	185776	IGB	Gabbro intrusion	213		0.14	
53	185788	IGB	Gabbro intrusion	264		0.19	
54	185789	IGB	Gabbro intrusion	336		0.17	
55	185795	IGB	Gabbro intrusion	287		0.16	
56	296670	OBA	#N/A	284		0.12	
57	296679	FTQ	Felsic tuff w/quartz	380		0.08	
58	296687	MTF	Mafic tuff	269		0.12	
59	296696	MTF	Mafic tuff	395		0.12	
60	296706	IGB	Gabbro intrusion	584		0.11	
61	296711	IGB	Gabbro intrusion	571		0.14	
62	296720	IGB	Gabbro intrusion	1169		0.24	
63	296733	IGB	Gabbro intrusion	232		0.13	
64	296740	IGB	Gabbro intrusion	306		0.23	
65	165252	IGB	Gabbro intrusion	219		0.15	
66	165261	IGB	Gabbro intrusion	273		0.23	
67	165267	IGB	Gabbro intrusion	214		0.25	
68	165277	IGB	Gabbro intrusion	175	174	0.21	
69	165283	IGB	Gabbro intrusion	193		0.10	0.10
70	165291	IGB	Gabbro intrusion	195		0.12	
71	165304	IGB	Gabbro intrusion	163		0.16	0.17
72	294268	FTA	Felsic tuff with augen	356		0.04	
73	294277	FTA	Felsic tuff with augen	222		0.11	
74	294292	MTF	Mafic tuff	142		0.13	
75	294302	IGB	Gabbro intrusion	577	572	0.16	
76	294309	IGB	Gabbro intrusion	462		0.13	
77	294336	IGB	Gabbro intrusion	446		0.19	
78	294368	IGB	Gabbro intrusion	323		0.12	
79	294407	IGB	Gabbro intrusion	190		0.12	
80	294427	IGB	Gabbro intrusion	187		0.06	
81	267679	IQD	Quartz diorite intrusion	188		0.15	
82	267691	FDQ	Felsic dykes - granitic	246		0.07	
83	267709	IQD	Quartz diorite intrusion	288		0.16	
84	267729	IQD	Quartz diorite intrusion	284		0.20	
85	267745	IQD	Quartz diorite intrusion	402		0.14	
86	267764	IQD	Quartz diorite intrusion	391		0.16	
87	159466	NOCODE	#N/A	184		0.08	
88	159492	WKB	Biotite wacke	299		0.17	
89	159498	WKB	Biotite wacke	377		0.15	
90	159504	WKB	Biotite wacke	522		0.14	
91	159583	SST	Siltstone	446		0.14	
92	159591	WKB	Biotite wacke	136		0.11	
93	159617	MTF	Mafic tuff	354		0.17	
94	161507	MTF	Mafic tuff	317		0.21	
95	161517	MTF	Mafic tuff	362		0.15	
96	161540	MTF	Mafic tuff	259		0.15	
97	166379	IGB	Gabbro intrusion	125		0.07	
98	166387	IGB	Gabbro intrusion	181		0.12	
99	166398	IGB	Gabbro intrusion	173		0.11	
100	166436	IGB	Gabbro intrusion	182		0.16	
101	166453	IGB	Gabbro intrusion	230		0.11	
102	166466	IGB	Gabbro intrusion	191		0.10	
103	166485	IGB	Gabbro intrusion	261		0.12	
104	184002	IGB	Gabbro intrusion	270		0.13	
105	184039	FTA	Felsic tuff with augen	443		0.06	
106	6803	WKB	Biotite wacke	386		0.06	
107	6808	WKB	Biotite wacke	380		0.17	
108	6814	WKB	Biotite wacke	218		0.25	
109	6917	WKB	Biotite wacke	583		0.08	

110	6923	WKB	Biotite wacke	489		0.08	
111	63207	WKB	Biotite wacke	597		0.10	
112	63212	WKB	Biotite wacke	434		0.08	
113	63221	FTQ	Felsic tuff w/quartz	556		0.08	
114	63230	NOCODE	#N/A	479		0.06	
115	63237	NOCODE	#N/A	385		0.09	
116	63248	NOCODE	#N/A	150		0.16	
117	163102	IQD	Quartz diorite intrusion	306		0.09	
118	163128	IQD	Quartz diorite intrusion	324		0.13	
119	163139	IQD	Quartz diorite intrusion	213		0.24	
120	163158	IQD	Quartz diorite intrusion	274		0.11	
121	163178	IQD	Quartz diorite intrusion	338		0.07	
122	163204	IQD	Quartz diorite intrusion	400		0.06	
123	163205	IQD	Quartz diorite intrusion	484		0.06	
124	163224	IQD	Quartz diorite intrusion	258		0.02	
125	163241	IQD	Quartz diorite intrusion	423		0.06	
126	163253	IQD	Quartz diorite intrusion	523		0.03	0.03
127	163272	IGB	Gabbro intrusion	219		0.11	
128	163278	IGB	Gabbro intrusion	211		0.09	
129	5395	FTQ	Felsic tuff w/quartz	560		0.08	
130	5407	FTQ	Felsic tuff w/quartz	494		0.11	
131	5423	FTQ	Felsic tuff w/quartz	490	491	0.03	
132	5434	FTQ	Felsic tuff w/quartz	490		0.03	
133	5448	FTQ	Felsic tuff w/quartz	506		0.02	
134	5461	FTQ	Felsic tuff w/quartz	444		0.05	
135	5472	FTQ	Felsic tuff w/quartz	372		0.06	
136	5487	FTQ	Felsic tuff w/quartz	506		0.09	
137	5499	FTQ	Felsic tuff w/quartz	458		0.09	
138	5508	FTA	Felsic tuff with augen	695		0.12	
139	5523	FTQ	Felsic tuff w/quartz	111		0.14	
140	5539	FTQ	Felsic tuff w/quartz	232		0.18	
141	5546	FTQ	Felsic tuff w/quartz	223		0.12	
142	5560	NOCODE	#N/A	258		0.09	
143	82973	FTQ	Felsic tuff w/quartz	261		0.08	
144	82982	FTQ	Felsic tuff w/quartz	241		0.17	
145	82983	FTQ	Felsic tuff w/quartz	369		0.08	
146	83007	FTA	Felsic tuff with augen	407		0.18	
147	83018	FTQ	Felsic tuff w/quartz	148		0.20	
148	83027	FTQ	Felsic tuff w/quartz	199		0.17	
149	83037	IGB	Gabbro intrusion	229		0.15	
150	83060	IGB	Gabbro intrusion	461		0.07	
151	83079	IGB	Gabbro intrusion	288		0.14	
152	923631	IGB	Gabbro intrusion	148		0.13	
153	923641	IGB	Gabbro intrusion	218		0.14	
154	923651	IGB	Gabbro intrusion	206		0.09	
155	923659	IGB	Gabbro intrusion	184		0.11	
156	923669	IGB	Gabbro intrusion	144		0.14	
157	923686	IGB	Gabbro intrusion	161		0.09	
158	918501	IGB	Gabbro intrusion	261		0.15	
159	918505	IGB	Gabbro intrusion	330		0.15	
160	918509	IGB	Gabbro intrusion	283		0.12	
161	918517	IGB	Gabbro intrusion	266		0.15	
162	918522	IGB	Gabbro intrusion	326		0.18	
163	918529	IGB	Gabbro intrusion	638		0.16	
164	918540	IGB	Gabbro intrusion	230		0.26	
165	918555	FTA	Felsic tuff with augen	210		0.18	
166	918613	FTA	Felsic tuff with augen	262	262	0.09	
167	918618	FTQ	Felsic tuff w/quartz	90		0.05	
168	918625	WKS	Biotite wacke with sericite	582		0.09	
169	918629	FTQ	Felsic tuff w/quartz	512		0.01	

170	81541	WKB	Biotite wacke	321		0.10	
171	81584	MTF	Mafic tuff	249		0.09	
172	81627	IGB	Gabbro intrusion	214		0.14	
173	125848	WKS	Biotite wacke with sericite	677	661	0.13	
174	125856	WKS	Biotite wacke with sericite	969		0.13	
175	125859	WKS	Biotite wacke with sericite	378		0.10	0.10
176	125869	WKS	Biotite wacke with sericite	469		0.11	
177	119932	MTF	Mafic tuff	297		0.20	
178	119938	FTQ	Felsic tuff w/quartz	472		0.13	
179	119943	FTQ	Felsic tuff w/quartz	331		0.06	0.08
180	295917	FTQ	Felsic tuff w/quartz	534		0.16	
181	295921	FTQ	Felsic tuff w/quartz	525		0.21	
182	295926	FTQ	Felsic tuff w/quartz	536		0.13	
183	295938	FTQ	Felsic tuff w/quartz	325		0.17	
184	295958	FTQ	Felsic tuff w/quartz	722		0.09	
QAQC							
Method Blank (1)				<5		<0.01	
Method Blank (2)				<5		<0.01	
Method Blank (3)				<5		<0.01	
Method Blank (4)				<5		<0.01	
Method Blank (5)				<5		<0.01	
Method Blank (6)				<5		<0.01	
Method Blank (7)				<5			
Reference Material (for Ba)							
STD SO-18 (1 & 2)				513	509		
STD SO-18 (3 & 4)				506	506		
STD SO-18 (5 & 6)				504	507		
STD SO-18 (7 & 8)				502	503		
STD SO-18 (9 & 10)				503	503		
STD SO-18 (11 & 12)				503	511		
STD SO-18 (13 & 14)				506	509		
True Values STD SO-18				**515**	**515**		
Percent Difference (1 & 2)				-0.4	-1.2		
Percent Difference (3 & 4)				-1.7	-1.7		
Percent Difference (5 & 6)				-2.1	-1.6		
Percent Difference (7 & 8)				-2.5	-2.3		
Percent Difference (9 & 10)				-2.3	-2.3		
Percent Difference (11 & 12)				-2.3	-0.8		
Percent Difference (13 & 14)				-1.7	-1.2		
Reference Material (for F)							
STD STSD-1 (True Value: 0.095%)						0.09%	0.10%
STD STSD-1 (True Value: 0.095%)						0.09%	0.11%
STD STSD-1 (True Value: 0.095%)						0.10%	0.10%
STD LIBF (True Value: 13.4%)						11.99%	11.19%
STD LIBF (True Value: 13.4%)						10.99%	12.90%
STD LIBF (True Value: 13.4%)						13.90%	13.20%
Detection Limits				*5*		*0.01%*	
Acme Group No.				*4A*		*Fusion ICP; Group G803*	

Notes:

Total Ba on solids:

Analytical Methods: Total Ba by lithium metaborate fusion method followed by ICP analysis done at Acme Labs. STD SO-18 is reference materials for total-Ba. Uses 0.2g of pulp sample. LOI (Loss On Ignition) is by weight difference after ignition at 1000°C.

Fluoride on solids:

Fusion ICP assay method (Group: G803) done at Acme Labs.

Analytical Methods: A 0.25 g of pulp sample is weighed into a nickel crucible and mixed with 3 ml of 1 part NaOH: 1 part water and fused at 580°C. The fused sample is cooled and dissolved in demineralized water, H2SO4 and NH4Citrate are added, then placed in a hot water bath and analysed by Selective Ion Electrode.

B3: Acid Base Accounting Results for Humidity Cells

Maxxam

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Northcliff Resources-Sisson (ML/ARD) Project, 5 Samples Rec'd 5-Aug-11 & 9 on 29-Aug-11

					Acme	Acme		Acme					Mod. ABA NP			
S. No.	**Sample ID**	**Maxxam HC ID**	**Paste pH (pH Units)**	**Paste EC (µS/cm)**	**Total Carbon (Wt.%)**	**CO2 (Wt.%)**	**CaCO3 Equivalents* (Kg CaCO3/tonne)**	**Total Sulphur (Wt.%)**	**Sulphate Sulphur (HCl; Wt.%)**	**Sulphate Sulphur (Na2CO3; Wt. %)**	**Sulphide Sulphur** (Wt.%)**	**Maximum Potential Acidity*** (Kg CaCO3/tonne)**	**Neutralization Potential (Kg CaCO3/Tonne)**	**Net Neutralization Potential**** (Kg CaCO3/tonne)**	**Neutralization Potential Ratio (NPR)***** (dimensionless; no unit)**	**Fizz Rating**
1	#1 - Gabbro	HC 1	9.4	233	0.04	0.20	4.5	0.10	<0.01	<0.01	0.10	3.1	14.0	10.9	4.5	None
2	#2 - FT	HC 2	8.8	243	0.18	0.66	15.0	0.41	<0.01	0.01	0.41	12.8	18.5	5.7	1.4	Slight
2D	#2 - FT (Dup)	HC 2D (Dup of HC-2)	8.9	275	0.18	0.72	16.4	0.42	0.01	<0.01	0.41	12.8	19.3	6.5	1.5	Slight
3	#3 - MTF	HC 3	8.3	278	0.14	0.62	14.1	0.61	0.01	0.01	0.60	18.8	16.6	-2.1	0.9	Slight
4	#4 - WKB	HC 4	8.8	242	0.21	0.83	18.9	0.48	0.01	<0.01	0.47	14.7	15.4	0.7	1.0	Slight
5	#5 - IQD	HC 5	9.4	141	0.03	0.11	2.5	0.20	<0.01	<0.01	0.20	6.3	11.3	5.1	1.8	None
6	185748	HC 6: PAG Gabbro	9.3	131	0.03	0.07	1.6	0.26	<0.01	<0.01	0.26	8.1	11.6	3.5	1.4	None
7	163760	HC 7: NAG Gabbro	8.4	256	0.98	3.75	85.2	0.36	<0.01	<0.01	0.36	11.3	88.1	76.9	7.8	Strong
8	161540	HC 8: PAG MTF	9.0	270	0.04	0.12	2.7	0.75	0.01	0.01	0.74	23.1	12.1	-11.1	0.5	None
9	267616	HC 9: Uncertain WKB	9.3	155	0.07	0.25	5.7	0.18	<0.01	<0.01	0.18	5.6	9.4	3.7	1.7	None
10	162363	HC 10: PAG IQD	9.5	131	<0.02	0.04	0.9	0.23	<0.01	<0.01	0.23	7.2	11.6	4.4	1.6	None
11	163128	HC 11: NAG IQD	8.7	148	0.45	1.63	37.0	0.24	<0.01	<0.01	0.24	7.5	42.7	35.2	5.7	Strong
12	162251	HC 12: < 0.1% S Gabbro	9.5	129	0.03	0.05	1.1	0.08	<0.01	<0.01	0.08	2.5	10.8	8.3	4.3	None
13	918618	HC 13: < 0.1% S FT	10.0	122	0.04	0.08	1.8	0.08	<0.01	<0.01	0.08	2.5	3.9	1.4	1.6	None
14	162352, 6814, 82973	HC 14: Low grade ore	8.5	173	0.04	0.09	2.0	1.16	<0.01	<0.01	1.16	36.3	6.4	-29.8	0.2	None
Detection Limits			*0.5*	*1.0*	*0.02*	*0.02*	*0.5*	*0.02*	*0.01*	*0.01*	*0.02*	*0.6*				
Maxxam SOP No:			*7160*		*LECO*	*LECO*	*Calculation*	*LECO*	*HCl Leach (SOP: 7410)*	*Na2CO3 Leach*	*Calculated from HCL Leach*	*Calculation*				

Notes:

Total sulphur, total carbon and carbonate carbon (CO2; HCl direct method) by Leco done at Acme Labs.

Paste pH & Paste EC were conducted on the same slurry sample.

CO2 Analysis: A 0.2g pf pulp sample is digested with 6 ml of 1.8N HCl in a hot water bath of 70 ˚C for 30 minutes. The CO2 that evolves is trapped in a gas chamber that is controled with a stopcock, once the stopcock is is opened the CO2 gas is swept into the Leco analyser with a oxygen carrier gas. Leco then determines the CO2 as total-carbon which is calculated to total CO2.

Calculations:

*CaCO3 Equivalent is based on Carbonate carbon (CO2).

**Sulphide sulphur is based on difference between total sulphur and sulphate sulphur (by HCl leach).

***MPA (Maximum Potential Acidity) is based on sulphide sulphur .

**** Net Neutralization Potential (NNP) is based on difference between Neutralization Potential (NP) and Maximum Potential Acidity (MPA).

***** Neutralization Potential Ratio (NPR) is based on NP divided by MPA.

References:

Reference for Mod ABA NP method (Maxxam SOP No. 7150): MEND Acid Rock Drainage Prediction Manual, MEND Project 1.16.1b (pages 6.2-11 to 17), March 1991.

B4: Trace Element Analysis Results for Humidity Cells

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Northcliff Resources-Sisson (ML/ARD) Project, 5 Samples Rec'd 5-Aug-11 & 9 on 29-Aug-11

																																							Maxxam
S. No.	**Sample**	**Mo**	**Cu**	**Pb**	**Zn**	**Ag**	**Ni**	**Co**	**Mn**	**Fe**	**As**	**U**	**Au**	**Th**	**Sr**	**Cd**	**Sb**	**Bi**	**V**	**Ca**	**P**	**La**	**Cr**	**Mg**	**Ba**	**Ti**	**B**	**Al**	**Na**	**K**	**W**	**Sc**	**Tl**	**S**	**Hg**	**Se**	**Te**	**Ga**	**Hg**
	ID	**PPM**	**PPM**	**PPM**	**PPM**	**PPB**	**PPM**	**PPM**	**PPM**	**%**	**PPM**	**PPM**	**PPB**	**PPM**	**PPM**	**PPM**	**PPM**	**PPM**	**PPM**	**%**	**%**	**PPM**	**PPM**	**%**	**PPM**	**%**	**PPM**	**%**	**%**	**%**	**PPM**	**PPM**	**PPM**	**%**	**PPB**	**PPM**	**PPM**	**PPM**	**mg/kg**
1	#1 - Gabbro	56.62	45.58	7.65	75.5	101	30.3	16.2	656	3.48	4.2	1.3	0.4	5.6	66.4	0.3	0.07	1.92	105	1.32	0.097	20.7	79.4	1.54	116	0.282	<20	2.76	0.202	1.08	46.2	7	1.03	0.11	<5	0.3	0.03	10.1	<0.01
2	#2 - FT	39.27	238.8	37.04	99.6	466	8.7	9	718	2.82	15.7	3.3	3	12.1	17.7	0.72	0.37	16.48	42	0.79	0.054	26.1	59.2	0.69	50.5	0.127	<20	1.24	0.037	0.45	88	5.6	0.59	0.47	<5	1.1	0.35	6.8	<0.01
2D	#2 - FT (Dup)	63.75	238.94	25.33	76.9	371	9.3	8.5	726	2.79	7.9	3.5	1.9	12.5	19.9	0.55	0.3	16.46	42	0.78	0.049	27.4	78.8	0.71	58.2	0.126	<20	1.3	0.047	0.51	>100.0	5.5	0.65	0.46	<5	0.9	0.43	7	<0.01
3	#3 - MTF	83.83	210.41	56.73	219.7	822	23.6	13.7	864	3.55	27.5	2	0.6	9.7	18.7	2.04	0.39	7.7	59	0.62	0.056	20.3	67	0.98	70.4	0.152	<20	1.78	0.024	0.76	>100.0	5.6	1.02	0.64	<5	0.6	0.21	7.4	<0.01
4	#4 - WKB	57.62	238.2	5.6	84.8	248	30.6	15.8	696	4.02	17	1.3	7	6.5	18.1	0.35	0.29	26.84	62	0.54	0.054	15.3	79.3	1.06	81	0.168	<20	1.99	0.04	0.9	53.5	6	1.18	0.53	<5	0.6	0.53	7.4	<0.01
5	#5 - IQD	139.21	102.21	4.21	53.6	165	25.9	16.6	476	3.21	2.9	2.6	0.7	6	56.7	0.18	0.08	2.15	93	1.07	0.104	24.8	65.7	1.38	188.5	0.284	<20	2.09	0.137	0.9	>100.0	5.3	0.92	0.24	<5	0.4	0.03	8.5	<0.01
6	185748	3.39	89.37	1.69	44.5	50	15.5	15.9	294	3.22	0.6	1.1	0.5	5.1	40.1	0.04	0.02	0.41	99	0.82	0.13	25.6	61.6	1.19	176.3	0.265	<20	1.72	0.114	0.82	14	4.5	0.65	0.25	<5	0.5	<0.02	7.1	<0.01
7	163760	7.45	59.59	4.76	86.2	59	41.8	23	2446	5.74	10.8	1.4	<0.2	5.9	85.4	0.07	0.36	0.29	103	3.32	0.091	21.5	75.9	1.79	28.2	0.073	<20	3.07	0.01	0.37	0.1	8.9	0.5	0.36	9	0.8	0.02	11.2	<0.01
8	161540	3.8	278.67	1.99	86.5	84	26.5	26.7	683	6.32	2	1.4	6.7	6	44.3	0.03	0.03	10.27	183	1.11	0.096	15.3	92	1.84	180.9	0.289	<20	3.94	0.238	1.66	36.2	18.2	2.53	0.78	<5	1	0.16	16.9	<0.01
9	267616	4.93	222.85	2.49	37.1	97	22.4	11	368	2.73	0.3	1	2.8	8.2	7.4	0.07	0.03	3.76	25	0.31	0.053	23.8	82.9	0.71	51	0.106	<20	1.53	0.008	0.74	1	2.3	1.23	0.17	<5	0.6	0.04	5	<0.01
10	162363	4.26	96.52	2.32	51.6	121	17.7	17.4	326	3.62	0.4	1.5	<0.2	6.7	61.3	0.07	<0.02	0.62	108	1.13	0.167	26.4	53.4	1.24	166.7	0.254	<20	2.03	0.158	0.88	43.7	4.3	0.78	0.22	<5	0.5	0.07	8.3	<0.01
11	163128	12.18	77.62	34.52	120.3	390	41	20.1	2319	3.88	60.4	1.2	2	5.7	51.1	0.51	0.72	2.03	99	1.79	0.057	20	84.8	2.23	106.9	0.199	<20	2.64	0.061	0.58	80.9	8.7	0.59	0.24	<5	0.5	<0.02	10.6	<0.01
12	162251	4.78	87.81	3.56	56.9	48	16.9	14.9	495	3.21	0.8	0.9	<0.2	8.1	33.4	0.06	<0.02	0.27	90	0.86	0.099	33.2	66.7	1.46	304	0.318	<20	2.02	0.112	1.12	>100.0	4.2	0.48	0.07	<5	0.3	<0.02	7.7	<0.01
13	918618	14.02	29.03	3.79	12.8	18	1.5	1.6	143	0.78	0.4	8.9	<0.2	10.1	2.8	0.03	0.03	0.21	6	0.26	0.017	5.2	53.2	0.15	1.9	0.032	<20	0.4	0.038	0.04	5.3	3.4	0.03	0.07	<5	0.4	<0.02	3.9	<0.01
14	162352, 6814, 82973	13.13	1361.4	49.69	160.2	3000	28.3	16.7	391	3.85	0.4	3	17.6	8.4	21.4	1.62	0.78	717.6	58	0.59	0.063	22.4	60.1	1.01	138.4	0.226	<20	1.49	0.055	0.78	>100.0	4.3	0.9	0.99	<5	1.9	1.31	6.6	<0.01
QA/QC (1F-MS)																																							
Method Blank(1F-MS)																																							
Method Blank		<0.01	<0.01	<0.01	<0.1	<2	<0.1	<0.1	<1	<0.01	<0.1	<0.1	<0.2	<0.1	<0.5	<0.01	<0.02	<0.02	<2	<0.01	<0.001	<0.5	<0.5	<0.01	<0.5	<0.001	<20	<0.01	<0.001	<0.01	<0.1	<0.1	<0.02	<0.02	<5	<0.1	<0.02	<0.1	
Reference Material (1F-MS)																																							
Reference Material (1)																																							
STD OREAS45CA		0.61	495.71	20.85	64.1	271	262.2	90.9	937	15.25	3	1.2	42.9	7.1	16.1	0.1	0.04	0.18	208	0.41	0.038	17.3	666.6	0.17	162.5	0.139	<20	3.9	0.009	0.07	<0.1	40.6	0.08	<0.02	35	0.7	<0.02	17.9	
True Value STD OREAS45CA		**1**	**494**	**20**	**60**	**275**	**240**	**92**	**943**	**15.690**	**2.8**	**1.2**	**43**	**7**	**15**	**0.10**	**0.13**	**0.19**	**215**	**0.4265**	**0.0385**	**15.9**	**709**	**0.1358**	**164**	**0.128**		**3.592**	**0.0075**	**0.0717**		**39.7**	**0.07**	**0.021**	**30**	**0.5**	**0.06**	**18.4**	
Percent Difference		-39.0	0.3	4.3	6.8	-1.5	9.3	-1.2	-0.6	-2.8	7.1	0.0	-0.2	1.4	7.3	0.0	-69.2	-5.3	-3.3	-3.9	-1.3	8.8	-6.0	25.2	-0.9	8.6		8.6	20.0	-2.4		2.3	14.3		16.7	40.0		-2.7	
Reference Material (2)																																							
STD DS8		13.42	106.33	113.44	297.7	1682	37.6	7.5	595	2.44	24.6	2.7	105.1	6.5	64.9	2.29	3.77	6.22	41	0.73	0.079	15.7	113.1	0.62	276	0.122	<20	0.95	0.096	0.42	2.4	2.4	4.97	0.16	176	4.9	4.57	4.5	
True Value STD DS8		**13.44**	**110**	**123**	**312**	**1690**	**38.1**	**7.5**	**615**	**2.46**	**26.0**	**2.8**	**107**	**6.89**	**67.7**	**2.38**	**4.8**	**6.67**	**41.1**	**0.7**	**0.08**	**14.6**	**115**	**0.6045**	**279**	**0.113**		**0.93**	**0.0883**	**0.41**	**3.0**	**2.3**	**5.4**	**0.2**	**192**	**5.23**	**5.00**	**4.7**	
Percent Difference		-0.1	-3.3	-7.8	-4.6	-0.5	-1.3	0.0	-3.3	-0.8	-5.4	-3.6	-1.8	-5.7	-4.1	-3.8	-21.5	-6.7	-0.2	4.3	-1.3	7.5	-1.7	2.6	-1.1	8.0		2.2	8.7	2.4	-20.0	4.3	-8.0	-4.7	-8.3	-6.3	-8.6	-4.3	
QA/QC (Hg)																																							
Duplicates (Hg)																																							
1	#1 - Gabbro																																						<0.01
Method Blank(Hg)																																							
Method Blank																																							<0.01
Detection Limits		*0.01*	*0.01*	*0.01*	*0.1*	*2*	*0.1*	*0.1*	*1*	*0.01*	*0.1*	*0.1*	*0.2*	*0.1*	*0.5*	*0.01*	*0.02*	*0.02*	*2*	*0.01*	*0.001*	*0.5*	*0.5*	*0.01*	*0.5*	*0.001*	*20*	*0.01*	*0.001*	*0.01*	*0.1*	*0.1*	*0.02*	*0.02*	*5*	*0.1*	*0.02*	*0.1*	*0.01*
Acme Group No.		*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*1F-MS*	*CVAF Method*

Notes:

Trace metals by aqua regia digestion followed by ICP-MS: Group 1F-MS analysis done at Acme Labs.

STD OREAS45CA & SRD DS8 are reference material for 1F-MS package.

Acme Analytical Methods:

Group 1DX by ICP-MS package: 0.5g of pulp sample is digested in hot reverse aqua regia (soil, silt) or hot aqua regia (for rocks).

* Refractory and graphitic samples can potentially limit Au solubility.

Maxxam

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Northcliff Resources-Sisson (ML/ARD) Project, 5 Samples Rec'd 5-Aug-11 & 9 on 29-Aug-11

S. No:	**Sample ID**	**Ba (on solids by WRA; PPM)**		**F (on solids by fusion method; %)**	
		Reported	***Duplicate***	***Reported***	***Duplicate***
1	#1 - Gabbro	258		0.12	
2	#2 - FT	429		0.12	
2D	#2 - FT (Dup)	427		0.12	
3	#3 - MTF	368		0.13	
4	#4 - WKB	453		0.14	
5	#5 - IQD	349		0.14	
6	185748	317		0.09	
7	163760	136		0.17	0.15
8	161540	263		0.17	
9	267616	379		0.16	
10	162363	248		0.12	
11	163128	365		0.18	
12	162251	487		0.08	
13	918618	81		0.02	
14	162352, 6814, 82973	350	347	0.17	
QAQC					
Method Blank (for Ba & F)					
Method Blank		<5		<0.01	
Reference Material (for Ba)					
STD SO-18 (1)		475			
STD SO-18 (2)		481			
True Values STD SO-18		**515**			
Percent Difference (1)		-7.8			
Percent Difference (2)		-6.6			
Reference Material (for F)					
STD STSD-1 (True Value: 0.095%)				0.11%	
STD LIBF (True Value: 13.4%)				12.90%	
Detection Limits		*5*		*0.01%*	
Acme Group No.		*4A*		*Fusion ICP; Group G803*	

Notes:

Total Ba on solids:

Analytical Methods: Total Ba by lithium metaborate fusion method followed by ICP analysis done at Acme Labs. STD SO-18 is reference materials for total-Ba. Uses 0.2g of pulp sample. LOI (Loss On Ignition) is by weight difference after ignition at 1000°C.

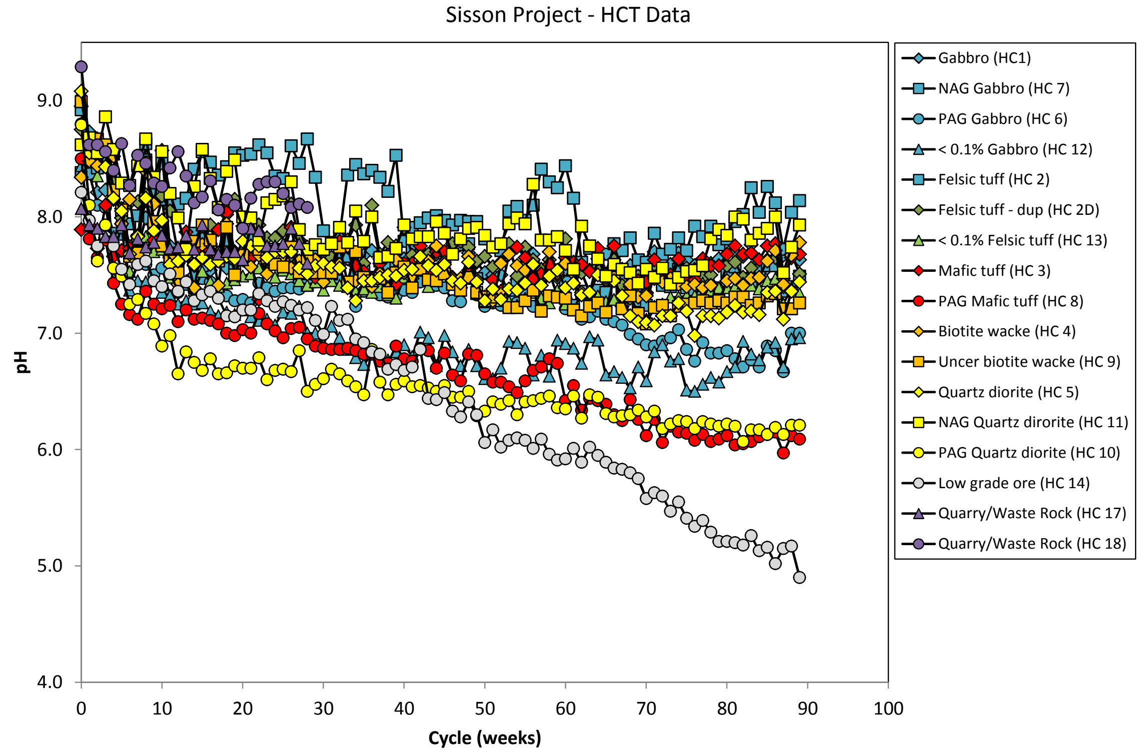
Fluoride on solids:

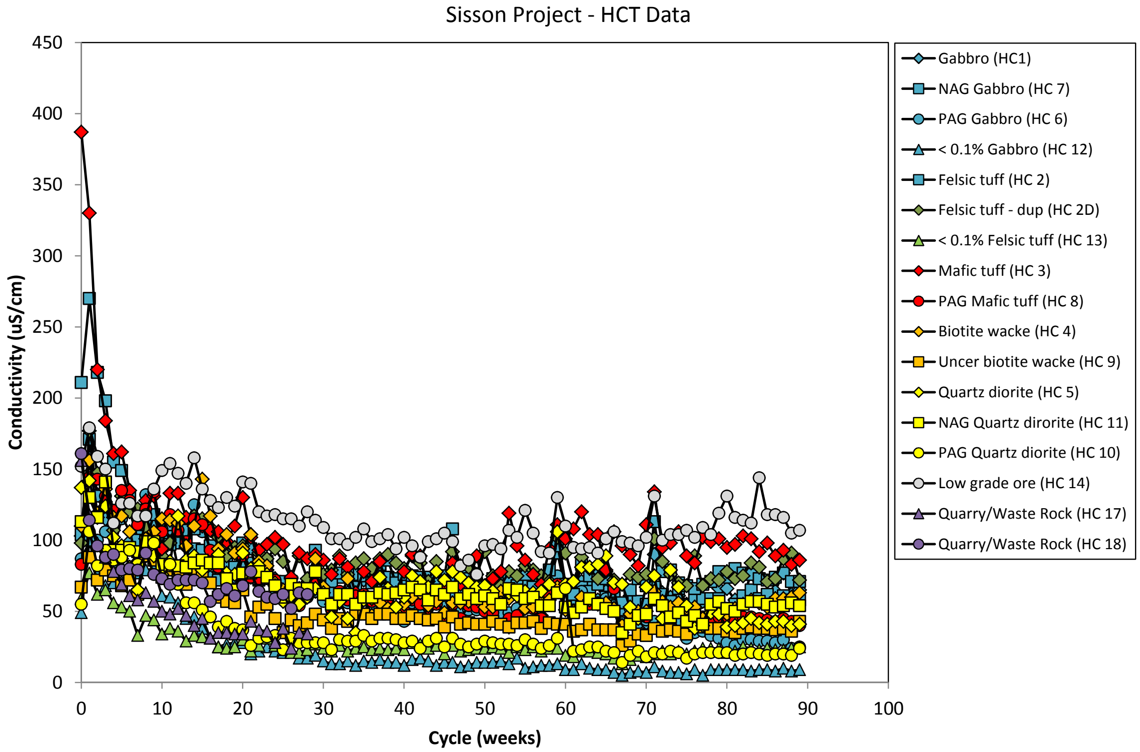
Fusion ICP assay method (Group: G803) done at Acme Labs.

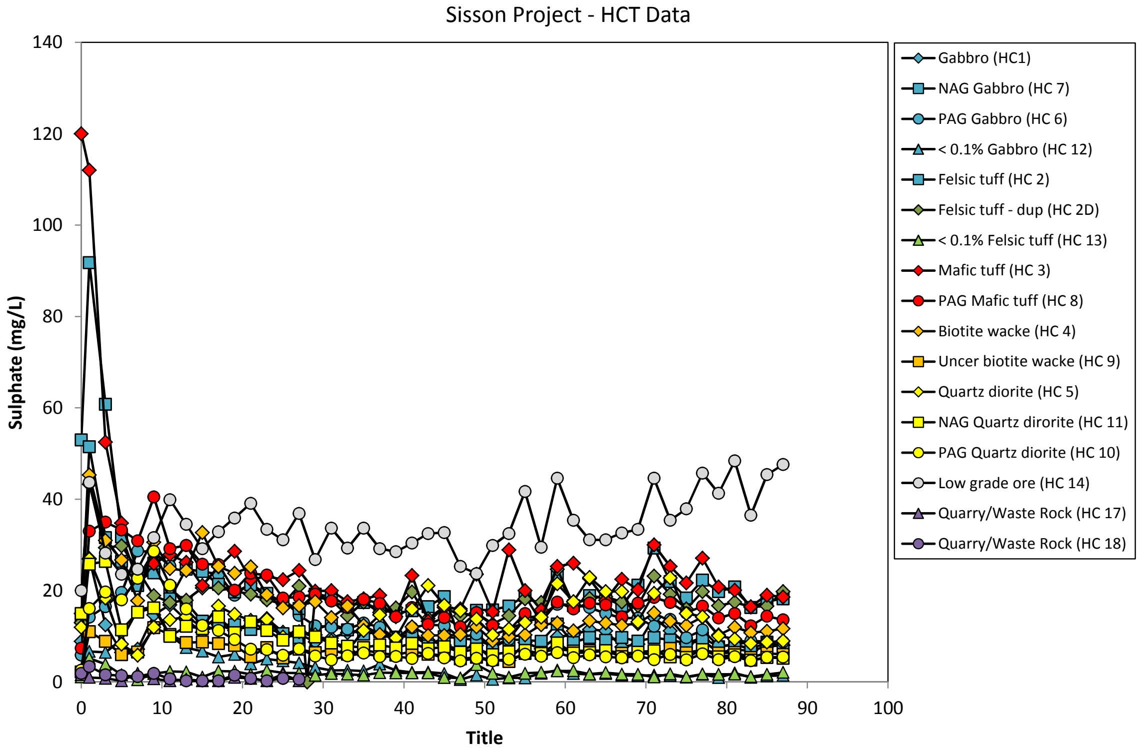
Analytical Methods: A 0.25 g of pulp sample is weighed into a nickel crucible and mixed with 3 ml of 1 part NaOH: 1 part water and fused at 580°C. The fused sample is cooled and dissolved in demineralized water, H_2SO_4 and NH_4Citrate are added, then placed in a hot water bath and analysed by Selective Ion Electrode.

Appendix C: Rock Kinetic Test Results

C1: Humidity Cell Charts


Sisson Project - HCT Data
pH
9.0
8.0
7.0
6.0
5.0
4.0
0
10
20
30
40
50
60
70
80
90
100
Cycle (weeks)
Gabbro (HC1)
NAG Gabbro (HC 7)
PAG Gabbro (HC 6)
< 0.1% Gabbro (HC 12)
Felsic tuff (HC 2)
Felsic tuff - dup (HC 2D)
< 0.1% Felsic tuff (HC 13)
Mafic tuff (HC 3)
PAG Mafic tuff (HC 8)
Biotite wacke (HC 4)
Uncer biotite wacke (HC 9)
Quartz diorite (HC 5)
NAG Quartz dirorite (HC 11)
PAG Quartz diorite (HC 10)
Low grade ore (HC 14)
Quarry/Waste Rock (HC 17)
Quarry/Waste Rock (HC 18)


Sisson Project - HCT Data
Conductivity (uS/cm)
450
400
350
300
250
200
150
100
50
0
0
10
20
30
40
50
60
70
80
90
100
Cycle (weeks)
Gabbro (HC1)
NAG Gabbro (HC 7)
PAG Gabbro (HC 6)
< 0.1% Gabbro (HC 12)
Felsic tuff (HC 2)
Felsic tuff - dup (HC 2D)
< 0.1% Felsic tuff (HC 13)
Mafic tuff (HC 3)
PAG Mafic tuff (HC 8)
Biotite wacke (HC 4)
Uncer biotite wacke (HC 9)
Quartz diorite (HC 5)
NAG Quartz dirorite (HC 11)
PAG Quartz diorite (HC 10)
Low grade ore (HC 14)
Quarry/Waste Rock (HC 17)
Quarry/Waste Rock (HC 18)



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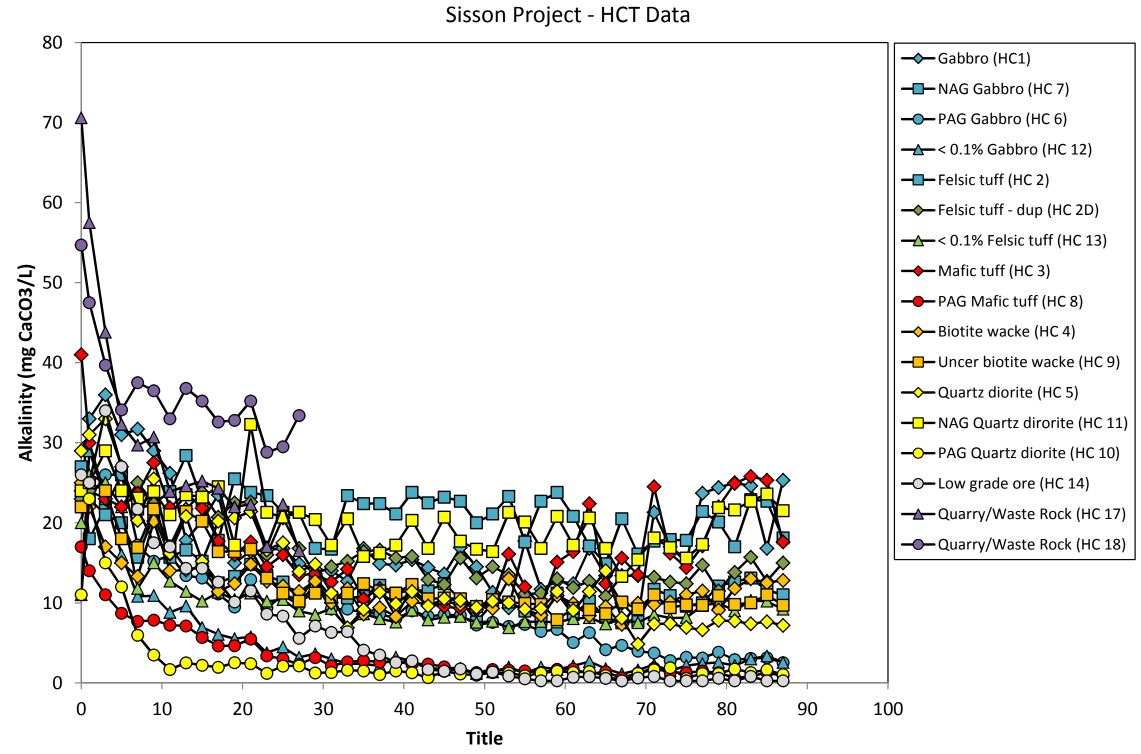

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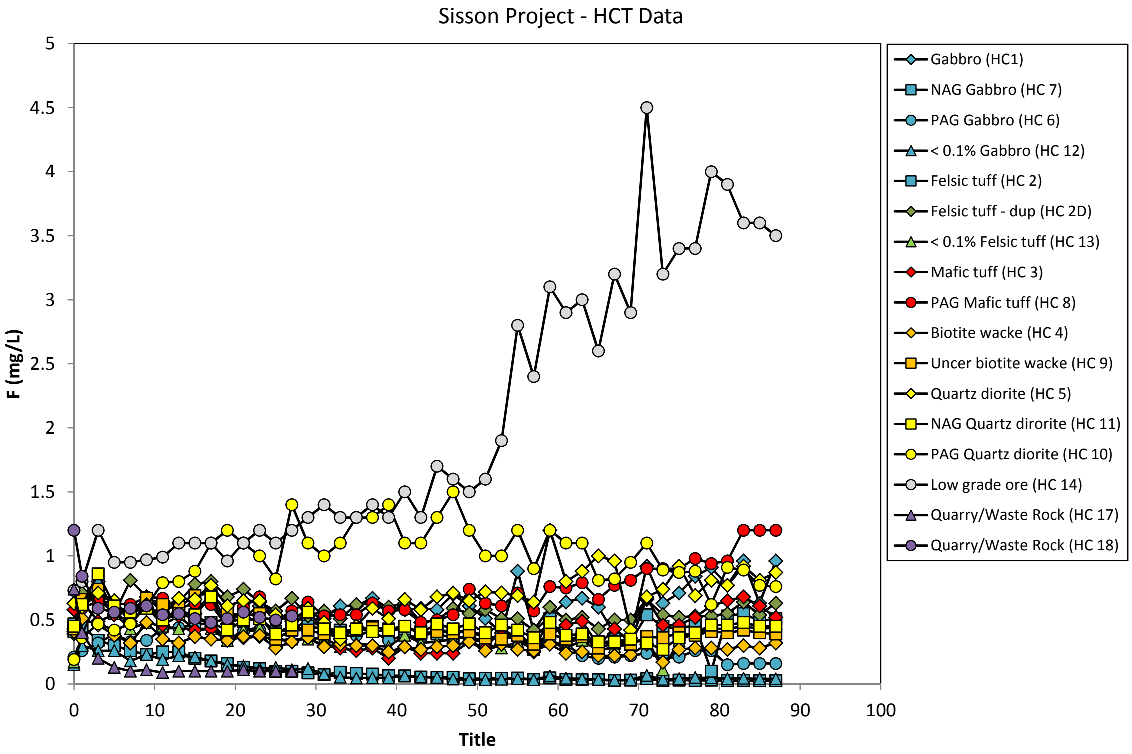

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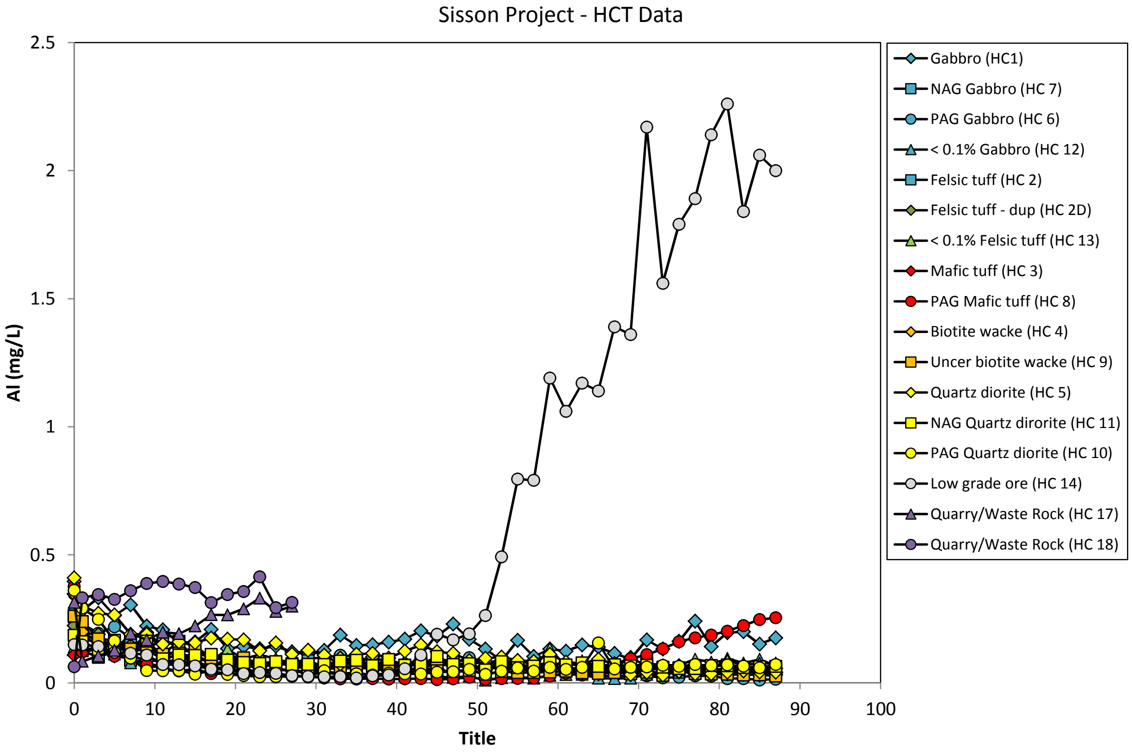

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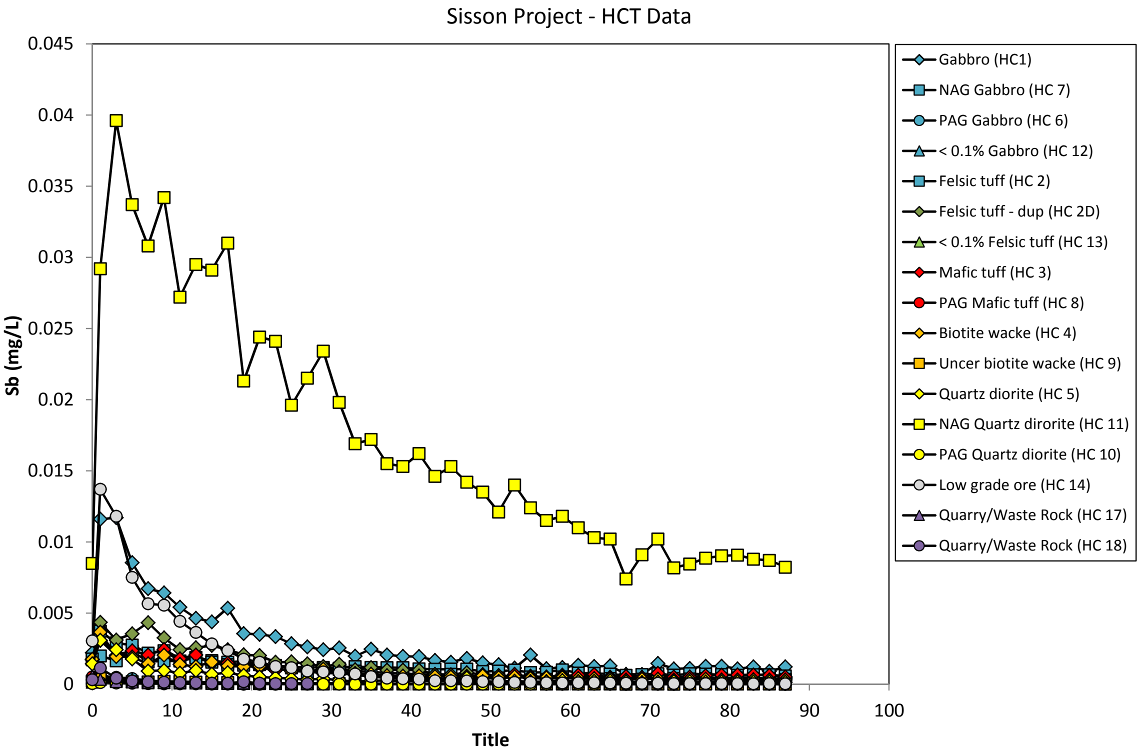

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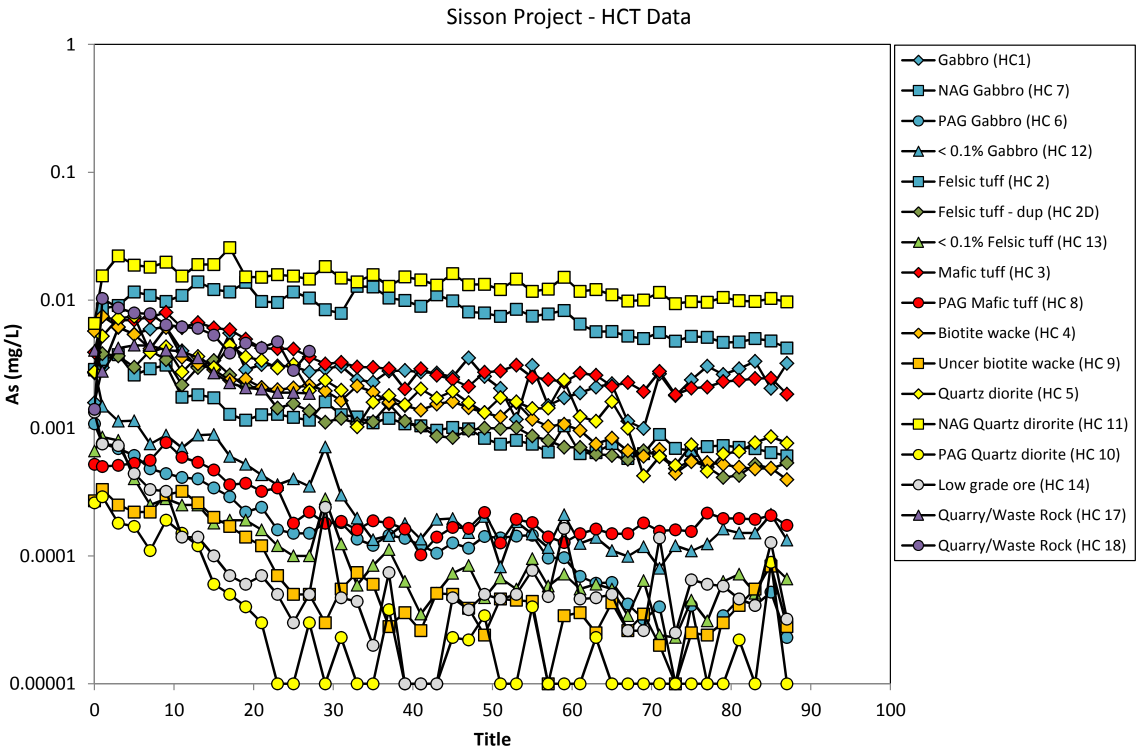

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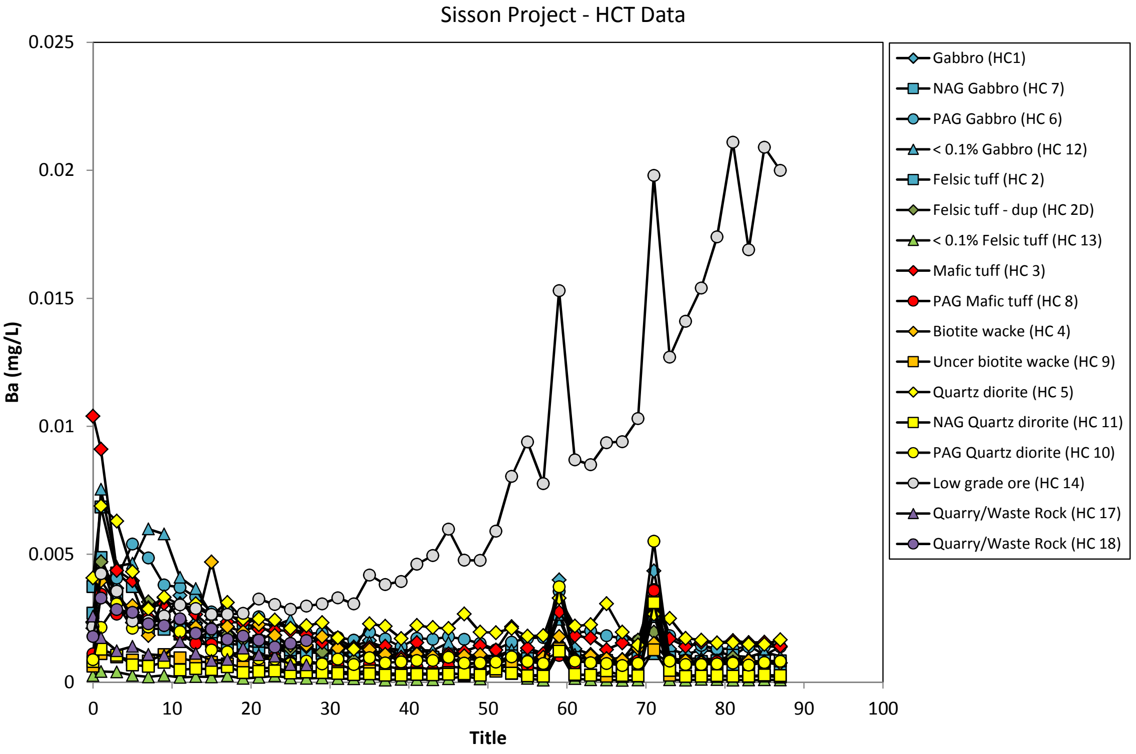

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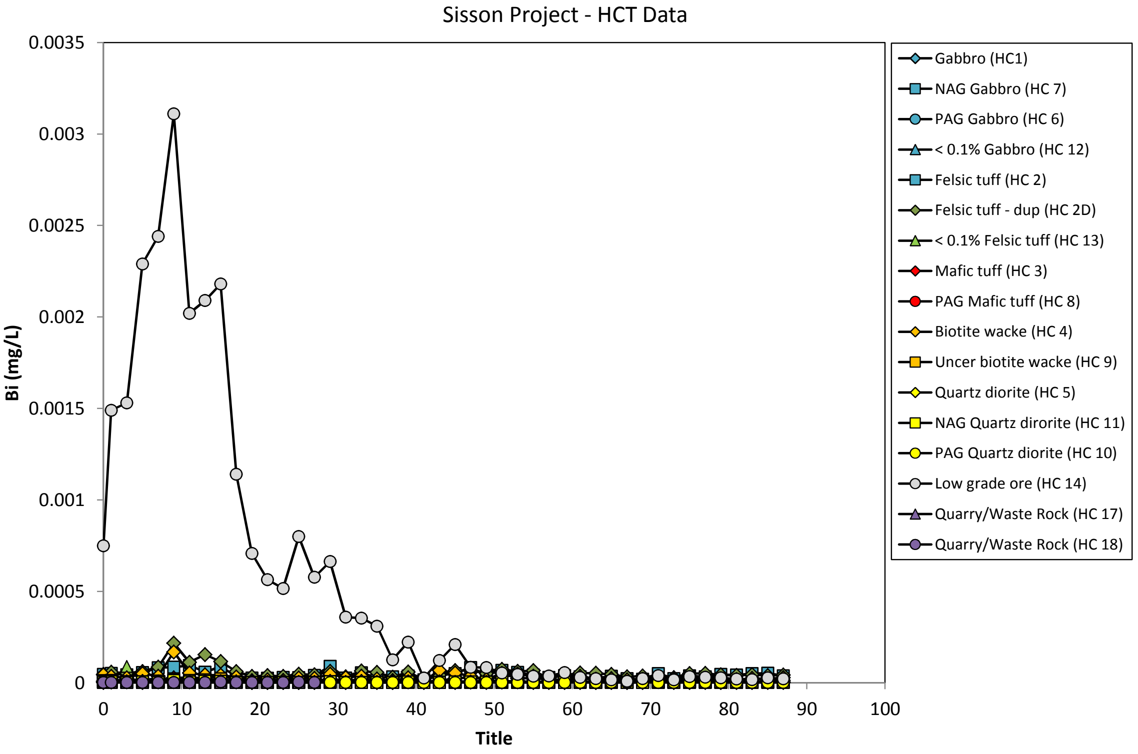

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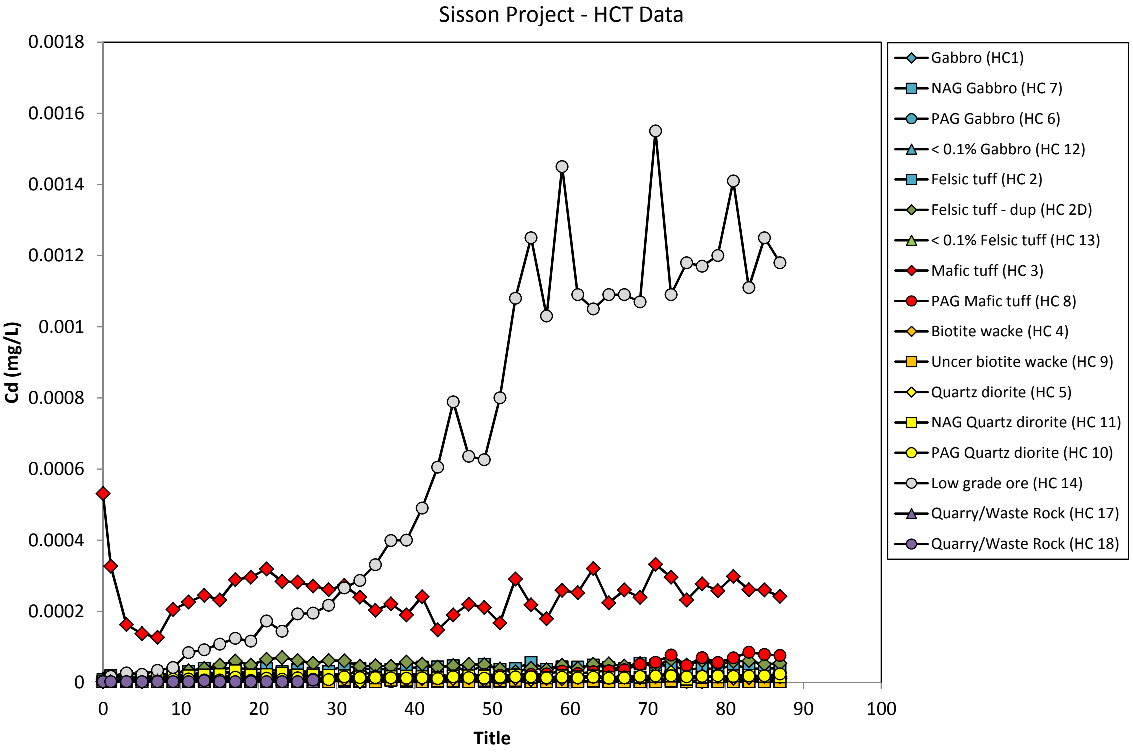

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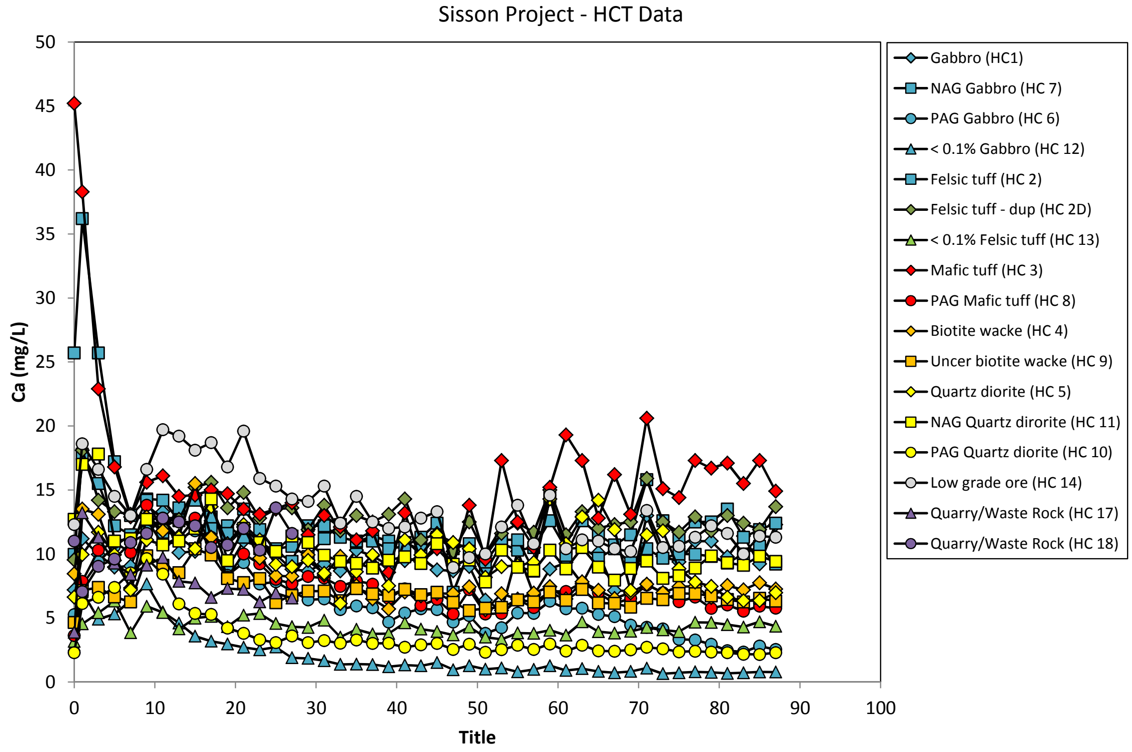

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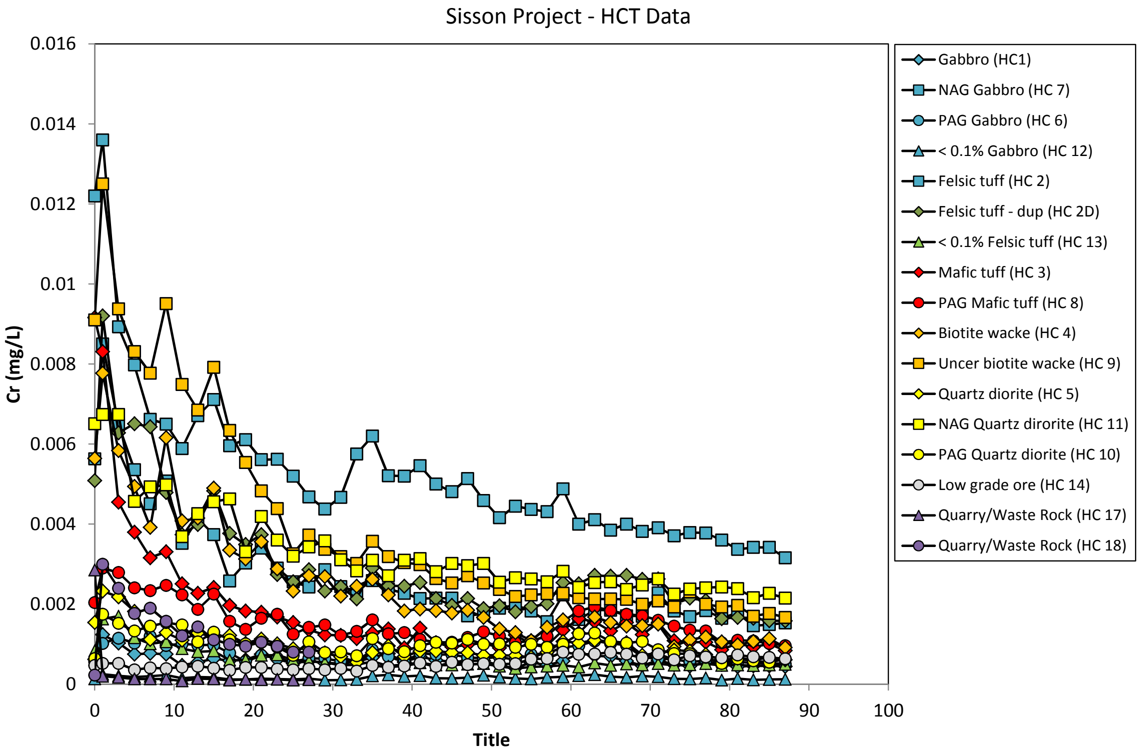

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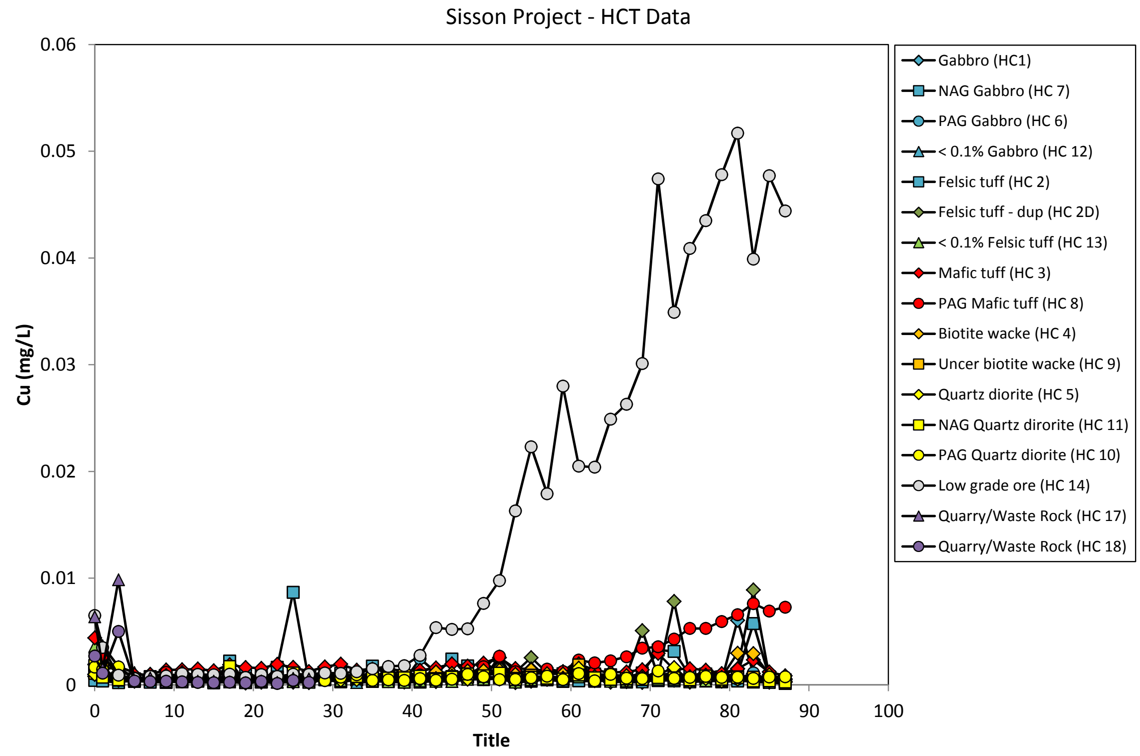

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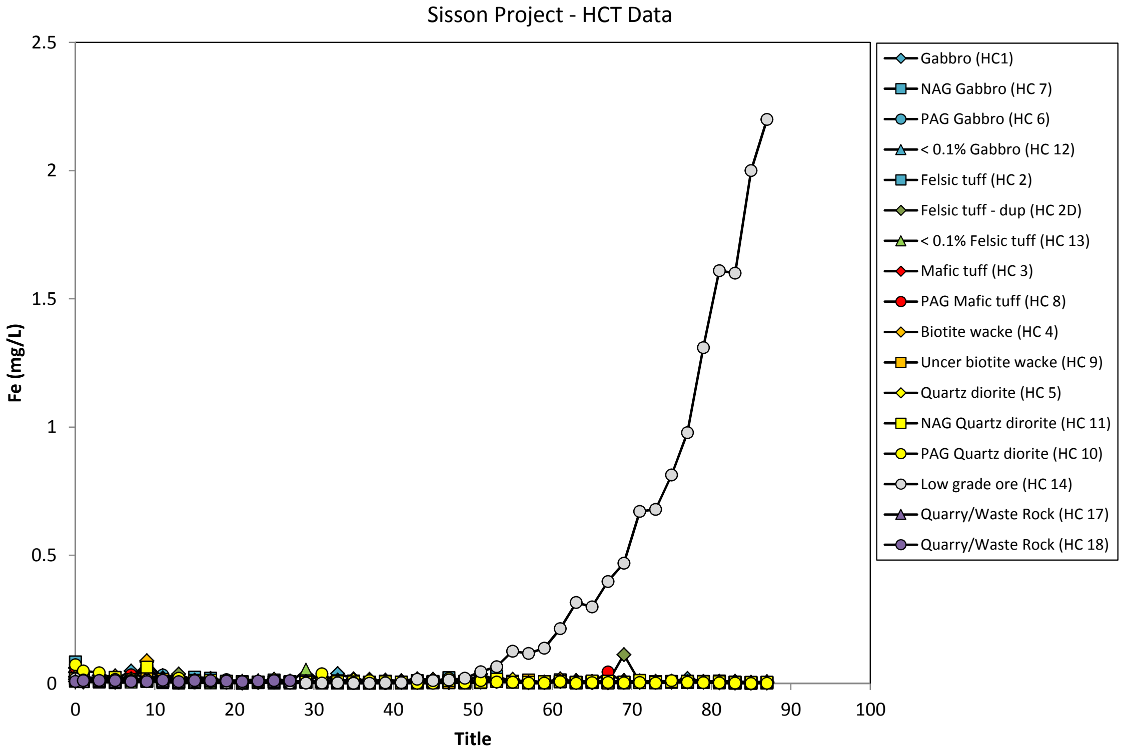

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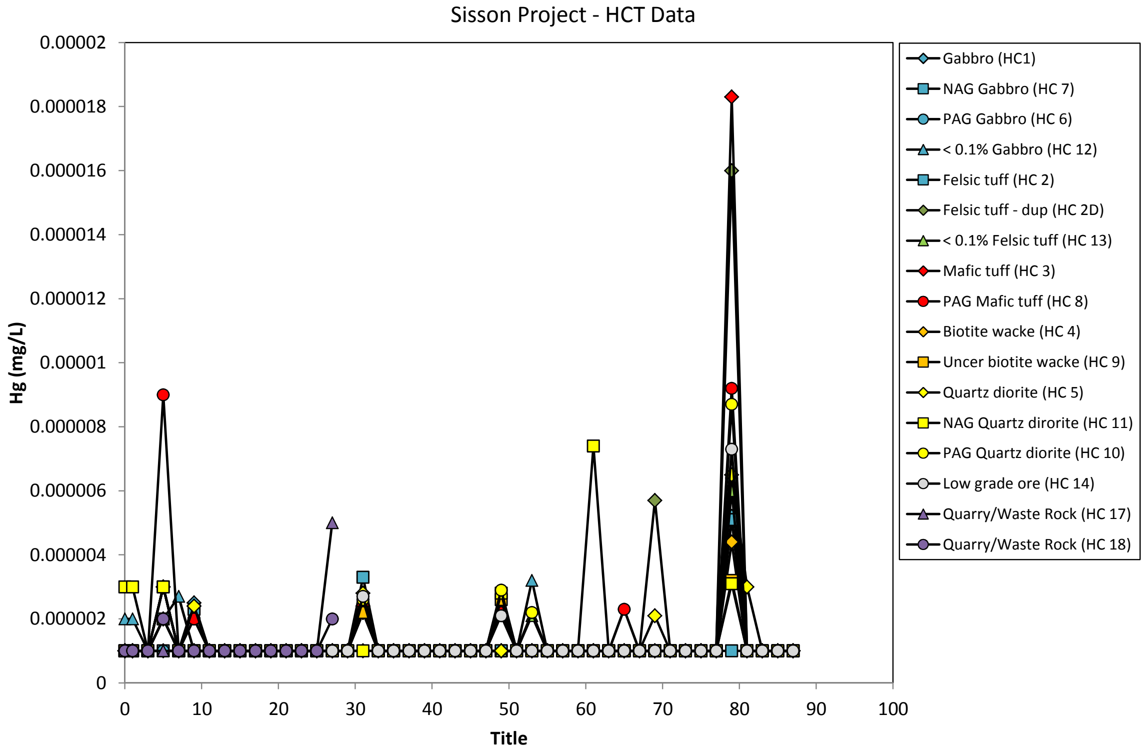

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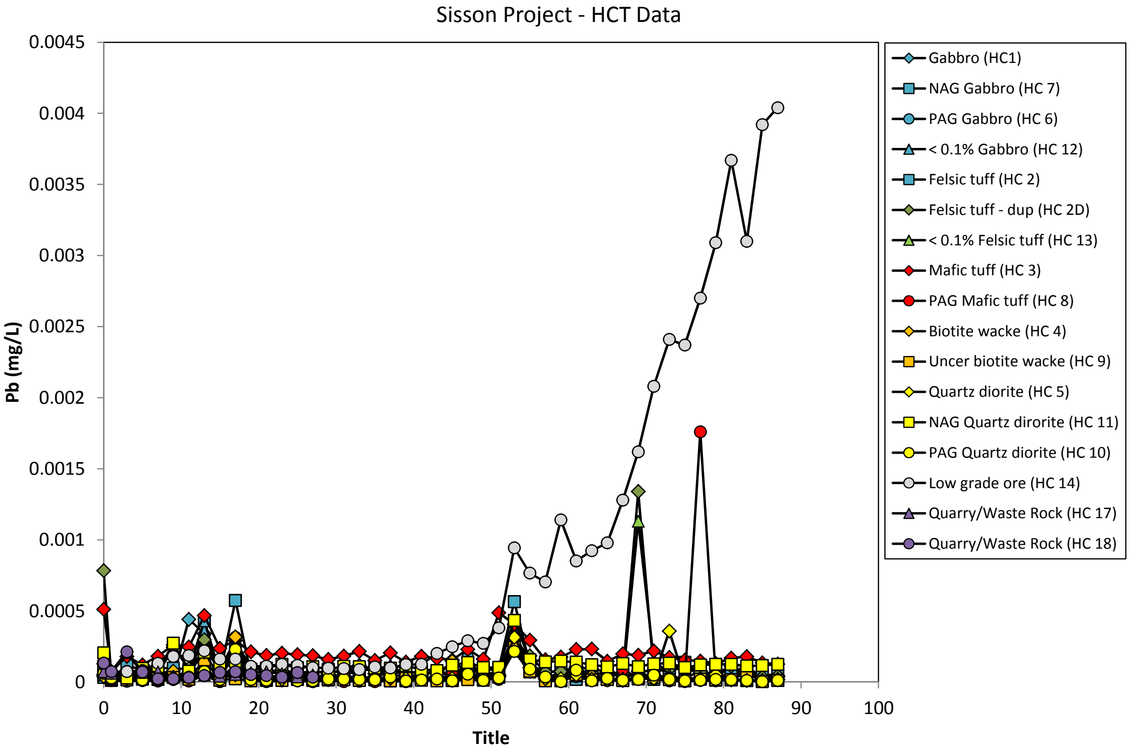

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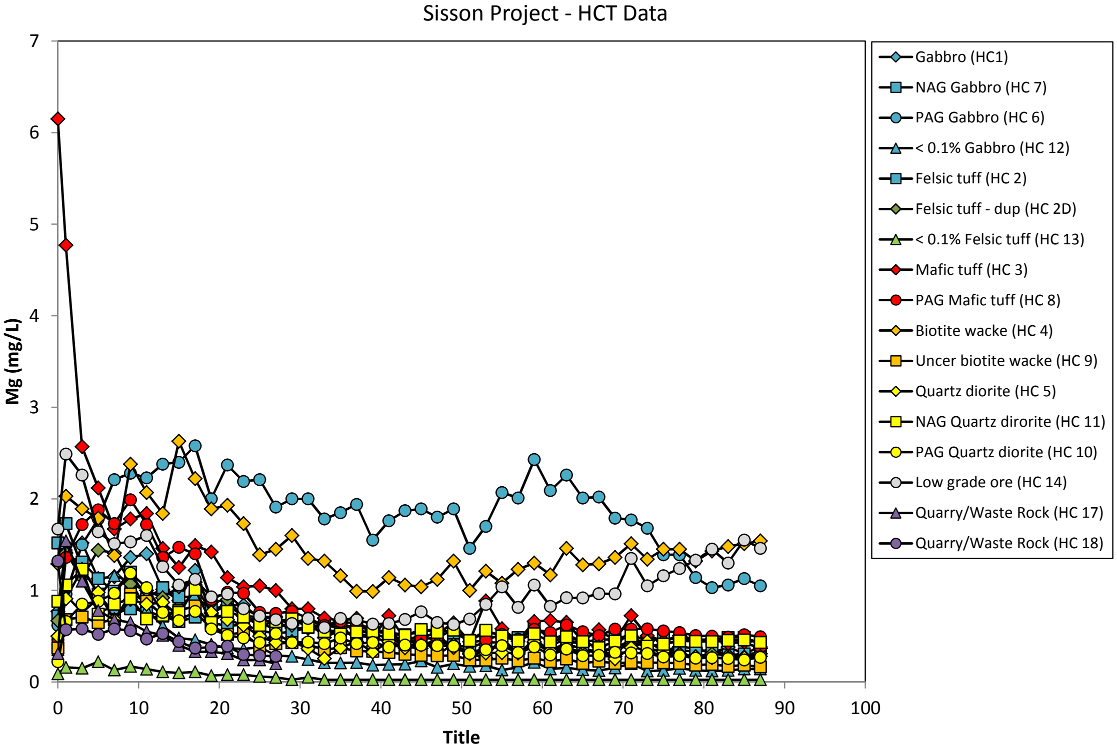

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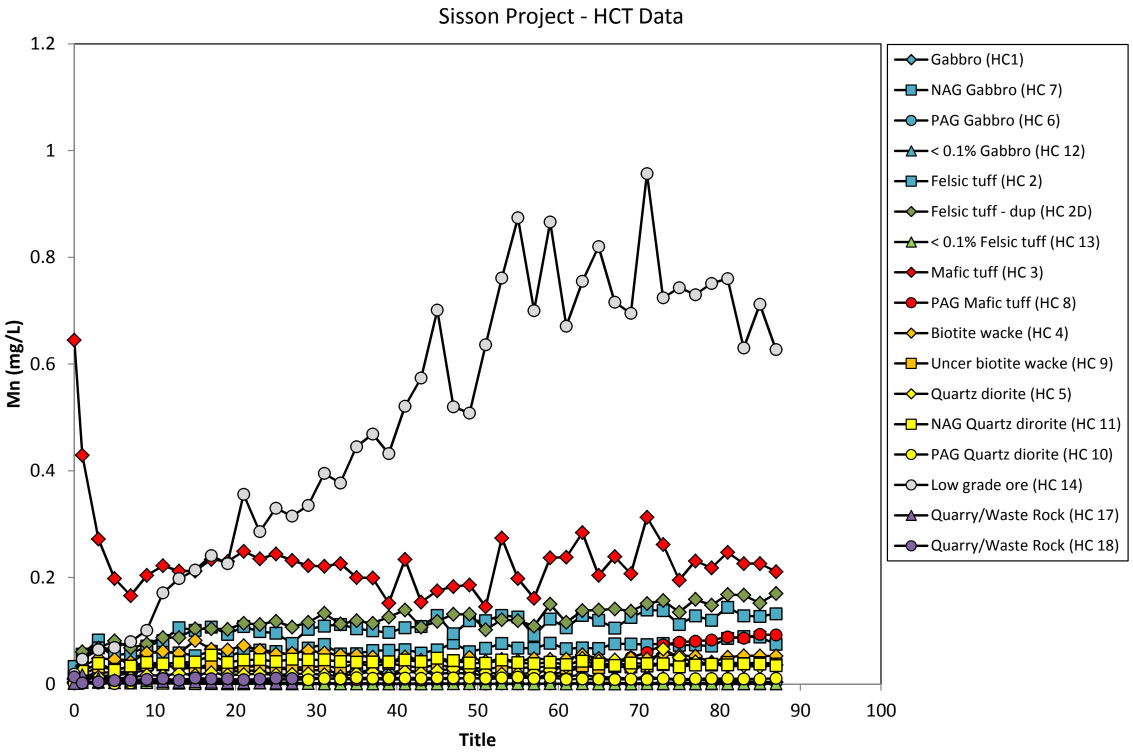

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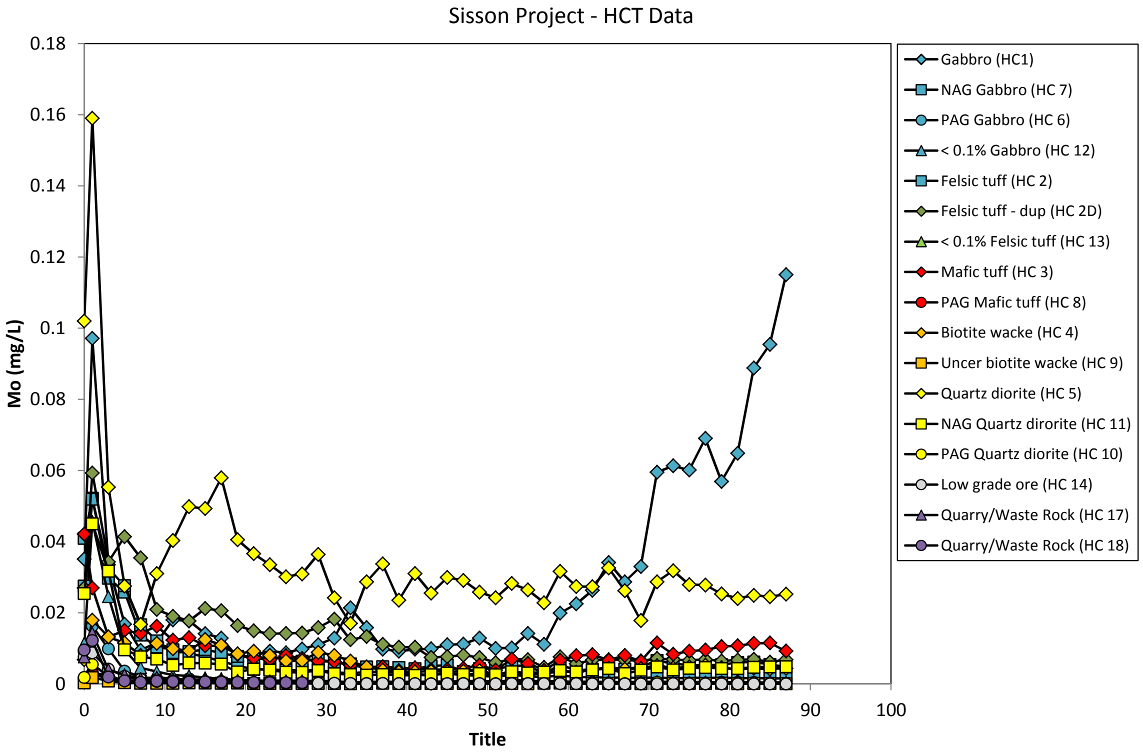

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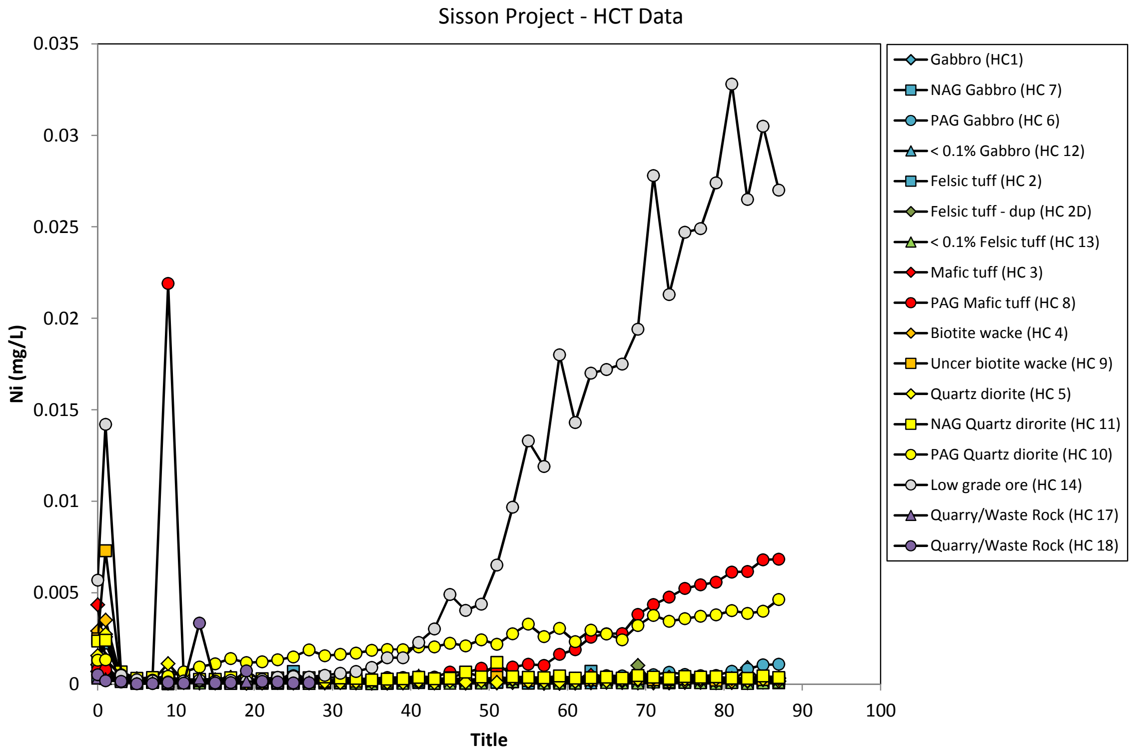

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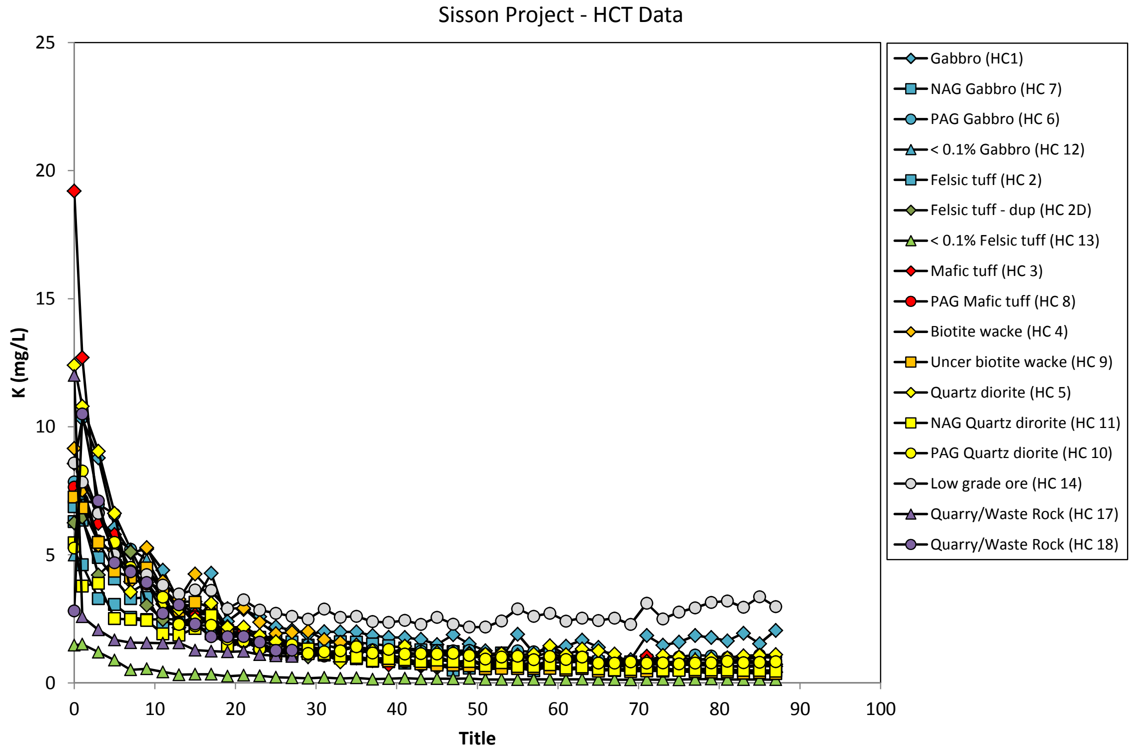

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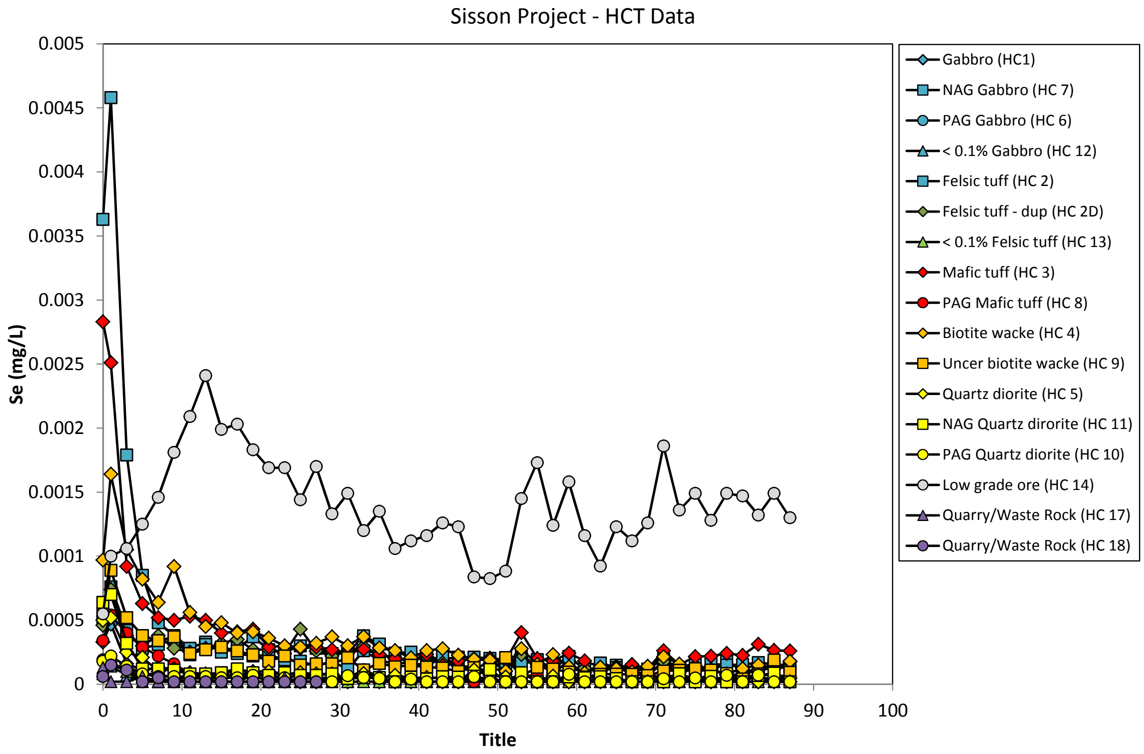

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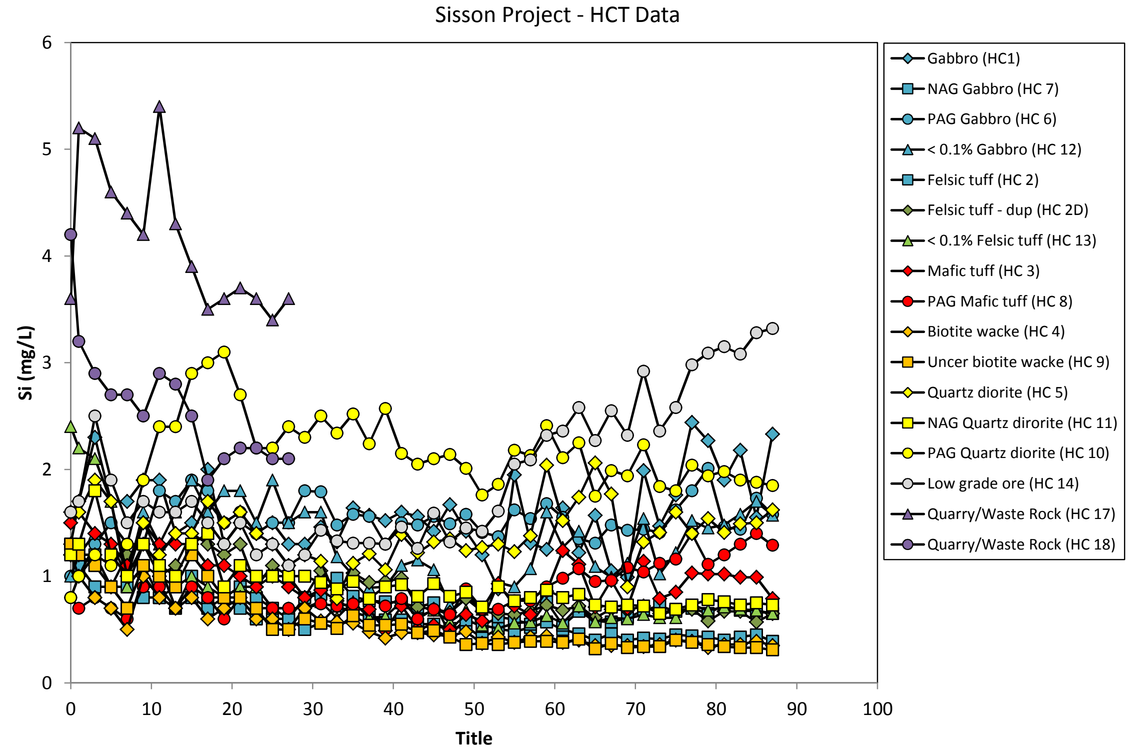

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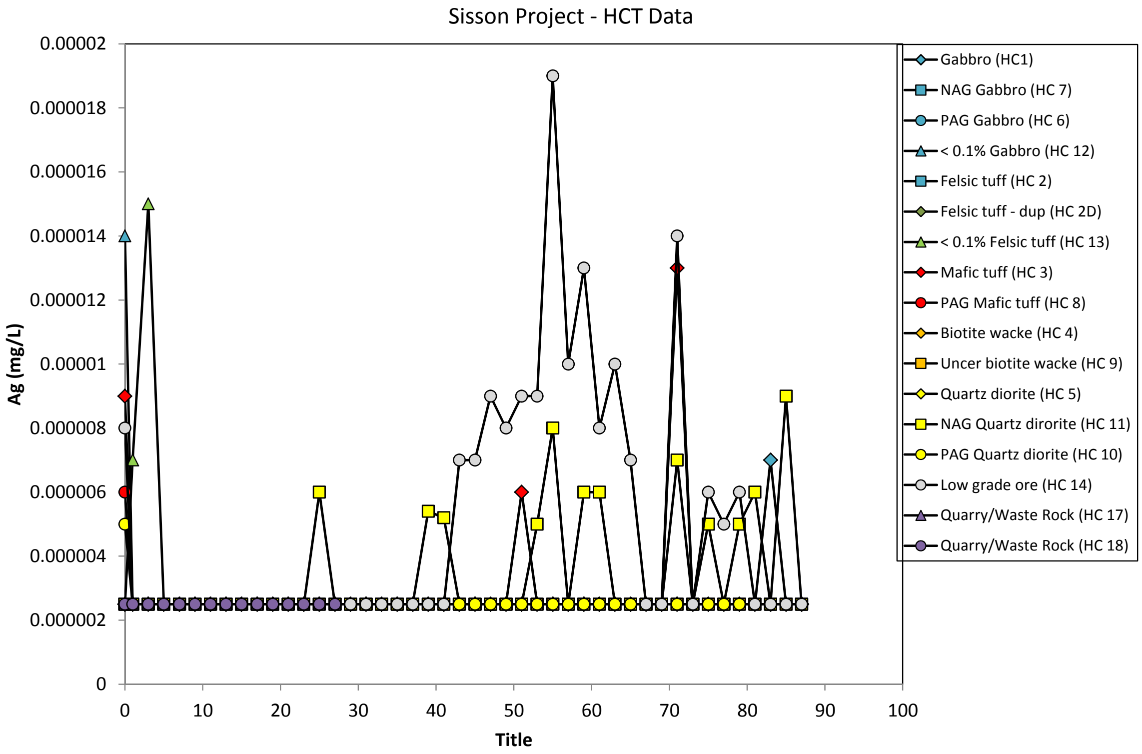

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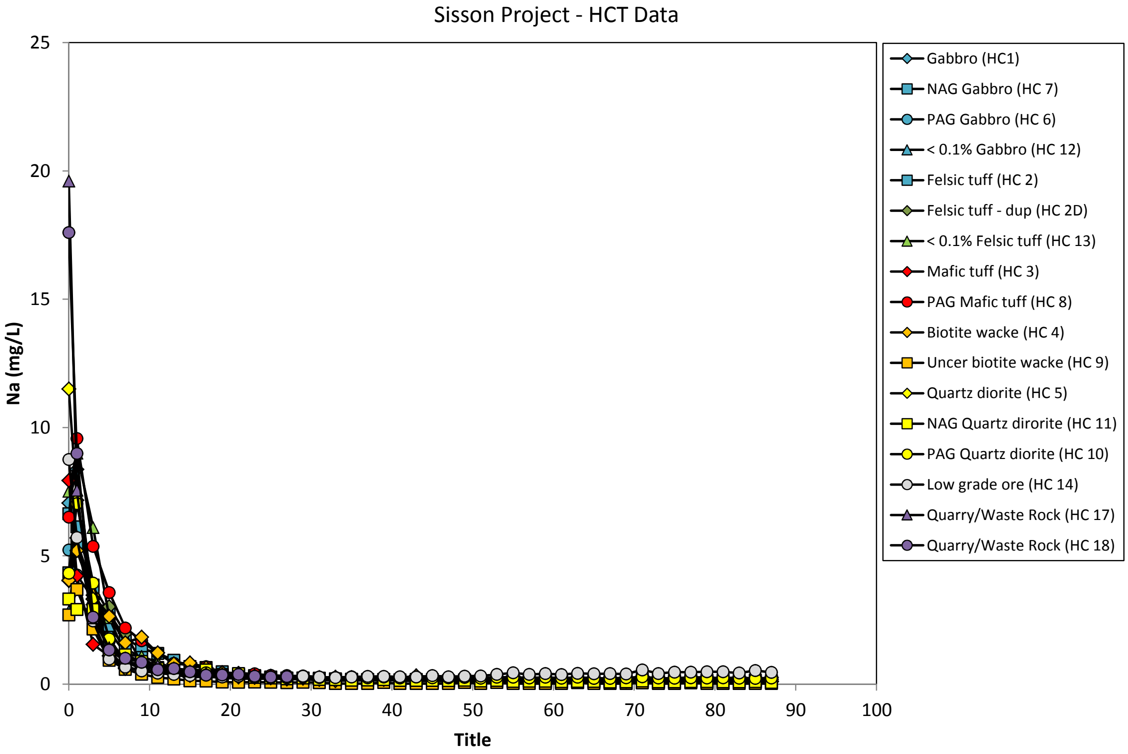

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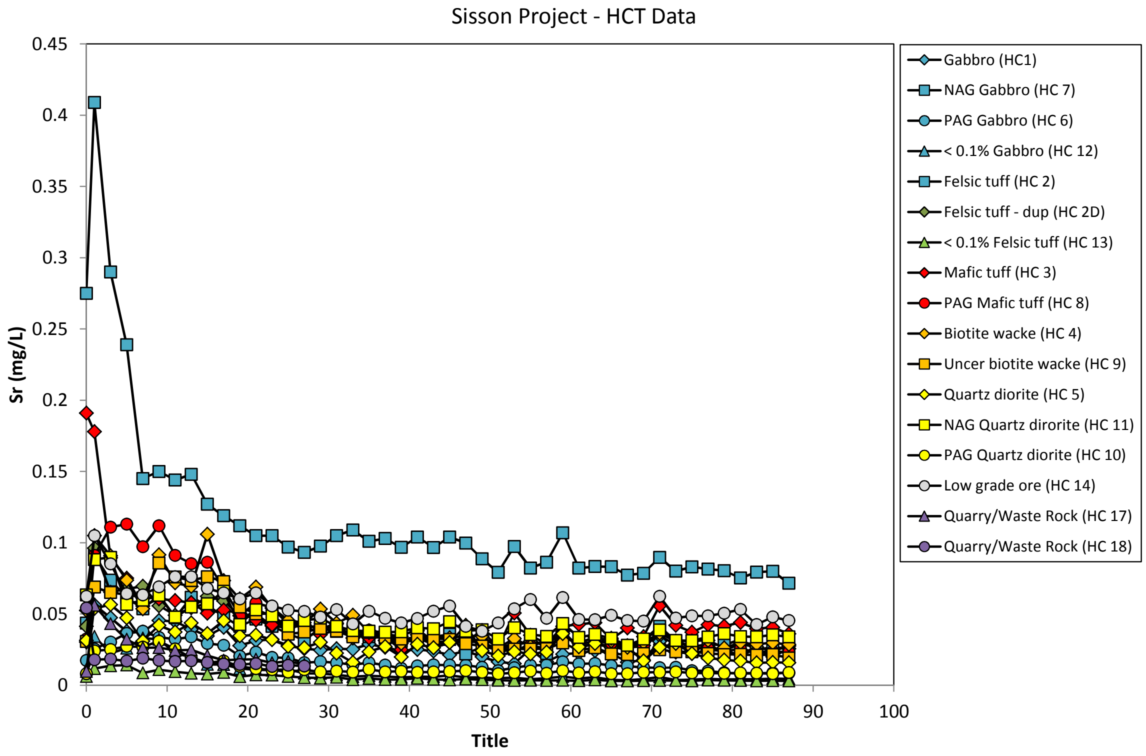

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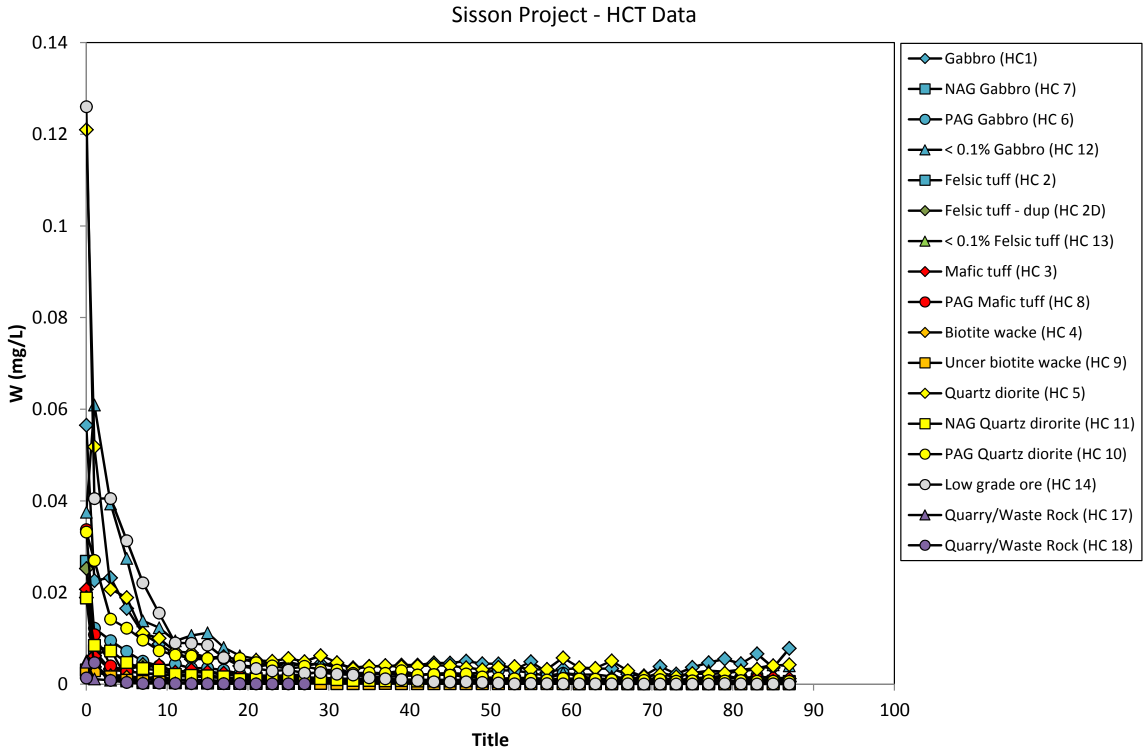

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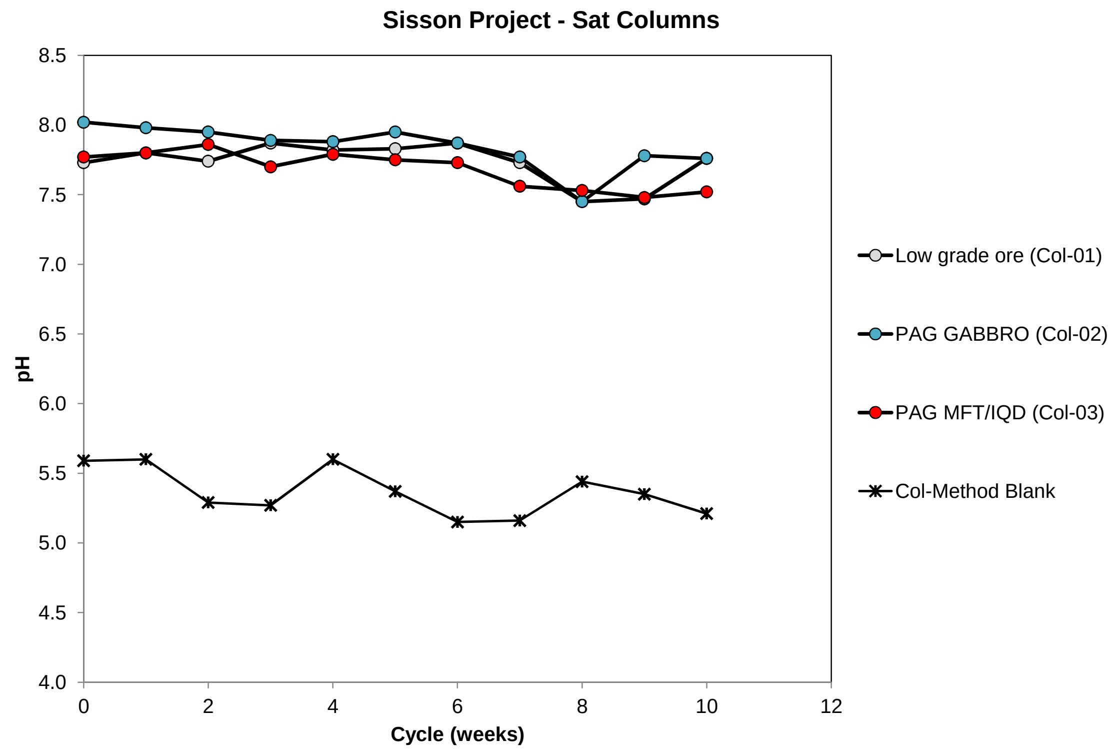
C2: Column Charts



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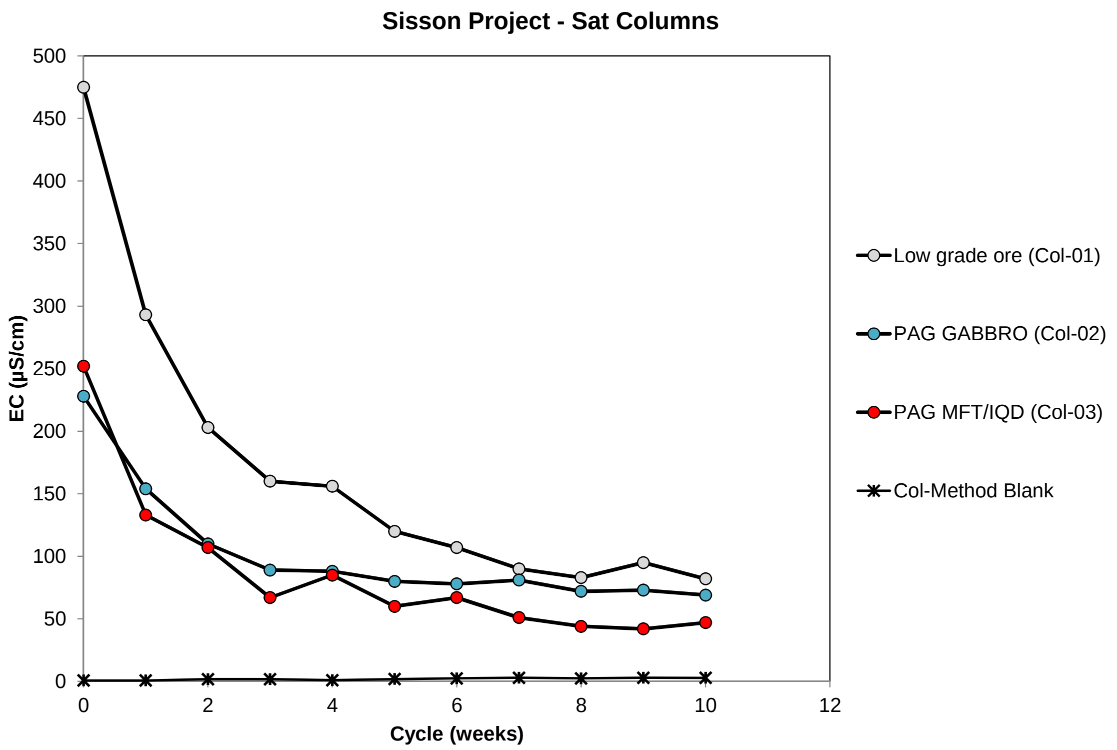

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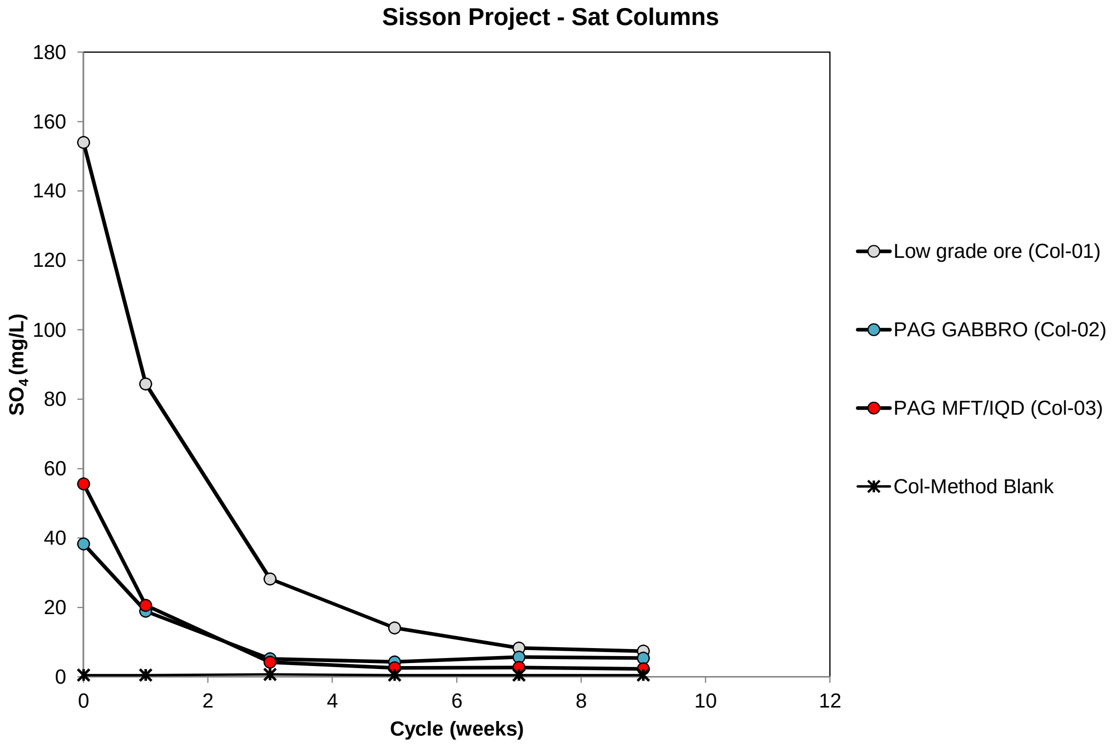

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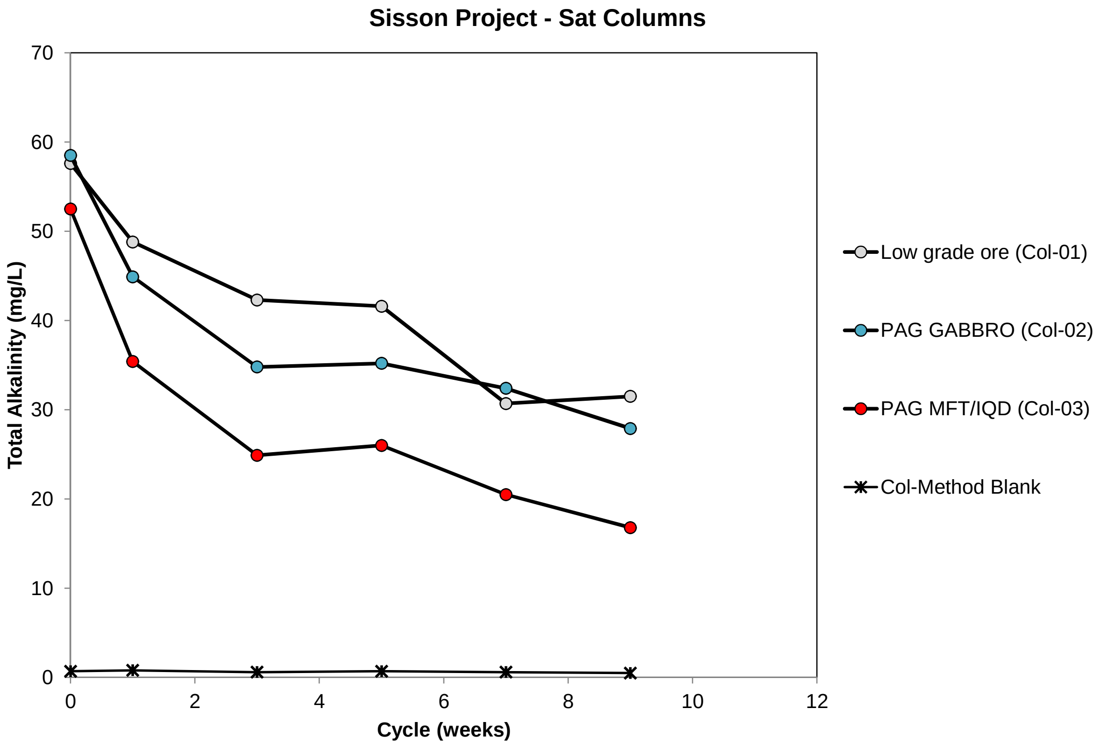

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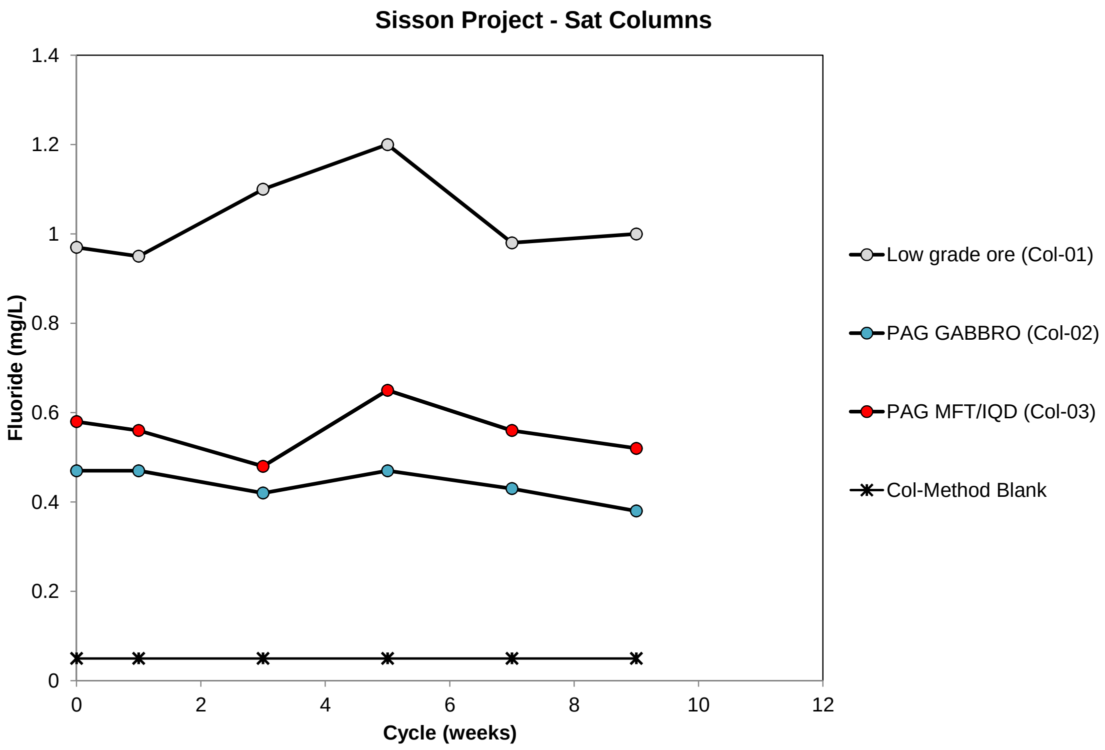

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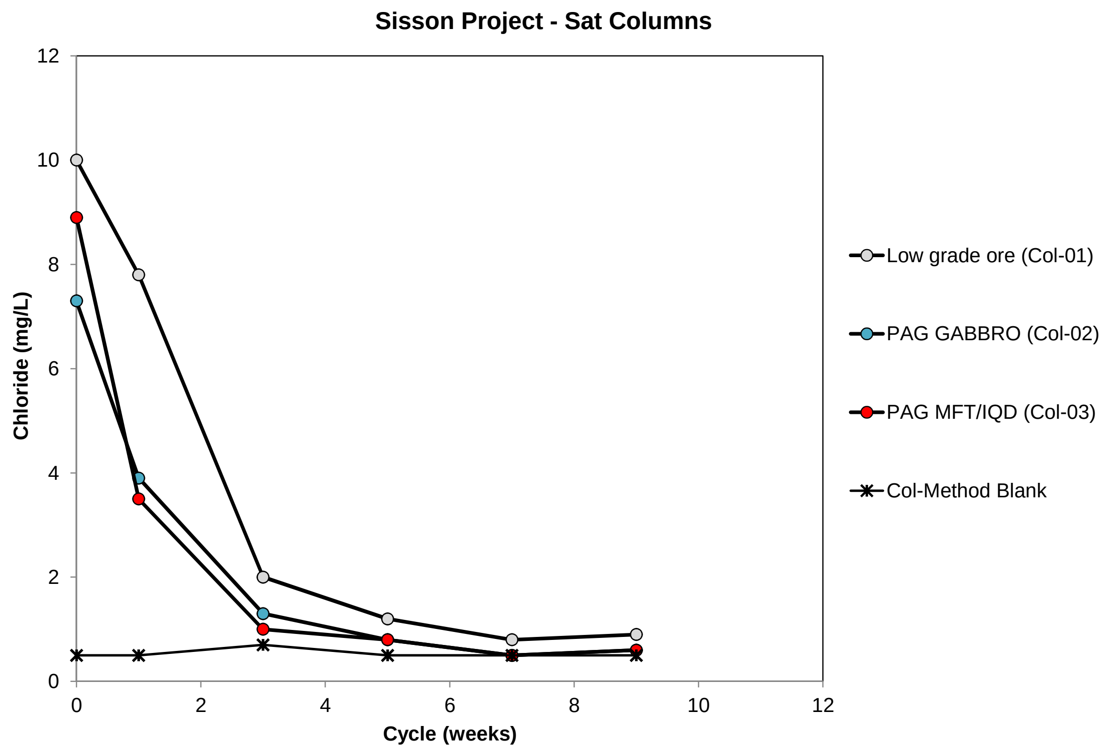

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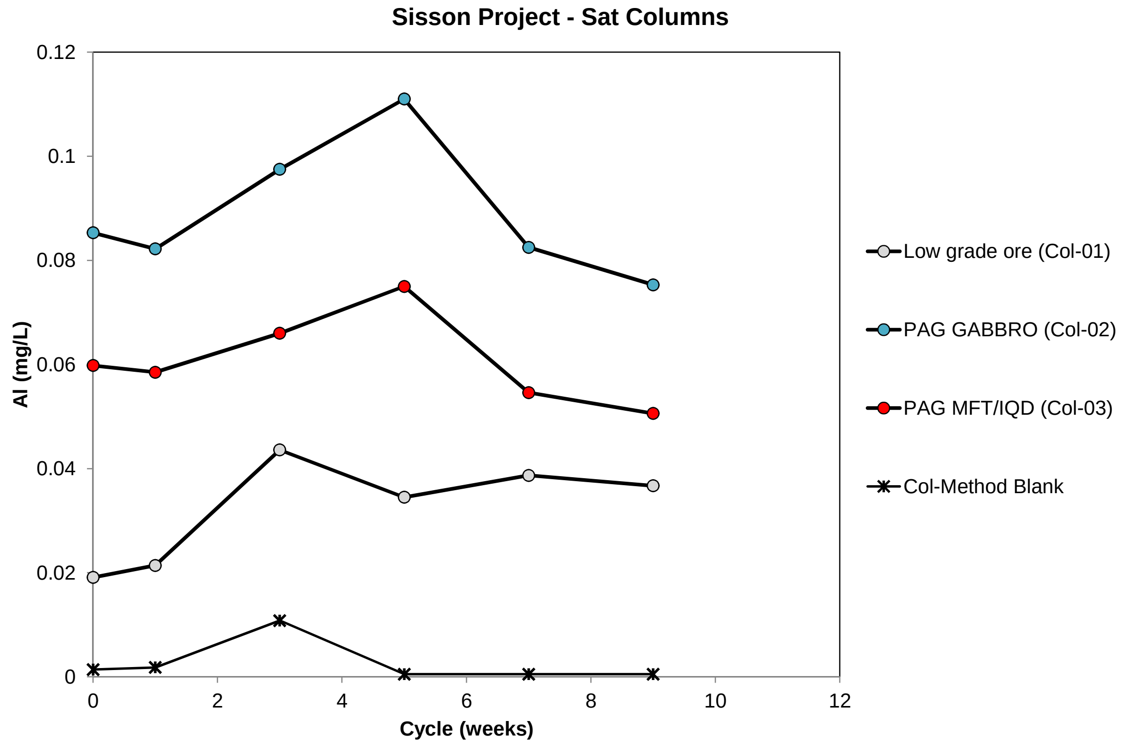

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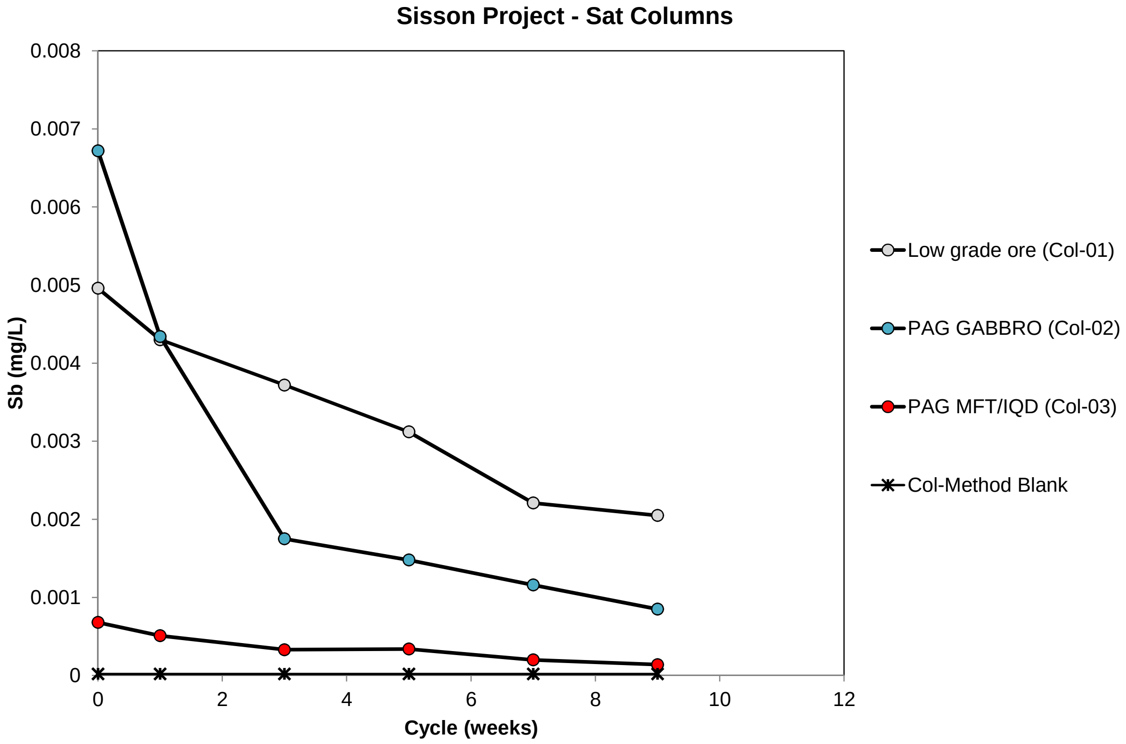

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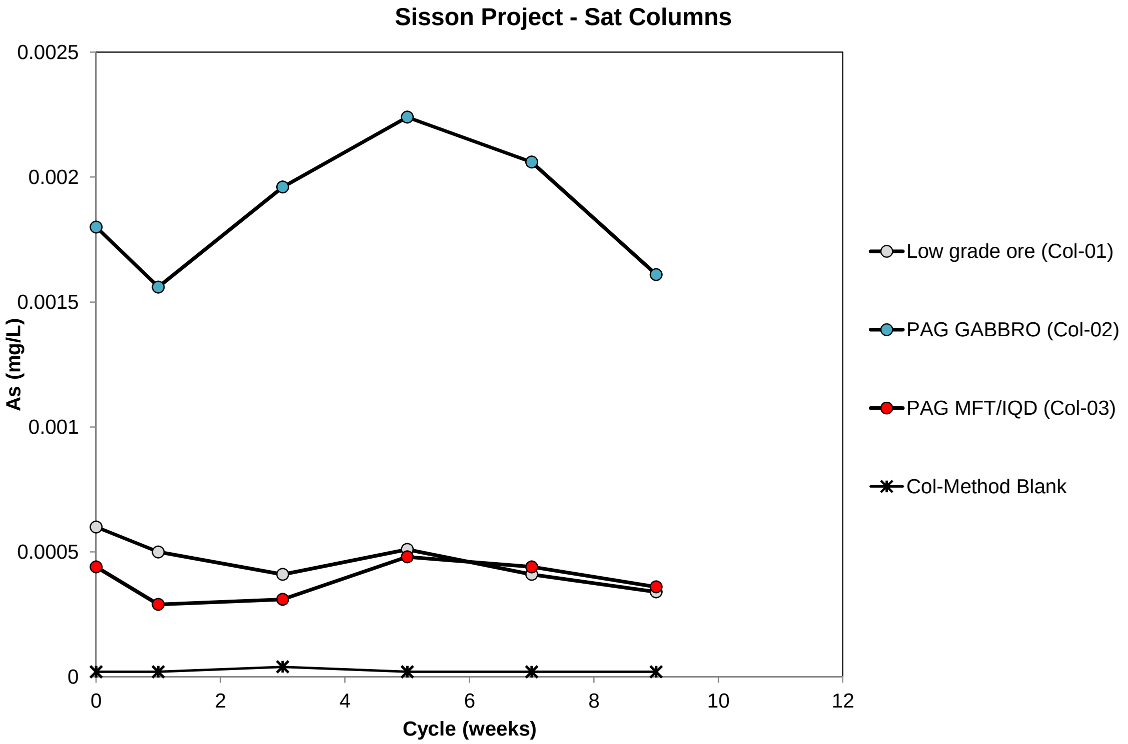

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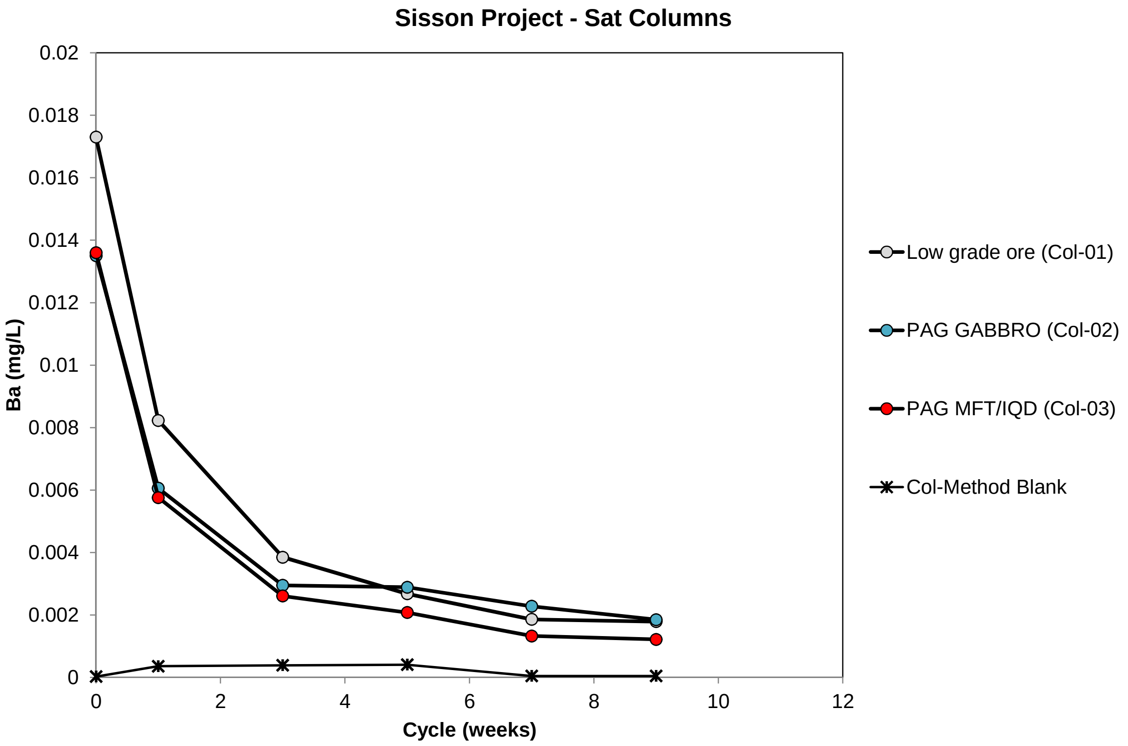

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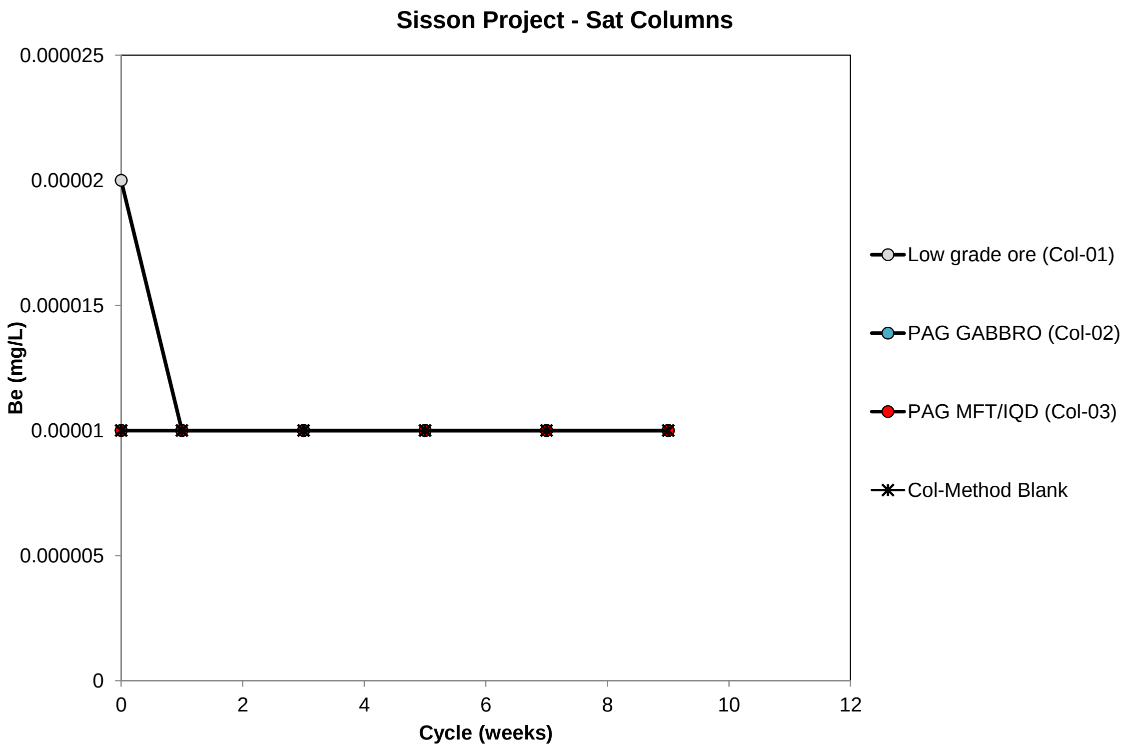

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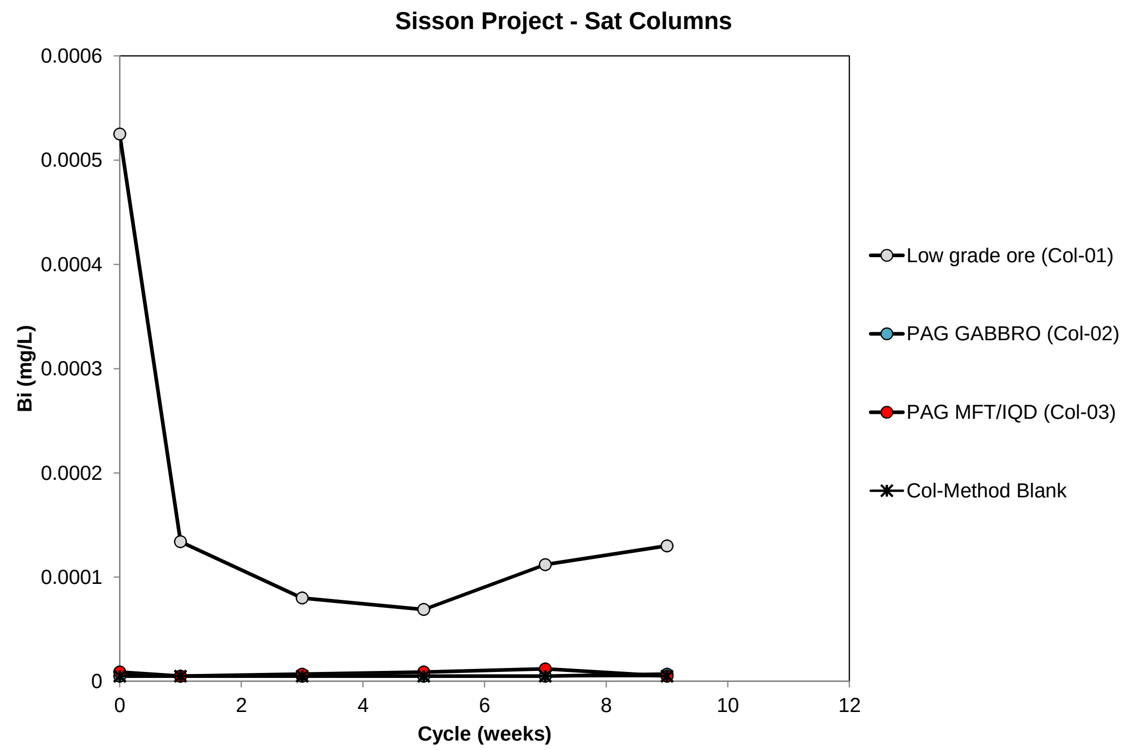

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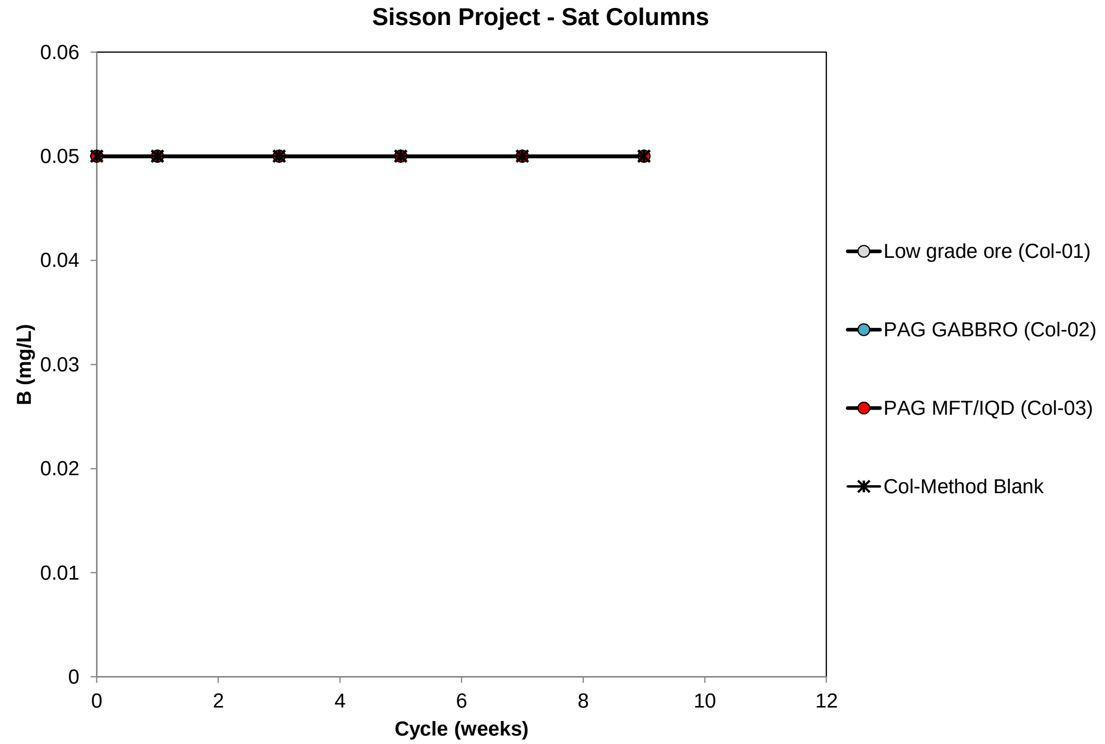

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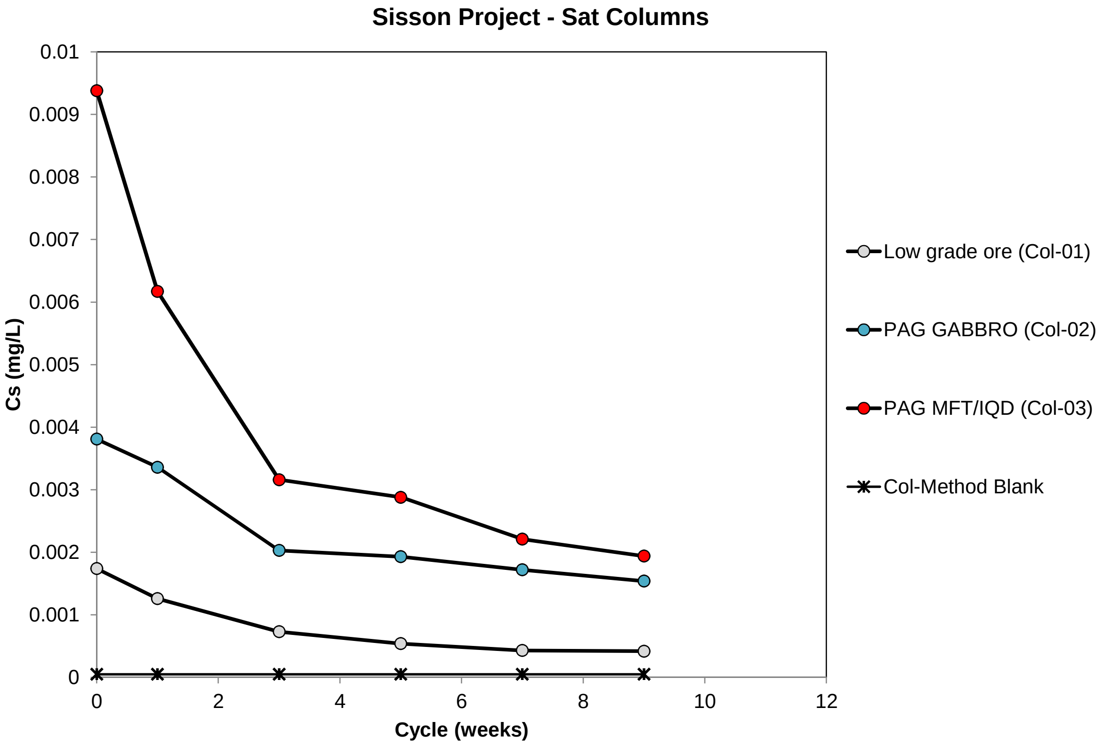

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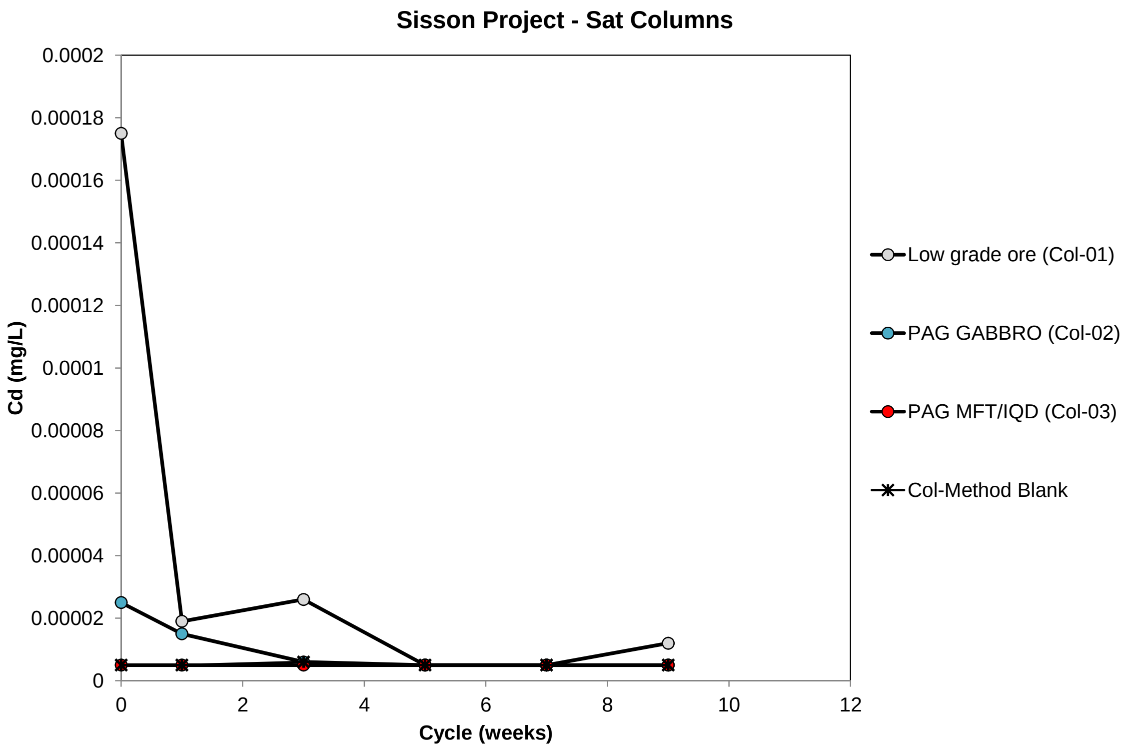

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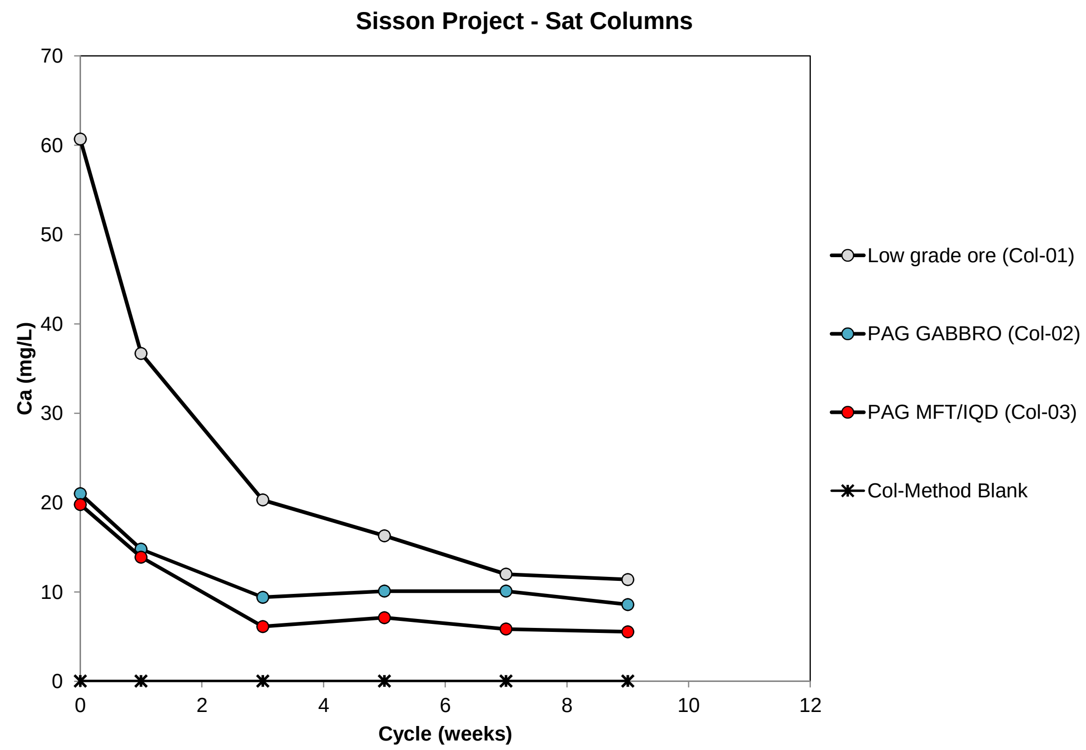

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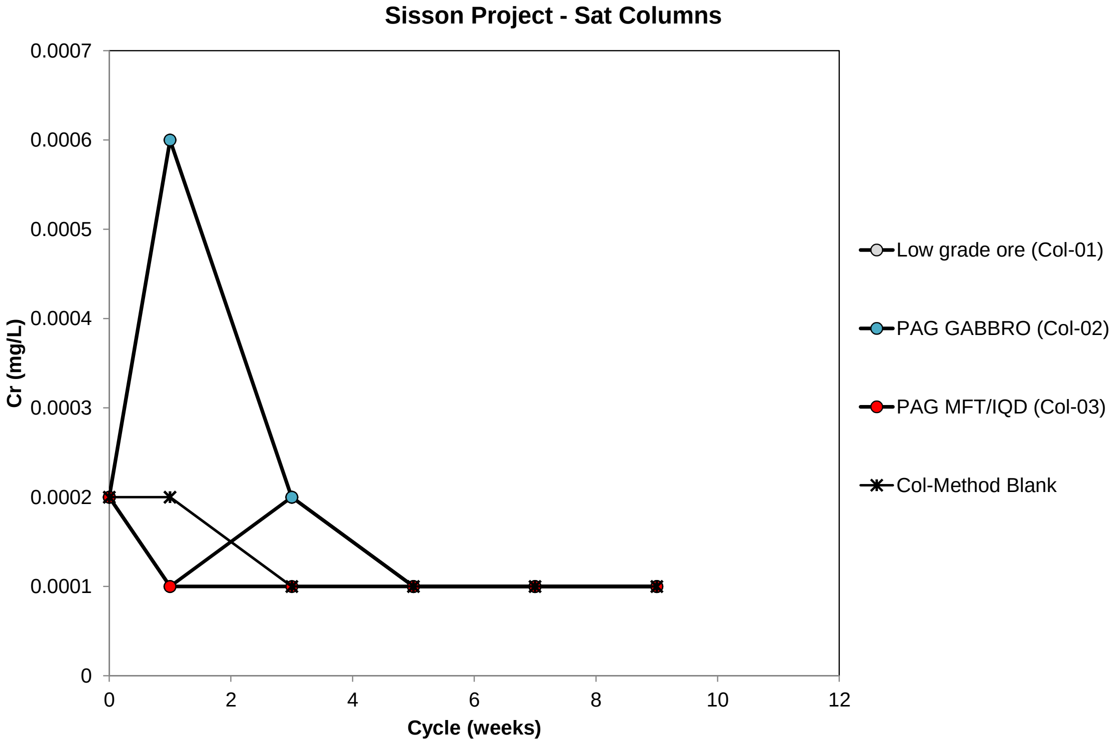

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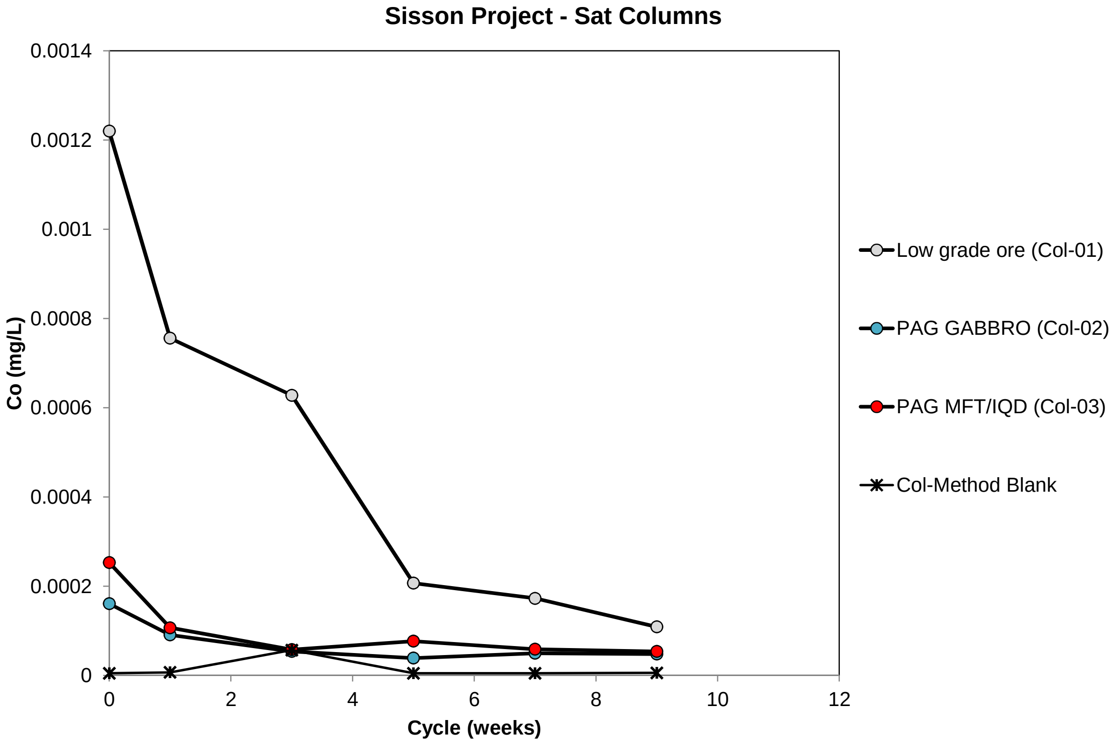

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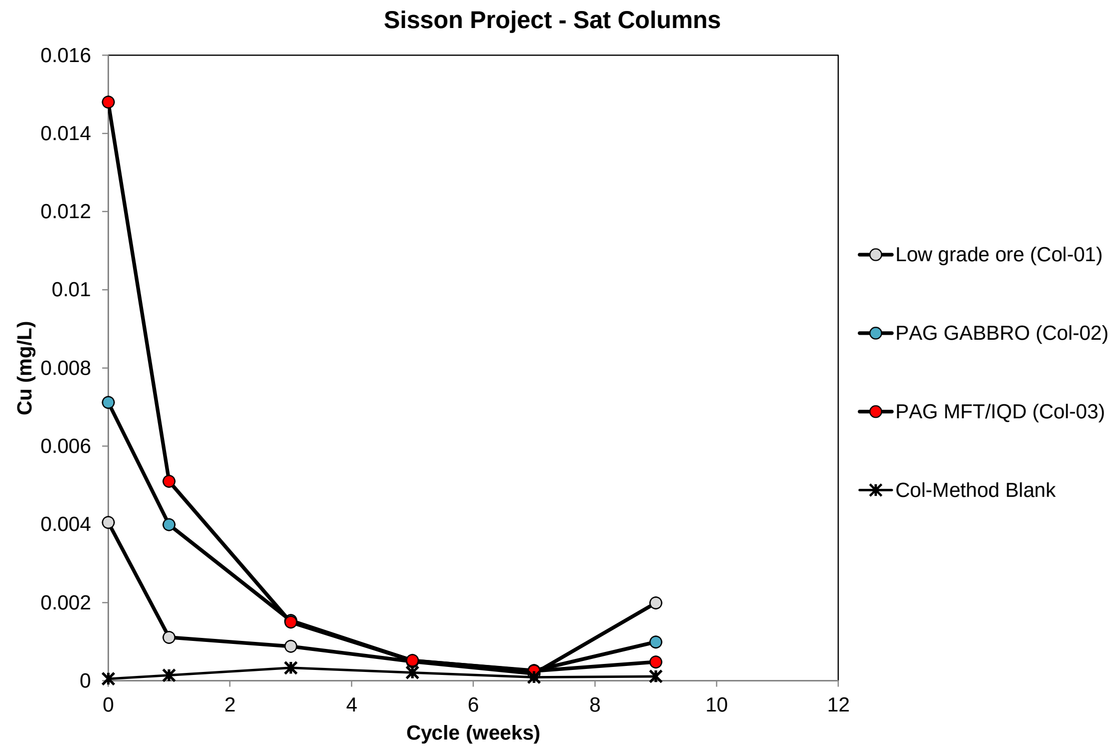

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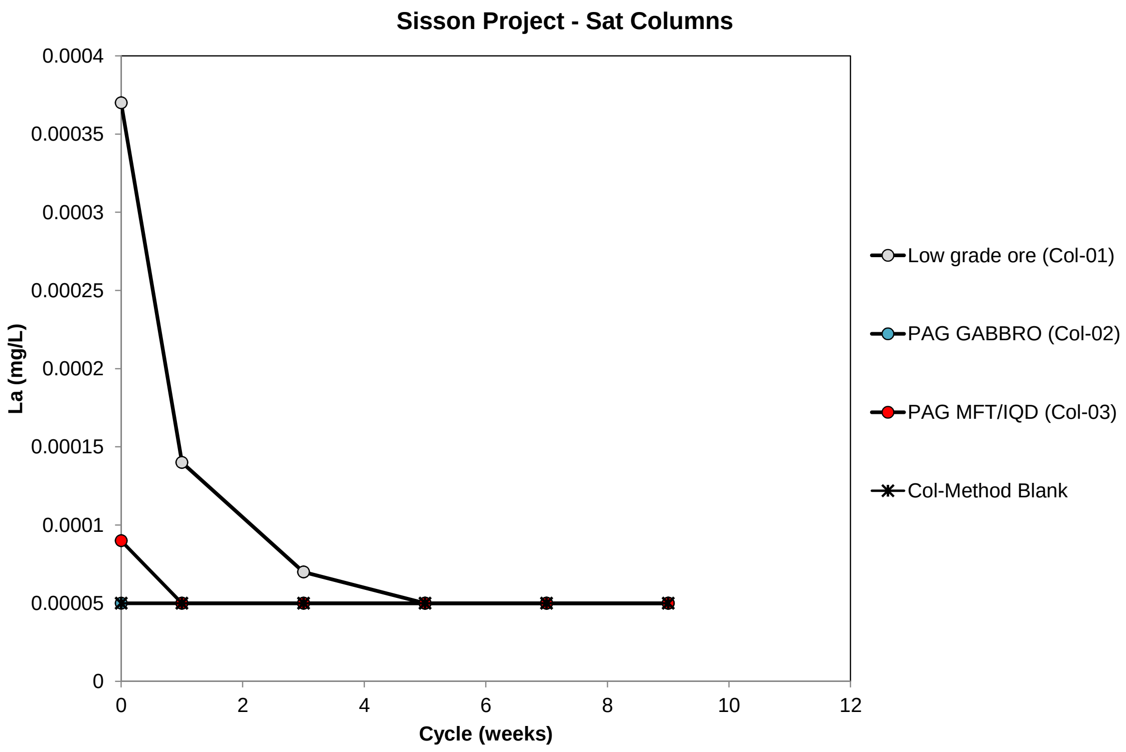

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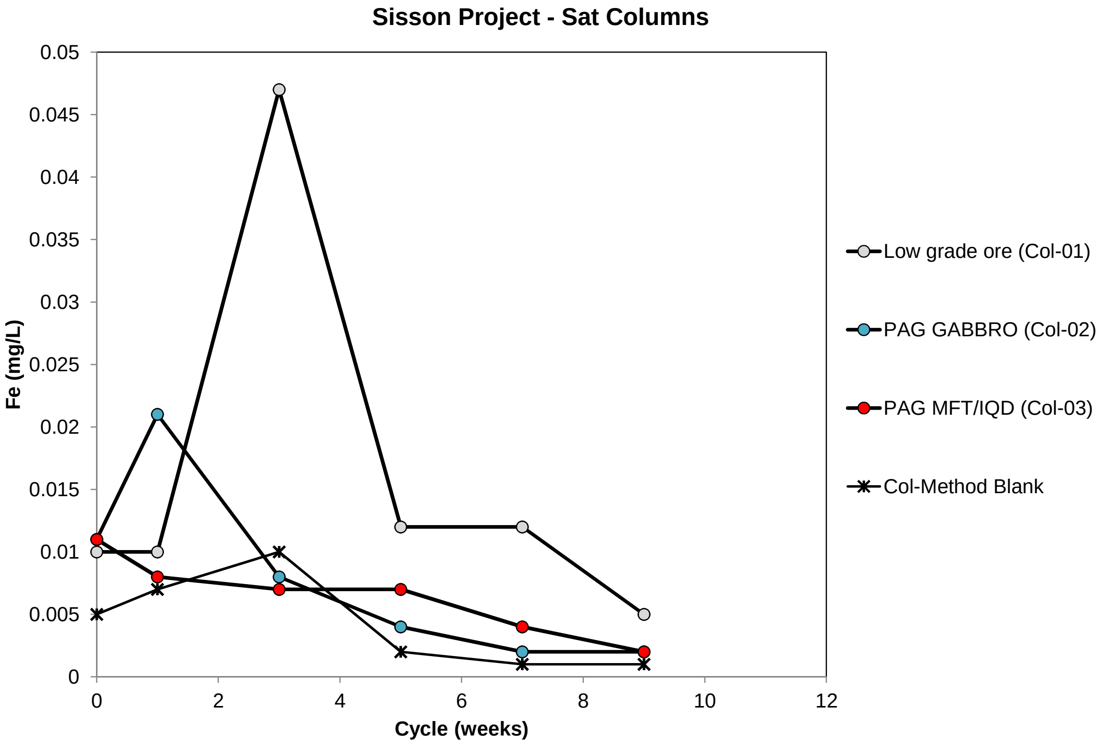

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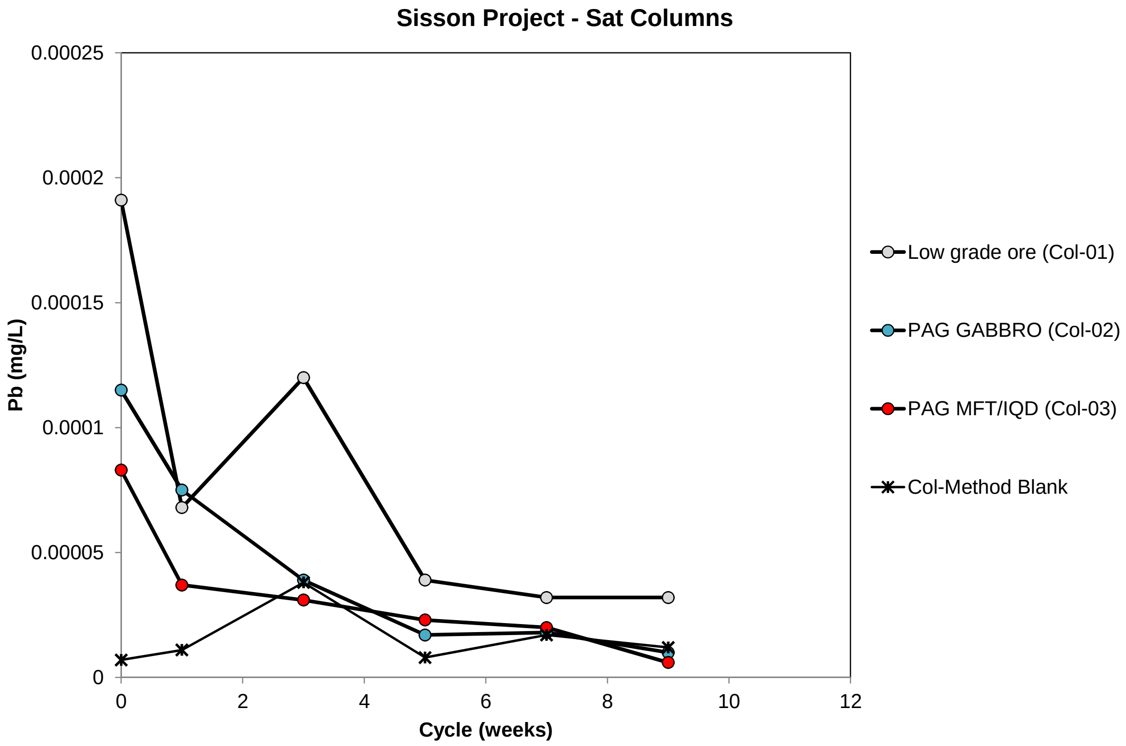

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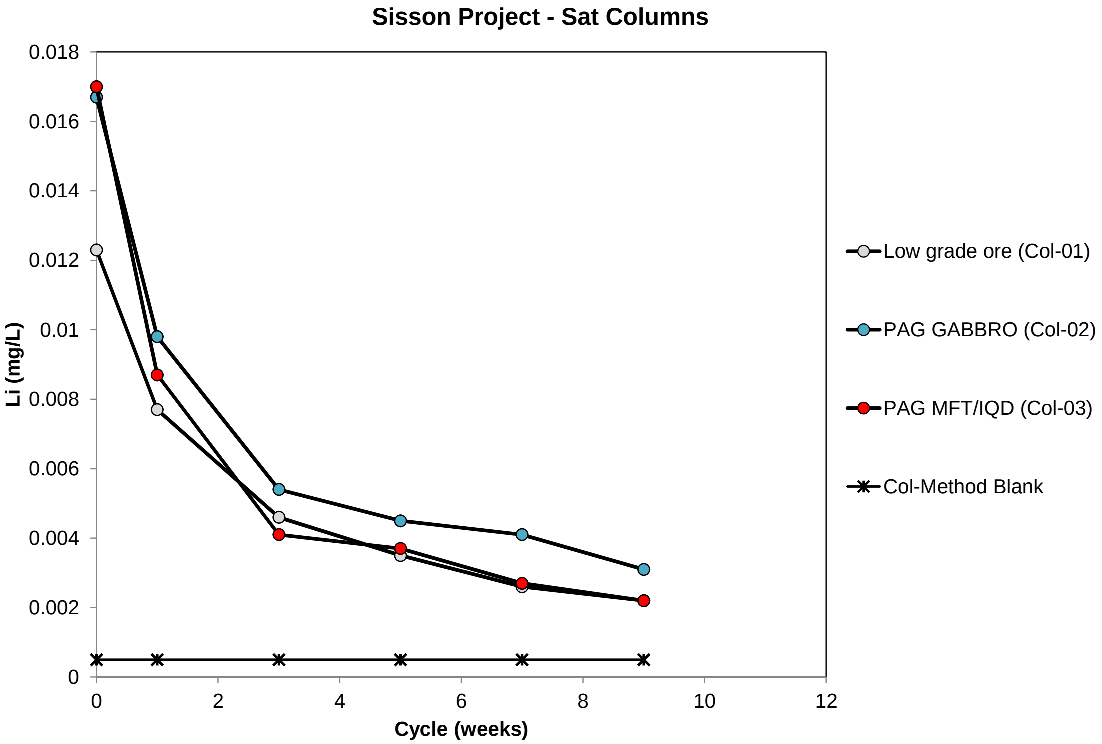

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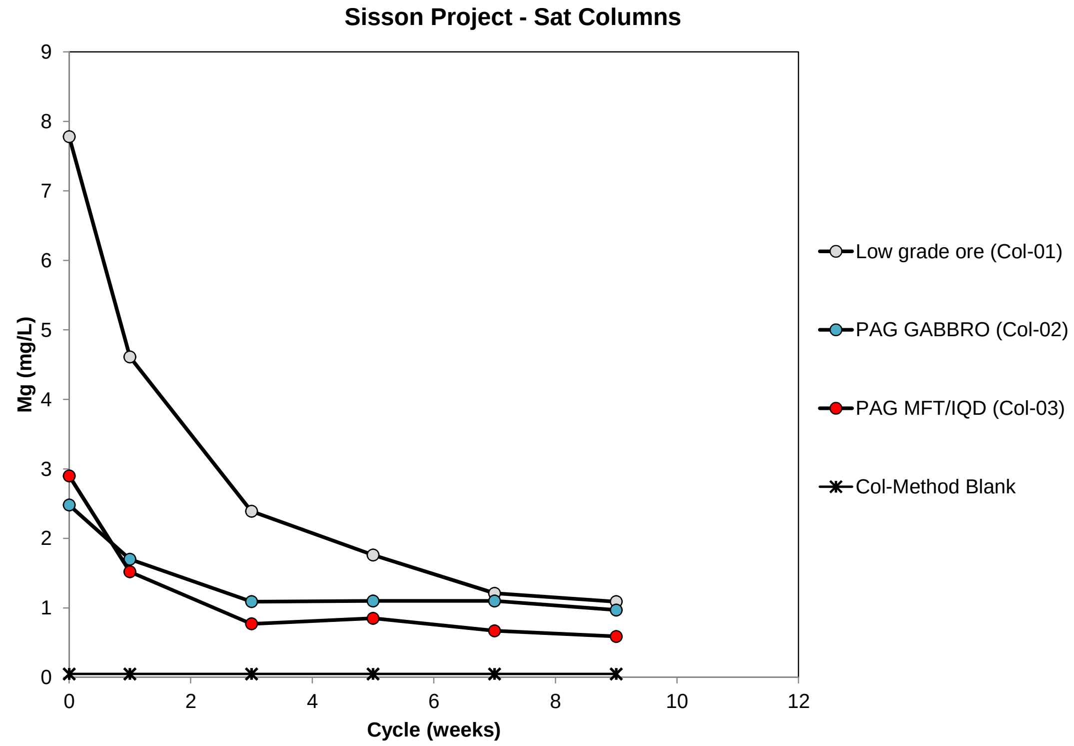

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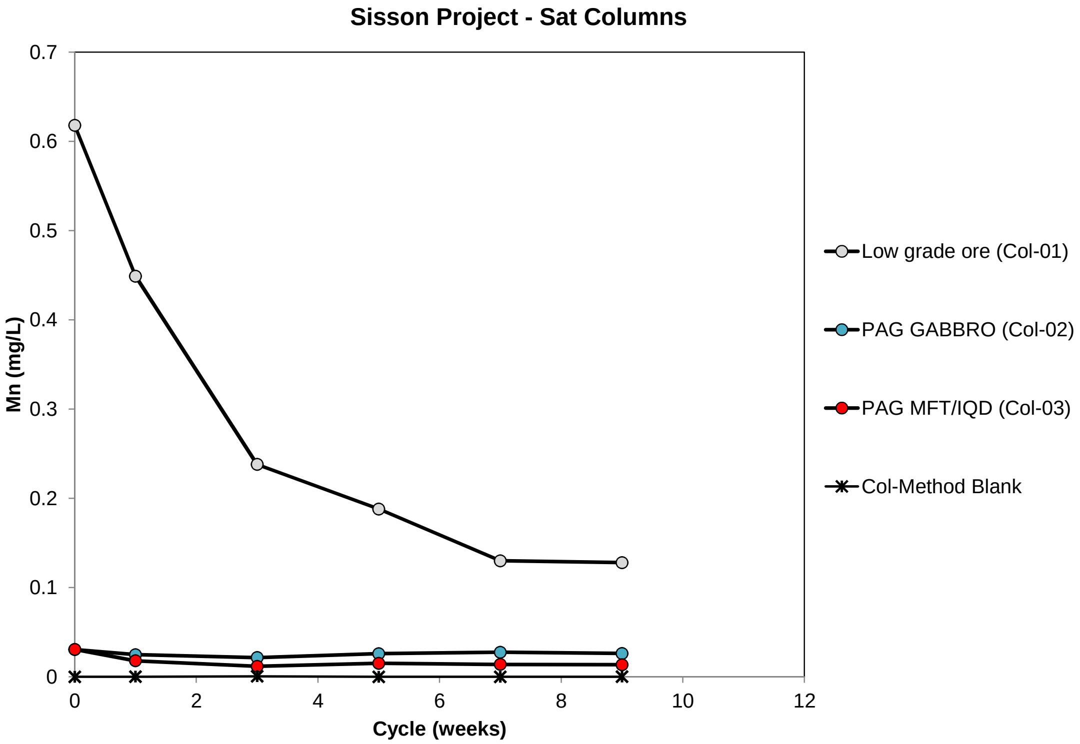

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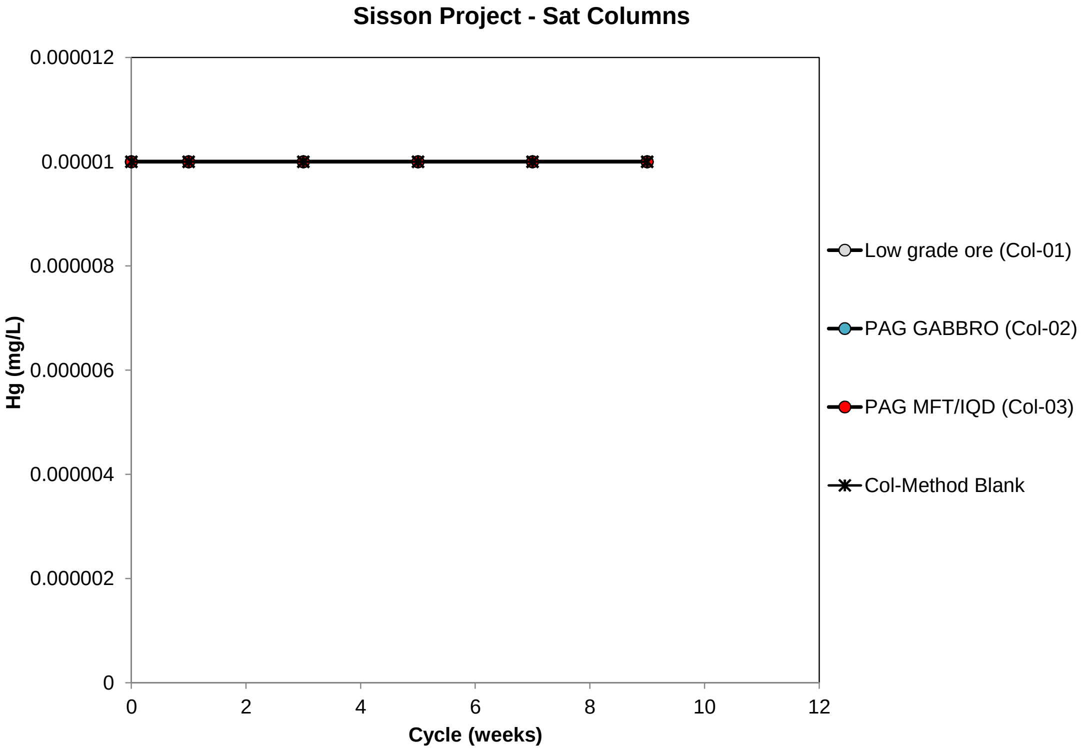

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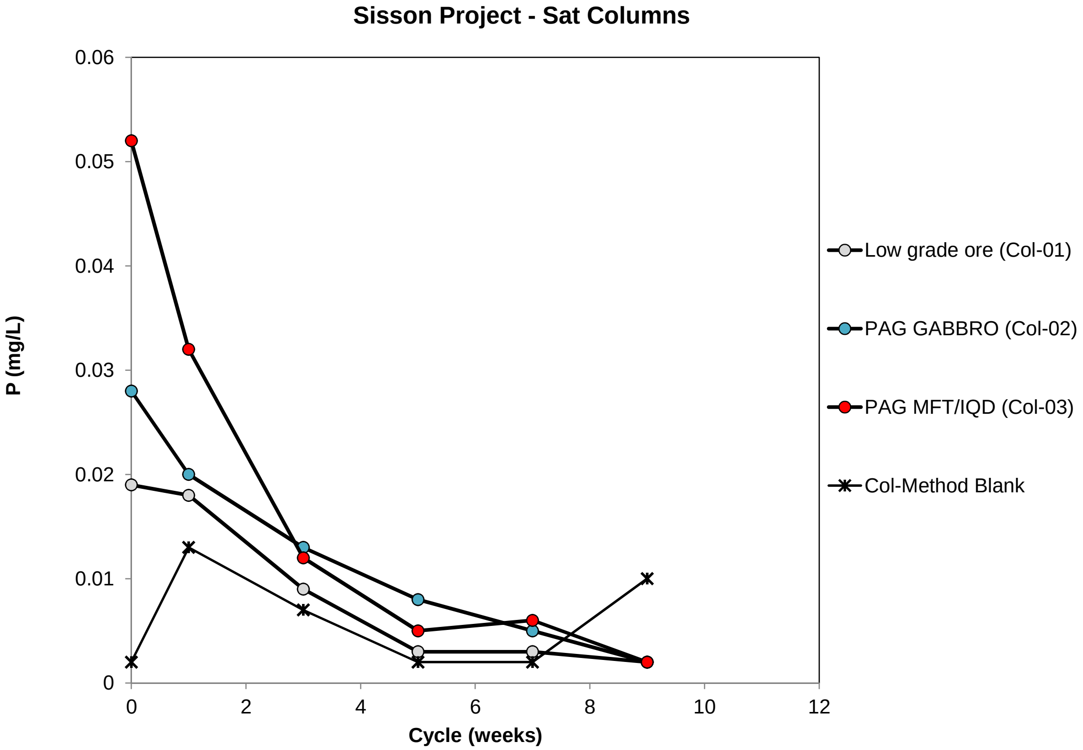

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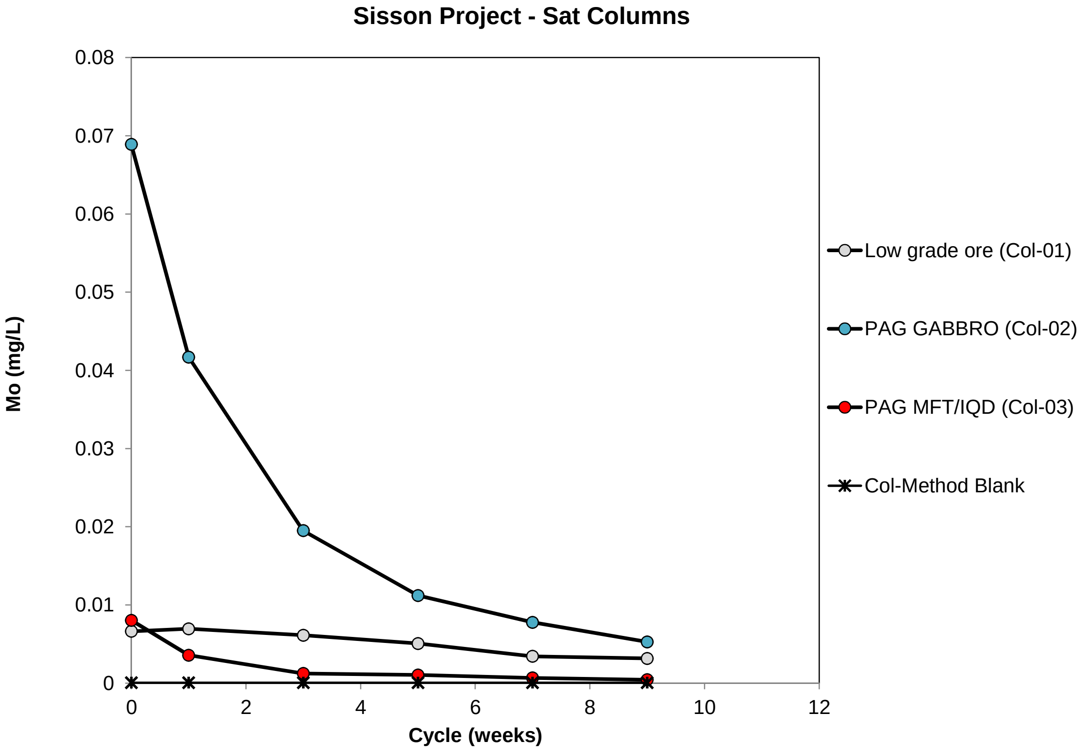

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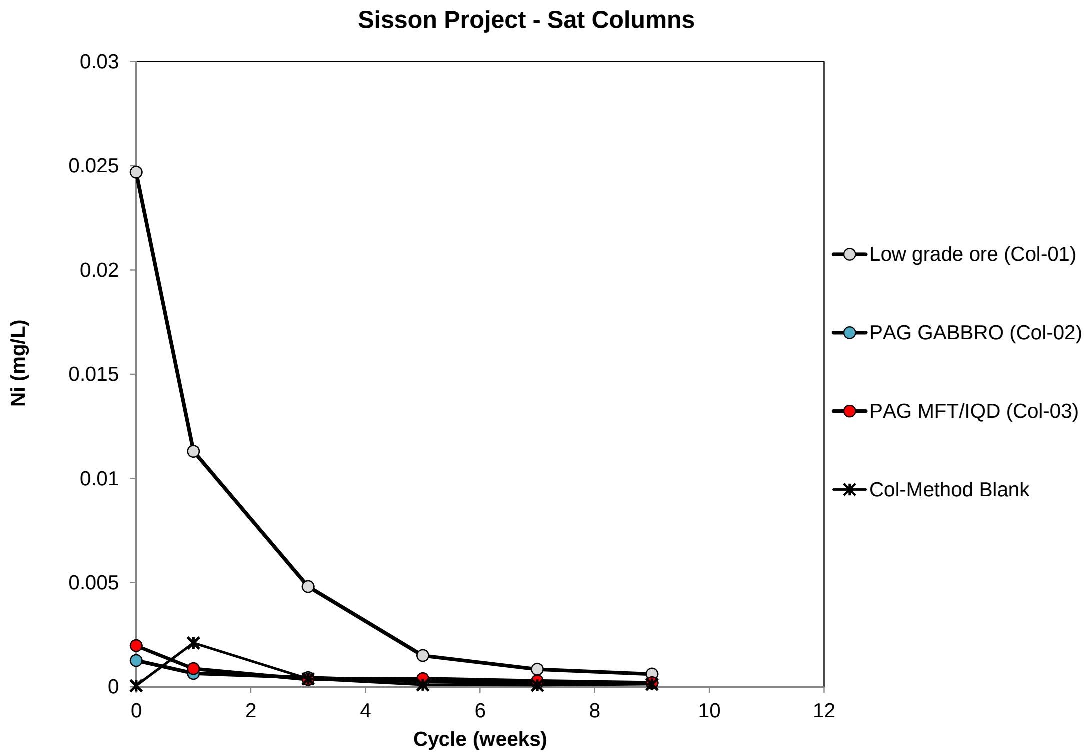

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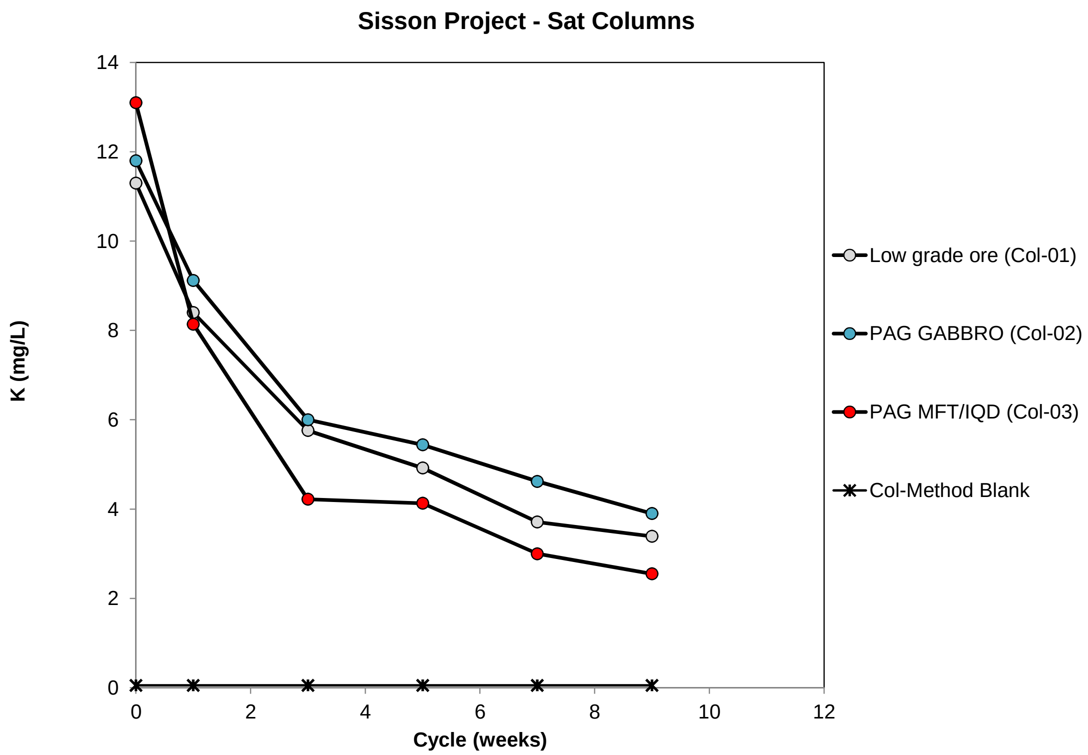

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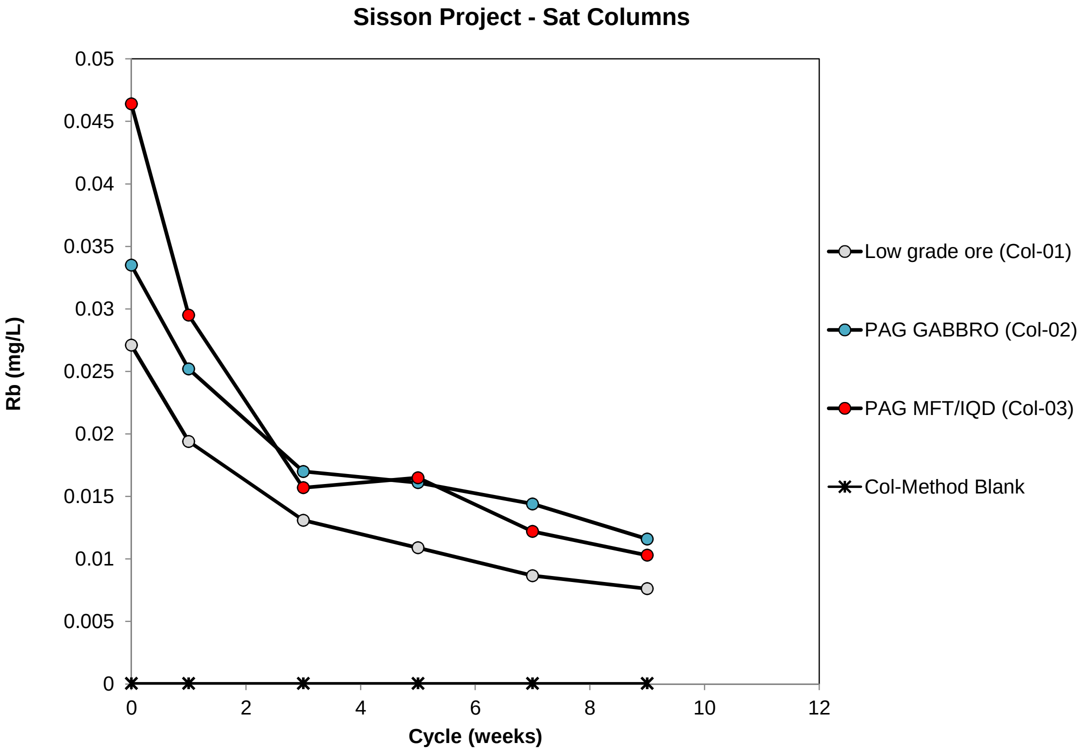

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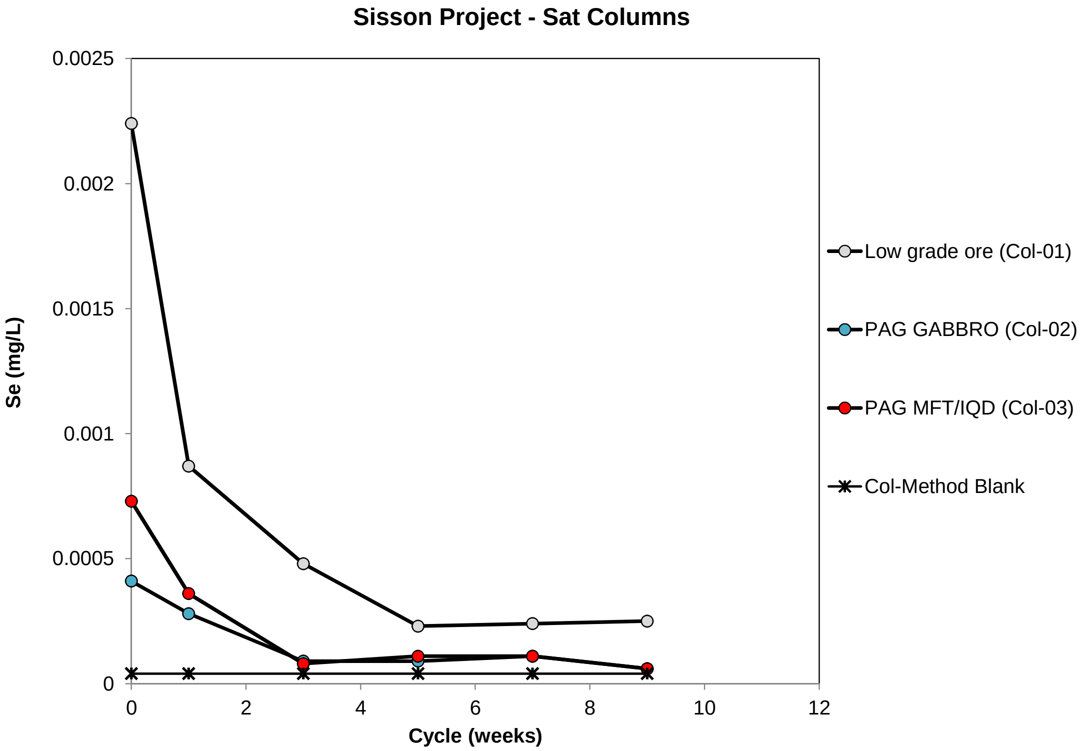

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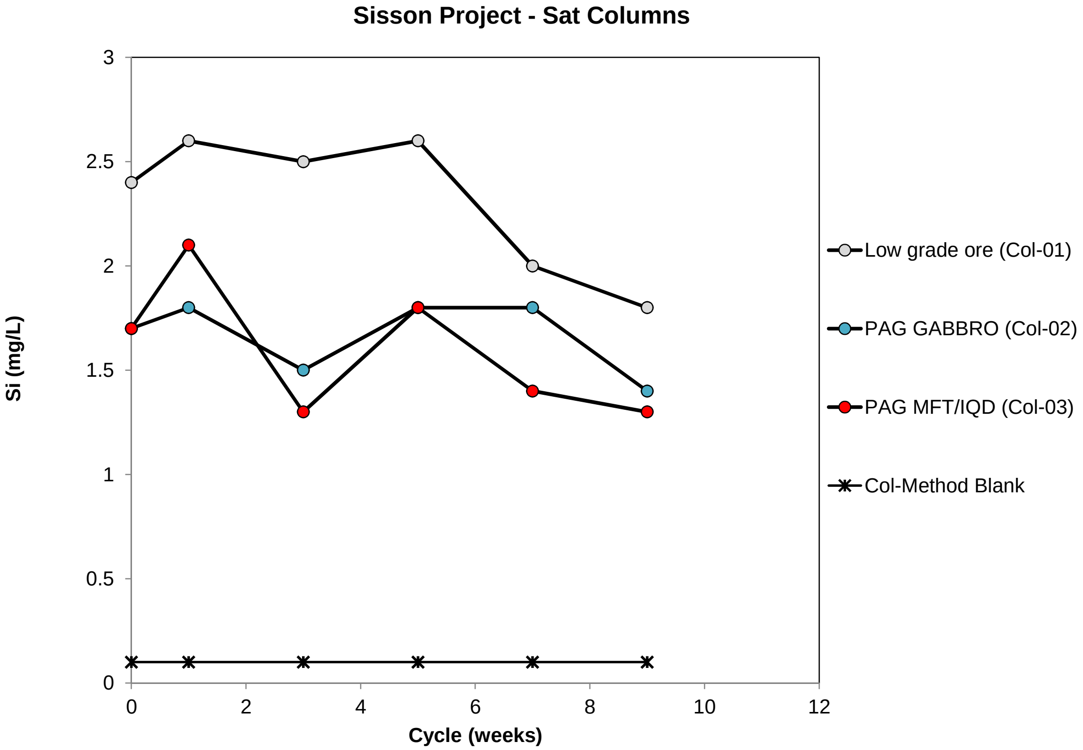

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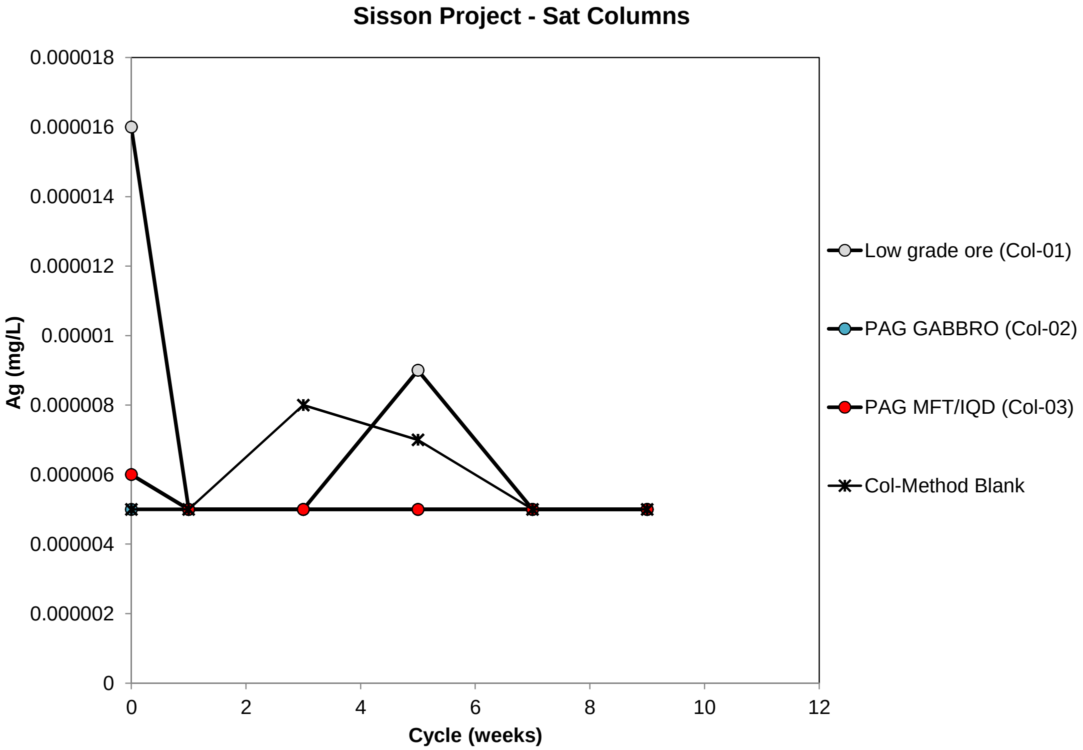

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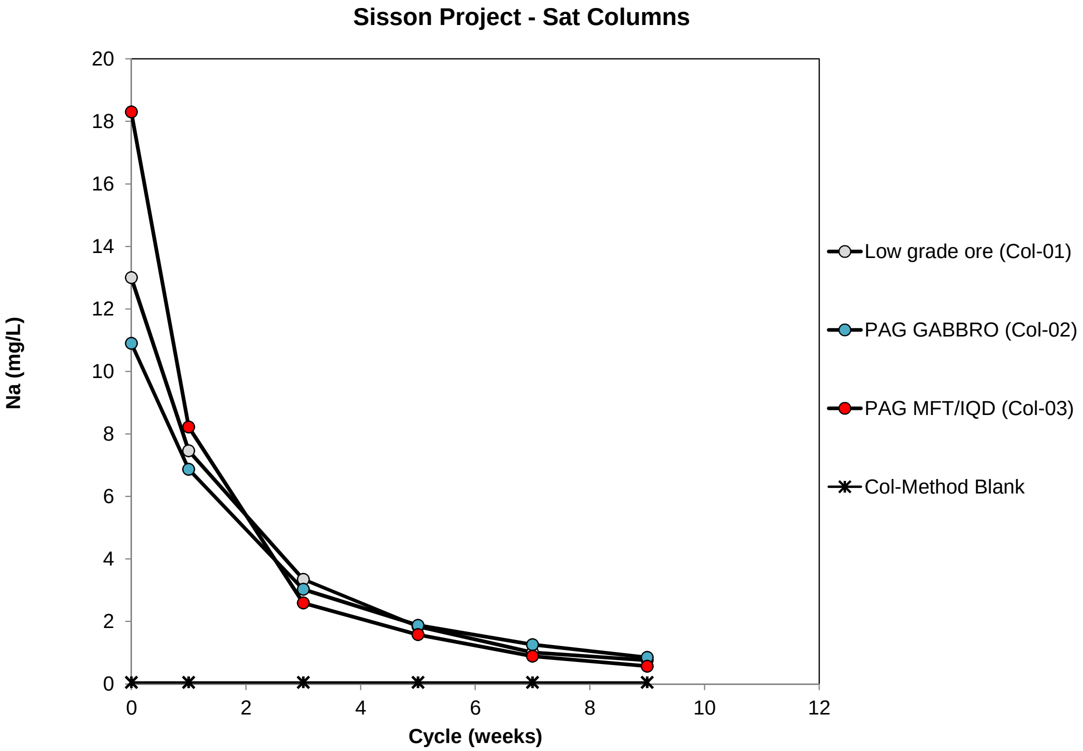

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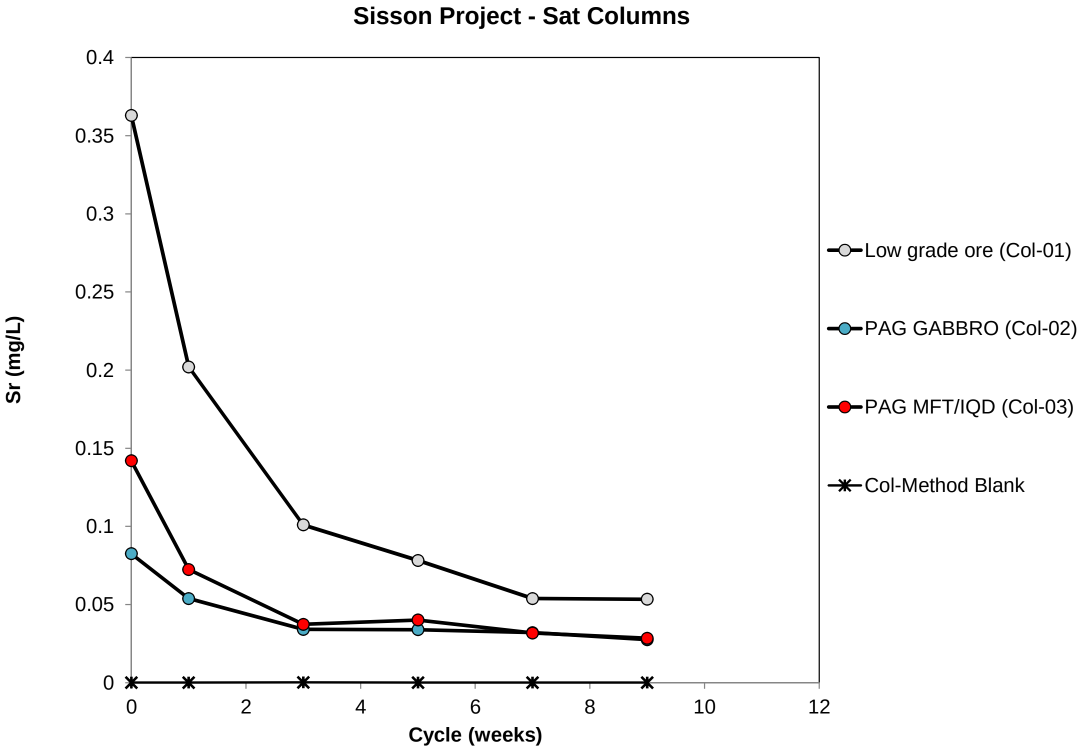

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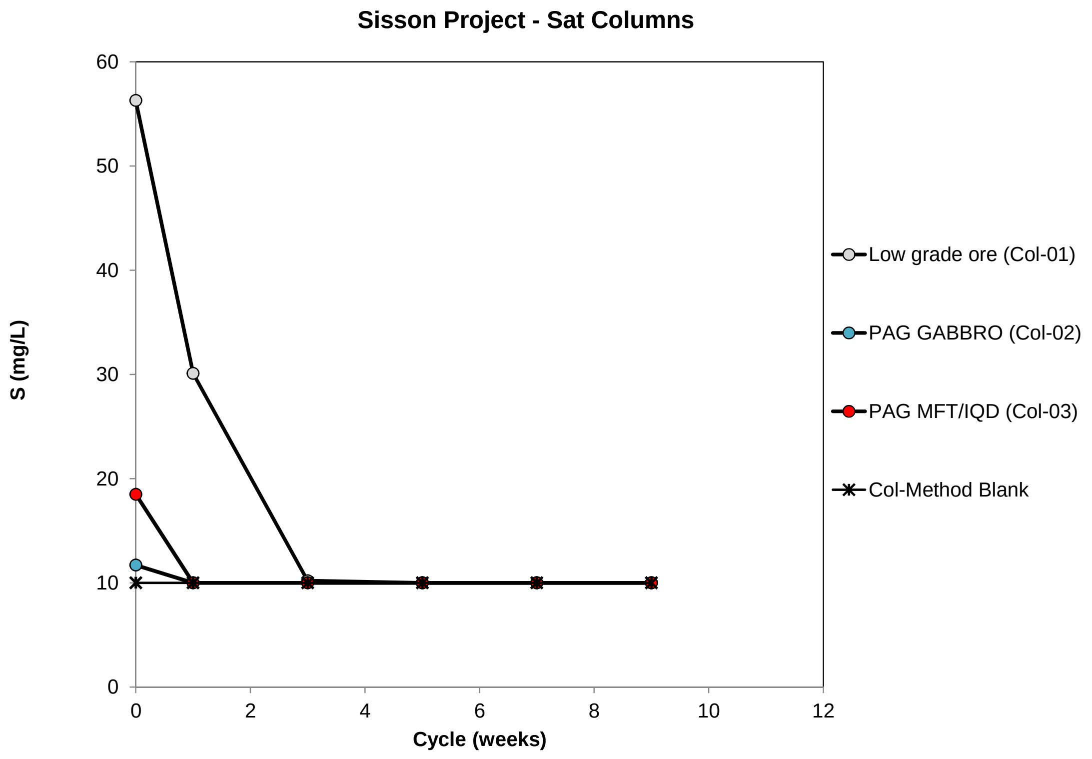

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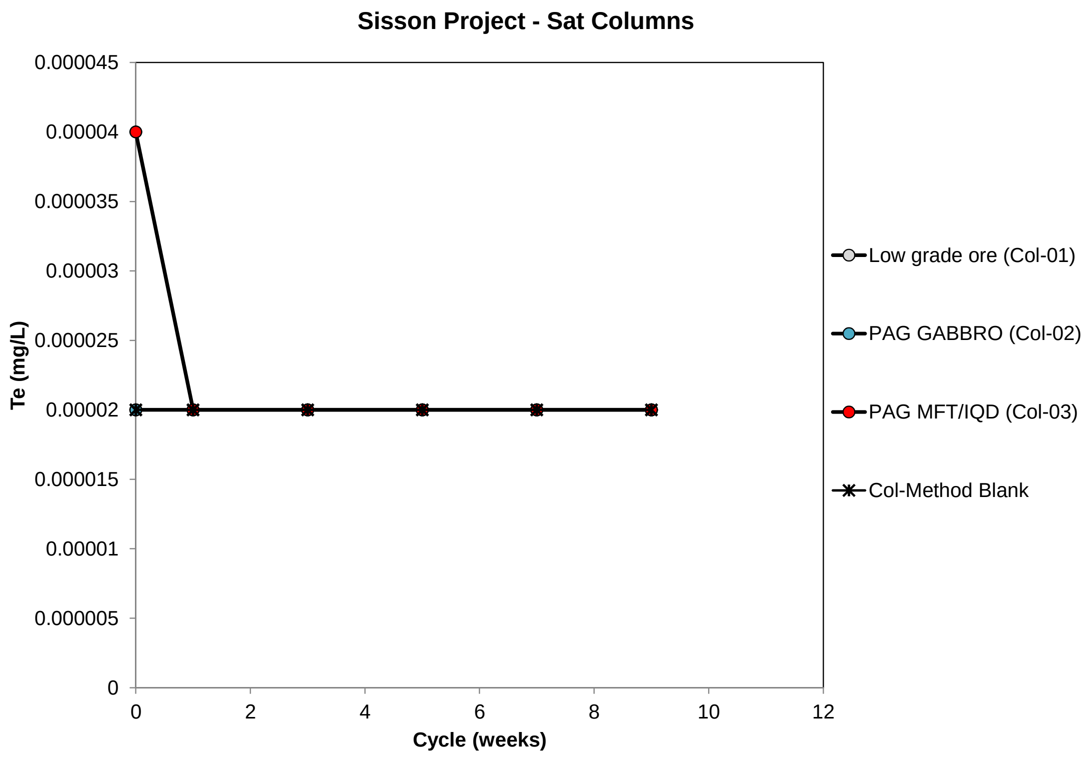

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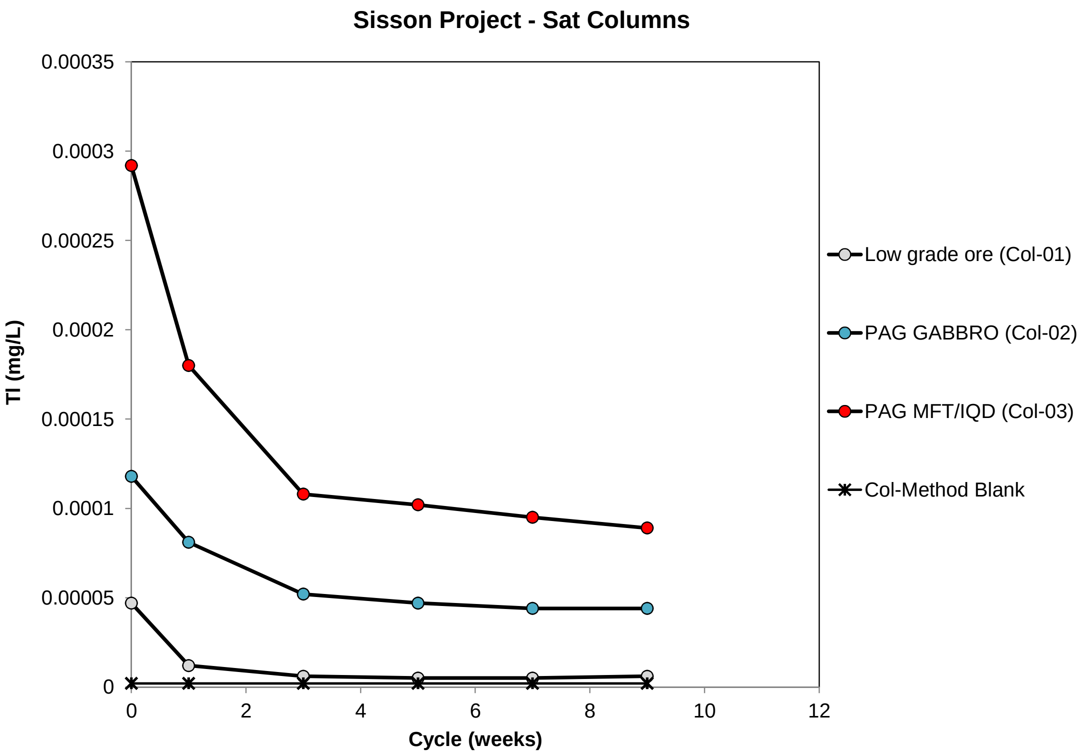

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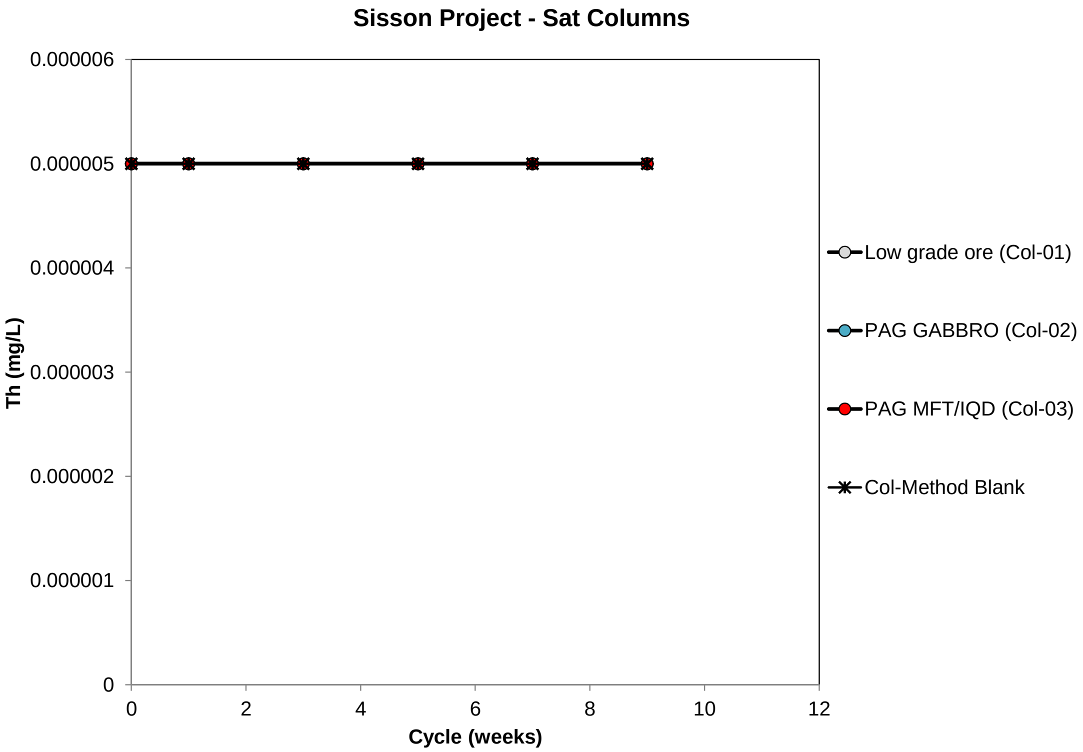

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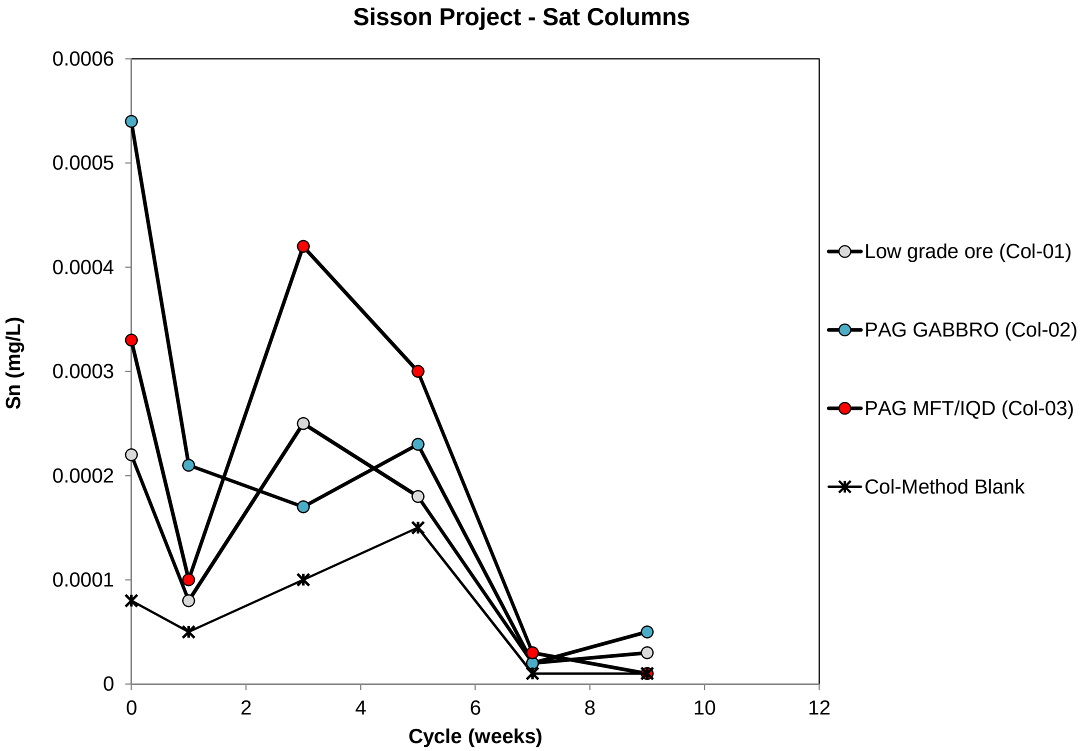

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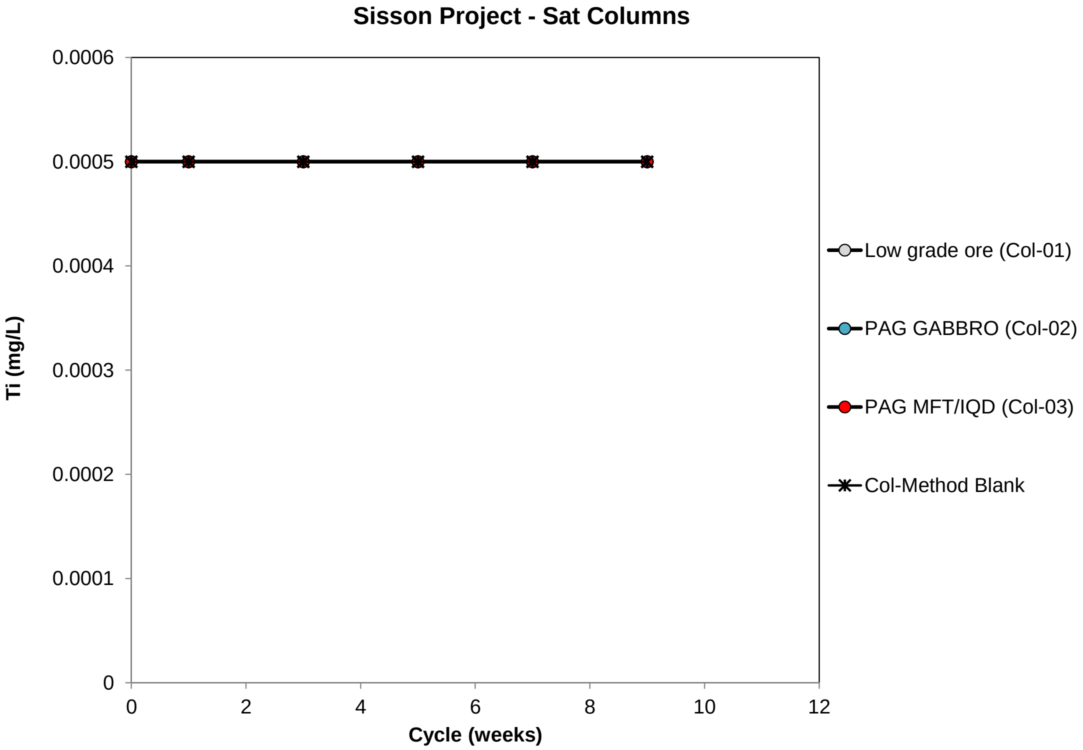

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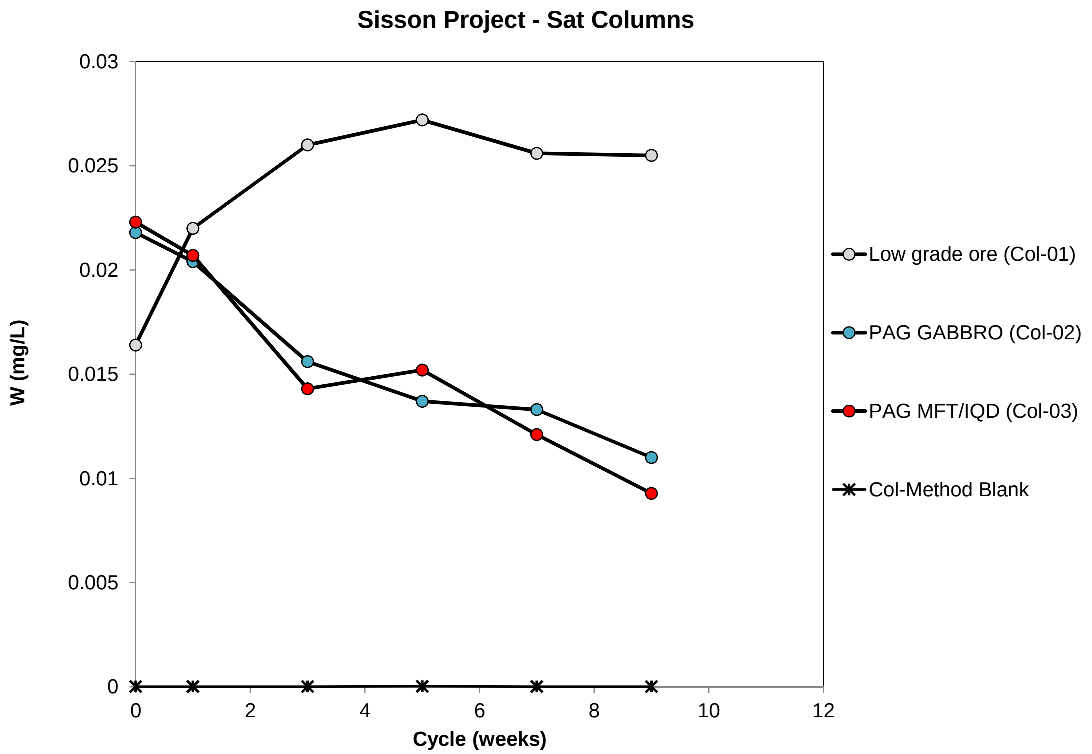

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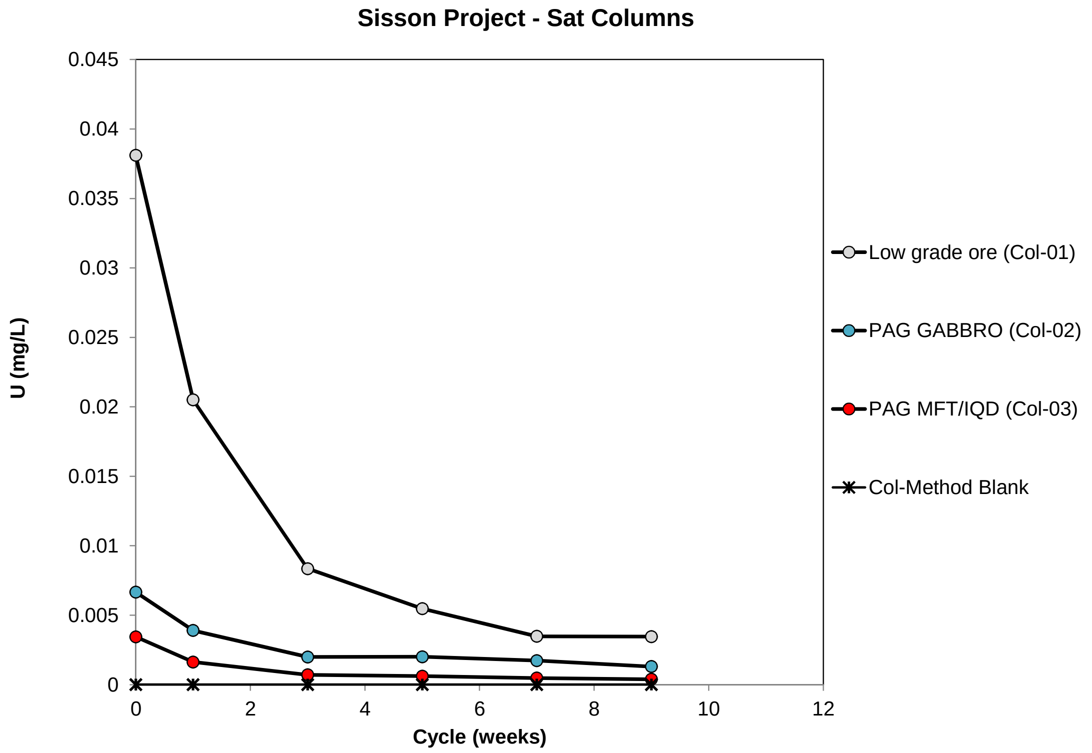

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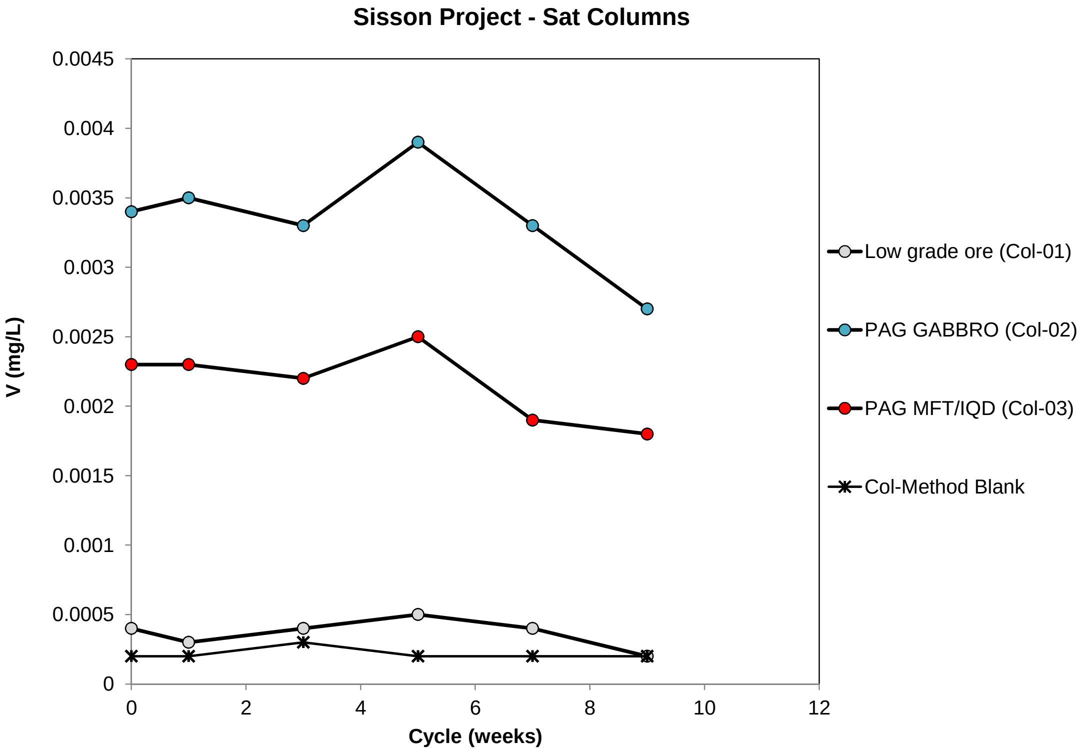

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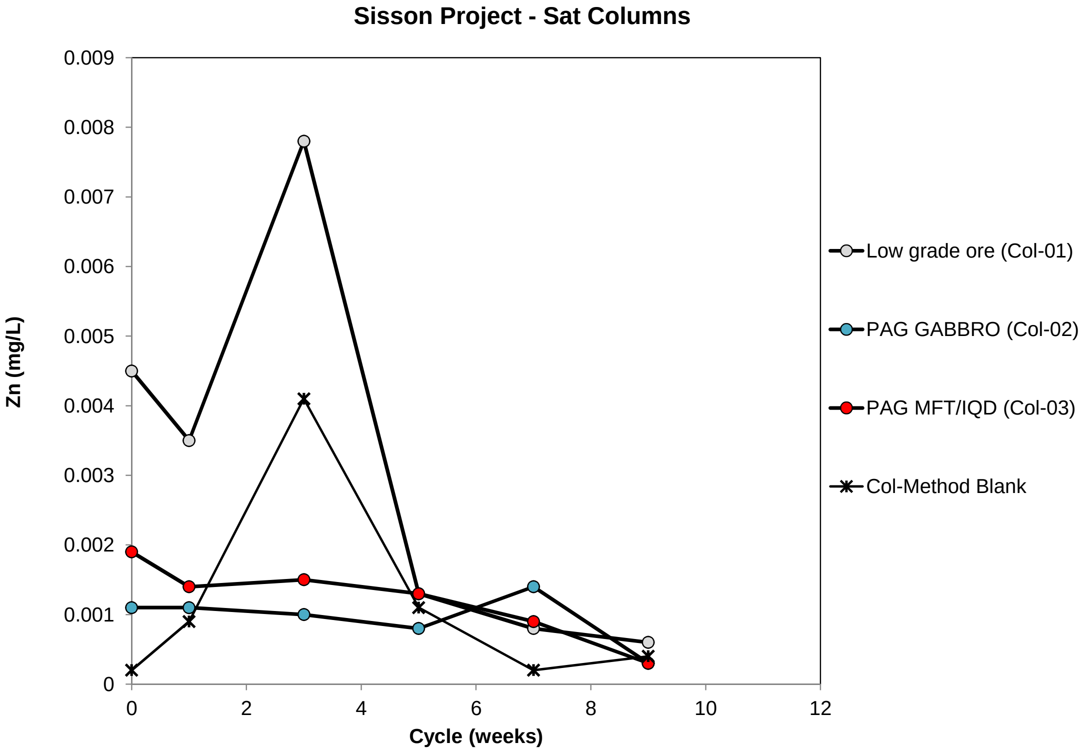

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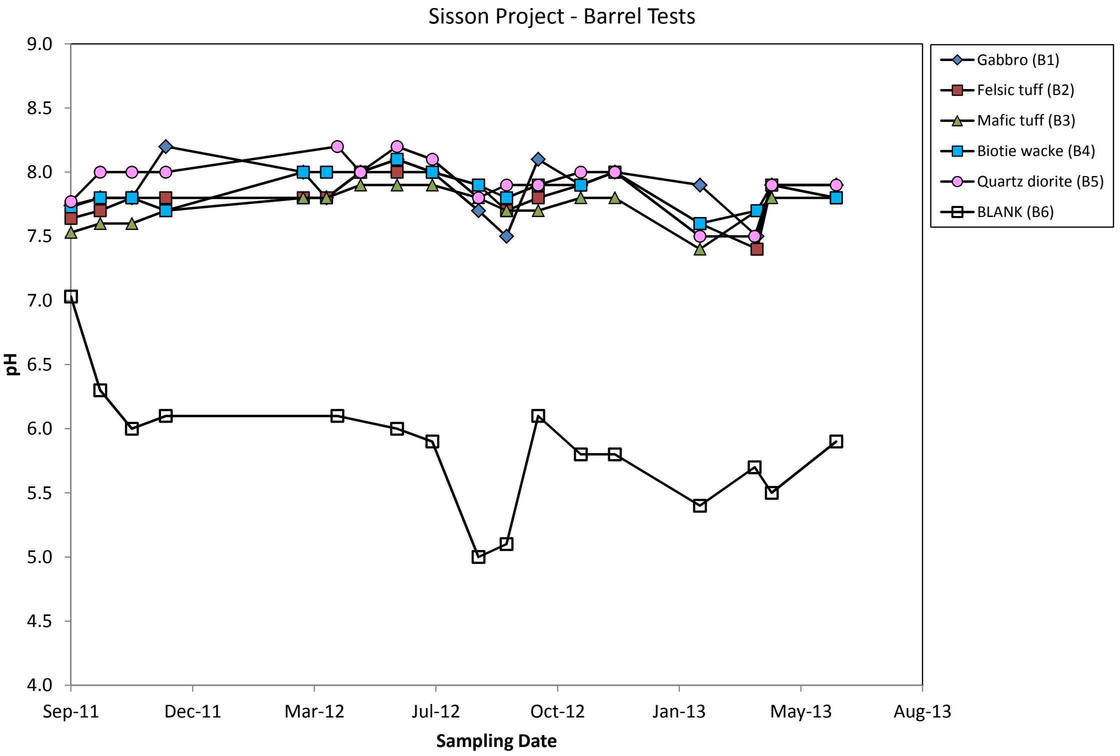
C3: Field Barrel Charts



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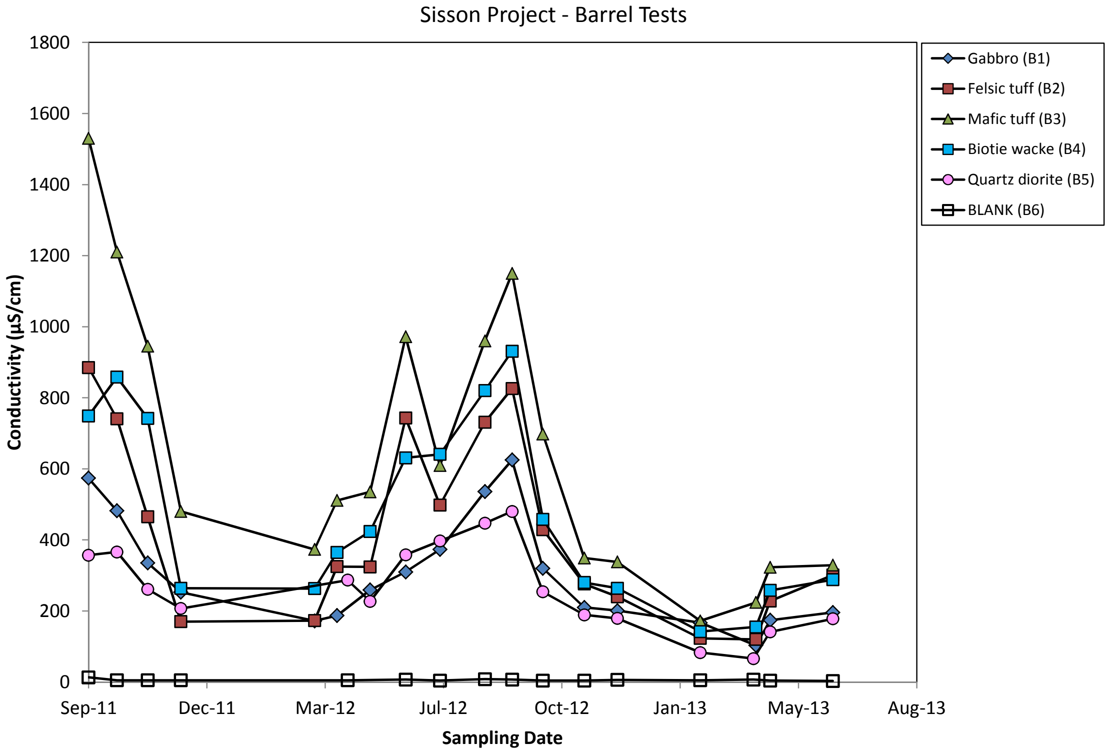

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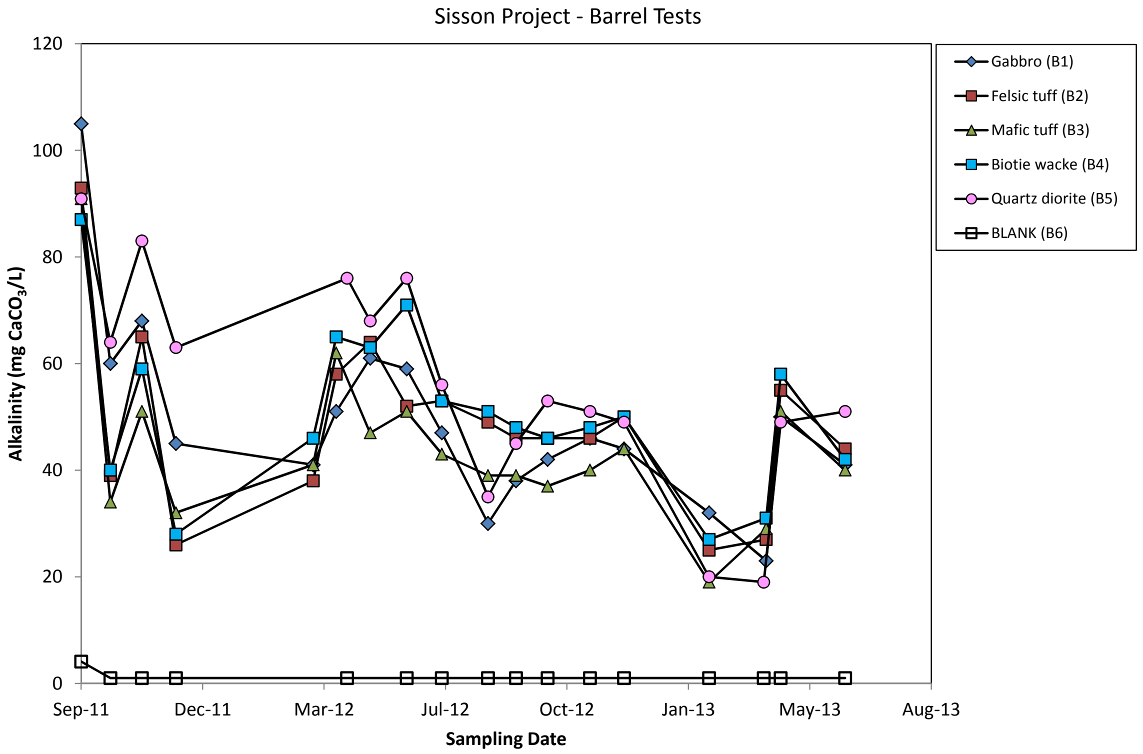

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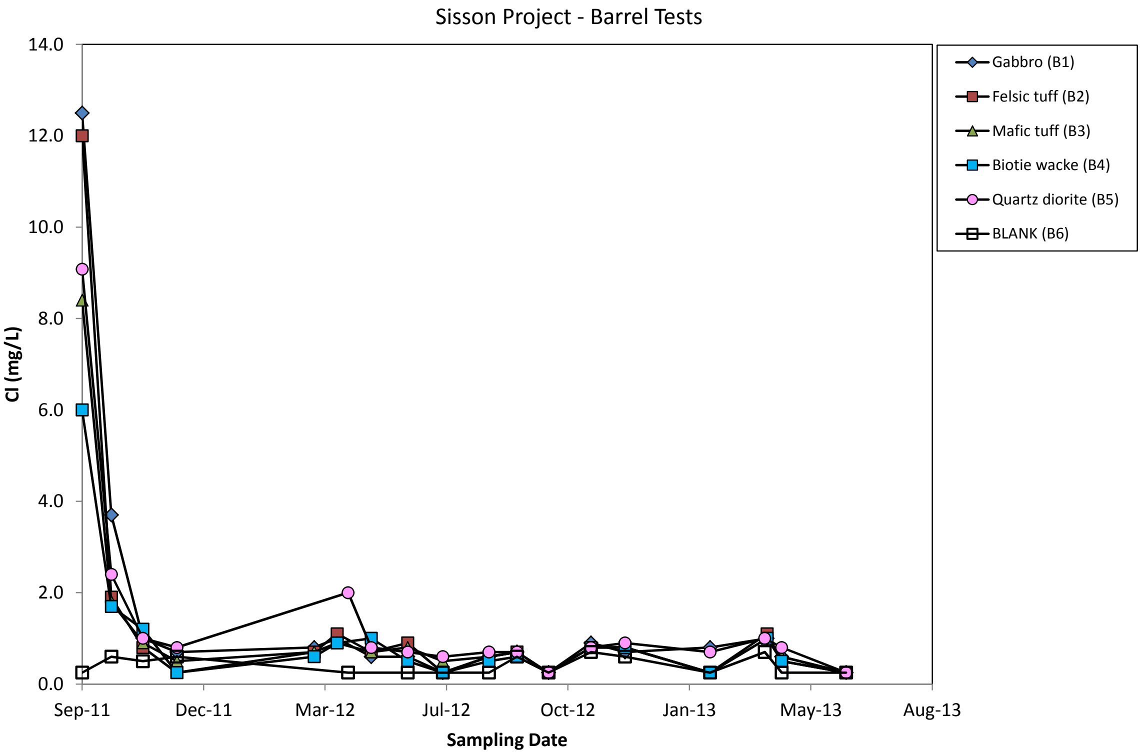

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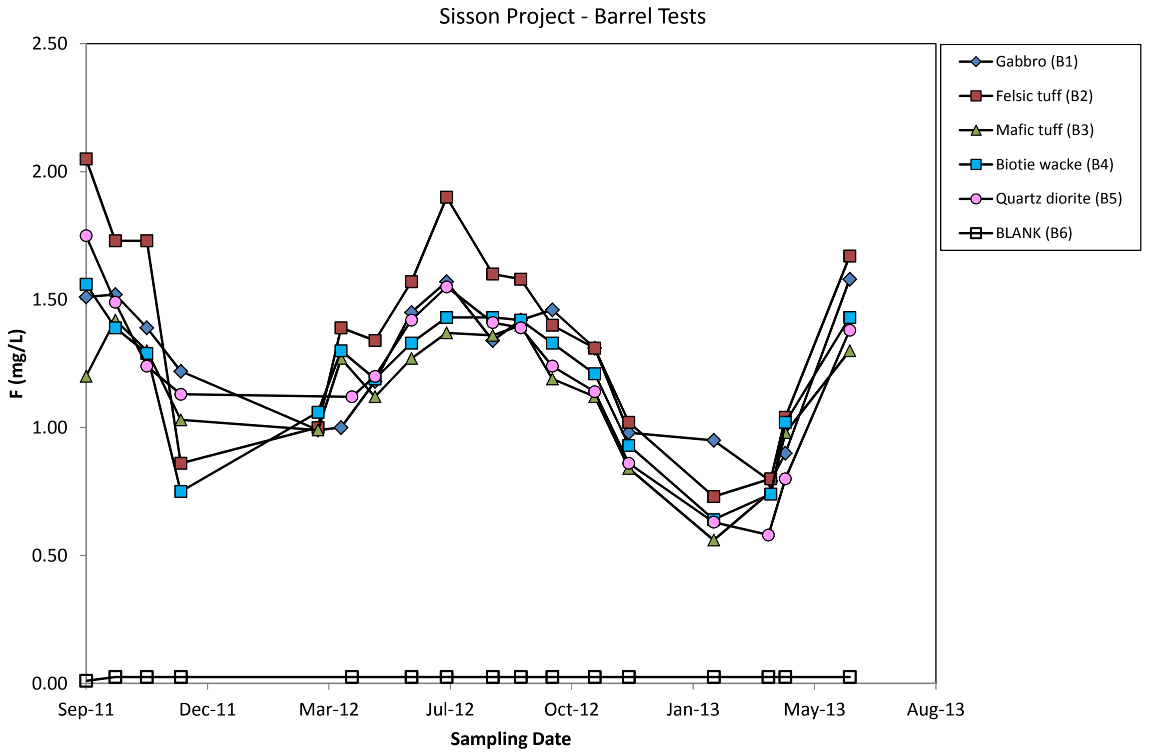

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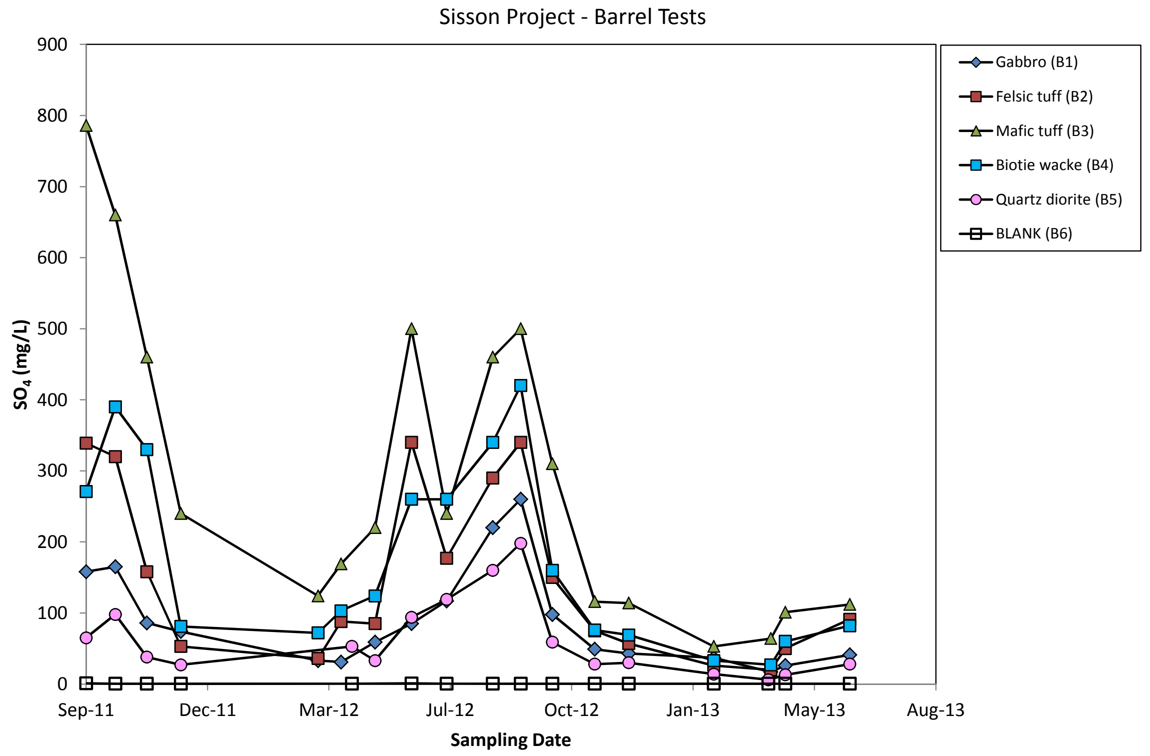

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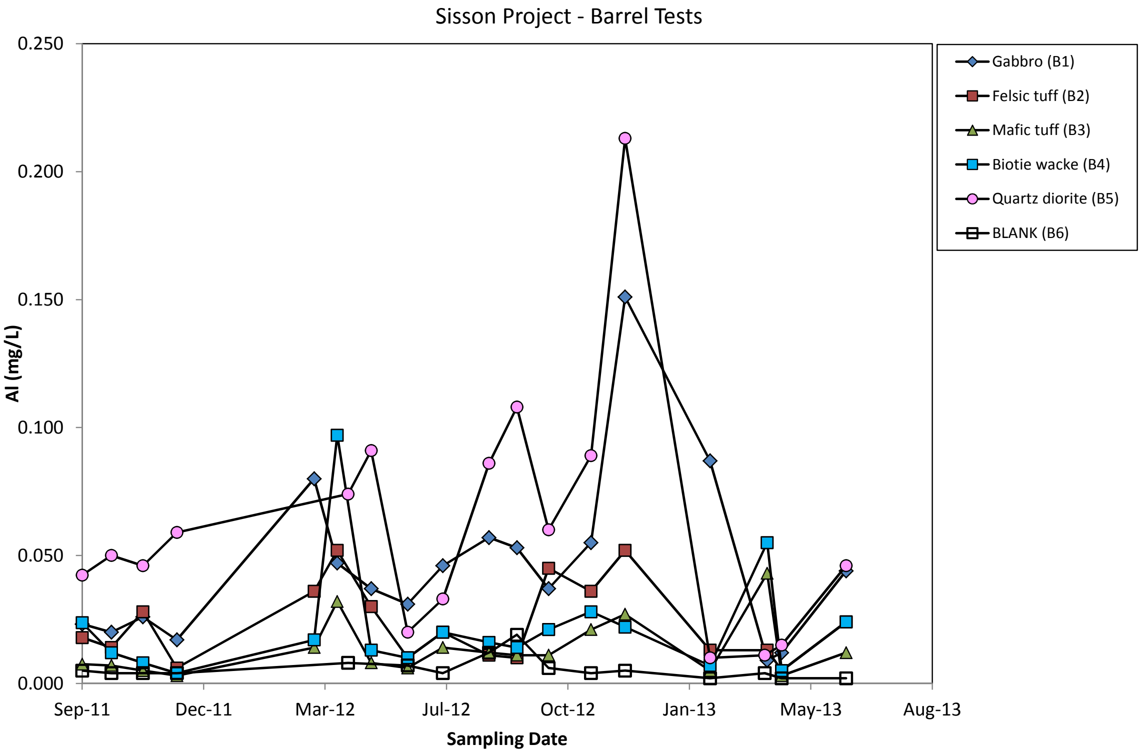

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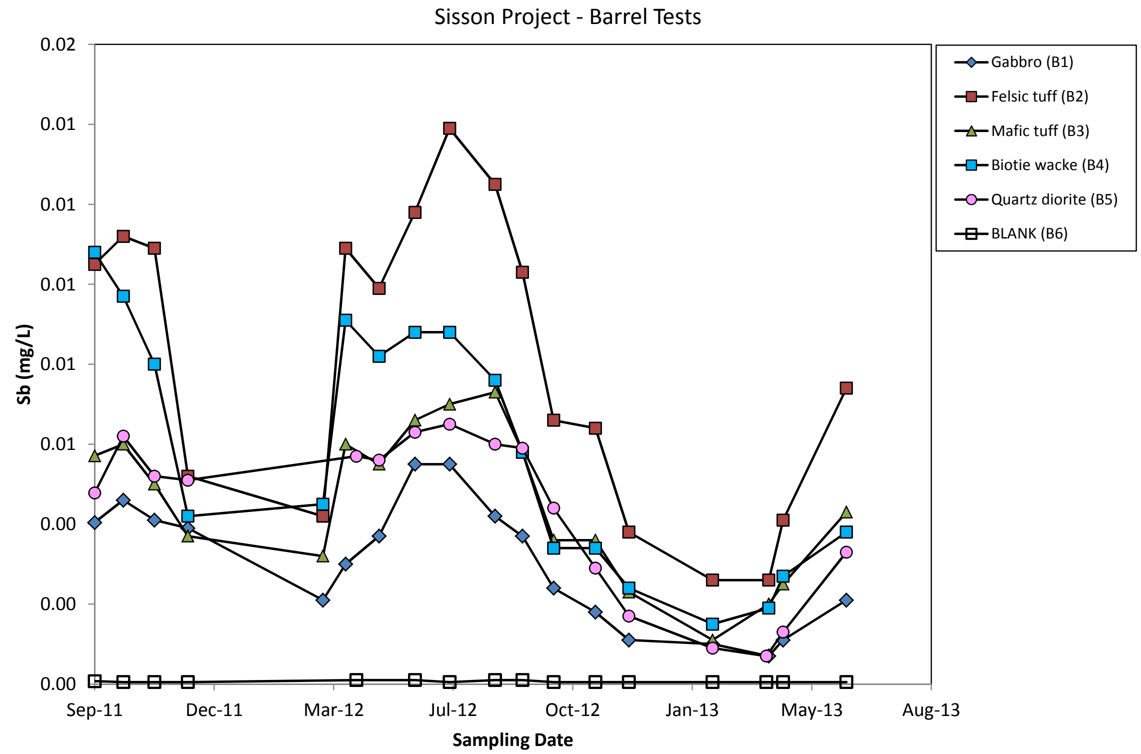

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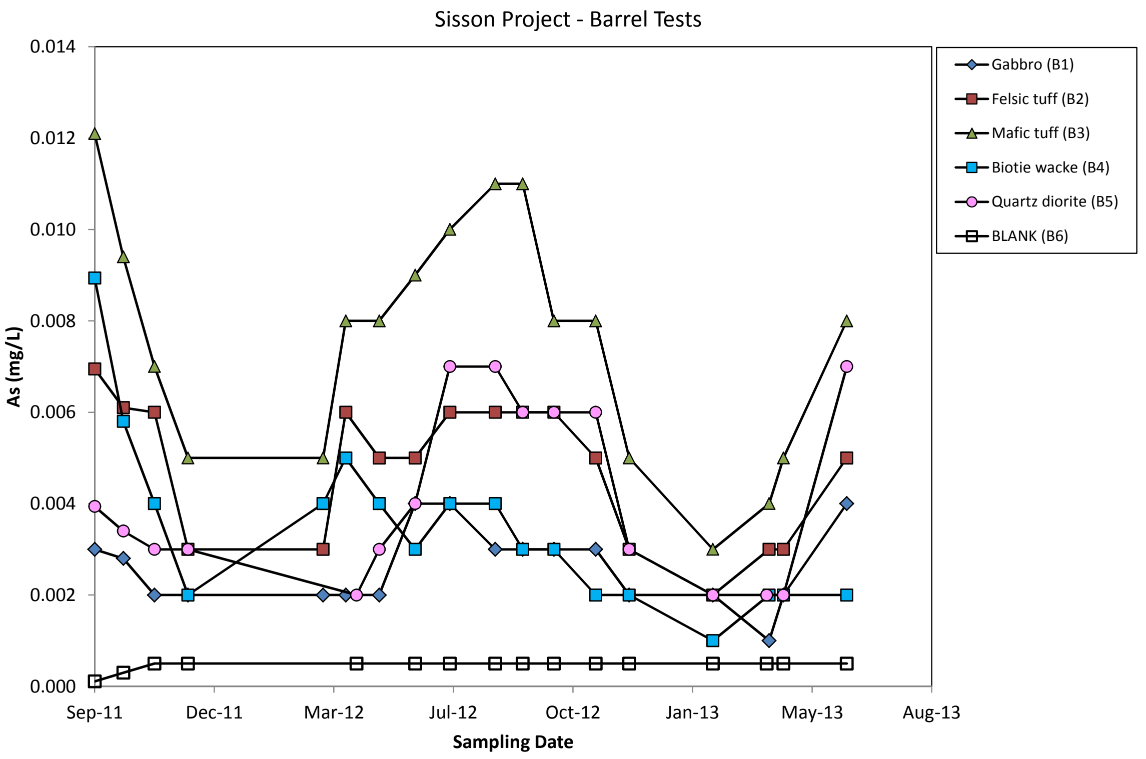

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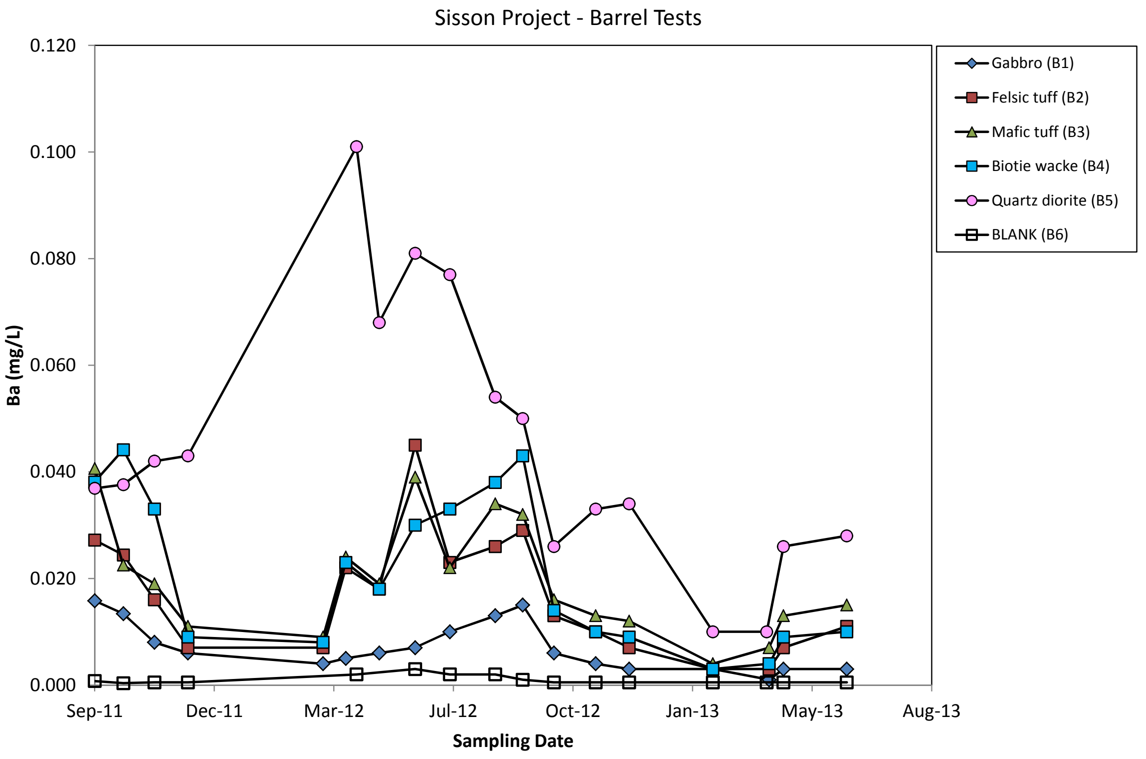

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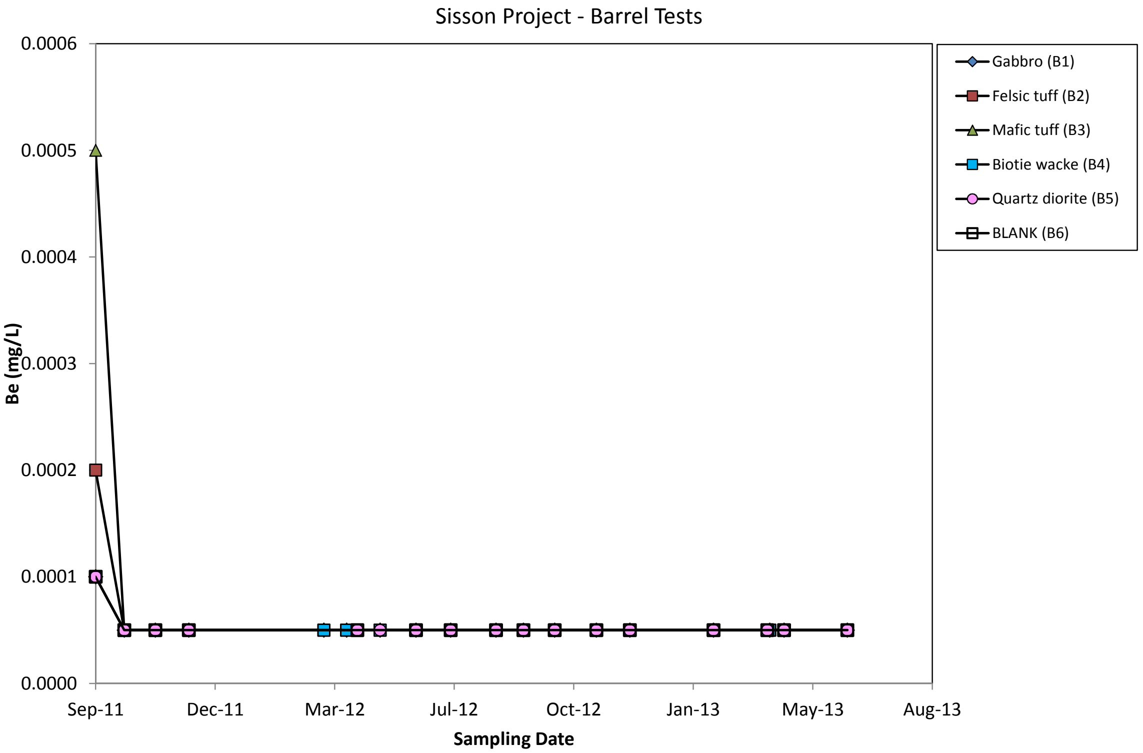

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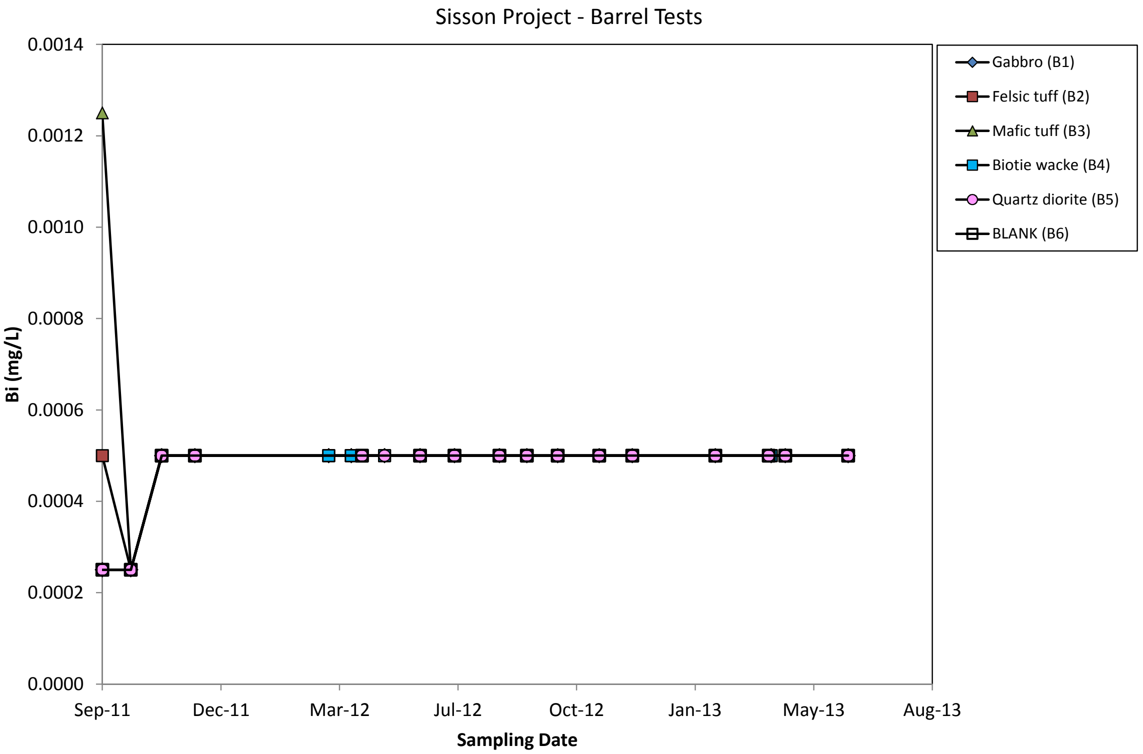

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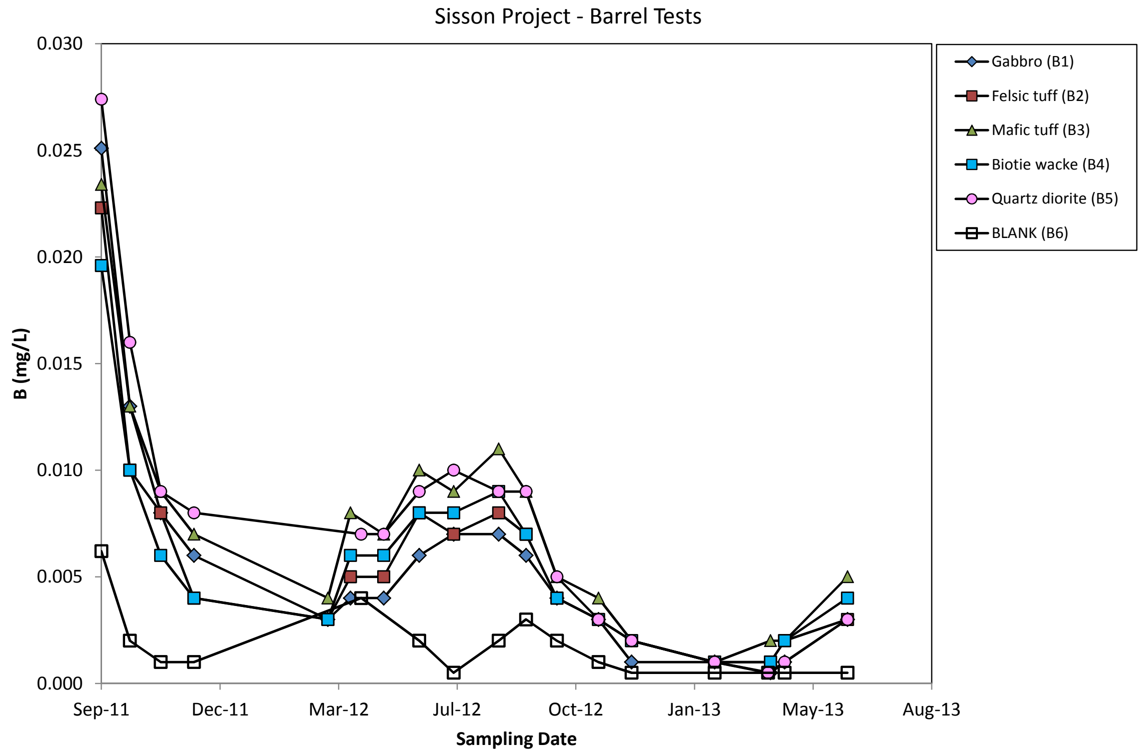

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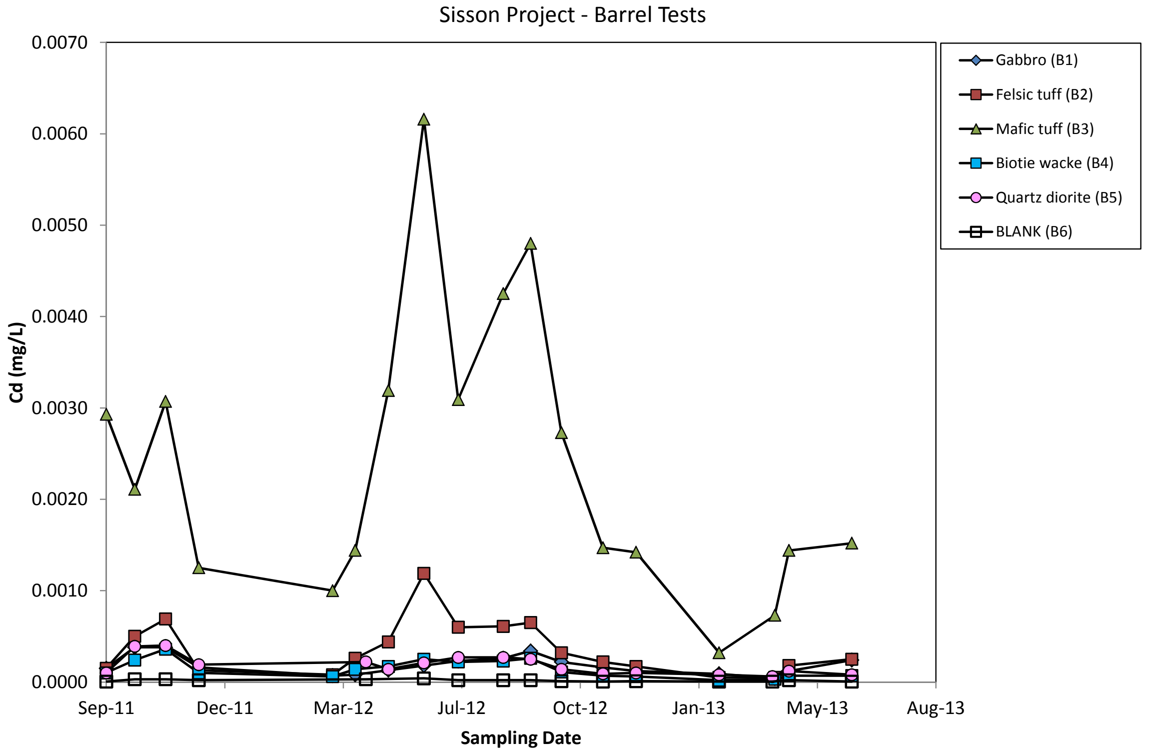

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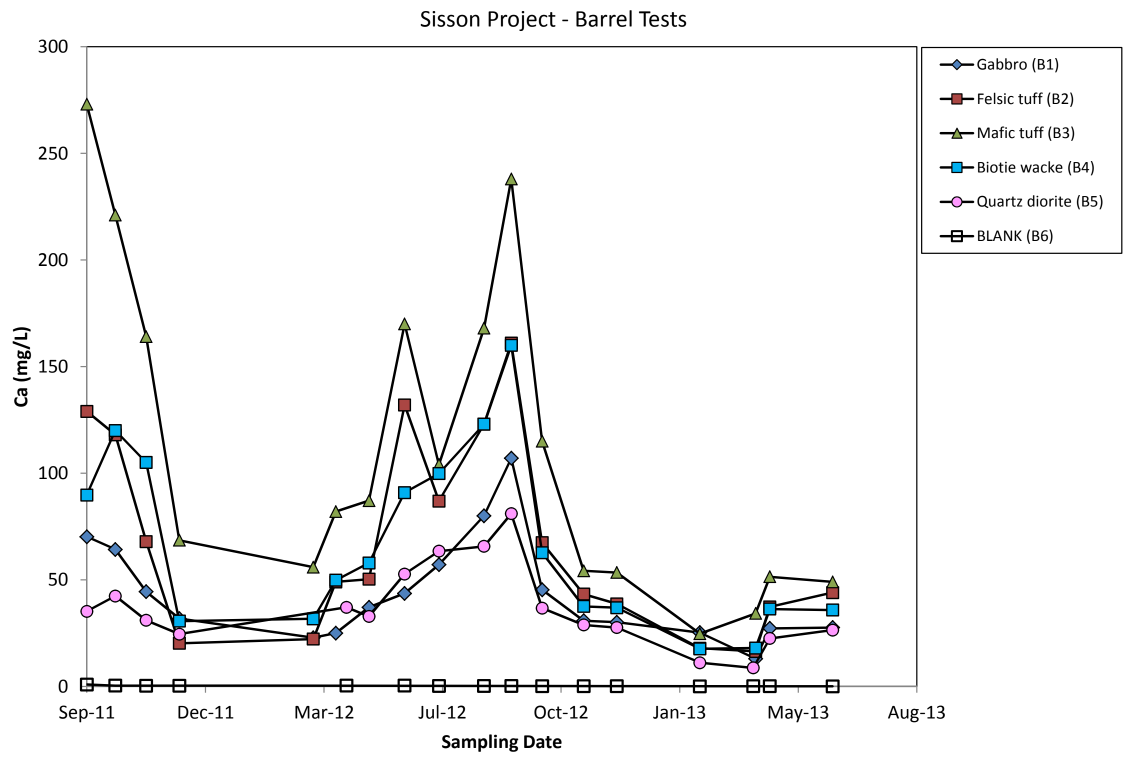

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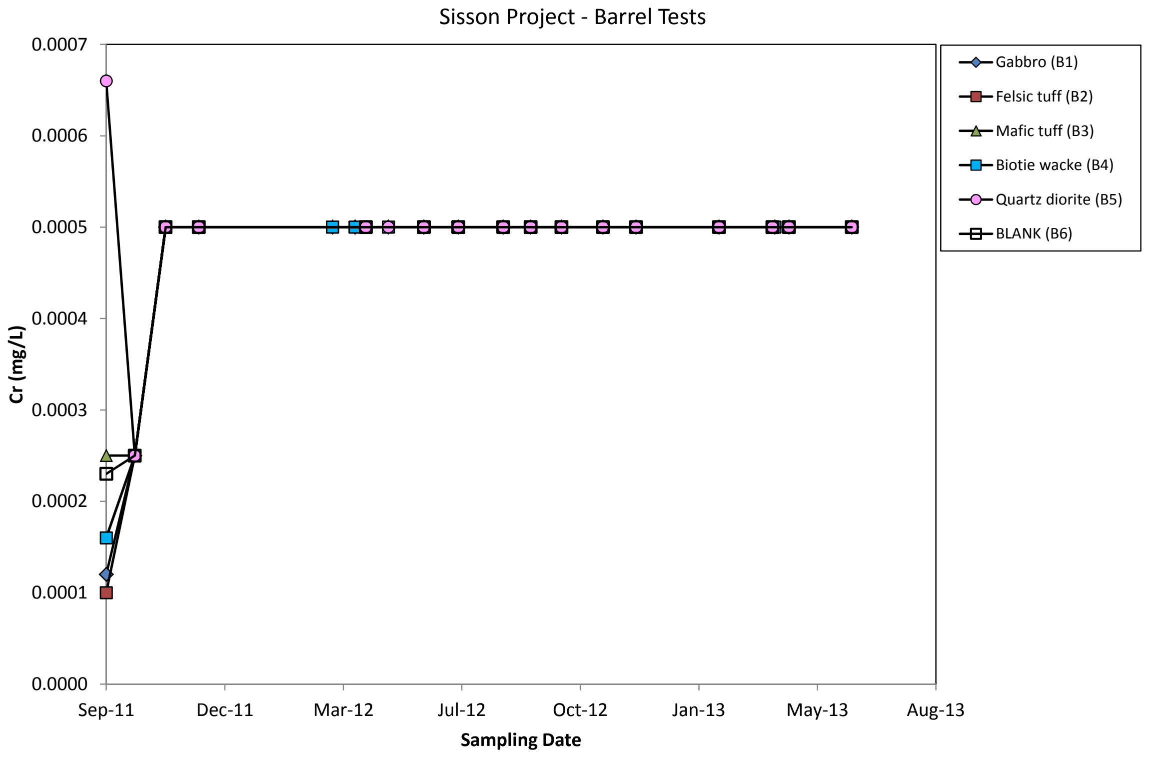

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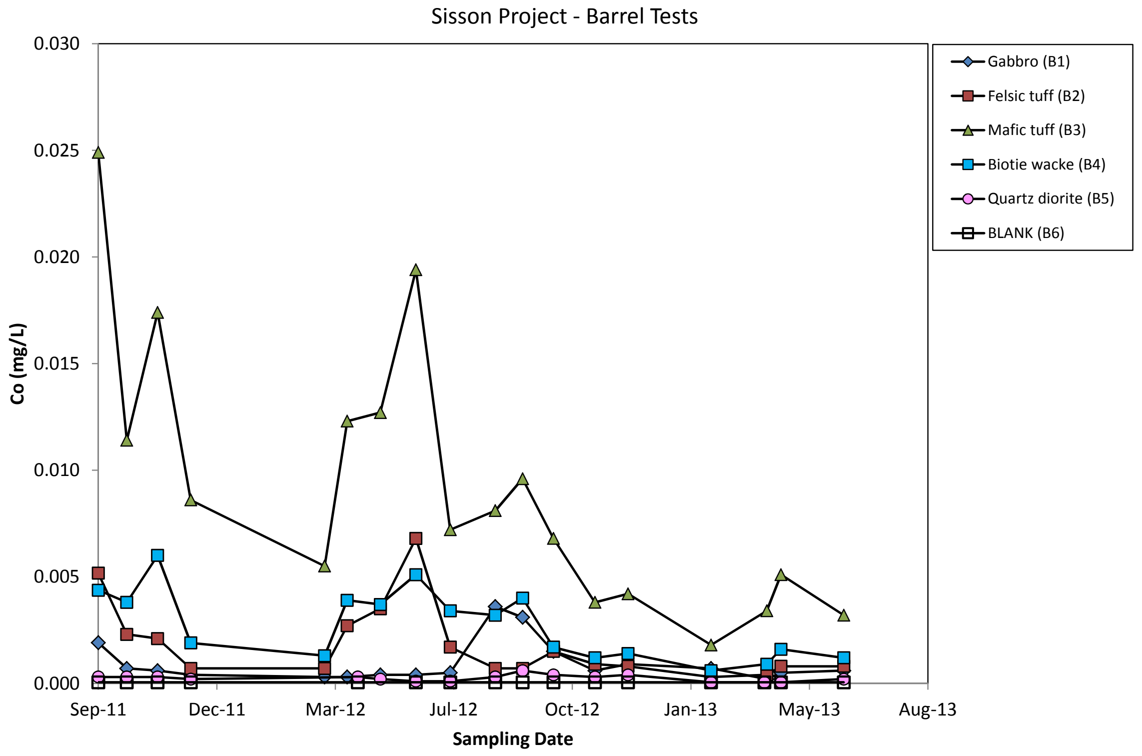

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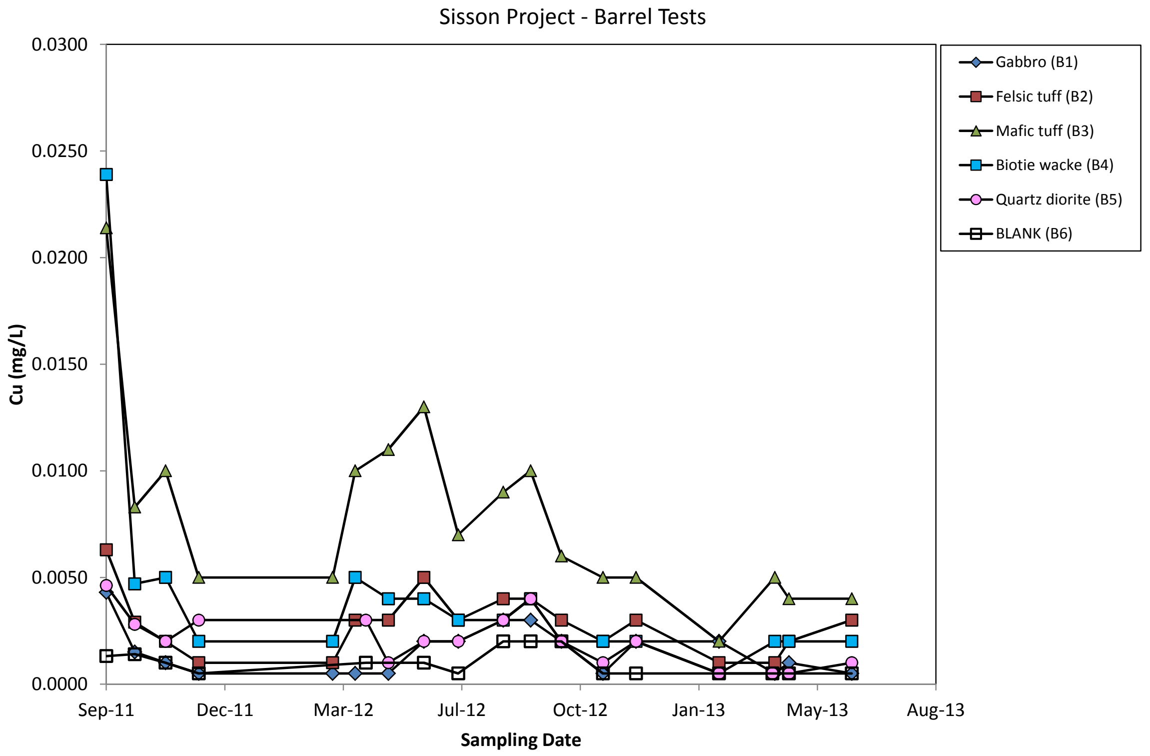

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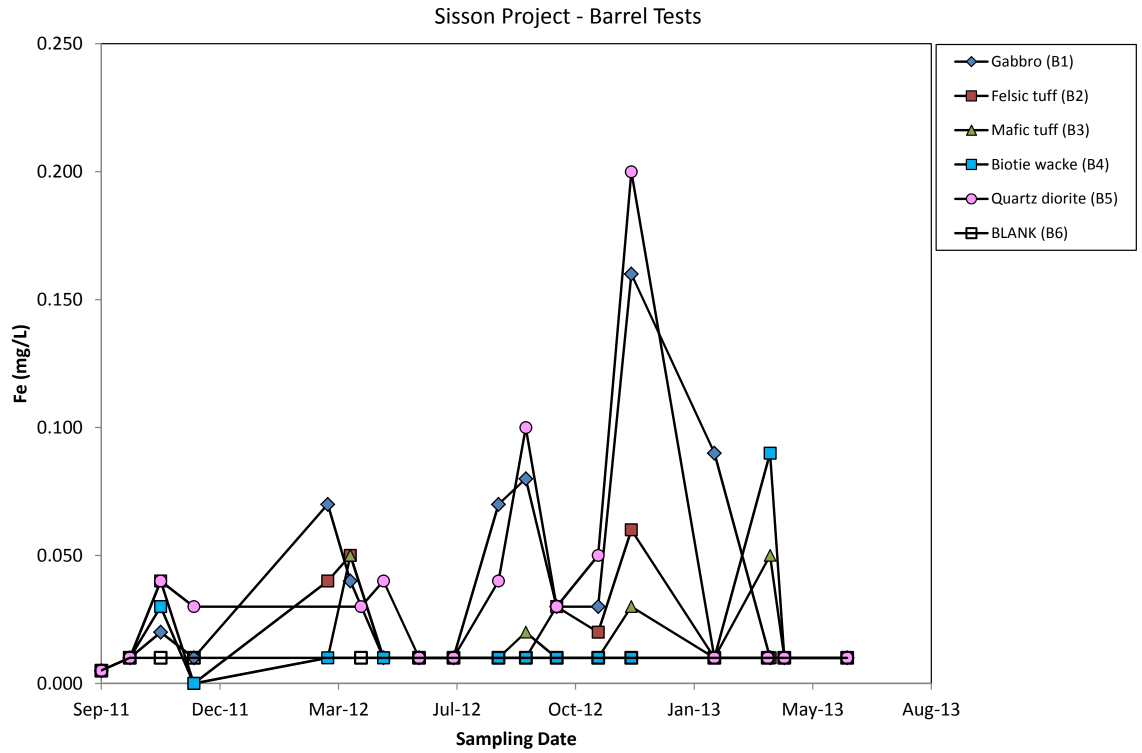

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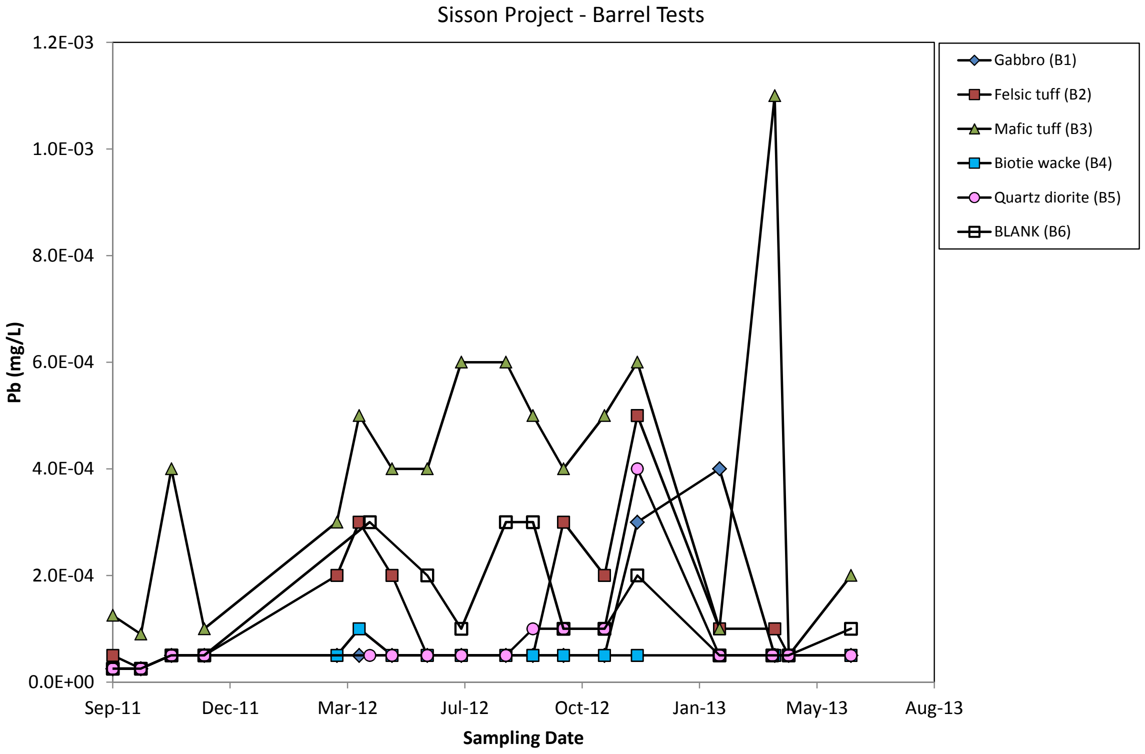

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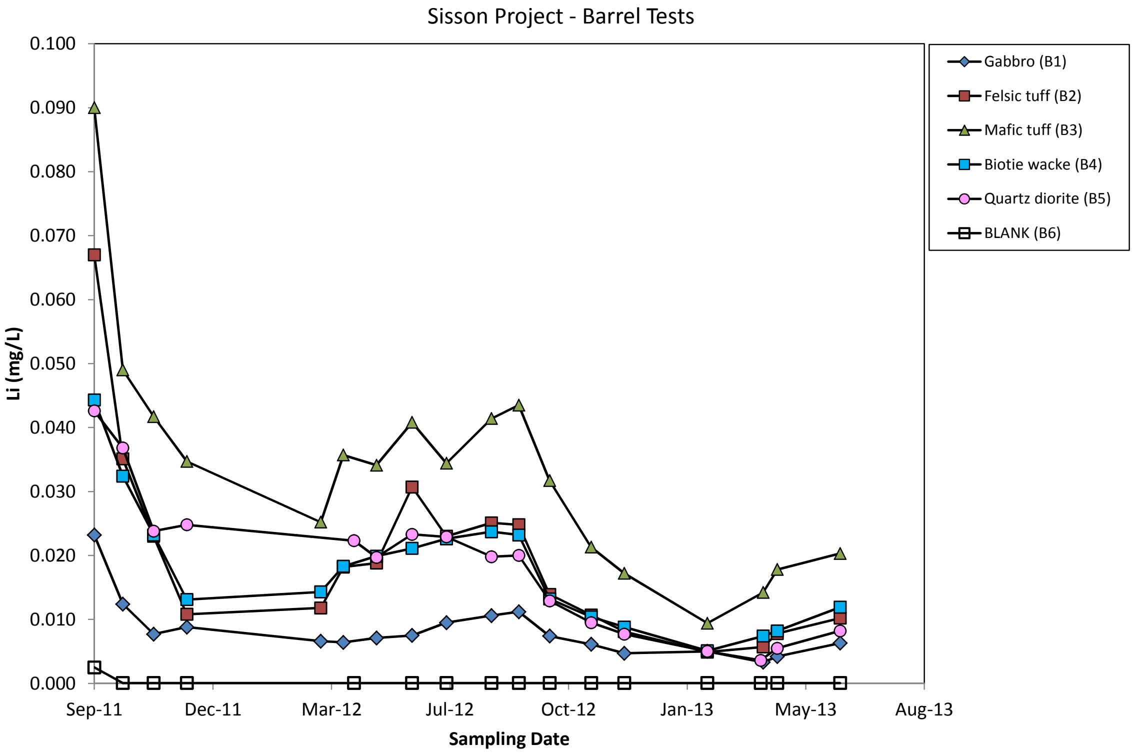

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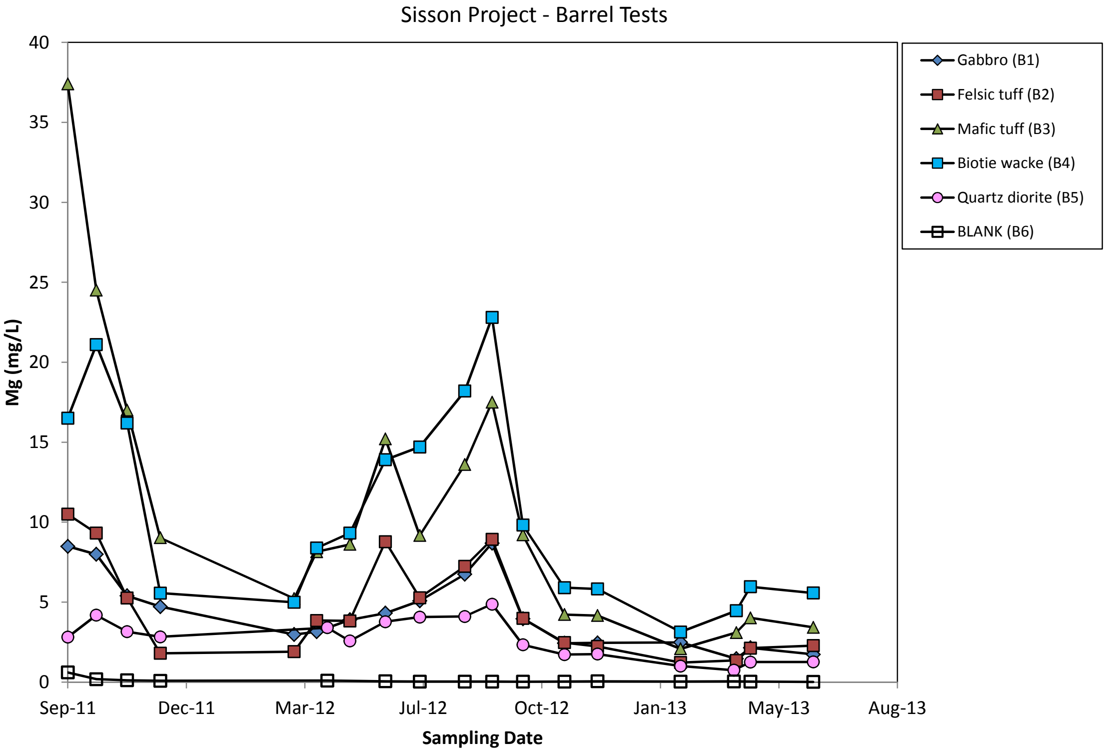

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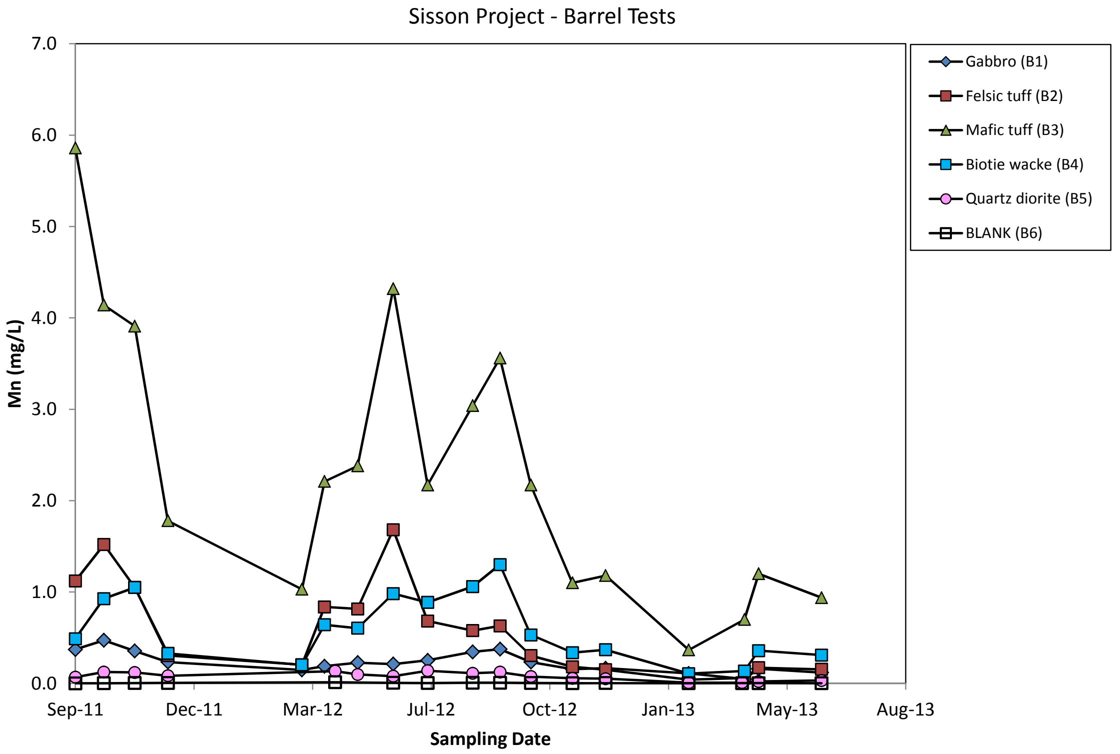

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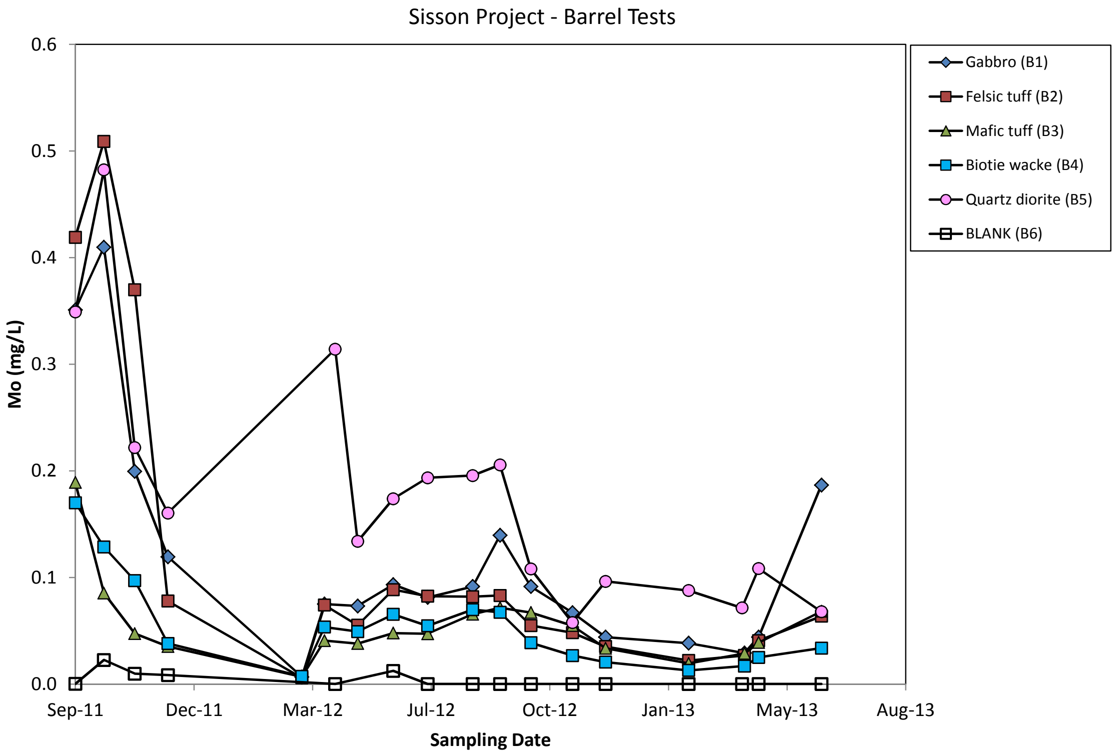

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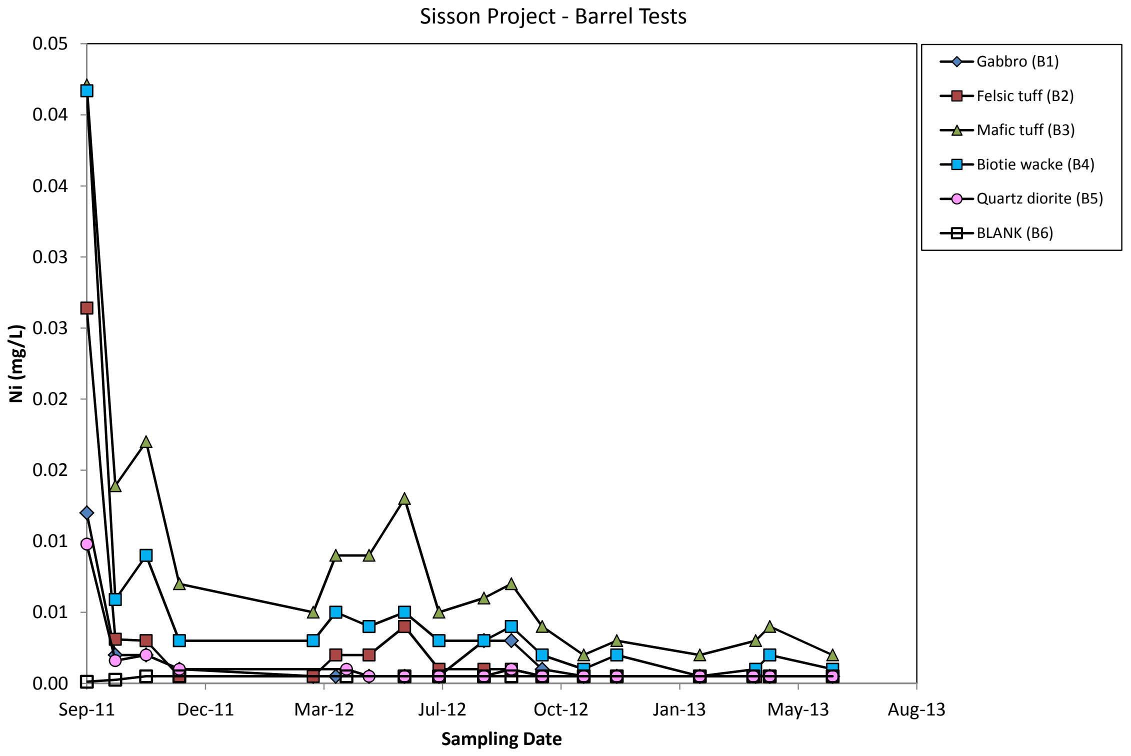

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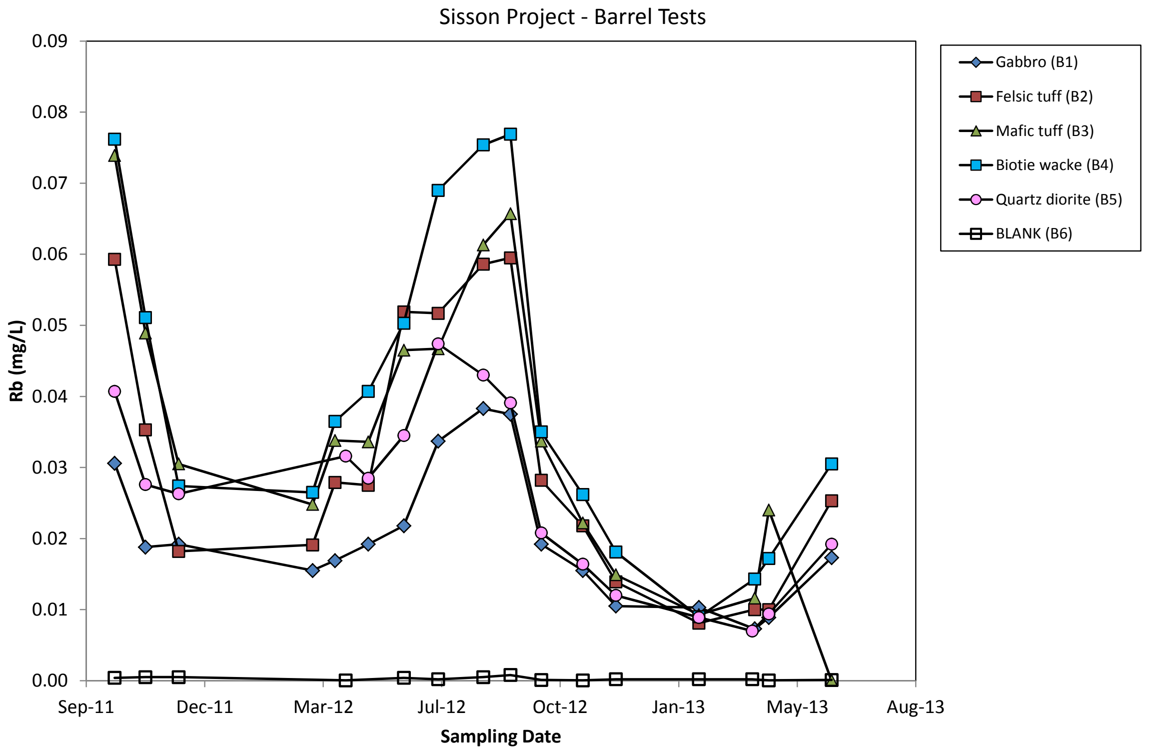

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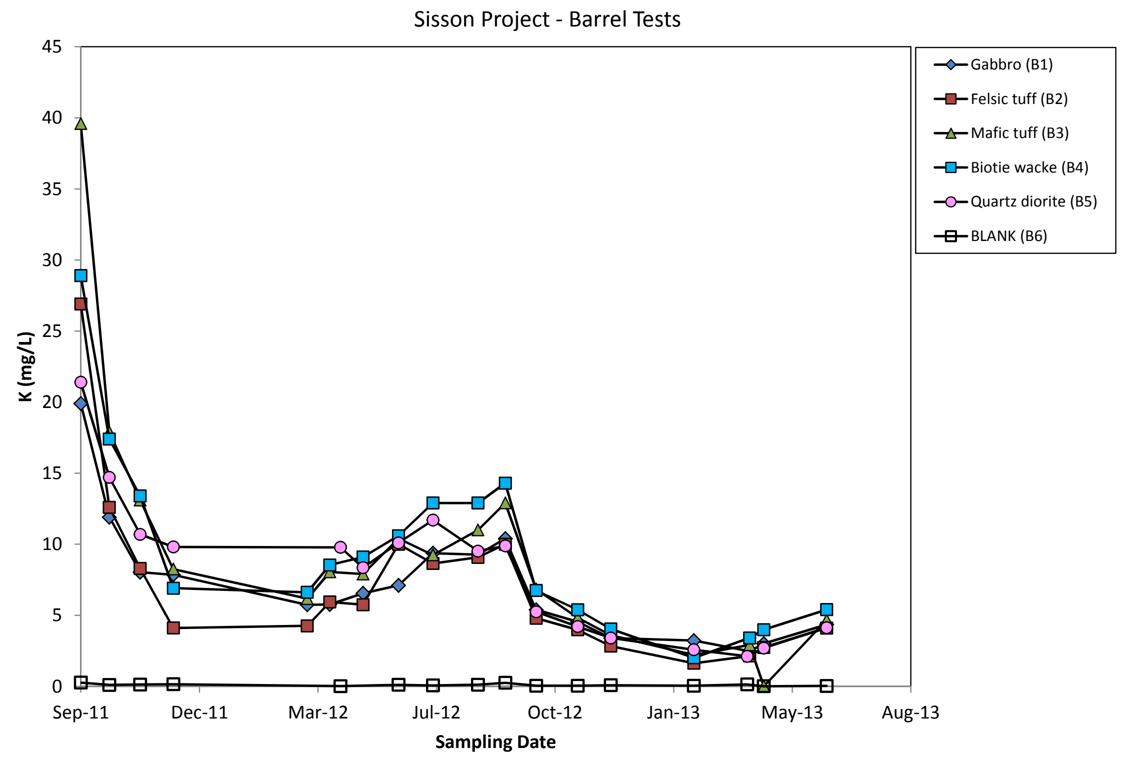

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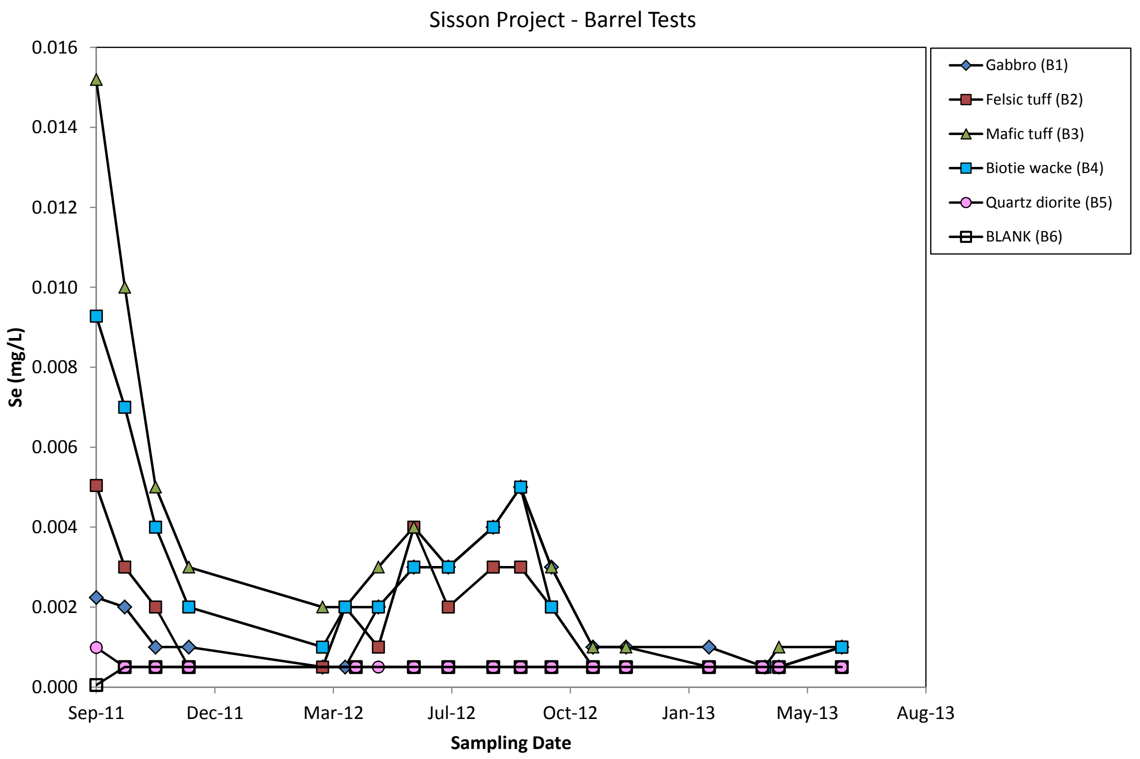

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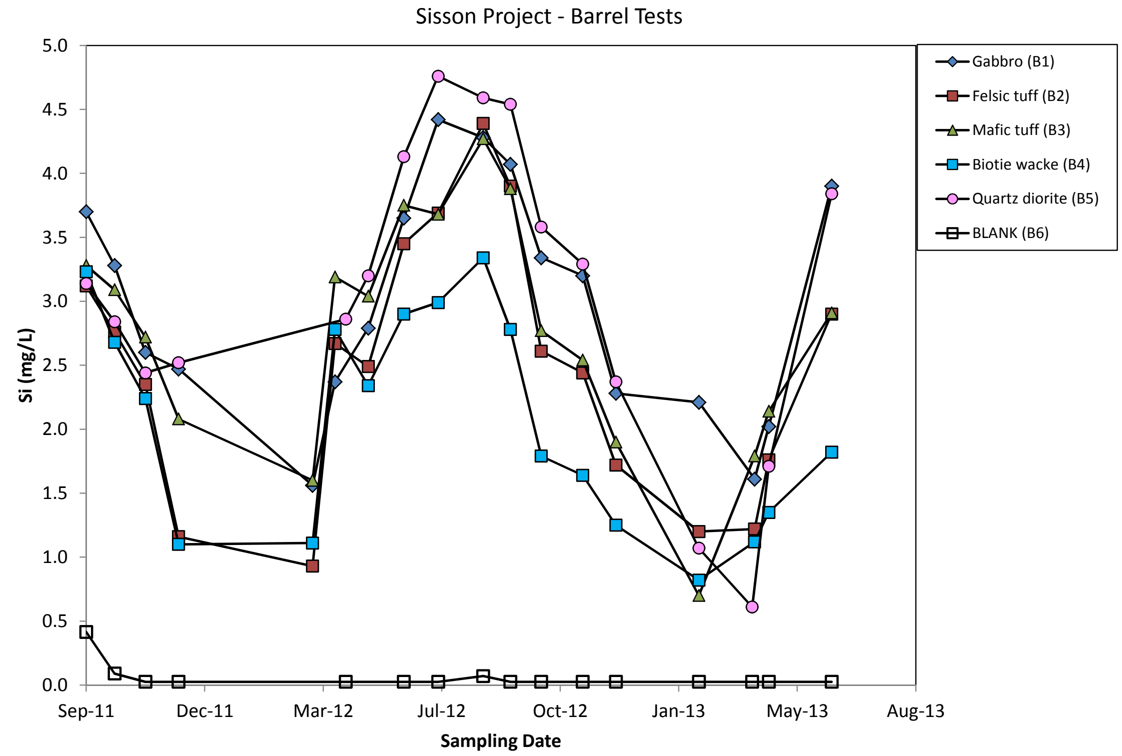

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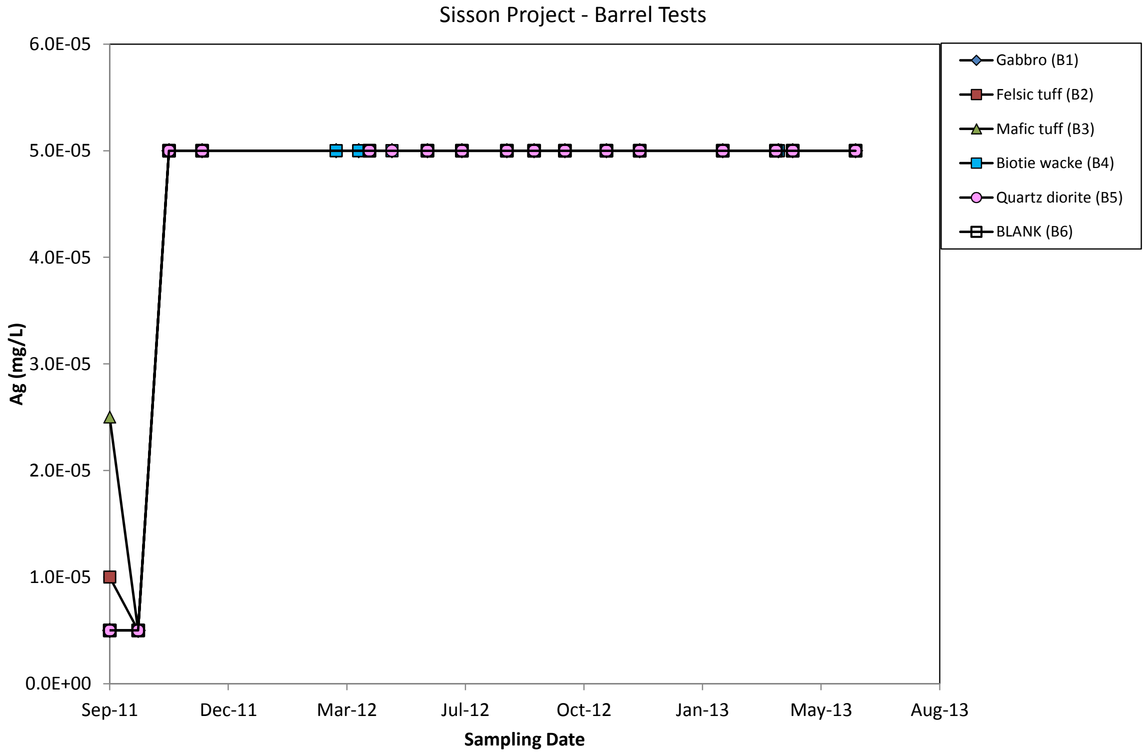

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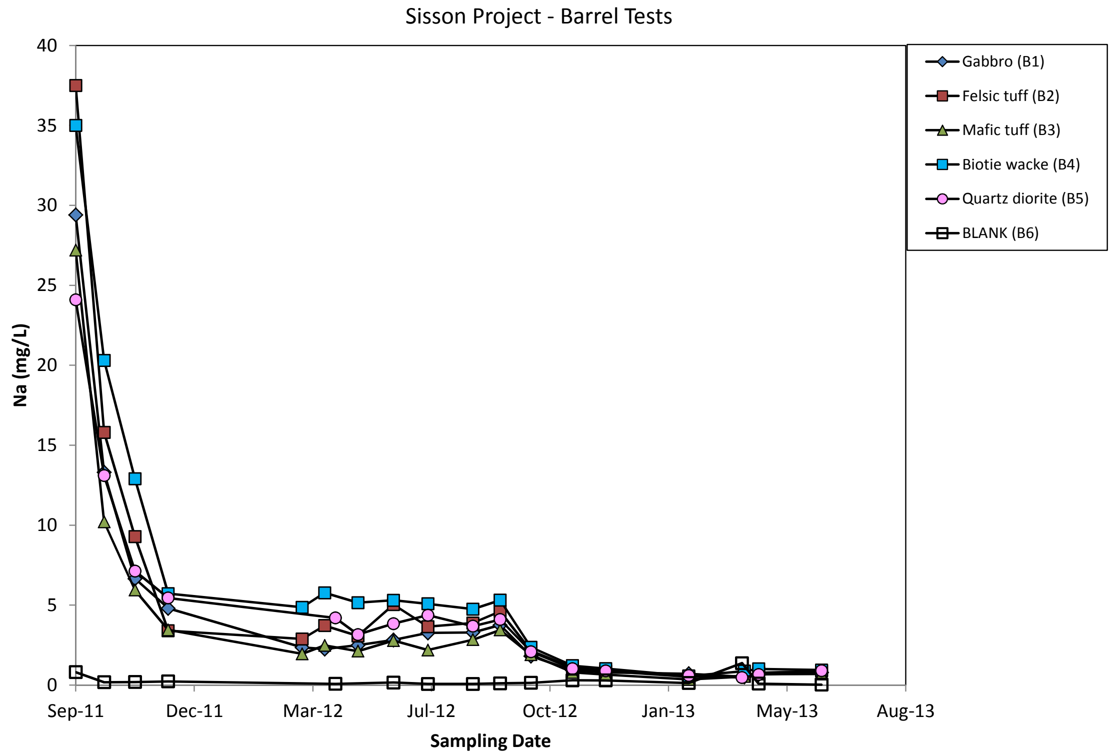

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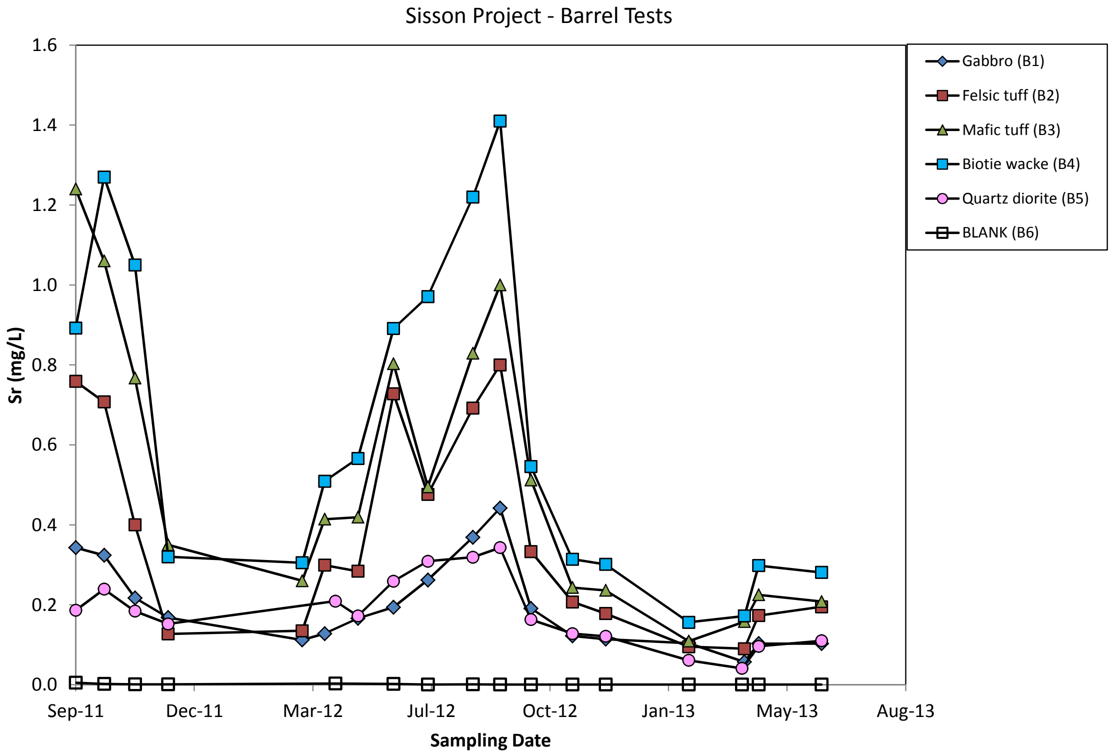

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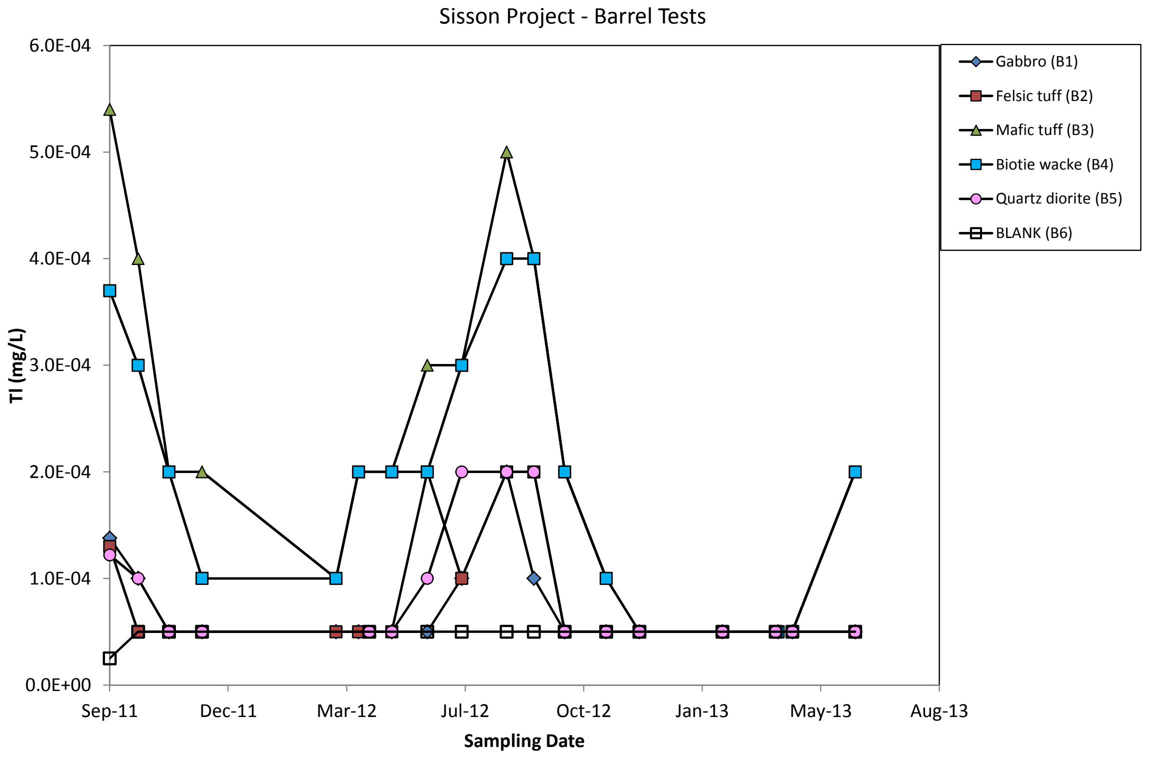

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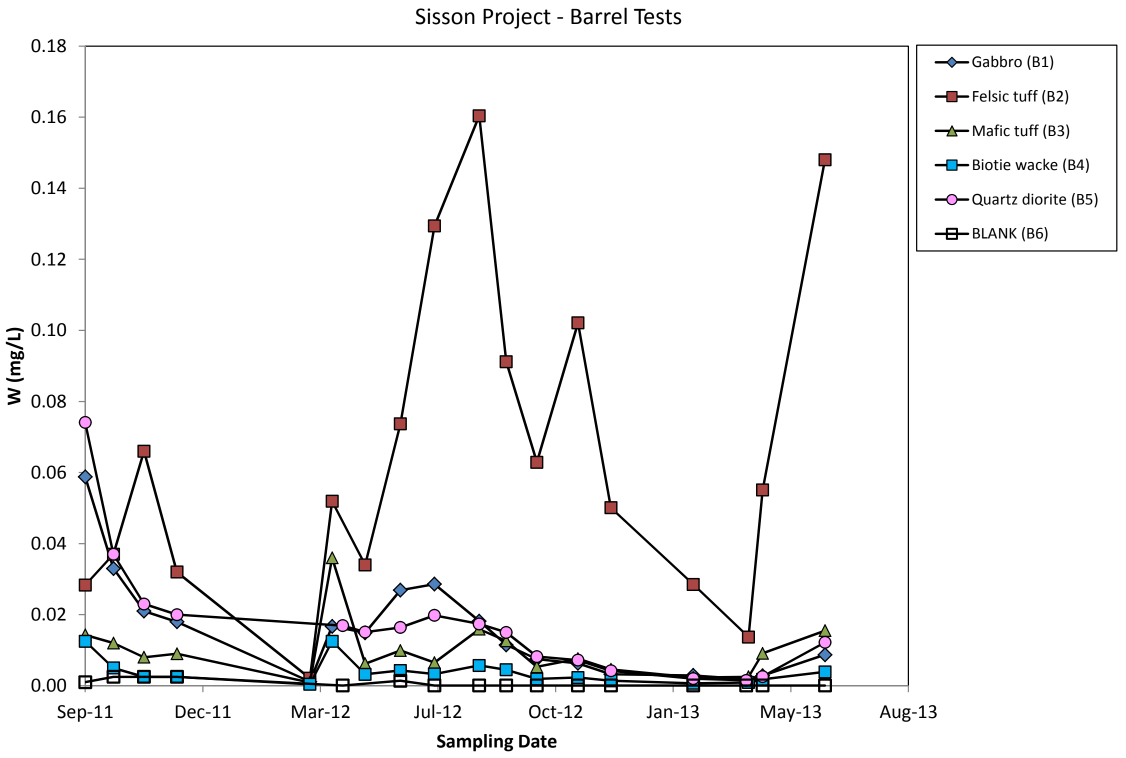

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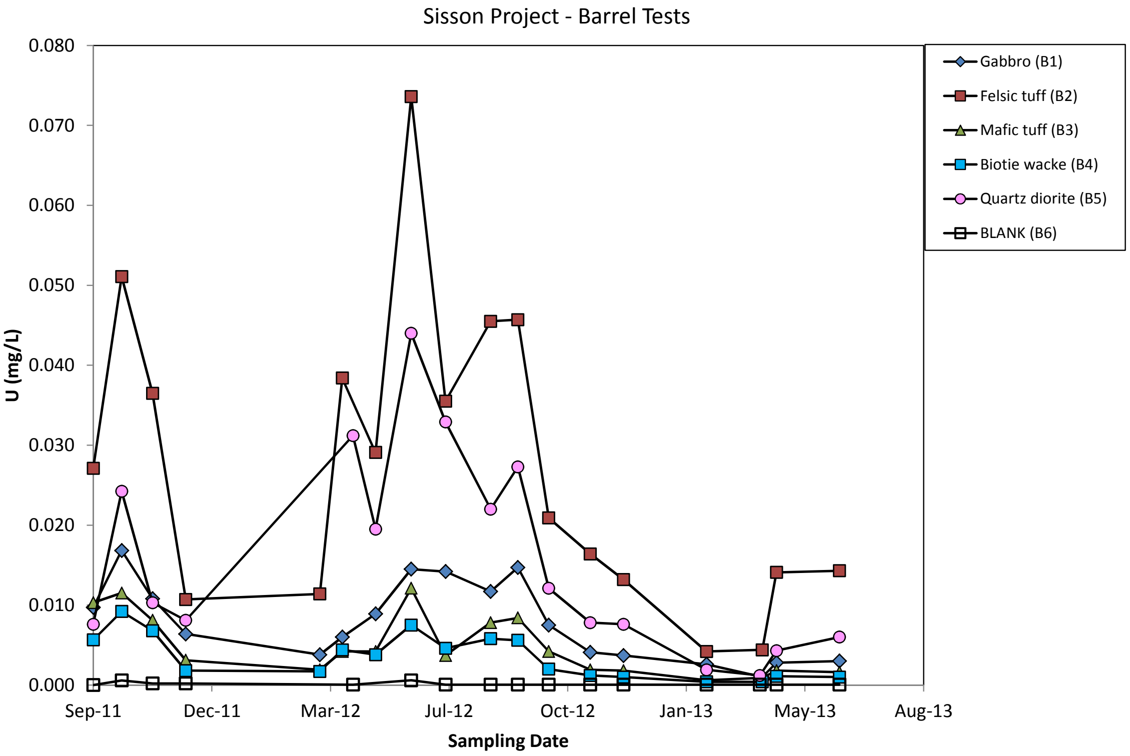

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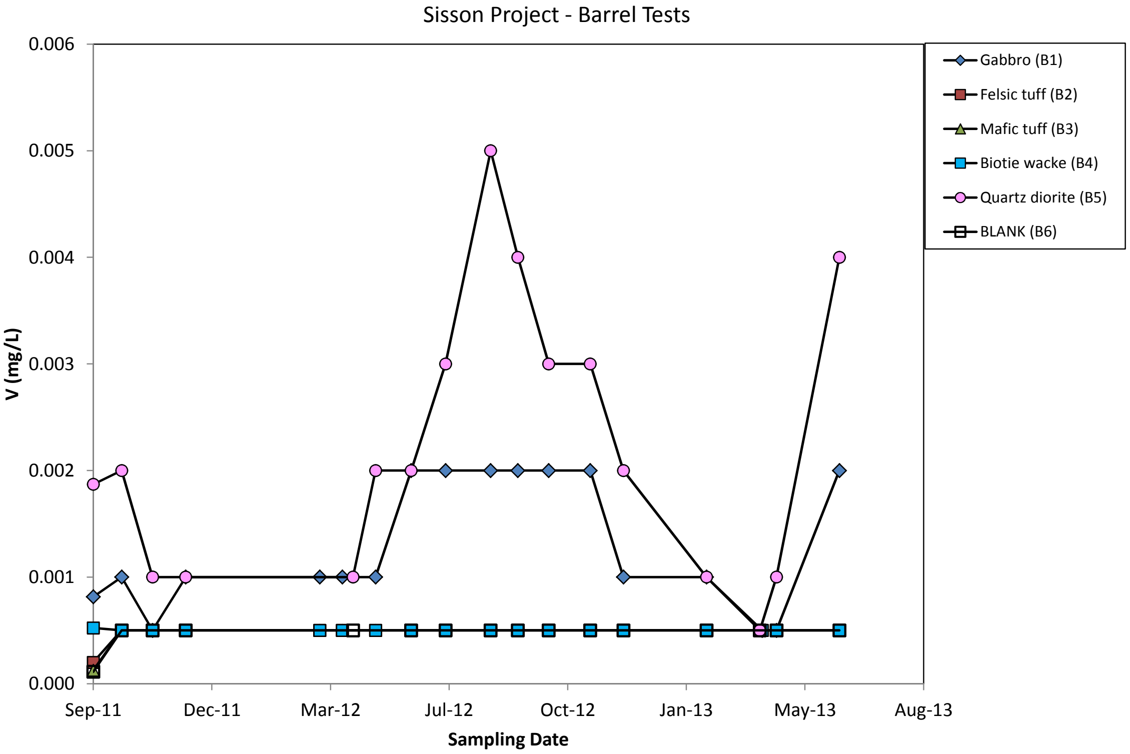

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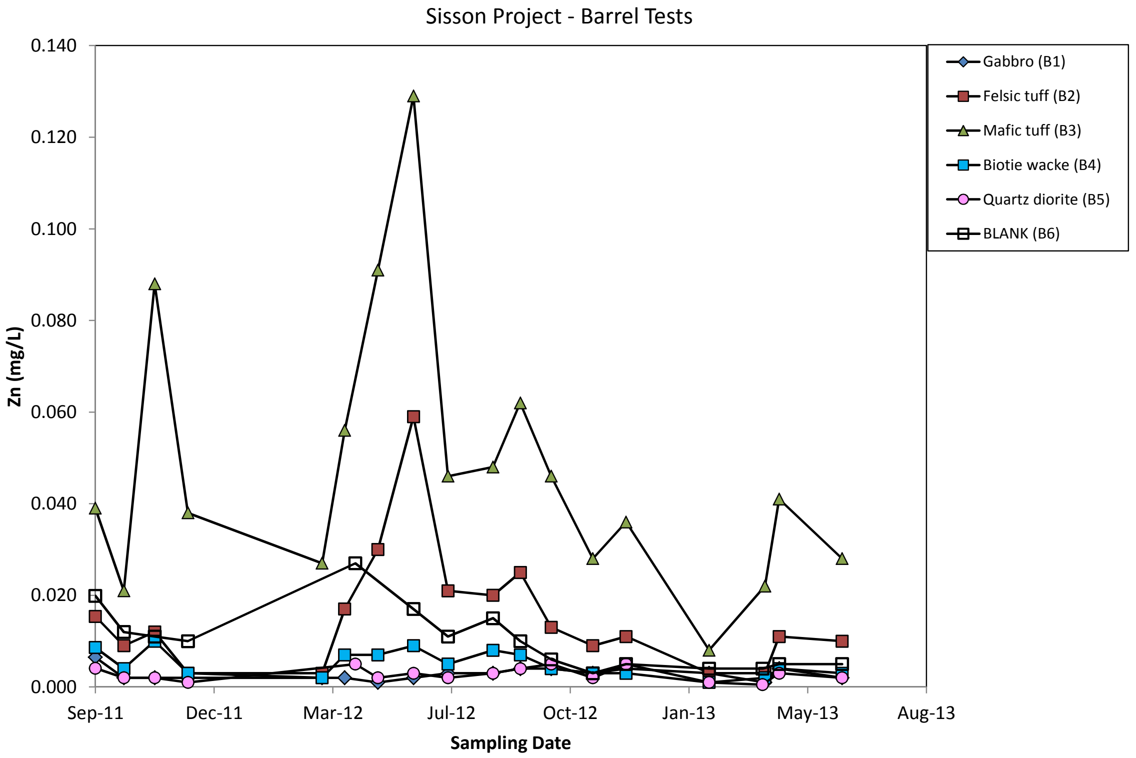

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Appendix D: Pit Wall Results

D1: Acid Base Accounting Results

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Client: Northcliff Resources

Maxxam Sample No	Sample ID	Lithocode	Paste pH	Paste EC	CO2	CaCO3 Equiv.	Total S	Na2CO3 Extractable Sulphur	HCl Extractable Sulphur	Sulphide Sulphur (by diff.)	Acid Generation Potential	Mod. ABA Neutralization Potential	Fizz Rating	Net Neutralization Potential	Neutralization Potential Ratio
	Units		pH Units	uS/cm	wt%	Kg CaCO3/T	wt%	wt%	wt%	wt%	Kg CaCO3/T	Kg CaCO3/T	N/A	Kg CaCO3/T	N/A
CP4558	PW-1	WKB	9.01	181	0.09	2.05	0.60	0.03	0.01	0.59	18.4	8.5	NONE	-9.9	0.5
CP4559	PW-2	WKB	8.94	255	0.53	12.05	0.53	0.03	0.01	0.52	16.3	17.3	MODERATE	1.1	1.1
CP4560	PW-3	WKB	8.76	265	0.20	4.55	0.61	0.03	<0.01	0.61	19.1	9.0	NONE	-10.1	0.5
CP4561	PW-4	WKB	8.81	262	0.15	3.41	0.61	0.03	0.01	0.60	18.8	7.8	NONE	-11.0	0.4
CP4562	PW-5	WKB	8.15	523	1.57	35.68	1.46	0.04	0.01	1.45	45.3	33.4	STRONG	-11.9	0.7
CP4563	PW-6	WKB	8.10	654	3.87	87.95	2.17	0.03	0.02	2.15	67.2	55.1	STRONG	-12.1	0.8
CP4564	PW-7	WKB	8.47	331	1.13	25.68	1.06	0.03	<0.01	1.06	33.1	27.4	MODERATE	-5.7	0.8
CP4565	PW-8	WKB	8.61	294	0.84	19.09	0.77	0.03	0.01	0.76	23.8	22.5	MODERATE	-1.3	0.9
CP4566	PW-9	WKB	9.16	280	0.43	9.77	0.43	0.02	0.01	0.42	13.1	19.9	SLIGHT	6.8	1.5
CP4567	PW-10	MCT	9.19	188	0.19	4.32	0.45	0.02	0.02	0.43	13.4	12.3	NONE	-1.1	0.9
CP4568	PW-11	MTF	8.63	408	1.57	35.68	1.28	0.02	0.01	1.27	39.7	29.8	SLIGHT	-9.9	0.8
CP4569	PW-12	WKB	9.37	166	0.43	9.77	0.29	0.02	0.01	0.28	8.8	16.6	SLIGHT	7.9	1.9
CP4570	PW-13	FTQ	9.13	292	0.59	13.41	0.42	0.02	<0.01	0.42	13.1	17.4	MODERATE	4.3	1.3
CP4571	PW-14	MCT	9.50	176	1.53	34.77	0.13	0.01	<0.01	0.13	4.1	48.5	STRONG	44.4	11.9
CP4572	PW-15	MTF	8.43	444	2.71	61.59	0.57	0.02	<0.01	0.57	17.8	44.8	STRONG	27.0	2.5
CP4573	PW-16	MTF	8.65	1030	0.08	1.82	1.07	0.06	0.04	1.03	32.2	3.6	NONE	-28.6	0.1
CP4574	PW-17	MTF	9.27	182	0.18	4.09	0.34	0.02	<0.01	0.34	10.6	10.9	NONE	0.3	1.0
CP4575	PW-18	MTF	9.43	177	0.07	1.59	0.48	0.03	0.01	0.47	14.7	13.1	NONE	-1.6	0.9
CP4576	PW-19	WKB	8.76	192	0.62	14.09	0.36	0.02	0.01	0.35	10.9	21.2	MODERATE	10.3	1.9
CP4577	PW-20	WKB	9.29	148	0.12	2.73	0.29	0.02	0.01	0.28	8.8	7.8	NONE	-1.0	0.9
CP4578	PW-21	MCT	9.57	154	0.08	1.82	0.23	0.01	<0.01	0.23	7.2	11.9	NONE	4.7	1.7
CP4579	PW-22	WKB	9.44	184	0.23	5.23	0.25	<0.01	0.02	0.23	7.2	10.5	NONE	3.3	1.5
CP4580	PW-23	FTQ	9.35	342	0.16	3.64	0.39	0.02	0.01	0.38	11.9	14.0	NONE	2.1	1.2
CP4581	PW-24	WKB	9.16	357	0.25	5.68	0.71	0.02	0.01	0.70	21.9	15.0	NONE	-6.9	0.7
CP4582	PW-25	MTF	9.55	423	0.24	5.45	0.72	0.02	0.02	0.70	21.9	23.2	NONE	1.3	1.1
CP4583	PW-26	MCT	9.52	294	0.47	10.68	0.19	0.02	<0.01	0.19	5.9	19.5	SLIGHT	13.6	3.3
CP4584	PW-27	MCT	8.35	784	1.73	39.32	2.30	0.04	0.02	2.28	71.3	23.0	SLIGHT	-48.3	0.3
CP4585	PW-28	WKB	9.30	322	0.13	2.95	0.48	0.02	0.04	0.44	13.8	8.0	NONE	-5.8	0.6
CP4586	PW-29	WKB	9.50	422	0.18	4.09	0.54	0.02	0.01	0.53	16.6	15.2	NONE	-1.4	0.9
CP4587	PW-30	WKB	9.55	328	0.14	3.18	0.17	0.01	0.04	0.13	4.1	16.7	NONE	11.0	3.7
CP4588	PW-31	FTQ	9.02	393	0.37	8.41	0.50	0.02	0.01	0.49	15.3	11.8	SLIGHT	-3.5	0.8
CP4589	PW-32	FTQ	9.28	379	0.22	5.00	0.54	0.02	<0.01	0.54	16.9	12.3	NONE	-4.6	0.7
CP4590	PW-33	MTF	9.14	163	0.21	4.77	0.69	0.02	<0.01	0.69	21.6	14.2	NONE	-7.4	0.7
CP4591	PW-34	MTF	9.38	161	0.31	7.05	0.15	0.01	<0.01	0.15	4.7	16.7	SLIGHT	12.0	3.6
CP4592	PW-35	MTF	9.58	140	0.07	1.59	0.15	<0.01	<0.01	0.15	4.7	9.1	NONE	4.4	1.9
CP4593	PW-36	MTF	8.61	168	0.08	1.82	0.31	0.01	0.01	0.30	9.4	11.4	NONE	2.0	1.2
CP4594	PW-37	FDQ	8.96	190	0.06	1.36	0.12	0.01	<0.01	0.12	3.8	7.4	NONE	3.7	2.0
CP4595	PW-38	MCT	9.36	142	0.21	4.77	0.31	0.02	<0.01	0.31	9.7	13.7	NONE	4.0	1.4
CP4596	PW-39	MTF	9.45	132	0.58	13.18	0.12	<0.01	<0.01	0.12	3.8	22.0	MODERATE	18.3	5.9
CP4597	PW-40	MCT	9.52	139	0.08	1.82	0.27	0.01	<0.01	0.27	8.4	11.7	NONE	3.3	1.4
CP4598	PW-41	FTA	9.36	140	0.37	8.41	0.25	0.01	<0.01	0.25	7.8	17.5	SLIGHT	9.7	2.2
CP4599	PW-42	FTA	9.23	297	0.69	15.68	0.69	0.02	0.02	0.67	20.9	25.9	SLIGHT	5.0	1.2
CP4600	PW-43	MTF	8.22	772	0.71	16.14	3.10	0.03	0.03	3.07	95.9	21.0	SLIGHT	-74.9	0.2
CP4601	PW-44	MCT	9.40	280	0.61	13.86	0.31	0.01	0.05	0.26	8.1	27.5	MODERATE	19.4	3.4

Maxxam

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Client: Northcliff Resources

Maxxam Sample No	Sample ID	Lithocode	Paste pH	Paste EC	CO2	CaCO3 Equiv.	Total S	Na2CO3 Extractable Sulphur	HCl Extractable Sulphur	Sulphide Sulphur (by diff.)	Acid Generation Potential	Mod. ABA Neutralization Potential	Fizz Rating	Net Neutralization Potential	Neutralization Potential Ratio
	Units		pH Units	uS/cm	wt%	Kg CaCO3/T	wt%	wt%	wt%	wt%	Kg CaCO3/T	Kg CaCO3/T	N/A	Kg CaCO3/T	N/A
CP4602	PW-45	IGB	8.58	321	0.82	18.64	2.45	0.01	0.01	2.44	76.3	33.6	STRONG	-42.7	0.4
CP4603	PW-46	IGB	8.66	326	0.63	14.32	2.49	0.02	0.03	2.46	76.9	33.4	STRONG	-43.5	0.4
CP4604	PW-47	IGB	9.78	149	0.04	0.91	0.09	<0.01	<0.01	0.09	2.8	36.3	NONE	33.5	13.0
CP4605	PW-48	IGB	9.65	167	0.07	1.59	0.52	0.02	0.10	0.42	13.1	19.3	NONE	6.2	1.5
CP4606	PW-49	IGB	9.62	306	0.10	2.27	0.26	0.02	<0.01	0.26	8.1	19.8	NONE	11.7	2.4
CP4607	PW-50	IGB	9.09	296	0.89	20.23	0.36	0.01	0.02	0.34	10.6	38.6	STRONG	28.0	3.6
CP4608	PW-51	FDQ	9.34	336	0.22	5.00	0.07	0.02	<0.01	0.07	2.2	10.8	SLIGHT	8.6	4.9
CP4609	PW-52	IGB	9.89	300	0.06	1.36	0.11	0.01	<0.01	0.11	3.4	20.1	NONE	16.7	5.8
CP4610	PW-53	IQD	9.73	289	0.10	2.27	0.11	<0.01	<0.01	0.11	3.4	18.2	NONE	14.8	5.3
CP4611	PW-54	IQD	8.73	124	0.07	1.59	0.08	<0.01	<0.01	0.08	2.5	11.7	NONE	9.2	4.7
CP4612	PW-55	IQD	9.53	127	0.08	1.82	0.17	0.01	<0.01	0.17	5.3	12.7	NONE	7.4	2.4
CP4613	PW-56	IQD	9.39	145	0.21	4.77	0.17	0.01	<0.01	0.17	5.3	14.4	NONE	9.1	2.7
CP4614	PW-57	IQD	9.63	153	0.06	1.36	0.11	<0.01	<0.01	0.11	3.4	12.4	NONE	9.0	3.6
CP4615	PW-58	IQD	9.86	299	0.08	1.82	0.22	0.02	<0.01	0.22	6.9	18.9	SLIGHT	12.0	2.7
CP4616	PW-59	IQD	9.46	297	0.29	6.59	0.29	0.02	<0.01	0.29	9.1	17.6	SLIGHT	8.5	1.9
CP4617	PW-60	IQD	8.53	532	1.15	26.14	2.25	0.03	0.03	2.22	69.4	38.2	STRONG	-31.2	0.6
CP4618	PW-61	IQD	9.65	331	0.08	1.82	0.58	0.02	0.01	0.57	17.8	18.0	NONE	0.2	1.0
CP4619	PW-64	IQD	9.09	125	0.39	8.86	0.37	0.01	<0.01	0.37	11.6	26.6	MODERATE	15.0	2.3
CP4620	PW-65	FDB	8.85	134	0.03	0.68	0.18	0.01	<0.01	0.18	5.6	5.1	NONE	-0.5	0.9
CP4621	PW-66	FDB	8.91	182	0.04	0.91	0.18	0.02	<0.01	0.18	5.6	6.0	NONE	0.4	1.1
CP4622	PW-67	WKB	8.36	384	0.51	11.59	1.02	0.02	<0.01	1.02	31.9	14.6	MODERATE	-17.3	0.5
CP4623	PW-68	WKB	9.45	338	0.19	4.32	0.64	0.02	0.02	0.62	19.4	21.7	NONE	2.3	1.1
CP4624	PW-69	WKB	9.40	314	0.37	8.41	0.44	0.02	<0.01	0.44	13.8	17.7	SLIGHT	4.0	1.3
CP4625	PW-70	WKB	9.68	145	0.13	2.95	0.25	<0.01	<0.01	0.25	7.8	11.2	NONE	3.4	1.4
Detection Limits			*N/A*	*1*	*0.02*	*0.5*	*0.02*	*0.01*	*0.01*	*0.02*	*0.6*	*0.1*		*0.1*	
Maxxam SOP #			*7160*		*Leco*	*Calculation*	*Leco*		*7410*	*Calculation*	*Calculation*	*7150*	*7150*	*Calculation*	*Calculation*

References:

Acid Generation Potential = Sulphide Sulphur (by diff.)*31.25

CaCO3 Equivalency = Carbonate Carbon (CO2)*(100/44)*10

Fizz Rating - Reference method used is based on NP method.

Net Neutralization Potential = (Modified ABA Neutralization Potential)-(Acid Generation Potential (S-S by diff))

Mod. ABA Neutralization Potential - MEND Acid Rock Drainage Prediction Manual, MEND Project 1.16.1b (pages 6.2-11 to 17), March 1991.

Neutralization Potential Ratio = (Neutralization Potential)/(Acid Generation Potential)

Paste EC – based on Field and Laboratory Methods Applicable to Overburdens and Minesoils, (EPA 600 / 2-78-054, March 1978)

Paste pH - Field and Laboratory Methods Applicable to Overburdens and Minesoils, (EPA 600 / 2-78-054, March 1978).

Sulphide Sulphur = (Total Sulphur)-(HCl Extractable Sulphur)

D2: Trace Element Analysis Results

Appendix D2: Trace Element Analysis Results

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Client: Northcliff Resources

Maxxam Sample No	Sample ID	Lithocode	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Au	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	B	Al	Na	K	W	W	Hg	Sc	Tl	S	Ga	Se
	Units		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppb	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	%	ppm	%	ppm	%	%	%	ppm	%	ppm	ppm	ppm	%	ppm	ppm
CP4558	PW-1	WKB	10.5	160	3.8	59	<0.1	25.8	14.2	426	3.75	3.1	1.9	0.8	12.7	4	<0.1	<0.1	8.4	54	0.26	0.061	23	33	0.85	95	0.162	<20	1.89	0.033	0.92	4.0		<0.01	7.0	1.1	0.52	8	<0.5
CP4559	PW-2	WKB	23.8	132	223	431	2.0	28.8	14.6	1690	4.19	30.7	1.4	1.3	9.3	6	4.2	0.7	16.5	51	0.61	0.061	19	42	1.13	62	0.123	<20	2.25	0.018	0.76	1.7		0.01	5.8	1.1	0.49	8	<0.5
CP4560	PW-3	WKB	242	194	4.0	61	0.1	27.1	13.1	463	3.57	3.3	1.6	1.9	7.7	3	<0.1	0.6	36.3	38	0.34	0.045	16	37	0.81	55	0.099	<20	1.83	0.020	0.59	8.8		<0.01	3.4	1.0	0.56	6	<0.5
CP4561	PW-4	WKB	198	169	4.5	50	<0.1	22.3	11.9	410	3.45	1.5	2.1	3.5	11.4	4	0.1	0.2	7.9	34	0.27	0.049	22	36	0.67	74	0.108	<20	1.67	0.030	0.62	2.1		<0.01	5.1	1.0	0.57	6	<0.5
CP4562	PW-5	WKB	53.7	1120	46.8	130	3.7	21.0	14.3	775	4.10	2490	1.8	8.1	9.3	20	1.3	4.9	79.7	19	1.25	0.044	18	19	0.38	24	0.009	<20	1.31	0.009	0.21	>100	0.053		2.9	1.0	1.32	4	1.2
CP4563	PW-6	WKB	99.7	698	45.8	124	2.3	23.2	18.3	1470	5.20	130	1.2	6.1	7.1	52	1.1	4.8	100	34	2.13	0.045	16	41	0.76	36	0.012	<20	1.26	0.011	0.31	>100	0.034	0.14	7.3	1.7	2.18	5	1.4
CP4564	PW-7	WKB	37.5	271	42.0	178	1.0	27.2	13.9	1090	3.70	28.0	1.1	2.7	7.1	24	1.4	0.8	43.0	32	0.96	0.047	19	38	0.83	33	0.051	<20	1.62	0.012	0.33	19.2		0.04	3.7	0.8	0.94	6	<0.5
CP4565	PW-8	WKB	52.0	155	12.1	100	0.3	26.5	14.9	927	4.13	1.7	1.5	<0.5	8.1	22	0.6	0.4	14.4	58	0.83	0.057	22	38	1.00	78	0.101	<20	2.00	0.022	0.52	13.2		<0.01	7.7	0.7	0.69	8	<0.5
CP4566	PW-9	WKB	90.3	741	6.1	88	0.8	19.7	17.6	708	4.30	1.5	1.7	14.5	8.2	33	0.4	0.2	200	90	0.89	0.094	25	40	1.21	179	0.225	<20	2.70	0.124	1.19	>100	0.034	0.13	12.6	1.3	0.42	11	0.5
CP4567	PW-10	MCT	54.6	142	12.1	87	0.3	17.0	15.8	862	4.73	1.3	2.0	2.5	11.5	16	0.2	0.1	14.4	100	0.66	0.086	32	35	1.17	203	0.263	<20	2.55	0.096	1.23	>100	0.052	0.29	15.4	1.6	0.42	12	0.6
CP4568	PW-11	MTF	21.8	857	32.6	161	2.6	29.6	24.2	1980	6.02	312	1.1	20.0	4.5	36	0.9	2.0	106	120	1.25	0.150	19	62	1.59	140	0.215	<20	2.84	0.159	1.34	>100	0.171		12.9	2.4	1.14	12	0.8
CP4569	PW-12	WKB	29.8	108	4.1	69	0.1	18.4	14.5	813	4.40	1.8	1.7	1.6	10.4	14	<0.1	0.1	15.0	74	0.59	0.072	30	41	1.08	154	0.243	<20	2.39	0.063	1.15	>100	0.033	0.29	14.2	1.0	0.28	11	<0.5
CP4570	PW-13	FTQ	8.1	147	8.6	43	0.2	6.2	6.5	494	2.52	1.1	2.6	3.7	11.6	32	0.2	0.2	16.2	17	0.74	0.054	43	15	0.47	37	0.033	<20	1.11	0.065	0.17	>100	0.085	0.54	7.8	0.4	0.39	7	<0.5
CP4571	PW-14	MCT	38.2	68.5	2.8	71	0.1	156	26.2	1020	4.15	1.5	1.6	3.4	4.5	134	<0.1	<0.1	10.1	84	1.97	0.072	17	194	3.11	188	0.236	<20	3.74	0.199	2.03	>100	0.156		9.2	2.5	0.11	13	<0.5
CP4572	PW-15	MTF	5.5	109	45.9	216	0.6	30.3	17.6	1760	4.20	13.4	1.0	0.8	8.0	59	1.7	0.9	6.8	53	1.78	0.071	25	53	1.00	81	0.055	<20	1.79	0.033	0.38	52.0		0.22	12.0	0.6	0.58	7	<0.5
CP4573	PW-16	MTF	123	402	4.8	30	0.2	3.2	5.4	253	2.59	6.1	3.2	<0.5	13.3	2	0.2	0.1	27.9	6	0.20	0.040	38	11	0.15	27	0.013	<20	0.69	0.029	0.20	>100	0.164	0.15	4.3	0.2	1.00	4	<0.5
CP4574	PW-17	MTF	108	118	2.6	56	<0.1	27.4	13.7	506	3.48	1.6	1.8	1.0	8.9	14	<0.1	<0.1	39.3	78	0.70	0.068	26	59	1.15	59	0.205	<20	1.89	0.115	0.83	>100	0.103	0.78	14.4	1.3	0.33	10	<0.5
CP4575	PW-18	MTF	67.2	172	1.3	63	<0.1	47.1	21.8	520	4.13	<0.5	0.9	1.0	3.7	26	<0.1	<0.1	12.5	103	0.82	0.085	14	139	1.93	104	0.298	<20	2.76	0.185	1.53	>100	0.074	0.57	10.3	2.3	0.46	11	<0.5
CP4576	PW-19	WKB	373	221	4.1	91	0.2	30.6	18.1	904	4.72	4.3	1.0	1.7	5.4	6	0.5	0.3	19.6	97	0.83	0.062	13	56	1.38	50	0.201	<20	2.56	0.022	0.86	17.8		0.08	10.1	1.2	0.37	11	<0.5
CP4577	PW-20	WKB	17.9	90.2	2.6	66	<0.1	26.3	13.5	634	3.76	1.2	1.3	1.6	9.2	3	<0.1	<0.1	12.3	53	0.29	0.045	19	46	0.98	65	0.201	<20	2.00	0.029	0.91	5.7		<0.01	6.5	1.0	0.26	8	<0.5
CP4578	PW-21	MCT	81.1	102	2.5	64	<0.1	27.0	16.7	606	3.85	2.6	3.6	2.3	11.5	62	<0.1	<0.1	8.6	113	0.85	0.084	32	37	1.68	282	0.366	<20	2.71	0.179	1.54	>100	0.116	0.80	10.8	1.8	0.21	11	<0.5
CP4579	PW-22	WKB	689	80.0	2.2	64	<0.1	26.8	14.4	630	3.88	1.0	1.0	3.7	6.9	7	0.4	<0.1	12.3	73	0.49	0.055	17	56	1.12	136	0.251	<20	2.37	0.050	1.36	>100	0.026	0.28	9.5	1.6	0.23	9	<0.5
CP4580	PW-23	FTQ	121	233	5.3	56	0.1	14.8	9.4	445	3.42	<0.5	1.9	2.7	14.1	20	<0.1	<0.1	43.3	55	0.68	0.081	36	69	0.70	112	0.184	<20	1.88	0.117	0.72	88.2		0.17	10.0	0.9	0.40	10	<0.5
CP4581	PW-24	WKB	36.8	172	3.2	54	0.1	32.2	15.1	465	4.06	14.2	1.6	2.9	8.9	10	<0.1	0.4	23.7	74	0.53	0.072	22	108	1.00	132	0.146	<20	2.42	0.074	1.01	7.2		0.01	8.6	1.2	0.67	9	<0.5
CP4582	PW-25	MTF	322	376	2.4	75	0.2	42.0	18.7	685	4.94	<0.5	1.9	3.1	6.9	57	0.3	<0.1	19.7	117	1.15	0.100	25	129	1.87	193	0.290	<20	3.79	0.270	2.03	>100	0.133	1.20	13.8	3.0	0.68	15	0.7
CP4583	PW-26	MCT	110	128	5.6	67	0.2	7.9	9.3	624	3.35	34.6	2.6	1.5	11.5	8	0.3	1.1	10.9	77	0.70	0.080	23	17	1.34	77	0.190	<20	2.25	0.054	1.24	>100	0.053	0.48	11.4	1.6	0.19	11	<0.5
CP4584	PW-27	MCT	42.0	2140	35.5	100	5.9	24.2	14.2	352	4.00	305	1.8	13.4	4.1	25	1.1	3.8	195	12	0.75	0.028	9	13	0.23	52	0.007	<20	0.96	0.019	0.50	>100	0.038	0.45	1.9	1.5	2.25	3	1.4
CP4585	PW-28	WKB	13.6	99.8	5.6	55	0.1	30.0	15.1	453	4.13	1.2	1.4	0.9	5.1	7	<0.1	<0.1	2.7	46	0.18	0.040	15	39	0.79	121	0.164	<20	2.36	0.036	1.27	1.5		<0.01	4.7	1.2	0.43	7	<0.5
CP4586	PW-29	WKB	43.0	207	9.6	90	0.2	25.2	12.2	428	3.19	3.5	1.9	2.2	7.0	10	0.1	<0.1	29.1	39	0.25	0.049	19	37	0.72	101	0.126	<20	2.01	0.043	1.16	63.0		0.14	4.2	1.2	0.50	6	<0.5
CP4587	PW-30	WKB	37.7	136	6.0	81	0.2	31.6	14.9	601	3.84	1.6	1.0	<0.5	5.8	7	0.4	0.1	5.5	60	0.25	0.046	16	52	1.19	124	0.206	<20	2.76	0.052	1.61	37.3		0.10	6.5	1.6	0.16	9	<0.5
CP4588	PW-31	FTQ	43.0	218	13.6	40	0.4	6.2	6.4	458	2.39	1.9	4.9	2.1	14.1	8	0.3	0.3	41.0	21	0.41	0.021	29	24	0.40	42	0.041	<20	1.06	0.056	0.42	87.5		0.24	4.9	0.5	0.45	6	<0.5
CP4589	PW-32	FTQ	165	212	41.4	84	0.6	6.7	8.8	520	2.84	<0.5	4.6	1.7	14.3	12	0.8	0.3	31.4	43	0.61	0.047	31	14	0.54	48	0.143	<20	1.29	0.090	0.52	>100	0.026	0.31	6.4	0.7	0.52	8	<0.5
CP4590	PW-33	MTF	318	222	91.5	209	1.2	24.7	17.9	1170	4.35	1.7	0.9	1.3	3.6	15	1.6	0.2	14.2	120	1.00	0.066	13	127	2.04	81	0.298	<20	2.41	0.096	1.02	>100	0.124		14.0	1.9	0.66	13	<0.5
CP4591	PW-34	MTF	12.5	104	9.0	60	0.2	16.9	10.7	604	2.48	1.9	5.3	0.7	8.7	17	0.3	0.5	3.4	57	0.89	0.057	19	45	1.00	48	0.211	<20	1.42	0.083	0.39	>100	0.027	0.26	7.0	0.6	0.16	8	<0.5
CP4592	PW-35	MTF	3.4	55.5	25.0	114	0.3	9.6	10.3	621	2.56	1.3	2.7	0.8	10.4	22	0.7	<0.1	4.9	58	0.66	0.062	32	21	0.96	97	0.240	<20	1.47	0.085	0.57	39.3		0.05	6.9	0.6	0.14	7	<0.5
CP4593	PW-36	MTF	30.7	146	3.4	66	0.1	16.2	17.2	783	4.37	77.0	4.7	9.2	7.1	17	0.1	2.0	5.4	138	0.90	0.112	11	32	1.25	32	0.292	<20	2.37	0.096	0.86	>100	0.147		12.5	1.3	0.27	13	<0.5
CP4594	PW-37	FDQ	11.5	63.0	4.1	40	<0.1	8.6	9.6	414	2.57	1.7	6.6	1.9	10.4	9	<0.1	0.1	0.6	72	0.74	0.075	9	18	0.72	23	0.209	<20	1.51	0.077	0.64	>100	0.062	<0.01	9.5	0.8	0.10	10	<0.5
CP4595	PW-38	MCT	9.6	99.3	8.9	63	0.2	19.6	17.3	696	4.06	2.7	2.7	0.8	10.0	15	<0.1	<0.1	7.3	111	0.95	0.115	23	33	1.21	57	0.317	<20	1.92	0.077	1.05	>100	0.098	<0.01	9.4	1.2	0.34	10	<0.5
CP4596	PW-39	MTF	28.5	37.1	101	214	0.6	27.2	15.8	1180	3.63	3.4	2.3	<0.5	12.7	24	1.2	0.1	2.0	85	1.05	0.084	34	39	1.54	135	0.280	<20	2.18	0.068	0.93	>100	0.025	<0.01	8.9	0.9	0.11	10	<0.5
CP4597	PW-40	MCT	67.0	83.9	2.6	66	<0.1	25.0	23.3	508	4.43	1.9	1.7	6.1	6.1	26	<0.1	<0.1	29.0	162	0.97	0.129	23	47	1.53	211	0.346	<20	2.60	0.131	1.43	>100	0.038	<0.01	14.8	1.4	0.27	12	<0.5
CP4598	PW-41	FTA	396	121	4.7	70	0.1	13.6	14.5	867	3.88	3.4	2.8	<0.5	13.0	17	0.3	0.2	1.5	87	0.80	0.113	31	16	1.19	88	0.266	<20	2.00	0.081	0.83	>100	0.025	<0.01	9.6	1.1	0.26	10	<0.5
CP4599	PW-42	FTA	44.5	128	239	537	1.1	15.2	16.7	2220	5.23	46.7	3.3	1.0	11.0	17	5.2	0.9	2.2	126	1.11	0.090	22	101	1.30	51	0.238	<20	2.58	0.084	0.85	>100	0.076	<0.01	13.2	1.4	0.66	13	<0.5
CP4600	PW-43	MTF	58.0	2900	41.7	256	4.7	16.7	37.1	756	6.41	82.0	9.5	1.1	8.5	9	2.9	1.1	49.3	52	0.93	0.081	10	110	0.43	23	0.014	<20	1.58	0.015	0.49	>100	0.154	<0.01	5.0	0.7	2.82	7	2.1
CP4601	PW-44	MCT	35.9	84.9	9.6	158	0.2	33.3	21.0	1250	5.38	4.2	3.6	<0.5	16.3	28	1.1	<0.1	2.1	177	1.16	0.074	30	86	1.78	73	0.314	<20	3.52	0.164	1.31	6.0		<0.01	17.3	2.0	0.32	16	<0.5
CP4602	PW-45	IGB	33.9	550	53.9	363	2.1	39.7	23.7	1760	7.71	4.9	1.8	1.1	6.1	15	4.1	0.5	45.5	106	1.49	0.090	23	41	2.20	42	0.237	<20	3.14	0.026	0.91	>100	0.067	<0.01	9.9	2.2	2.04	14	<0.5
CP4603	PW-46	IGB	7.9	542	132	650	3.8	51.6	36.2	2240	8.18	3.7	0.8	0.7	2.5	96	7.0	0.3	24.1	142	2.44	0.067	11	63	3.02	62	0.284	<20	5.21	0.204	1.13	>100	0.04	<0.01	13.7	3.3	2.18	17	<0.5
CP4604	PW-47	IGB	0.5	32.8	3.6	123	<0.1	54.2	25.8	681	3.65	<0.5	0.5	<0.5	3.0	328	0.3	<0.1	0.6	117	5.05	0.072	7	68	2.27	78	0.263	<20	8.76	0.618	1.40	13.2		0.01	6.9	1.4	0.06	17	<0.5
CP4605	PW-48	IGB	0.9	178	13.9	107	0.3	33.2	26.5	702	4.05	<0.5	0.7	<0.5	4.0	195	0.2	<0.1	2.2	116	3.90	0.132	8	35	1.86	47	0.251	<20	6.48	0.623	1.22	46.2		<0.01	8.1	1.4	0.46	16	<0.5
CP4606	PW-49	IGB	5.9	117	3.0	71	<0.1	21.9	19.6	674	4.38	1.4	1.3	<0.5	6.9	103	<0.1	<0.1	0.7	125	1.83	0.148	28	59	1.86	159	0.364	<20	3.83	0.338	1.61	73.6		<0.01	11.2	2.0	0.28	14	<0.5
CP4607	PW-50	IGB	2.2	82.9	177	395	1.2	18.4	16.5	1800	4.24	3.2	2.0	<0.5	7.3	73	4.2	0.3	3.2	109	1.87	0.128	30	47	1.69	102	0.239	<20	2.97	0.186	0.77	9.8		<0.01	7.8	1.3	0.33	12	<0.5
CP4608	PW-51	FDQ	21.3	69.1	9.0	24	0.1	8.0	4.5	379	1.69	1.3	2.9	<0.5	17.5	19	<0.1	0.1	7.4	23	0.65	0.011	22	141	0.27	15	0.084	<20	1.13	0.125	0.28	5.0		<0.01	4.5	0.4	0.08	7	<0.5
CP4609	PW-52	IGB	2.7	56.3	3.5	54	<0.1	14.2	15.6	472	3.41	0.5	2.7	<0.5	8.8	91	<0.1	<0.1	2.0	101	1.31	0.107	27	57	1.37	192	0.323	<20	2.78	0.322	1.19	18.6		<0.01	8.1	1.4	0.11	10	<0.5
CP4610	PW-53	IQD	1.9	54.1	3.7	59	<0.1	17.2	15.9	570	3.42	0.5	1.9	<0.5	7.1	76	<0.1	<0.1	0.4	90	1.24	0.107	27	54	1.45	160	0.321	<20	2.66	0.241	1.04	7.7		<0.01	5.5	1.2	0.11	10	<0.5
CP4611	PW-54	IQD	3.8	86.3	2.9	79	0.2	24.6	18.3	677	3.83	3.7	3.1	<0.5	5.8	117	0.1	<0.1	0.6	116	1.53	0.116	21	33	1.75	156	0.330	<20	3.23	0.179	1.33	23.7		<0.01	9.8	1.8	0.08	12	<0.5
CP4612	PW-55	IQD	0.6	61.2	4.9	60	<0.1	19.3	16.4	418	3.37	<0.5	1.2	<0.5	7.2	77	<0.1	<0.1	0.9	101	0.97	0.120	33	27	1.35	269	0.281	<20	2.11	0.151	1.11	26.6		<0.01	5.3	1.1	0.16	8	<0.5
CP4613	PW-56	IQD	32.5	63.8	4.3	61	<0.1	20.4	17.5	587	3.54	1.5	1.9	<0.5	8.7	59	<0.1	<0.1	0.3	103	1.26	0.142	30	31	1.50	182	0.288	<20	2.33	0.140	1.01	>100	0.028	<0.01	5.7	1.3	0.18	9	<0.5
CP4614	PW-57	IQD	45.2	44.1	4.9	58	<0.1	17.9	14.8	432	3.05	<0.5	4.1	<0.5	6.3	49	<0.1	<0.1	0.6	87	1.07	0.123	23	28	1.27	187	0.254	<20	2.02	0.139	0.93	33.5		<0.01	6.5	1.0	0.11	8	<0.5
CP4615	PW-58	IQD	7.7	133	7.8	75	0.2	27.0	20.2	530	3.99	3.2	1.6	<0.5	6.8	135	0.2	<0.1	1.2	124	1.59	0.136	25	55	1.72	239	0.297	<20	3.18	0.377	1.34	>100	0.058	<0.01	8.8	1.7	0.24	12	<0.5
CP4616	PW-59	IQD	12.0	151	95.9	126	1.4	13.6	11.7	1230	3.33	29.1	1.2	<0.5	16.3	39	0.9	0.2	11.1	70	1.02	0.080	40	86	1.17	168	0.235	<20	2.10	0.135	0.61	27.1		0.01	7.5	0.9	0.28	10	<0.5
CP4617	PW-60	IQD	18.6	2480	901	918	16.7	32.9	28.2	5170	6.21	1440	1.4	22.9	4.1	50	9.1	2.0	37.5	91	1.64	0.101	17	125	1.73	52	0.078	<20	2.89	0.076	0.58	>100	0.087		7.7	1.3	2.30	12	0.8
CP4618	PW-61	IQD	26.5	187	24.4	73	0.3	27.8	23.1	495	4.39	3.1	1.2	9.6	5.9	110	0.2	<0.1	247	139	1.55	0.118	25	64	1.83	161	0.252	<20	3.05	0.308	1.17	>100	0.128		11.5	1.9	0.55	13	<0.5
CP4619	PW-64	IQD	5.9	70.9	44.2	178	0.5	31.3	22.2	1360	3.96	2.2	0.7	<0.5	4.6	84	1.4	0.1	0.8	117	1.69	0.131	20	30	2.11	64	0.234	<20	2.87	0.152	0.38	>100	0.03	<0.01	7.5	0.6	0.39	11	<0.5
CP4620	PW-65	FDB	5.6	87.1	10.3	78	0.4	3.9	6.1	331	2.10	3.8	6.3	1.0	11.8	9	0.8	0.1	4.6	30	0.36	0.058	20	11	0.49	57	0.161	<20	1.04	0.058	0.29	3.6		<0.01	4.7	0.2	0.18	6	<0.5
CP4621	PW-66	FDB	44.5	68.8	6.5	72	0.2	5.6	6.9	329	2.22	1.5	5.8	<0.5	11.4	14	0.5	<0.1	7.3	39	0.47	0.058	21	23	0.63	81	0.191	<20	1.22	0.074	0.46	13.8		<0.01	6.5	0.5	0.18	7	<0.5
CP4622	PW-67	WKB	58.1	708	146	1170	5.0	25.4	13.3	1040	3.74	12.8	2.9	<0.5	10.1	8	11.9	1.3	83.0	45	0.60	0.062	24	33	0.93	65	0.112	<20	1.70	0.029	0.62	76.4		<0.01	5.5	1.0	0.96	6	<0.5
CP4623	PW-68	WKB	431	223	34.8	238	1.5	28.1	15.7	893	4.32	378	2.1	4.8	9.0	22	2.4	0.4	18.3	89	0.63	0.072	23	116	1.57	107	0.243	<20	2.91	0.098	1.41	>100	0.067	<0.01	11.3	1.9	0.63	11	<0.5
CP4624	PW-69	WKB	32.2	155	6.5	123	0.4	20.7	12.3	579	3.38	157	2.6	2.7	10.5	14	1.0	2.3	9.8	59	0.69	0.051	23	108	0.97	66	0.171	<20	2.08	0.080	0.99	38.8		0.05	9.7	1.2	0.42	9	0.5
CP4625	PW-70	WKB	74.1	199	7.4	114	0.6	17.3	11.6	543	2.90	0.9	2.6	<0.5	10.2	24	1.1	<0.1	5.4	69	0.78	0.046	18	37	1.12	59	0.236	<20	2.12	0.138	0.91	>100	0.044		9.8	1.4	0.24	9	<0.5

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Client: Northcliff Resources

Maxxam Sample No	Sample ID	Lithocode	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Au	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	B	Al	Na	K	W	W	Hg	Sc	Tl	S	Ga	Se
	Units		ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppb	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	%	ppm	%	ppm	%	%	%	ppm	%	ppm	ppm	ppm	%	ppm	ppm
QAQC																																							
Duplicates																																							
CP4563 Dup	PW-6		92.0	716	48.0	125	2.4	23.9	18.5	1500	5.22	125	1.2	5.6	7.1	52	1.0	5.2	105	35	2.12	0.047	16	41	0.77	36	0.012	<20	1.29	0.011	0.31	>100		0.12	7.3	1.7	2.21	5	0.5
CP4575 Dup	PW-18																																0.076						
Blanks																																							
Method Blank											<0.01										<0.01	<0.001			<0.01		<0.001		<0.01	0.004	<0.01		<0.005				<0.05		
Method Blank														<0.5																									
Method Blank			<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.1	<1		<0.5	<0.1		<0.1	<1	<0.1	<0.1	<0.1	<2			<1	<1		<1		<20				<0.1		<0.01	<0.1	<0.1		<1	<0.5
Reference Material																																							
REFMAT OREAS45CA (%) (5											16.7										0.470	0.0400			0.150		0.126		3.71	0.0130	0.0700						<0.05		
True Values REFMAT OREA											**15.69**										**0.4265**	**0.0385**			**0.1358**		**0.128**		**3.592**	**0.0075**	**0.0717**						**0.021**		
Percent Difference (5683968)											-6.25										-10.20	-3.90			-10.46		1.56		-3.29	-73.33	2.37						100.00		
Reference Material																																							
REFMAT OREAS45CA PPB (														39.4																									
True Values REFMAT OREA														**43**																									
Percent Difference (5683970)														8.37																									
Reference Material																																							
REFMAT OREAS45CA PPM (			1.00	506	21.8	63.0	0.300	256	93.7	990		3.80	1.20		7.10	16.0	0.100	0.100	0.100	231			17.0	731		174		<20				0.200		0.0300	46.1	<0.1		20.0	<0.5
True Values REFMAT OREA			**1**	**494**	**20**	**60**		**240**	**92**			**3.8**	**1.2**		**7**	**15**	**0.1**	**0.13**	**0.19**	**215**			**15.9**	**709**		**164**									**39.7**	**0.07**		**18.4**	**0.5**
Percent Difference (5683971)			0.00	-2.35	-9.00	-5.00		-6.46	-1.85			0.00	0.00		-1.43	-6.67	0.00	23.08	47.37	-7.44			-6.92	-3.10		-6.10									-16.12	100.00		-8.70	100.00
Reference Material																																							
SPIKE DS8 (%) (5683968)											2.44										0.670	0.0780			0.600		0.106		0.940	0.0830	0.410						0.160		
True Values SPIKE DS8											**2.46**										**0.7**	**0.08**			**0.6045**		**0.113**		**0.93**	**0.0883**	**0.41**						**0.1679**		
Percent Difference (5683968)											0.81										4.29	2.50			0.74		6.19		-1.08	6.00	0.00						4.71		
Reference Material																																							
SPIKE DS8 PPB (5683970)														106																									
True Values SPIKE DS8 PPB														**107**																									
Percent Difference (5683970)														0.93																									
Reference Material																																							
SPIKE DS8 PPM (5683971)			14.0	113	141	315	2.40	39.7	7.50	609		24.0	2.70		6.40	62.0	2.40	4.30	6.80	38.0			12.0	116		291		<20				2.90		0.220	2.40	5.80		5.00	5.20
True Values SPIKE DS8 PPM			**13.44**	**110**	**123**	**312**		**38.1**	**7.5**			**26**	**2.8**		**6.89**	**67.7**	**2.38**	**4.8**	**6.67**	**41.1**			**14.6**	**115**		**279**		**2.6**				**3**			**2.3**	**5.4**		**4.7**	**5.23**
Percent Difference (5683971)			-4.17	-3.00	-14.31	-0.96		-4.20	0.00			7.69	3.57		7.11	8.42	-0.84	10.42	-1.95	7.54			17.81	-0.87		-4.30		100.00				3.33			-4.35	-7.41		-6.38	0.57
Reference Material																																							
SPIKE W107 (%) (5683968)																																	0.430						
True Values SPIKE W107 (%																																	**0.430**						
Percent Difference (5683968)																																	0.00						
Detection Limits			0.1	0.1	0.1	1	0.1	0.1	0.1	1	0.01	0.5	0.1	0.5	0.1	1	0.1	0.1	0.1	2	0.01	0.001	1	1	0.01	1	0.001	20	0.01	0.001	0.01	0.1	0.005	0.01	0.1	0.1	0.05	1	0.5
			1DX	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*7KP*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*

Table 4: Fluoride Test Results for project Sisson 1CN019.000

Maxxam Sample No	Sample ID Units	Lithocode	F %
CP4558	PW-1	WKB	0.12
CP4559	PW-2	WKB	0.13
CP4560	PW-3	WKB	0.11
CP4561	PW-4	WKB	0.09
CP4562	PW-5	WKB	0.15
CP4563	PW-6	WKB	0.19
CP4564	PW-7	WKB	0.12
CP4565	PW-8	WKB	0.14
CP4566	PW-9	WKB	0.12
CP4567	PW-10	MCT	0.17
CP4568	PW-11	MTF	0.26
CP4569	PW-12	WKB	0.11
CP4570	PW-13	FTQ	0.06
CP4571	PW-14	MCT	0.24
CP4572	PW-15	MTF	0.16
CP4573	PW-16	MTF	0.08
CP4574	PW-17	MTF	0.18
CP4575	PW-18	MTF	0.24
CP4576	PW-19	WKB	0.15
CP4577	PW-20	WKB	0.09
CP4578	PW-21	MCT	0.18
CP4579	PW-22	WKB	0.12
CP4580	PW-23	FTQ	0.13
CP4581	PW-24	WKB	0.13
CP4582	PW-25	MTF	0.28
CP4583	PW-26	MCT	0.15
CP4584	PW-27	MCT	0.17
CP4585	PW-28	WKB	0.09
CP4586	PW-29	WKB	0.09
CP4587	PW-30	WKB	0.11
CP4588	PW-31	FTQ	0.08
CP4589	PW-32	FTQ	0.09
CP4590	PW-33	MTF	0.26
CP4591	PW-34	MTF	0.12
CP4592	PW-35	MTF	0.08
CP4593	PW-36	MTF	0.14
CP4594	PW-37	FDQ	0.11
CP4595	PW-38	MCT	0.11
CP4596	PW-39	MTF	0.1
CP4597	PW-40	MCT	0.11

Table 4: Fluoride Test Results for project Sisson 1CN019.000

Maxxam Sample No	Sample ID	Lithocode	F
	Units		%
CP4598	PW-41	FTA	0.12
CP4599	PW-42	FTA	0.17
CP4600	PW-43	MTF	0.14
CP4601	PW-44	MCT	0.14
CP4602	PW-45	IGB	0.44
CP4603	PW-46	IGB	0.33
CP4604	PW-47	IGB	0.12
CP4605	PW-48	IGB	0.12
CP4606	PW-49	IGB	0.11
CP4607	PW-50	IGB	0.09
CP4608	PW-51	FDQ	0.03
CP4609	PW-52	IGB	0.06
CP4610	PW-53	IQD	0.06
CP4611	PW-54	IQD	0.08
CP4612	PW-55	IQD	0.08
CP4613	PW-56	IQD	0.1
CP4614	PW-57	IQD	0.09
CP4615	PW-58	IQD	0.13
CP4616	PW-59	IQD	0.1
CP4617	PW-60	IQD	0.17
CP4618	PW-61	IQD	0.12
CP4619	PW-64	IQD	0.13
CP4620	PW-65	FDB	0.05
CP4621	PW-66	FDB	0.05
CP4622	PW-67	WKB	0.12
CP4623	PW-68	WKB	0.14
CP4624	PW-69	WKB	0.09
CP4625	PW-70	WKB	0.12
QAQC			
Duplicates			
CP4565 Dup	PW-8		0.14
Detection Limits			*0.01*
			G803

Table 3: WRA Minors Test Results for project Sisson 1CN019.000

Maxxam Sample No	Sample ID Units	Lithocode	Ba ppm
CP4558	PW-1	WKB	639
CP4559	PW-2	WKB	465
CP4560	PW-3	WKB	604
CP4561	PW-4	WKB	619
CP4562	PW-5	WKB	414
CP4563	PW-6	WKB	271
CP4564	PW-7	WKB	451
CP4565	PW-8	WKB	527
CP4566	PW-9	WKB	499
CP4567	PW-10	MCT	465
CP4568	PW-11	MTF	206
CP4569	PW-12	WKB	486
CP4570	PW-13	FTQ	471
CP4571	PW-14	MCT	326
CP4572	PW-15	MTF	171
CP4573	PW-16	MTF	558
CP4574	PW-17	MTF	377
CP4575	PW-18	MTF	142
CP4576	PW-19	WKB	277
CP4577	PW-20	WKB	423
CP4578	PW-21	MCT	387
CP4579	PW-22	WKB	404
CP4580	PW-23	FTQ	799
CP4581	PW-24	WKB	446
CP4582	PW-25	MTF	265
CP4583	PW-26	MCT	367
CP4584	PW-27	MCT	311
CP4585	PW-28	WKB	501
CP4586	PW-29	WKB	472
CP4587	PW-30	WKB	429
CP4588	PW-31	FTQ	512
CP4589	PW-32	FTQ	442
CP4590	PW-33	MTF	165
CP4591	PW-34	MTF	259
CP4592	PW-35	MTF	434
CP4593	PW-36	MTF	87
CP4594	PW-37	FDQ	77
CP4595	PW-38	MCT	210
CP4596	PW-39	MTF	471
CP4597	PW-40	MCT	280

Table 3: WRA Minors Test Results for project Sisson 1CN019.000

Maxxam Sample No	Sample ID Units	Lithocode	Ba ppm
CP4598	PW-41	FTA	251
CP4599	PW-42	FTA	185
CP4600	PW-43	MTF	127
CP4601	PW-44	MCT	187
CP4602	PW-45	IGB	165
CP4603	PW-46	IGB	178
CP4604	PW-47	IGB	120
CP4605	PW-48	IGB	117
CP4606	PW-49	IGB	255
CP4607	PW-50	IGB	295
CP4608	PW-51	FDQ	122
CP4609	PW-52	IGB	281
CP4610	PW-53	IQD	279
CP4611	PW-54	IQD	292
CP4612	PW-55	IQD	359
CP4613	PW-56	IQD	315
CP4614	PW-57	IQD	341
CP4615	PW-58	IQD	298
CP4616	PW-59	IQD	453
CP4617	PW-60	IQD	181
CP4618	PW-61	IQD	247
CP4619	PW-64	IQD	338
CP4620	PW-65	FDB	506
CP4621	PW-66	FDB	544
CP4622	PW-67	WKB	349
CP4623	PW-68	WKB	372
CP4624	PW-69	WKB	388
CP4625	PW-70	WKB	206
QAQC			
Duplicates			
CP4600 Dup	PW-43		127
Detection Limits			*1*
			4A

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Table 6: Hg-CVAF Test Results for project Sisson 1CN019.000

Maxxam Sample No	Sample ID Units	Lithocode	Hg on Solids mg/kg
CP4558	PW-1	WKB	<0.01
CP4559	PW-2	WKB	<0.01
CP4560	PW-3	WKB	<0.01
CP4561	PW-4	WKB	<0.01
CP4562	PW-5	WKB	0.02
CP4563	PW-6	WKB	0.01
CP4564	PW-7	WKB	<0.01
CP4565	PW-8	WKB	<0.01
CP4566	PW-9	WKB	<0.01
CP4567	PW-10	MCT	<0.01
CP4568	PW-11	MTF	<0.01
CP4569	PW-12	WKB	<0.01
CP4570	PW-13	FTQ	<0.01
CP4571	PW-14	MCT	<0.01
CP4572	PW-15	MTF	<0.01
CP4573	PW-16	MTF	<0.01
CP4574	PW-17	MTF	<0.01
CP4575	PW-18	MTF	<0.01
CP4576	PW-19	WKB	<0.01
CP4577	PW-20	WKB	<0.01
CP4578	PW-21	MCT	<0.01
CP4579	PW-22	WKB	<0.01
CP4580	PW-23	FTQ	<0.01
CP4581	PW-24	WKB	<0.01
CP4582	PW-25	MTF	<0.01
CP4583	PW-26	MCT	<0.01
CP4584	PW-27	MCT	0.04
CP4585	PW-28	WKB	<0.01
CP4586	PW-29	WKB	<0.01
CP4587	PW-30	WKB	<0.01
CP4588	PW-31	FTQ	<0.01
CP4589	PW-32	FTQ	<0.01
CP4590	PW-33	MTF	<0.01
CP4591	PW-34	MTF	<0.01
CP4592	PW-35	MTF	<0.01
CP4593	PW-36	MTF	<0.01
CP4594	PW-37	FDQ	<0.01
CP4595	PW-38	MCT	<0.01
CP4596	PW-39	MTF	<0.01
CP4597	PW-40	MCT	<0.01
CP4598	PW-41	FTA	<0.01
CP4599	PW-42	FTA	<0.01
CP4600	PW-43	MTF	<0.01
CP4601	PW-44	MCT	<0.01
CP4602	PW-45	IGB	<0.01
CP4603	PW-46	IGB	<0.01
CP4604	PW-47	IGB	<0.01
CP4605	PW-48	IGB	<0.01
CP4606	PW-49	IGB	<0.01
CP4607	PW-50	IGB	<0.01
CP4608	PW-51	FDQ	<0.01
CP4609	PW-52	IGB	<0.01

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Table 6: Hg-CVAF Test Results for project Sisson 1CN019.000

Maxxam Sample No	Sample ID	Lithocode	Hg on Solids
	Units		mg/kg
CP4610	PW-53	IQD	<0.01
CP4611	PW-54	IQD	<0.01
CP4612	PW-55	IQD	<0.01
CP4613	PW-56	IQD	<0.01
CP4614	PW-57	IQD	<0.01
CP4615	PW-58	IQD	<0.01
CP4616	PW-59	IQD	<0.01
CP4617	PW-60	IQD	<0.01
CP4618	PW-61	IQD	<0.01
CP4619	PW-64	IQD	<0.01
CP4620	PW-65	FDB	<0.01
CP4621	PW-66	FDB	<0.01
CP4622	PW-67	WKB	<0.01
CP4623	PW-68	WKB	<0.01
CP4624	PW-69	WKB	<0.01
CP4625	PW-70	WKB	<0.01
QAQC			
Duplicates			
CP4558 Dup	PW-1		<0.01
CP4573 Dup	PW-16		<0.01
CP4592 Dup	PW-35		<0.01
CP4593 Dup	PW-36		<0.01
CP4608 Dup	PW-51		<0.01
CP4626 Dup	PW-71		<0.01
Blanks			
Method Blank			*<0.01*
Method Blank			*<0.01*
Reference Material			
Hg Soil CRM SS-2 (5694566)			*0.34*
Hg Soil CRM SS-2 (5694568)			*0.33*
True Values Hg Soil CRM SS-2			**0.33**
Percent Difference (5694566)			*3*
Percent Difference (5694568)			*0*
Reference Material			
Hg Soil Spike 1 ppm (5694566)			*0.80*
Hg Soil Spike 1 ppm (5694568)			*0.98*
True Values Hg Soil Spike 1 ppm			**1**
Percent Difference (5694566)			*-20*
Percent Difference (5694568)			*-2*
Detection Limits			*0.01*
Maxxam SOP #			*65-C-015-03*

Appendix E: Tailings Results

E1: Petrographic Descriptions

Mineral Services
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REPORT NO. MSC12/036R

PETROGRAPHY OF FOUR TAILING SAMPLES
FROM THE SISSON (W, Mo) PROJECT (N.B.)

Report prepared for
Maxxam Analytics
4606 Canada Way
Burnaby, B.C.
V5G 1K5

By
Mineral Services Canada Inc.
205-930 Harbourside Drive
North Vancouver, B.C.
V7P 3S7

December 14, 2012

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PETROGRAPHY OF FOUR TAILING SAMPLES FROM THE SISSON (W, Mo) PROJECT (N.B.)

1. INTRODUCTION

This report presents the results of petrographic analyses of four samples received from Ashley Leow of Maxxam Analytics. The study is part of an ongoing environmental impact assessment of the Sisson (W, Mo) Project in New Brunswick. Analyses of a previous set of twenty two drill core and humidity cell samples are reported in Mineral Services report MSC11/042R. The samples (Table 1) were submitted as crushed material, from which polished thin sections (one per sample) have been prepared. The aim of the study was to characterize the mineralogy of the samples, focusing on the carbonates and sulphides.

Table 1: List of samples examined as part of this investigation.

MSC Sample Number	Sample Name
1	FS2-W Rougher Tails
2	FS1-W Cleaner Tails
3	FS1-Mo Cleaner Tails
4	FS1-Mo-S2 Conc Tails

2. METHODS

The samples were submitted to Vancouver Petrographics for preparation of 30 µm thick polished thin sections. The thin section offcuts were stained for K-feldspar in order to readily distinguish K-feldspar from quartz and untwinned plagioclase. The offcuts were immersed in a solution of sodium cobaltinitrite, a process which causes the potassium feldspar to develop a yellow stain.

Petrographic descriptions were performed in the office of Mineral Services Canada Inc. using a Nikon Eclipse E400 microscope equipped with transmitted and reflected light. The microscopic characteristics of the samples are described in Appendix A and illustrated in a series of representative photomicrographs presented in Appendix B. All modal abundance percentages in the descriptions are approximate.

3. SUMMARY OF RESULTS

3.1 GANGUE MINERALS

The four samples consist of subangular mineral (85-90%) and lesser lithic (10-15%) fragments that range in size from 2 µm to 400 µm in samples 2, 3 and 4, and up to 1 mm in sample 1. The average grain size is coarser (75-100 µm) in samples 1 and 2 than in samples 3 and 4. In the latter, the average grain size is less than 50 µm and agglomerated clots of the finer fraction of the mineral grains are ubiquitous.

The mineral grain fragments consist of varying amounts of plagioclase, quartz, biotite, amphibole, K-feldspar, muscovite (sericite), chlorite, carbonate, rutile, magnetite/ilmenite. Grains and clusters of titanite, epidote and possible fluorite variably occur throughout samples 1 and 2. Rims of titanite are commonly developed around magnetite/ilmenite.

The lithic fragments typically consist of small fine-grained to microcrystalline granular aggregates of a few grains and encompass:

- Laminated aggregates of quartz ± plagioclase (± sericite ± carbonate) ± biotite ± sulphides that are likely phyllite fragments (all samples);
- Granular aggregates of plagioclase + amphibole ± biotite ± carbonate ± sulphides that possibly represent diorite/gabbro lithologies (samples 1, 2 and 3); and
- Granular aggregates of alteration minerals, made up of epidote ± titanite ± rutile (samples 1 and 2).

3.2 CARBONATE

Carbonate occurs in all samples and varies in abundance from trace (samples 3 and 4) to 20% in sample 2. In all samples, the carbonate is essentially colourless with varying relief suggesting it is calcite. In samples 1 and 2, a few cloudy to turbid grains of a possible Mg- and/or Fe-bearing carbonate are recognized. The carbonate occurs either liberated or set in lithic fragments. Where liberated (all samples), carbonate occurs as angular grains. In lithic fragments (samples 1, 2 and 4), carbonate forms small anhedral grains associated with biotite, titanite or rutile as alteration of mafic phases or associated with the feldspars it replaces.

3.3 OPAQUE MINERALS

Sulphides and native elements occur in all samples and vary in total abundance from <1% in the W-tailing samples 1 and 2 to 20-25% in the Mo-tailing samples 3 and 4.

In the W-tailing samples, the sulphides consist of pyrite, pyrrhotite, chalcopyrite and arsenopyrite with sphalerite additionally occurring in sample 2. The sulphides are typically very fine-grained (<50 µm in size) except for sphalerite and pyrrhotite that reach 150 and 200 µm in size, respectively, in sample 2. The smaller sulphides (pyrite, chalcopyrite and arsenopyrite) variably form inclusions in and/or attachments to gangue minerals that are either enclosed in polygranular lithic fragments or liberated. The coarser sulphides commonly occur as liberated grains or polymineralic intergrowths of pyrrhotite-chalcopyrite and pyrrhotite-sphalerite.

In the Mo-tailing samples, pyrite, pyrrhotite, chalcopyrite, arsenopyrite and sphalerite are observed, with additional galena, covellite, marcasite and molybdenite in both samples, as well as native bismuth and bismuthinite in sample 3. Pyrite, pyrrhotite, chalcopyrite are the more abundant sulphides (typically 2-12%) while the other sulphides and native elements form less than 1% of the samples (except for molybdenite in sample 4 which has an abundance of 2%).

The sulphides in the Mo-tailing samples are coarser-grained than in the W-tailing samples and reach 150 µm for sphalerite, 300 µm for pyrrhotite and molybdenite, and up to 400 µm for pyrite/marcasite and chalcopyrite. Arsenopyrite, galena, bismuthinite, native bismuth and covellite are typically less than 100 µm in size.

Pyrite, pyrrhotite, chalcopyrite, sphalerite and molybdenite typically form liberated grains or occur as intergrowths and attachments of various sulphides. These encompass intergrowths of pyrite-marcasite, pyrrhotite-chalcopyrite ± sphalerite ± arsenopyrite (± rutile), galena-native bismuth in sample 3 and pyrrhotite-bismuthinite in sample 4. Rarely, sulphides are enclosed or attached to gangue minerals in lithic fragments. This is the case for chalcopyrite in both samples and for arsenopyrite and sphalerite in sample 4. Covellite typically occurs as partial to complete rims around chalcopyrite (samples 3 and 4) or sphalerite (sample 4), sporadic patches within gangue minerals in sample 3 and as liberated grains (likely after chalcopyrite) in sample 4. Rims of chalcopyrite around gangue minerals are observed in sample 3.

Rutile and magnetite/ilmenite occur in minor amounts in all the samples.

Oxidation of the four samples is weak and marked by the rare occurrence (<1%) of hematite and/or Fe-oxyhydroxides. Hematite occurs as liberated grains and patches in samples 1, 2 (intergrown with Fe-oxyhydroxides) and 4, and as partial to complete rims around pyrite in samples 2, 3 and 4, as well as around chalcopyrite in sample 4. Fe-oxyhydroxides form liberated masses in sample 1, masses intergrown with hematite in sample 2 and rims around pyrrhotite in samples 3 and 4.

4. PROFESSIONAL SEAL

Geology reported by:
Alexandra Mauler-Steinmann,
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Date: 2012.12.14 01:28:17 -08'00'

Report reviewed by:
Tom Nowicki, Ph. D., P. Geo.

APPENDIX A1: INDIVIDUAL SAMPLE DESCRIPTIONS

MSC Sample #	Sample #		Carbonate	Pyrite/marcasite	Pyrrhotite
1	FS2-W Rougher Tails	Sample made up of mineral (85%) and lesser (15%) lithic fragments that are typically subangular, subequant to elongated and vary in size from 2 µm to 1 mm; mineral fragments consist of biotite, amphibole, plagioclase, K-feldspar and quartz with minor carbonate, titanite, chlorite, rutile, epidote, magnetite/ilmenite and sulphides; plagioclase is commonly twinned, variably altered to K-feldspar and/or to sericite; sericite alteration of K-feldspar is also developed throughout the mineral fragments. Lithic fragments typically consist of microcrystalline polygranular aggregates of alteration minerals such as granular aggregates of epidote ± titanite ± rutile, clusters of microcrystalline quartz (± feldspars) and biotite and intergrowths of amphibole and biotite.	Colourless or rarely cloudy and turbid; occurs as liberated grains and microcrystalline aggregates (2-300 µm in size) or in polymineralic aggregates, typically with plagioclase or biotite	One anhedral inclusion of pyrite, 20 µm in size in a liberated quartz grain; one anhedral pyrite grain 30 µm in size in quartz ± biotite ± plagioclase aggregates	Blebs (<5 µm in size) of possible pyrrhotite as inclusions in magnetite; anhedral grain (50 µm) in an aggregate with feldspar and sericite
2	FS1-W Cleaner Tails	Sample made up of mineral (90%) and lesser (10%) lithic fragments that are typically subangular, subequant to elongated and vary in size from 2 to 400 µm; mineral fragments essentially consist of carbonate (colourless to cloudy and turbid), biotite, amphibole, plagioclase, sericite and quartz with minor K-feldspar, titanite, magnetite/ilmenite, rutile, sericite, fluorite, chlorite and various sulphides. Lithic fragments consist of microcrystalline polygranular aggregates of intergrown biotite, amphibole and/or carbonate and/or plagioclase or of granular aggregates of epidote, titanite and/or rutile; sericite and carbonate also occur intergrown with the plagioclase they replace; sulphides also occur attached to or enclosed in gangue minerals.	Colourless to cloudy and turbid grains and granular clusters (2-400 µm in size); occur liberated or in polymineralic aggregates with plagioclase or biotite	Pyrite grains (2-50 µm in size) enclosed in or attached to mineral and lithic fragments or rarely liberated; one liberated pyrite grain partially rimmed by hematite	Grains and granular aggregates (2-200 µm in size) enclosed in lithic fragments or rarely liberated; one liberated pyrrhotite-chalcopyrite intergrowth and one pyrrhotite-sphalerite intergrowth

APPENDIX A1: INDIVIDUAL SAMPLE DESCRIPTIONS

MSC Sample #	Sample #		Carbonate	Pyrite/marcasite	Pyrrhotite
3	FS1-Mo Cleaner Tails	Sample made up of mineral (90%) and lesser (10%) lithic fragments ranging in size from 2 to 400 µm; most mineral fragments are less than 50 µm in size, occur in agglomerated clots and consist of biotite, sericite, amphibole, plagioclase, K-feldspar, quartz and sulphides/oxides; carbonate (colourless to cloudy and turbid), titanite, magnetite/ilmenite and rutile occur locally. Lithic fragments consist of microcrystalline to fine-grained polygranular aggregates of quartz (± sericite ± biotite ± sulphides) or of plagioclase ± amphibole ± sulphides.	Liberated colourless grains and granular aggregates (2-200 µm in size)	Liberated subangular grains (2-150 µm in size) occurring in agglomerated clots; locally with corroded boundaries, intergrown with possible marcasite or partially rimmed by hematite	Liberated subangular grains and lesser pyrrhotite-chalcopyrite (± sphalerite ± rutile) intergrowths (2-200 µm in size) occurring in agglomerated clots
4	FS1-Mo-S2 Conc Tails	Sample made up of mineral (90%) and lesser (10%) lithic fragments ranging in size from 2 to 400 µm; most mineral fragments are less than 50 µm in size, occur in agglomerated clots and consist of biotite, quartz, plagioclase and sulphides/oxides; K-feldspar, sericite, amphibole and carbonate (colourless) occur locally. Lithic fragments consist of microcrystalline to fine-grained polygranular aggregates of quartz (± biotite ± plagioclase ± sericite ± sulphides)	Rare grains (<100 µm in size), typically colourless, occurring liberated or in granular clusters with biotite and/or sulphides	Liberated subangular grains and less common pyrite-marcasite intergrowths (2-400 µm in size) commonly occurring in agglomerated clots	Liberated subangular grains, rare pyrrhotite-chalcopyrite (± sphalerite) intergrowths and attachments to bismuthinite; grain size 2-300 µm; commonly occurring in agglomerated clots

APPENDIX A1: INDIVIDUAL SAMPLE DESCRIPTIONS

MSC Sample #	Sample #	Chalcopyrite	Arsenopyrite	Sphalerite	Magnetite/ilmenite	Other	Hematite/Fe-oxyhydroxides
1	FS2-W Rougher Tails	Grains (2-50 µm in size) attached to liberated grains of magnetite or occurring with quartz and sericite or with biotite and amphibole in lithic fragments	Anhedral grains (2-20 µm in size) enclosed in a possible mineral fragment	na	Grains and aggregates of magnetite and intergrown magnetite/ilmenite occurring liberated or in lithic fragments; commonly rimmed by titanite	na	Few liberated masses of Fe-oxyhydroxides and liberated angular grains and masses of hematite
2	FS1-W Cleaner Tails	Grains (2-20 µm in size) enclosed in or attached to mineral and lithic fragments or rarely liberated; one liberated pyrrhotite-chalcopyrite intergrowth	Subhedral prismatic grains (2-20 µm in size) enclosed in mineral and lithic fragments	One grain (150 µm in size), attached to pyrrhotite	Liberated anhedral grains and grains in lithic fragments, commonly enclosed in titanite	na	Liberated masses of intergrown hematite and Fe-oxyhydroxides and one partial hematite rim around liberated pyrite

APPENDIX A1: INDIVIDUAL SAMPLE DESCRIPTIONS

MSC Sample #	Sample #	Chalcopyrite	Arsenopyrite	Sphalerite	Magnetite/ilmenite	Other	Hematite/Fe-oxyhydroxides
3	FS1-Mo Cleaner Tails	Liberated subangular grains and lesser pyrrhotite-chalcopyrite (± sphalerite ± rutile) intergrowths (2-400 µm in size) occurring in agglomerated clots; locally with arsenopyrite attachments or as attachments to gangue minerals; rarely rimmed by covellite or as rim around gangue minerals	One attachment to chalcopyrite, 50 µm in size	Liberated subangular grains and lesser pyrrhotite-chalcopyrite (± sphalerite ± rutile) intergrowths (2-200 µm in size) occurring in agglomerated clots; rarely rimmed by covellite	Few liberated poikilitic grains	Molybdenite: elongated sheaves and patches (2-300 µm in size) occurring liberated in agglomerated clots or as inclusions and attachments to quartz Covellite: rims around chalcopyrite, sphalerite and gangue minerals as well as patches (<25 µm in size) that occur liberated or in lithic fragments Galena: liberated subangular grains (2-100 µm in size), rarely intergrown with native bismuth Native bismuth: Intergrowths with galena Bismuthinite: one liberated angular grain, 60 µm in size	Rare hematite rims around pyrite and Fe-oxyhydroxide rims around pyrrhotite
4	FS1-Mo-S2 Conc Tails	Liberated subangular grains and rare chalcopyrite-pyrrhotite (± sphalerite) intergrowths (2-250 µm in size) commonly occurring in agglomerated clots; few anhedral grains in lithic fragments	Clusters of prismatic grains (<60 µm in size) in a possible granular fragment and liberated grains up to 100 µm in size	Subangular grains (2-150 µm in size) occurring liberated in agglomerated clots or as attachments to gangue minerals, chalcopyrite or pyrrhotite	Few grains, liberated or attached to pyrite	Molybdenite: Elongated sheaves and patches (2-250 µm in size) occurring liberated in agglomerated clots Covellite: partial rims around sphalerite and liberated grains (<10 µm in size) Galena: subangular grains (2-30 µm in size), liberated or attached to pyrrhotite	Rare possible hematite rims around pyrite and chalcopyrite and disseminated patches; rare rims of Fe-oxyhydroxides around pyrrhotite

APPENDIX A2: MINERAL MODAL ABUNDANCE ESTIMATES

MSC Sample #	Sample Name	Quartz	Plagioclase	K-feldspar	Amphibole	Biotite	Chlorite	Muscovite (sericite)	Carbonate	Fluorite	Titanite	Epidote	Rutile	Magnetite/ilmenite	Pyrite	Marcasite	Pyrrhotite	Chalcopyrite	Arsenopyrite	Sphalerite	Galena	Bismuthinite	Native Bismuth	Molybdenite	Covellite	Hematite	Fe-oxyhydroxides
1	FS2-W Rougher Tails	20	30	12	10	15	1	3	2	0	2	tr	tr	1	tr	0	tr	tr	tr	0	0	0	0	0	0	tr	tr
2	FS1-W Cleaner Tails	15	20	1	12	20	tr	7	20	tr	1	tr	tr	2	tr	0	tr-1	tr	tr	tr	0	0	0	0	0	tr	tr
3	FS1-Mo Cleaner Tails	20	15	5	10	20	0	10	tr	0	0	0	tr	tr	5	tr	7	7	tr	tr-1	tr	tr	tr	tr	tr	tr	tr
4	FS1-Mo-S2 Conc Tails	20	15	3	3	25	0	5	tr	0	0	0	tr	tr	10	tr	12	2	tr	tr	tr	0	0	2	tr	tr-1	tr

APPENDIX B: PHOTOMICROGRAPHS

List of abbreviations used in the description of photomicrographs:

FOV: Field of view – defined for the long dimension of photomicrographs
PPL: Plane polarized light
XPL: Crossed polars
RL: Reflected light

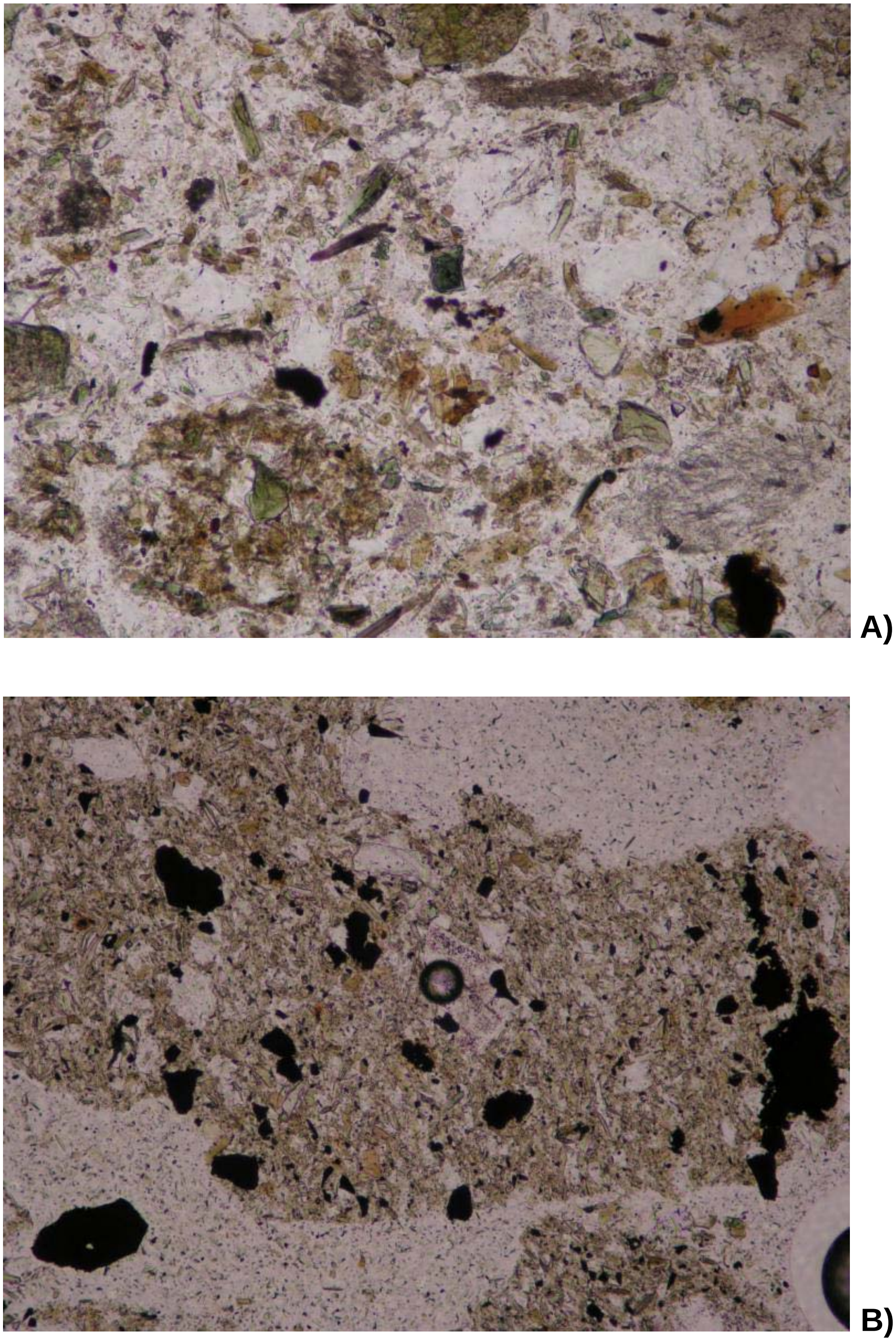

Figure 1: *Photomicrographs of A) sample 1 and B) sample 3 showing the coarser grain size of the fragments in sample 1 and the higher abundance of opaque minerals in sample 3. In the latter, the fragments are agglomerated in a larger clot. PPL, FOV = ~ 1.4 mm.*

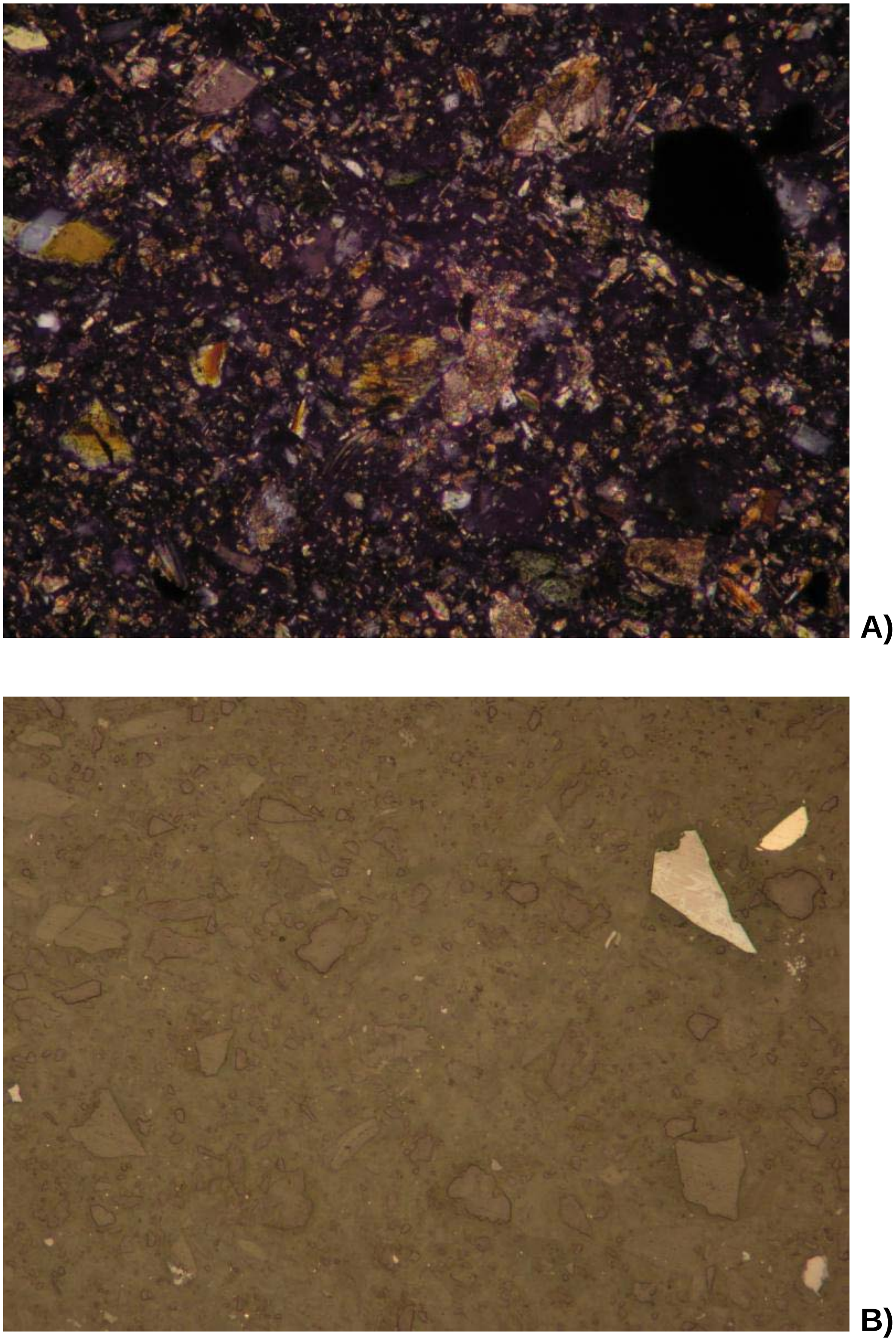

Figure 2: *Photomicrographs of sample 2 showing A) the high abundance of carbonate (pinkish birefringence colours) and B) the presence of liberated grains of magnetite/ilmenite and pyrrhotite. A) XPL, B) RL, FOV= ~ 1.4 mm.*

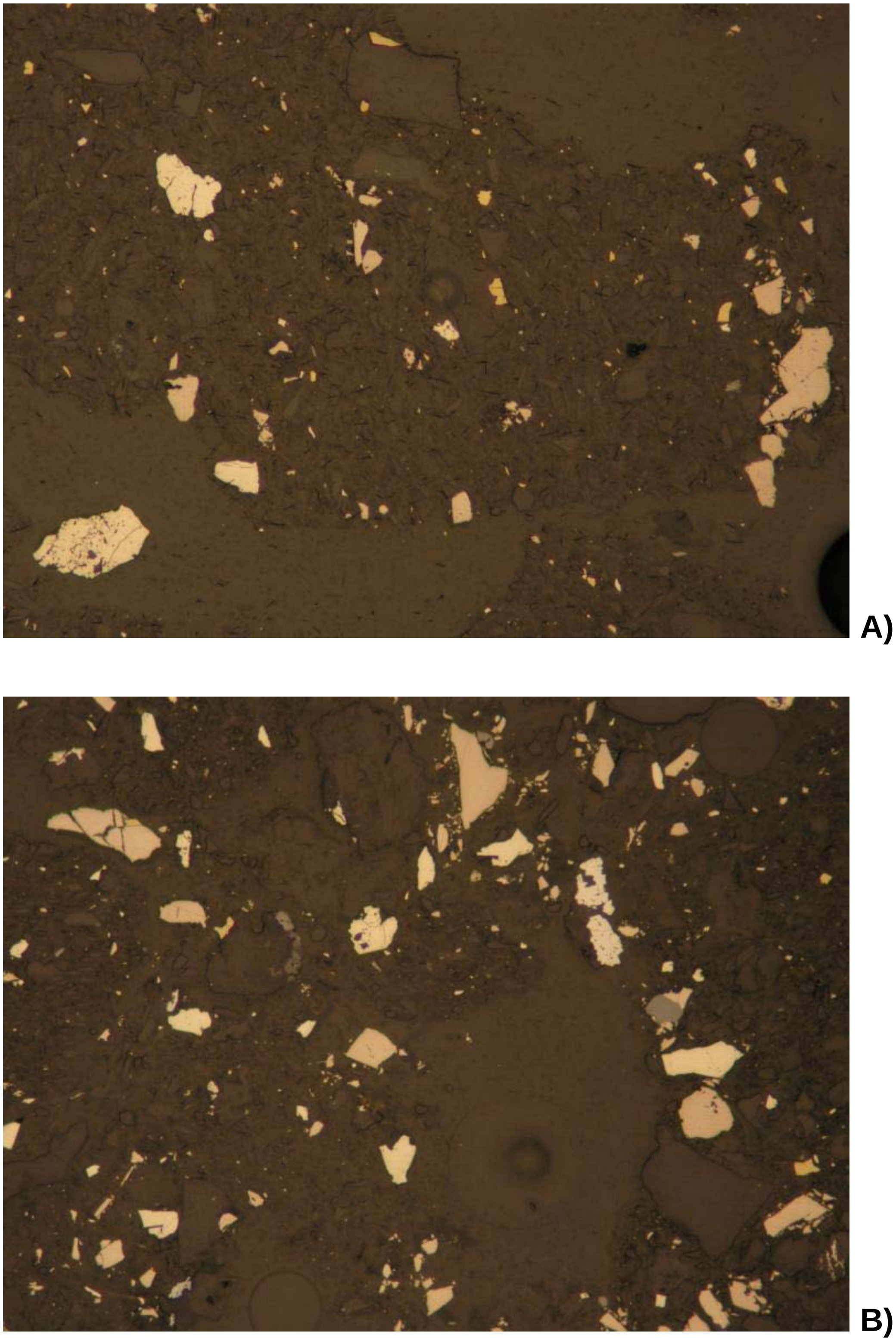

Figure 3: *Photomicrographs of A) sample 3 and B) sample 4 showing the higher abundance of reflective opaque minerals in sample 4 than in sample 3. In both samples, pyrrhotite (pinkish) is the main sulphide with pyrite (off-white) and chalcopyrite (yellow) being subordinate. RL, FOV= ~ 1.4 mm.*

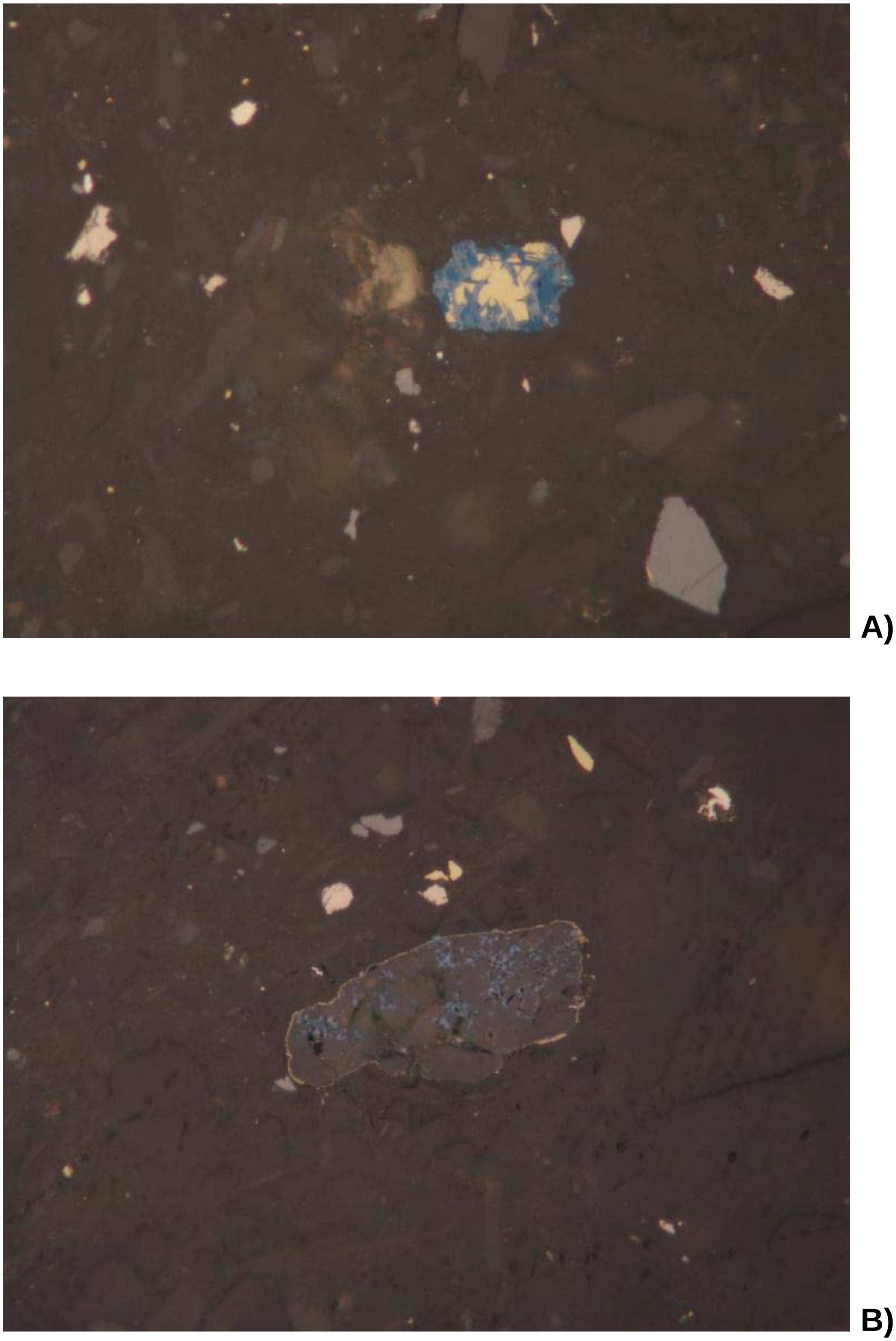

Figure 4: *Close-up of sample 3 showing the occurrence of chalcopyrite and covellite. In photomicrograph A, a liberated chalcopyrite grain is rimmed by covellite. In B, a gangue mineral is pitted by covellite and rimmed by chalcopyrite. RL, FOV= ~ 0.28 mm.*

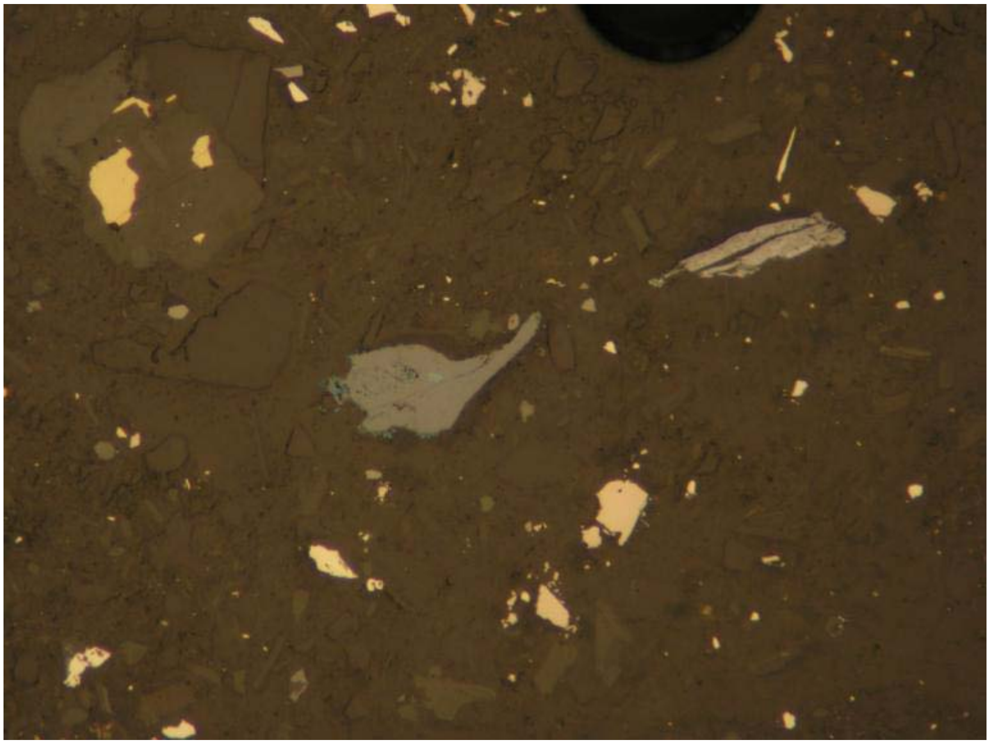

Figure 5: *Photomicrograph of the sulphides in sample 4, showing chalcopyrite (yellow) enclosed in a lithic fragment, a liberated sheaf of molybdenite (light gray) and a liberated grain of sphalerite (dark gray) partially rimmed by covellite. RL, FOV = ~ 0.7 mm.*

Figure 6: *Photomicrograph of a liberated grain of pyrite, partially rimmed by hematite. RL, FOV = ~ 0.27 mm.*

E2: XRD Results

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

Project: SRK – Sisson

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March 21, 2012

EXPERIMENTAL METHOD

The five samples of **Project SRK – Sisson** were reduced to the optimum grain-size range for quantitative X-ray analysis (<10 μm) by grinding under ethanol in a vibratory McCrone Micronising Mill for 7 minutes. Step-scan X-ray powder-diffraction data were collected over a range 3-80°2θ with CoKa radiation on a Bruker D8 Focus Bragg-Brentano diffractometer equipped with an Fe monochromator foil, 0.6 mm (0.3°) divergence slit, incident- and diffracted-beam Soller slits and a LynxEye detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA, using a take-off angle of 6°.

RESULTS

The X-ray diffractograms were analyzed using the International Centre for Diffraction Database PDF-4 and Search-Match software by Siemens (Bruker). X-ray powder-diffraction data of the samples were refined with Rietveld program Topas 4.2 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinements are given in Table 1. These amounts represent the relative amounts of crystalline phases normalized to 100%. The Rietveld refinement plots are shown in Figures 1 – 5.

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

Mineral	**Ideal Formula**	**Mo-S2-con-tails**	**Mo-cleaner-tails**	**W-rougher-tails**	**W-cleaner-tails**	**Ore-Comp**
Quartz	SiO_2	19.4	15.2	30.6	19.7	32.3
Clinochlore	$(Mg,Fe^{2+})_5Al(Si_3Al)O_{10}(OH)_8$	9.0	9.8	6.1	11.7	5.6
Muscovite	$KAl_2(AlSi_3O_{10})(OH)_2$	7.7	4.2	5.6	6.7	4.3
Biotite	$K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$	8.7	8.0	11.1	12.2	8.5
Actinolite	$Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$	4.3	4.4	6.8	6.9	7.7
K-Feldspar	$KAlSi_3O_8$	6.7	8.4	11.1	11.0	10.9
Plagioclase	$NaAlSi_3O_8$ – $CaAl_2Si_2O_8$	16.1	13.9	27.8	24.6	29.3
Calcite	$CaCO_3$	2.0		0.5	5.4	0.7
Pyrite	FeS_2	17.3	6.8	0.2		0.5
Pyrrhotite	$Fe_{1-x}S$	8.8	26.3			
Chalcopyrite	$CuFeS_2$		2.2			
Hydroxylapatite	$Ca_5(PO_4)_3(OH)$				1.6	
Molybdenite	MoS_2		0.7			0.1
Scheelite	$CaWO_4$				0.2	0.2
Total		100.0	100.0	100.0	100.0	100.0

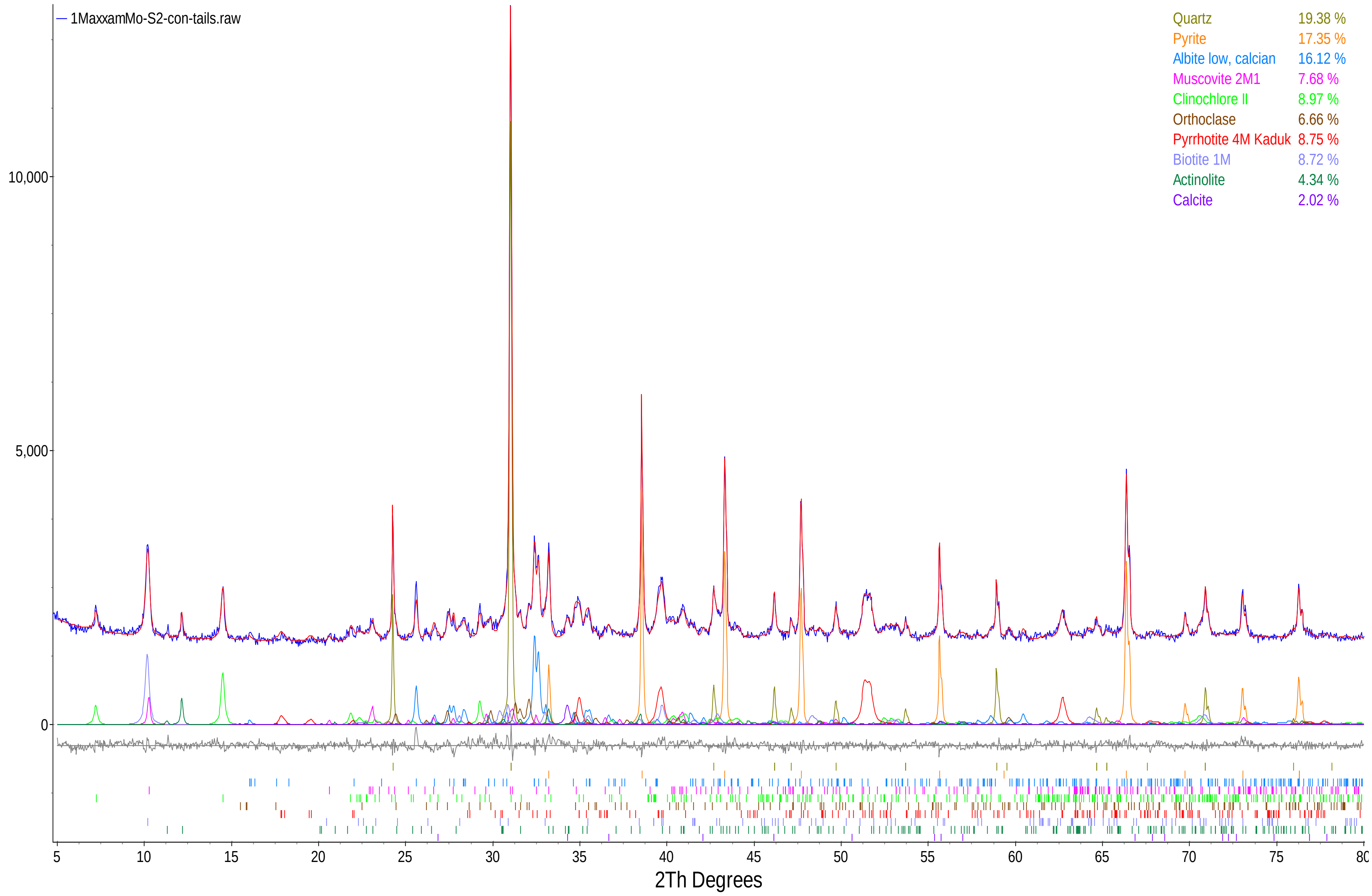

Figure 1. Rietveld refinement plot of sample **“Mo-S2-con-tails”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

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

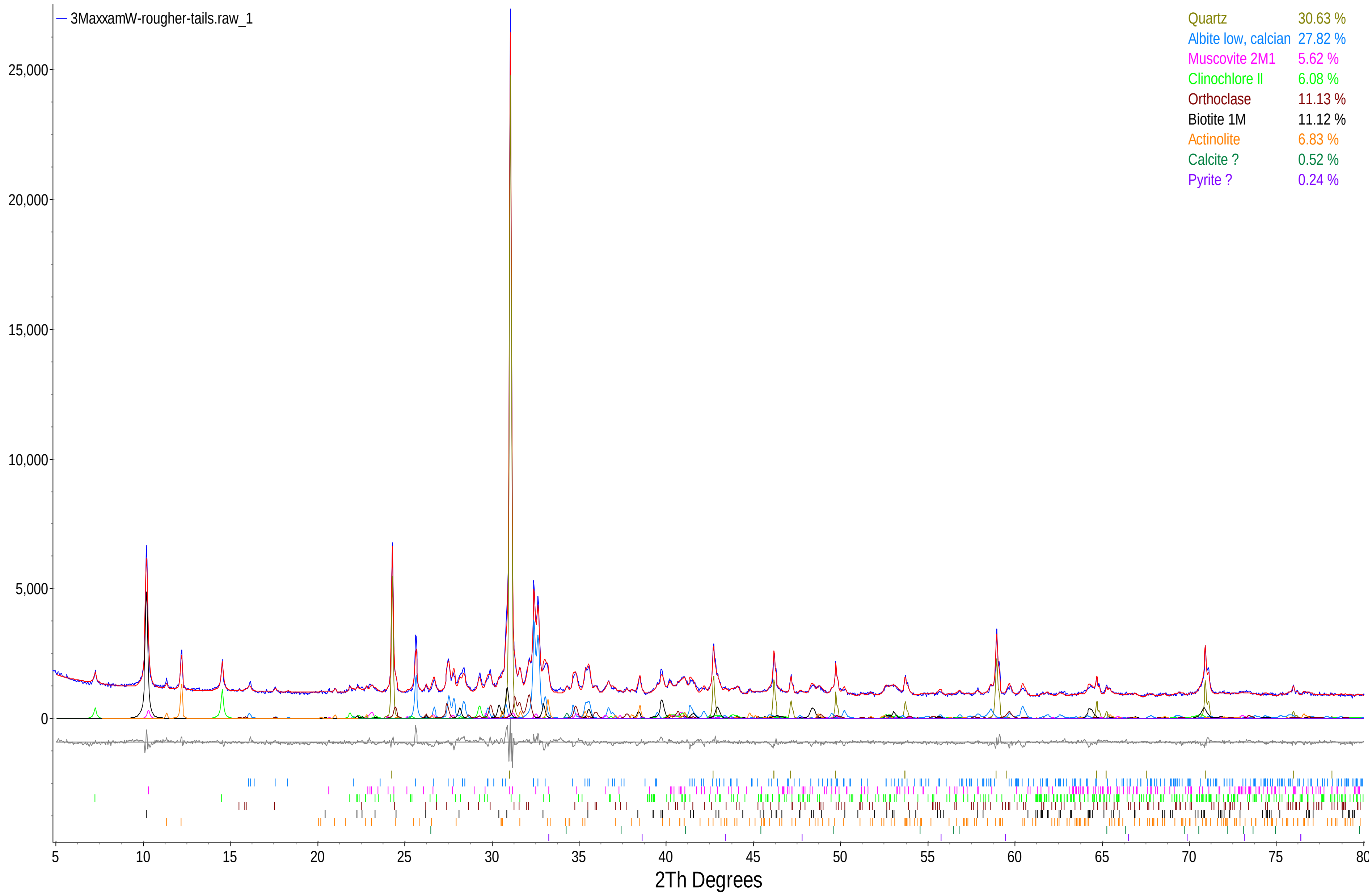

Figure 3. Rietveld refinement plot of sample **“W-rougher-tails”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual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

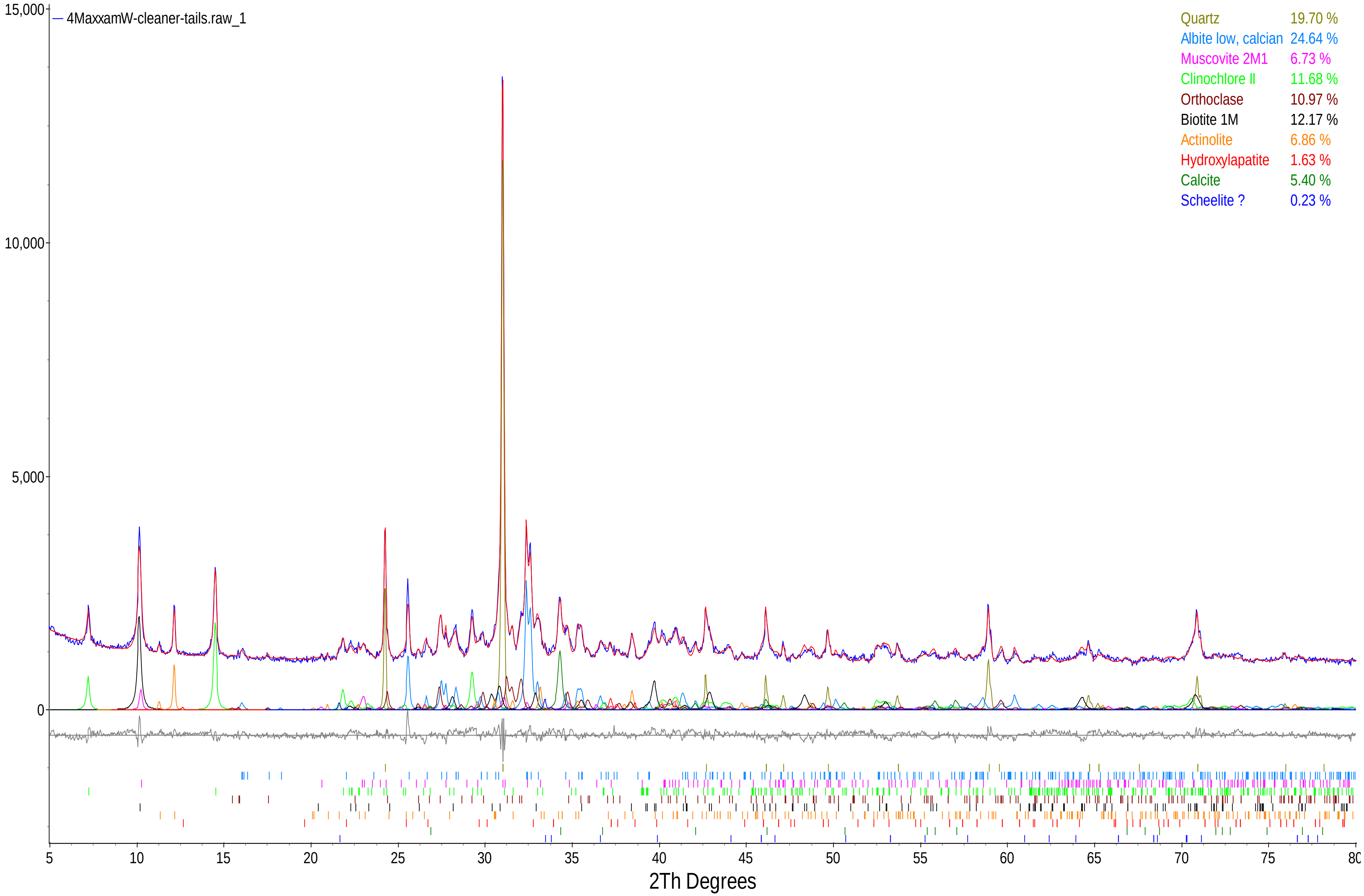

Figure 4. Rietveld refinement plot of sample **"W-cleaner-tails"** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual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

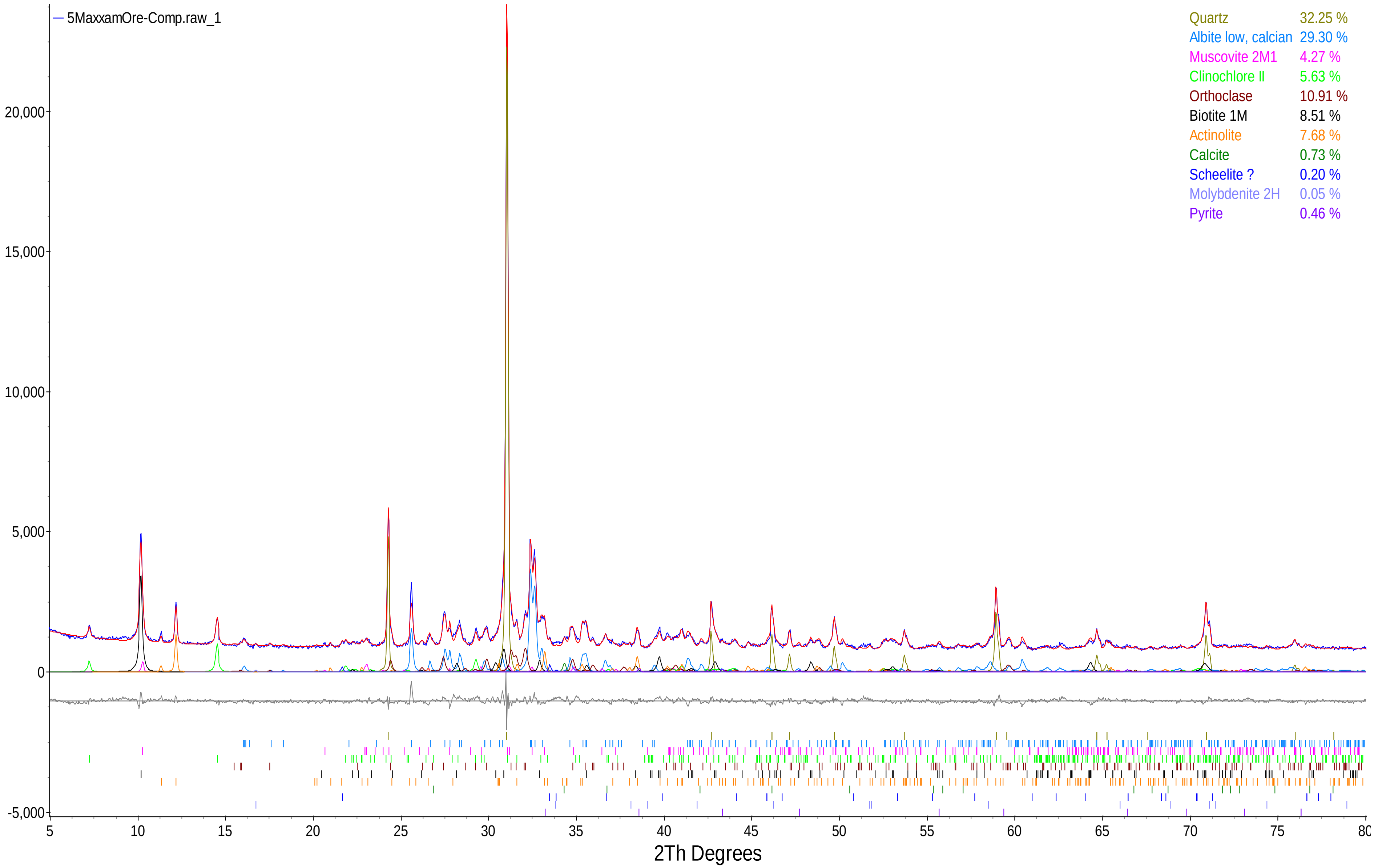

Figure 5. Rietveld refinement plot of sample **"Ore-Comp"** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction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

E3: Electron Microprobe Results

Sample ID	S	Mn	Fe	Cu	Zn	As	Cd	Sb	Pb	Total
Mo-S2-con-tails-S1	53.29	0.00	47.23	0.00	0.02	0.03	0.11	0.00	0.00	100.68
Mo-S2-con-tails-S2	23.45	0.03	36.14	0.01	0.00	38.33	0.01	1.04	0.00	99.01
Mo-S2-con-tails-S3	20.60	0.00	34.85	0.02	0.03	43.12	0.10	0.01	0.00	98.73
Mo-S2-con-tails-S4	20.59	0.01	34.86	0.00	0.04	40.66	0.00	2.88	0.00	99.05
Mo-S2-con-tails-S5	21.36	0.01	35.83	0.00	0.00	41.85	0.05	0.00	0.00	99.11
Mo-cleaner-tails-S1	22.10	0.00	35.25	0.00	0.00	41.03	0.07	0.00	0.00	98.46
Mo-cleaner-tails-S2	53.27	0.00	46.74	0.01	0.00	0.05	0.12	0.00	0.00	100.19
Mo-cleaner-tails-S3	21.12	0.00	35.33	0.00	0.01	41.89	0.05	0.33	0.00	98.73
Mo-cleaner-tails-S4	20.86	0.00	36.07	0.03	0.02	42.79	0.00	0.03	0.00	99.79
Mo-cleaner-tails-S5	52.82	0.02	46.60	0.00	0.00	0.02	0.04	0.01	0.00	99.51
W-rougher-tails-S1	54.03	0.01	46.76	0.00	0.02	0.14	0.00	0.09	0.00	101.06
W-rougher-tails-S2	53.42	0.00	47.64	0.06	0.00	0.00	0.08	0.02	0.00	101.22
W-rougher-tails-S3	52.49	0.02	45.99	0.02	0.00	0.04	0.10	0.00	0.00	98.67
W-rougher-tails-S4	0.06	1.52	65.61	0.46	0.05	0.13	0.03	0.00	0.00	67.86
OreComp-S1	53.58	0.00	47.51	0.03	0.00	0.09	0.00	0.03	0.00	101.25
OreComp-S2	53.30	0.01	46.97	0.00	0.00	0.05	0.00	0.01	0.00	100.35
OreComp-S3	53.72	0.04	47.02	0.04	0.00	0.03	0.01	0.00	0.00	100.86
OreComp-S4	52.76	0.00	47.04	0.01	0.01	0.09	0.04	0.00	0.00	99.94
OreComp-S5	39.20	0.03	58.39	0.00	0.09	0.09	0.04	0.02	0.07	97.93

Sample ID	**MGO**	**CAO**	**MNO**	**FEO**	**CO2 ***	**TOTAL**	**MG2+**	**CA2+**	**MN2+**	**FE2+**	**C4+**
Mo-S2-con-tails-C1-1	0.07	53.94	1.47	0.84	43.84	100.16	0.00	1.93	0.04	0.02	2.00
Mo-S2-con-tails-C2-1	0.00	53.56	2.61	0.09	43.71	99.97	0.00	1.92	0.07	0.00	2.00
Mo-S2-con-tails-C3-1	3.84	2.58	2.95	50.83	39.18	99.38	0.21	0.10	0.09	1.59	2.00
Mo-S2-con-tails-C4-1	0.00	54.34	1.67	0.31	43.87	100.19	0.00	1.94	0.05	0.01	2.00
Mo-S2-con-tails-C5-1	15.63	0.73	1.50	38.41	42.10	98.37	0.81	0.03	0.04	1.12	2.00
Mo-S2-con-tails-C6-1	0.05	54.87	0.81	0.34	43.83	99.90	0.00	1.97	0.02	0.01	2.00
Mo-S2-con-tails-C7-1	0.08	54.35	0.94	0.57	43.67	99.61	0.00	1.95	0.03	0.02	2.00
Mo-S2-con-tails-C8-1	0.04	54.26	1.58	0.27	43.77	99.92	0.00	1.95	0.05	0.01	2.00
Mo-S2-con-tails-C9-1	0.04	54.82	0.99	0.33	43.88	100.06	0.00	1.96	0.03	0.01	2.00
Mo-S2-con-tails-C10-1	0.24	49.79	2.16	0.99	41.28	94.46	0.01	1.89	0.07	0.03	2.00
Mo-S2-con-tails-C11-1	0.00	55.43	0.55	0.11	43.91	100.00	0.00	1.98	0.02	0.00	2.00
Mo-S2-con-tails-C12-1	0.09	54.74	1.10	0.40	43.99	100.32	0.00	1.95	0.03	0.01	2.00
Mo-S2-con-tails-C13-1	0.00	53.77	2.69	0.19	43.98	100.63	0.00	1.92	0.08	0.01	2.00
Mo-S2-con-tails-C14-1	0.13	54.70	0.87	0.26	43.77	99.73	0.01	1.96	0.03	0.01	2.00
Mo-S2-con-tails-C15-1	0.15	53.75	2.46	0.38	44.11	100.85	0.01	1.91	0.07	0.01	2.00
Mo-cleaner-tails-C1-1	0.05	53.46	2.72	0.54	44.03	100.80	0.00	1.91	0.08	0.02	2.00
Mo-cleaner-tails-C2-1	0.00	56.01	0.15	0.40	44.29	100.85	0.00	1.99	0.00	0.01	2.00
Mo-cleaner-tails-C3-1	0.02	56.25	0.05	0.13	44.28	100.73	0.00	1.99	0.00	0.00	2.00
Mo-cleaner-tails-C4-3	1.92	43.49	1.05	4.98	39.93	91.37	0.11	1.71	0.03	0.15	2.00
Mo-cleaner-tails-C5-1	0.15	50.74	4.87	0.41	43.26	99.43	0.01	1.84	0.14	0.01	2.00
Mo-cleaner-tails-C6-1	0.41	50.49	5.07	1.05	43.86	100.88	0.02	1.81	0.14	0.03	2.00
Mo-cleaner-tails-C7-1	0.17	54.63	0.30	0.50	43.55	99.15	0.01	1.97	0.01	0.01	2.00
OreComp-C1-1	0.00	56.36	0.20	0.00	44.36	100.92	0.00	1.99	0.01	0.00	2.00
OreComp-C2-1	7.42	1.76	4.03	47.91	41.33	102.45	0.39	0.07	0.12	1.42	2.00
OreComp-C3-1	0.00	55.63	0.28	0.20	43.95	100.06	0.00	1.99	0.01	0.01	2.00
OreComp-C4-1	0.09	53.26	1.40	0.20	42.89	97.84	0.01	1.95	0.04	0.01	2.00
OreComp-C5-1	0.10	54.74	0.90	0.24	43.77	99.75	0.01	1.96	0.03	0.01	2.00
OreComp-C6-1	0.01	54.41	1.83	0.19	43.96	100.40	0.00	1.94	0.05	0.01	2.00
OreComp-C7-1	0.04	53.14	2.49	0.70	43.72	100.09	0.00	1.91	0.07	0.02	2.00
OreComp-C8-1	0.00	55.37	0.43	0.26	43.88	99.94	0.00	1.98	0.01	0.01	2.00
OreComp-C9-1	0.11	54.48	1.22	0.36	43.85	100.02	0.01	1.95	0.04	0.01	2.00
OreComp-C10-1	0.04	54.83	0.07	0.03	43.14	98.11	0.00	2.00	0.00	0.00	2.00
OreComp-C11-1	0.00	55.98	0.18	0.00	44.05	100.21	0.00	2.00	0.01	0.00	2.00
OreComp-C12-1	0.00	53.66	1.70	0.90	43.72	99.98	0.00	1.93	0.05	0.03	2.00
OreComp-C13-1	0.00	56.07	0.09	0.15	44.15	100.46	0.00	1.99	0.00	0.00	2.00
OreComp-C14-1	0.02	55.10	0.24	0.36	43.63	99.35	0.00	1.98	0.01	0.01	2.00
OreComp-C15-1	0.04	52.67	2.08	1.42	43.54	99.75	0.00	1.90	0.06	0.04	2.00

E4: Acid base Accounting Results

Maxxam

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Client: Northcliff Resources

= humidity cell

Maxxam Sample No	Sample ID	Paste pH	Paste EC	Total Carbon	CO2	CaCO3 Equiv.	Total S	Na2CO3 Extractable Sulphur	HCl Extractable Sulphur	Sulphide Sulphur (by diff.)	Acid Generation Potential	Mod. Neutralization Potential	Net Neutralization Potential	Neutralization Potential Ratio	Fizz Rating	
	Units	pH Units	uS/cm	wt%	wt%	Kg CaCO3/T	wt%	wt%	wt%	wt%	Kg CaCO3/T	Kg CaCO3/T	Kg CaCO3/T	N/A	N/A	
CE8419	ORE COMP	9.0	249	0.11	0.44	10.00	0.45	<0.01	<0.01	0.45	14.1	16.7	2.6	1.2	SLIGHT	
CE8420	MO-S2-CON-TAILS	7.9	618	0.27	0.76	17.27	11.84	0.05	0.02	11.82	369.4	3.6	-356.8	0.01	SLIGHT	
CE8421	MO-CLEANER-TAILS	8.0	650	0.49	0.80	18.18	13.32	0.02	0.02	13.30	415.6	22.4	-393.2	0.05	SLIGHT	
CE8422	W-ROUGHER-TAILS	9.5	137	0.06	0.20	4.550	0.08	0.02	<0.01	0.08	2.5	3.3	0.8	1.3	NONE	
CJ3379	W-CLEANER TAILS	9.3		0.65	2.62	59.55	0.14	0.01	<0.01	0.14	4.4	65.2	60.8	14.8	STRONG	
EY8707	FS2-W-ROUGHER-TAILS (100 mesh)	8.60	--	0.07	0.10	2.3	0.02	0.03	0.02	<0.02	<0.6	13.5	NONE	13.5	#N/A	
EY8708	FS2-W-ROUGHER-TAILS (-100+200 mesh)	8.52	--	0.06	0.07	1.6	<0.02	0.02	0.02	<0.02	<0.6	11.5	NONE	11.5	#N/A	
EY8709	FS2-W-ROUGHER-TAILS (-200 mesh)	7.78	--	0.06	<0.02	<0.5	<0.02	0.03	0.02	<0.02	<0.6	7.5	NONE	7.5	#N/A	
EY8710	FS1-W-CLEANER-TAILS	8.50	--	1.67	4.98	113.2	0.19	0.01	0.02	0.17	5.3	137.5	MODERATE	132.2	25.9	
EY8711	FS1-MO-CLEANER-TAILS (100 mesh)	7.64	--	0.12	0.08	1.8	3.77	0.11	0.10	3.67	114.7	17.5	NONE	-97.2	0.2	
EY8712	FS1-MO-CLEANER-TAILS (-100+200mesh)	7.85	--	0.16	0.14	3.2	5.99	0.15	0.14	5.85	182.8	17.5	NONE	-165.3	<0.1	
EY8713	FS1-MO-CLEANER-TAILS (-200 mesh)	7.77	--	0.11	0.13	3.0	4.20	0.09	0.07	4.13	129.1	16.0	NONE	-113.1	0.1	
EY8714	FS1-MO-S2-CONC-TAILS (100 mesh)	7.51	--	0.15	0.18	4.1	5.57	0.09	0.07	5.50	171.9	18.0	NONE	-153.9	0.1	
EY8715	FS1-MO-S2-CONC-TAILS (-100+200 mesh)	7.23	--	0.15	0.17	3.9	13.42	0.09	0.06	13.36	417.5	15.3	NONE	-402.2	<0.1	
EY8716	FS1-MO-S2-CONC-TAILS (-200 mesh)	7.29	--	0.13	0.15	3.4	9.56	0.09	0.06	9.50	296.9	16.0	NONE	-280.9	<0.1	
DA3424	SP-WTAIL-2011-1 +100M	9.46	254	0.12	0.16	3.6	0.08	0.01	0.02	0.06	1.9	20.5	10.6	SLIGHT	18.6	10.9
DA3425	SP-WTAIL-2011-2 +100M	9.68	304	0.11	0.17	3.9	0.07	0.01	0.01	0.06	1.9	20.8	10.0	SLIGHT	18.9	11.1
DD0199	SP-WTAIL-2011-1 -100+200M	9.50	327	0.09	0.18	4.1	0.05	0.01	0.01	0.04	1.3	18.8	11.3	SLIGHT	17.6	15.0
DD0325	SP-WTAIL-2011-2 -100+200M	9.74	272	0.09	0.18	4.1	0.04	<0.01	0.01	0.03	0.9	18.8	11.3	SLIGHT	17.9	20.0
DD0329	SP-WTAIL-2011-1 -200M	9.50	315	0.07	0.13	3.0	0.03	0.01	0.01	0.02	0.6	13.0	8.8	NONE	12.4	20.6
DD0507	SP-WTAIL-2011-2 -200M	9.76	280	0.07	0.12	2.7	<0.02	<0.01	0.01	<0.02	<0.6	13.8	8.8	NONE	13.8	#N/A
Detection Limits		*0.5*	*1*	*0.02*	*0.02*		*0.02*	*0.01*	*0.01*	*0.02*	*0.3*					
Maxxam SOP #		*7160*	*7160*	*LECO*	*LECO*	*Calculation*	*LECO*		*7410*	*Calculation*	*Calculation*	*7150*	*Calculation*	*Calculation*	*7150*	

Notes:

Total sulphur, total carbon and carbonate carbon (CO2; direct HCl method) by Leco furnace done at Acme Labs.

0.2g pf pulp

References:

Reference for Mod ABA NP method (Maxxam SOP No. 7150): MEND Acid Rock Drainage Prediction Manual, MEND Project 1.16.1b (pages 6.2-11 to 17), March 1991.

Reference for HCl extractable Sulphate Sulphur (Maxxam SOP No. 7410): Modified ASTM D2492-02 Method (The S extracted is determined by analysing the extract for sulphate).

Sulphide Sulphur (by.diff.) = Total S - HCl Extractable Sulphur

Acid Generation Potential = Sulphide Sulphur (by diff.)*31.25

Net Neutralization Potential = (Modified ABA Neutralization Potential)-(Acid Generation Potential)

Neutralization Potential Ratio = (Neutralization Potential)/(Acid Generation Potential)

CaCO3 Equivalency = Carbonate Carbon (CO2)*(100/44)*10

E5: Trace Element Analysis Results

Maxxam

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Client: Northcliff Resources

= humidity cell

Maxxam Sample No	Sample ID	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Au	Th	Sr
	Units	ppm	ppm	ppm	ppm	ppb	ppm	ppm	ppm	%	ppm	ppm	ppb	ppm	ppm
CE8419	ORE COMP	298	177	45.1	148	501	19.6	13.2	715	3.18	40.9	2.80	3.3	8.5	30.9
CE8420	MO-S2-CON-TAILS	218	745	359	2090	6560	200	104	1090	14.0	988	9.10	60.1	22.1	32.3
CE8421	MO-CLEANER-TAILS	>2000	6100	1130	3690	13500	971	143	1250	18.6	1090	18.1	121	20.7	34.4
CE8422	W-ROUGHER-TAILS	43.0	64.3	12.5	71.0	156	120	15.7	870	3.96	10.2	2.20	ND	8.3	36.4
CJ3379	W-CLEANER TAILS	46.6	114	18.1	85.2	270	133	18.4	1830	4.82	19.1	4.30	6.5	20.9	52.1
EY8707	FS2-W-ROUGHER-TAILS (100 mesh)	9.0	47.7	14.9	60	<0.1	25.5	12.0	730	3.15	4.4	1.8	1.8	7.0	82
EY8708	FS2-W-ROUGHER-TAILS (-100+200 mesh)	7.1	39.1	14.5	51	<0.1	18.2	10.5	613	2.65	4.4	1.6	2.8	7.0	66
EY8709	FS2-W-ROUGHER-TAILS (-200 mesh)	8.6	68.9	10.6	62	<0.1	29.0	15.2	841	3.87	15.0	2.0	2.7	8.3	49
EY8710	FS1-W-CLEANER-TAILS	44.1	82.1	24.9	82	0.4	44.3	23.3	2900	4.81	22.9	6.0	10.0	24.1	95
EY8711	FS1-MO-CLEANER-TAILS (100 mesh)	220	5640	574	931	10.0	107	74.0	1060	9.36	48.0	11.5	25.2	19.7	23
EY8712	FS1-MO-CLEANER-TAILS (-100+200mesh)	244	>10000	627	1340	13.6	129	93.2	1030	11.5	66.0	15.1	79.7	21.1	27
EY8713	FS1-MO-CLEANER-TAILS (-200 mesh)	183	5230	552	1080	10.1	125	83.5	1080	10.0	53.9	10.7	38.7	18.5	22
EY8714	FS1-MO-S2-CONC-TAILS (100 mesh)	1490	1380	220	990	5.0	110	86.1	1100	10.7	230	10.2	24.8	22.0	27
EY8715	FS1-MO-S2-CONC-TAILS (-100+200 mesh)	>2000	3250	460	1820	9.6	152	133	875	16.9	449	17.0	41.5	25.5	23
EY8716	FS1-MO-S2-CONC-TAILS (-200 mesh)	920	1340	382	1440	6.0	161	127	973	15.0	301	11.9	34.9	23.8	22
DA3424	SP-WTAIL-2011-1 +100M	20.1	39.9	13.1	49	0.2	27.6	11.4	623	2.47	15.4	1.3	<0.5	5.0	113
DA3425	SP-WTAIL-2011-2 +100M	22.0	41.5	11.8	49	0.1	26.5	11.1	619	2.49	12.3	1.3	<0.5	4.7	121
DD0199	SP-WTAIL-2011-1 -100+200M	15.2	29.6	11.0	42	0.1	33.7	9.9	592	2.25	8.3	1.3	<0.5	4.8	104
DD0325	SP-WTAIL-2011-2 -100+200M	15.3	29.9	9.8	43	0.1	32.9	9.8	583	2.22	7.4	1.3	<0.5	5.1	100
DD0329	SP-WTAIL-2011-1 -200M	26.8	23.7	10.9	59	0.4	149	17.9	871	3.87	3.8	1.5	32.2	5.6	69
DD0507	SP-WTAIL-2011-2 -200M	27.6	29.8	8.3	58	0.3	155	18.8	915	4.07	5.8	1.7	7.1	6.1	71
Detection Limits		0.01	0.01	0.01	0.1	2	0.1	0.1	1	0.01	0.1	0.05	0.2	0.1	0.5
Maxxam SOP #															
Method Blank		<0.01	<0.01	<0.01	<0.1		<0.1	<0.1	<1		<0.1	<0.05		<0.1	<0.5
		Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As		Au	Th	Sr

= humidity cell

Maxxam Sample No	Sample ID	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	B	Al	Na
	Units	ppm	ppm	ppm	ppm	%	%	ppm	ppm	%	ppm	%	ppm	%	%
CE8419	ORE COMP	1.04	0.81	7.35	80	0.92	0.063	18.5	67.3	1.08	70.6	0.201	<20	1.82	0.082
CE8420	MO-S2-CON-TAILS	20.5	15.1	211	94	1.10	0.051	27.9	192	1.21	54.1	0.191	<20	2.09	0.069
CE8421	MO-CLEANER-TAILS	33.9	14.7	158	105	1.31	0.068	27.3	1210	1.30	66.9	0.211	<20	2.23	0.071
CE8422	W-ROUGHER-TAILS	0.18	0.16	2.11	110	0.80	0.013	20.3	241	1.57	107	0.346	<20	2.63	0.130
CJ3379	W-CLEANER TAILS	0.26	0.47	5.26	131	3.02	0.265	46.8	245	1.82	92.9	0.232	<20	2.91	0.093
EY8707	FS2-W-ROUGHER-TAILS (100 mesh)	0.2	0.3	1.6	87	1.23	0.037	18	154	1.19	100	0.258	<20	2.76	0.270
EY8708	FS2-W-ROUGHER-TAILS (-100+200 mesh)	0.2	0.3	1.6	76	1.07	0.038	18	88	1.02	81	0.215	<20	2.28	0.192
EY8709	FS2-W-ROUGHER-TAILS (-200 mesh)	0.1	0.3	1.4	116	0.82	0.028	20	77	1.59	120	0.331	<20	2.75	0.151
EY8710	FS1-W-CLEANER-TAILS	0.3	0.6	5.7	127	8.63	1.04	56	76	1.84	81	0.072	<20	2.91	0.100
EY8711	FS1-MO-CLEANER-TAILS (100 mesh)	8.2	2.3	191	129	0.98	0.061	25	101	1.66	120	0.344	<20	2.94	0.106
EY8712	FS1-MO-CLEANER-TAILS (-100+200mesh)	10.9	3.1	211	119	1.12	0.058	26	127	1.51	110	0.321	<20	2.84	0.120
EY8713	FS1-MO-CLEANER-TAILS (-200 mesh)	9.0	2.5	210	133	0.94	0.065	23	105	1.71	124	0.348	<20	2.96	0.098
EY8714	FS1-MO-S2-CONC-TAILS (100 mesh)	8.5	6.5	140	119	1.04	0.064	27	98	1.56	112	0.325	<20	2.79	0.091
EY8715	FS1-MO-S2-CONC-TAILS (-100+200 mesh)	16.6	13.5	239	83	0.93	0.051	24	88	1.11	76	0.234	<20	2.19	0.051
EY8716	FS1-MO-S2-CONC-TAILS (-200 mesh)	12.2	8.0	229	111	0.90	0.059	23	102	1.39	100	0.298	<20	2.46	0.075
DA3424	SP-WTAIL-2011-1 +100M	0.1	0.3	3.4	74	1.84	0.042	14	116	1.04	70	0.202	<20	3.09	0.322
DA3425	SP-WTAIL-2011-2 +100M	<0.1	0.3	2.0	76	1.92	0.042	14	106	1.04	59	0.215	<20	3.21	0.362
DD0199	SP-WTAIL-2011-1 -100+200M	<0.1	0.3	1.6	69	1.73	0.036	15	120	0.94	51	0.215	<20	2.80	0.305
DD0325	SP-WTAIL-2011-2 -100+200M	<0.1	0.3	1.7	67	1.69	0.037	16	101	0.93	50	0.210	<20	2.73	0.286
DD0329	SP-WTAIL-2011-1 -200M	<0.1	0.2	0.9	119	1.24	0.030	17	274	1.77	115	0.365	<20	3.18	0.210
DD0507	SP-WTAIL-2011-2 -200M	<0.1	0.1	0.9	124	1.27	0.028	18	285	1.87	119	0.387	<20	3.36	0.220
Detection Limits		0.01	0.02	0.002	2	0.01	0.001	0.5	0.5	0.01	0.5	0.001	20	0.01	0.001
Maxxam SOP #															
Method Blank		<0.01	<0.02	<0.002	<2			<0.5	<0.5		<0.5		<20		
		Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	B	Al	Na

= humidity cell

Maxxam Sample No	Sample ID	K	W	Sc	Tl	S	Se	Te	Ga
	Units	%	ppm	ppm	ppm	%	ppm	ppm	ppm
CE8419	ORE COMP	0.75	ND	7.7	0.97	0.44	0.8	0.32	8.7
CE8420	MO-S2-CON-TAILS	0.66	ND	9.0	3.89	8.97	6.0	3.00	10.6
CE8421	MO-CLEANER-TAILS	0.71	ND	9.2	2.47	7.32	6.6	4.27	11.1
CE8422	W-ROUGHER-TAILS	1.16	23.8	8.2	1.25	0.08	ND	0.06	12.6
CJ3379	W-CLEANER TAILS	0.96	ND	12.4	1.19	0.12	1.0	0.22	14.2
EY8707	FS2-W-ROUGHER-TAILS (100 mesh)	0.85	>100	7.6	0.9	0.06	10	<0.5	<0.2
EY8708	FS2-W-ROUGHER-TAILS (-100+200 mesh)	0.68	67.9	6.4	0.8	<0.05	9	<0.5	<0.2
EY8709	FS2-W-ROUGHER-TAILS (-200 mesh)	1.16	50.8	9.7	1.4	<0.05	11	<0.5	<0.2
EY8710	FS1-W-CLEANER-TAILS	0.82	>100	11.2	1.2	0.19	14	<0.5	<0.2
EY8711	FS1-MO-CLEANER-TAILS (100 mesh)	1.31	>100	13.4	2.2	2.97	14	2.8	6.5
EY8712	FS1-MO-CLEANER-TAILS (-100+200mesh)	1.19	>100	12.5	2.3	4.30	13	4.4	6.4
EY8713	FS1-MO-CLEANER-TAILS (-200 mesh)	1.36	>100	13.5	2.4	3.16	14	3.6	6.9
EY8714	FS1-MO-S2-CONC-TAILS (100 mesh)	1.23	>100	12.9	2.9	4.62	13	3.6	3.3
EY8715	FS1-MO-S2-CONC-TAILS (-100+200 mesh)	0.86	>100	9.5	3.5	9.15	10	8.3	6.6
EY8716	FS1-MO-S2-CONC-TAILS (-200 mesh)	1.12	>100	11.7	3.1	6.39	12	6.0	6.8
DA3424	SP-WTAIL-2011-1 +100M	0.64	>100	6.0	0.8	0.08	<0.5	<0.2	11
DA3425	SP-WTAIL-2011-2 +100M	0.66	>100	6.2	0.9	0.07	<0.5	<0.2	11
DD0199	SP-WTAIL-2011-1 -100+200M	0.57	62.4	5.8	0.7	<0.05	<0.5	<0.2	10
DD0325	SP-WTAIL-2011-2 -100+200M	0.56	62.2	5.6	0.7	<0.05	<0.5	<0.2	9
DD0329	SP-WTAIL-2011-1 -200M	1.26	19.5	9.4	1.5	<0.05	<0.5	<0.2	13
DD0507	SP-WTAIL-2011-2 -200M	1.33	19.4	10.4	1.6	<0.05	<0.5	<0.2	14
Detection Limits		0.01	0.05	0.1	0.02	0.02	0.1	0.02	0.1
Maxxam SOP #									
Method Blank			<0.05	<0.1	<0.02	<0.02	<0.1	<0.02	<0.1
		K							

Client: Northcliff Resources

= humidity cell

Maxxam Sample No	Sample ID	Ba	F
	Units	ppm	%
CE8419	ORE COMP	269	0.15
CE8420	MO-S2-CON-TAILS	224	0.21
CE8421	MO-CLEANER-TAILS	194	0.23
CE8422	W-ROUGHER-TAILS	307	0.17
CJ3379	W-CLEANER TAILS	265	0.38
EY8707	FS2-W-ROUGHER-TAILS (10	289	0.130
EY8708	FS2-W-ROUGHER-TAILS (-10	283	0.100
EY8709	FS2-W-ROUGHER-TAILS (-20	316	0.140
EY8710	FS1-W-CLEANER-TAILS	211	0.910
EY8711	FS1-MO-CLEANER-TAILS (10	351	0.200
EY8712	FS1-MO-CLEANER-TAILS (-1	333	0.190
EY8713	FS1-MO-CLEANER-TAILS (-2	347	0.210
EY8714	FS1-MO-S2-CONC-TAILS (10	357	0.210
EY8715	FS1-MO-S2-CONC-TAILS (-10	268	0.170
EY8716	FS1-MO-S2-CONC-TAILS (-20	316	0.190
DA3424	SP-WTAIL-2011-1 +100M	200	0.1
DA3425	SP-WTAIL-2011-2 +100M	204	0.1
DD0199	SP-WTAIL-2011-1 -100+200M	187	0.1
DD0325	SP-WTAIL-2011-2 -100+200M	194	0.08
DD0329	SP-WTAIL-2011-1 -200M	247	0.11
DD0507	SP-WTAIL-2011-2 -200M	240	0.15
Maxxam SOP #			
Method Blank		<5	<0.01

Client: Northcliff Resources

= humidity cell

Maxxam Sample No	Sample ID	Hg on Solids
	Units	**mg/kg**
CE8419	ORE COMP	0.01
CE8420	MO-S2-CON-TAILS	0.06
CE8421	MO-CLEANER-TAILS	0.17
CE8422	W-ROUGHER-TAILS	<0.01
EY8707	FS2-W-ROUGHER-TAILS (100 mesh)	0.012
EY8708	FS2-W-ROUGHER-TAILS (-100+200 mesh)	<0.010
EY8709	FS2-W-ROUGHER-TAILS (-200 mesh)	0.016
EY8710	FS1-W-CLEANER-TAILS	<0.010
EY8711	FS1-MO-CLEANER-TAILS (100 mesh)	0.011
EY8712	FS1-MO-CLEANER-TAILS (-100+200mesh)	0.021
EY8713	FS1-MO-CLEANER-TAILS (-200 mesh)	0.023
EY8714	FS1-MO-S2-CONC-TAILS (100 mesh)	0.015
EY8715	FS1-MO-S2-CONC-TAILS (-100+200 mesh)	0.027
EY8716	FS1-MO-S2-CONC-TAILS (-200 mesh)	0.018
DA3424	SP-WTAIL-2011-1 +100M	0.016
DA3425	SP-WTAIL-2011-2 +100M	0.012
DD0199	SP-WTAIL-2011-1 -100+200M	<0.010
DD0325	SP-WTAIL-2011-2 -100+200M	<0.010
DD0329	SP-WTAIL-2011-1 -200M	0.014
DD0507	SP-WTAIL-2011-2 -200M	0.014
Duplicates		
CE8419 Dup	ORE COMP	0.01
Blanks		
Method Blank		*<0.01*
Reference Material		
Reference Material (5609088)		*111*
True Values Reference Material		
Percent Difference (5609088)		
Detection Limits		*0.01*
Maxxam SOP #		*65-C-015-03*

E6: Humidity Cell Charts

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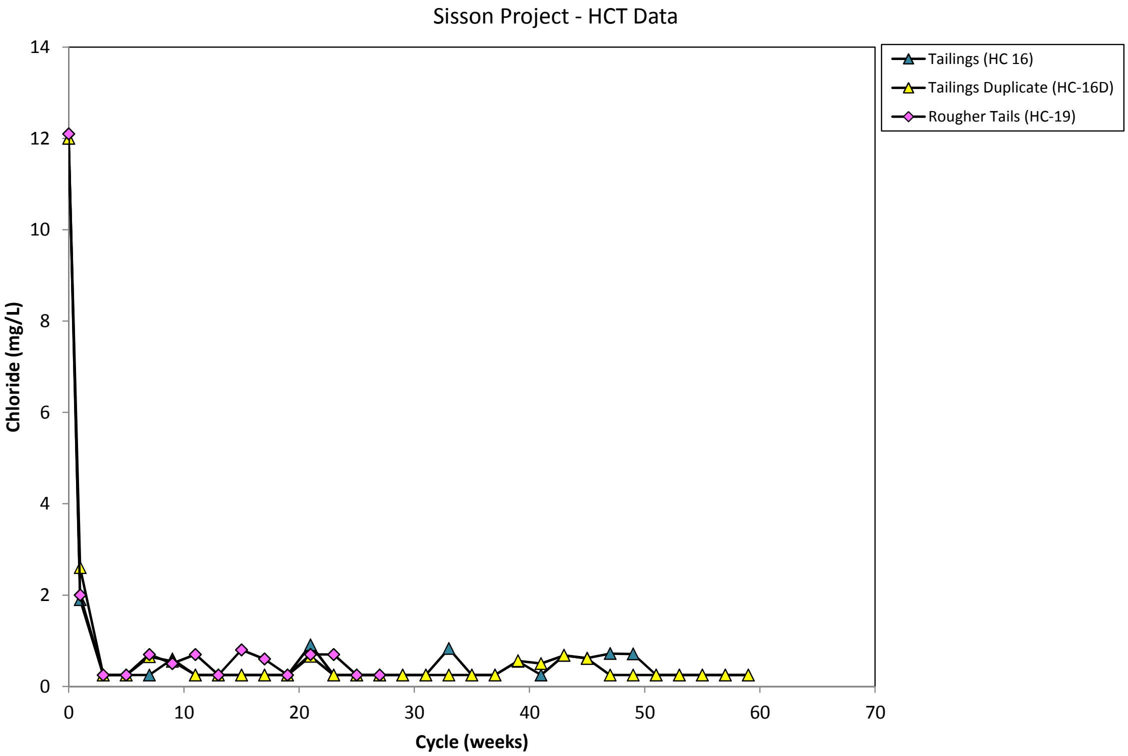

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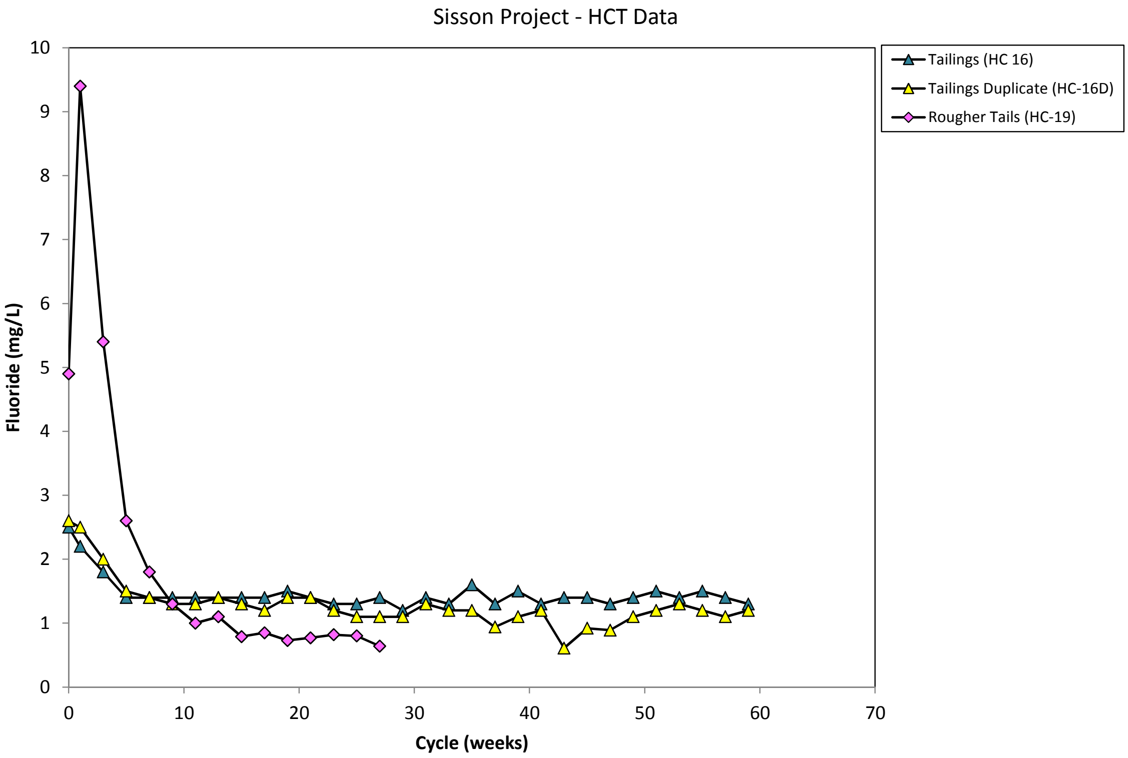

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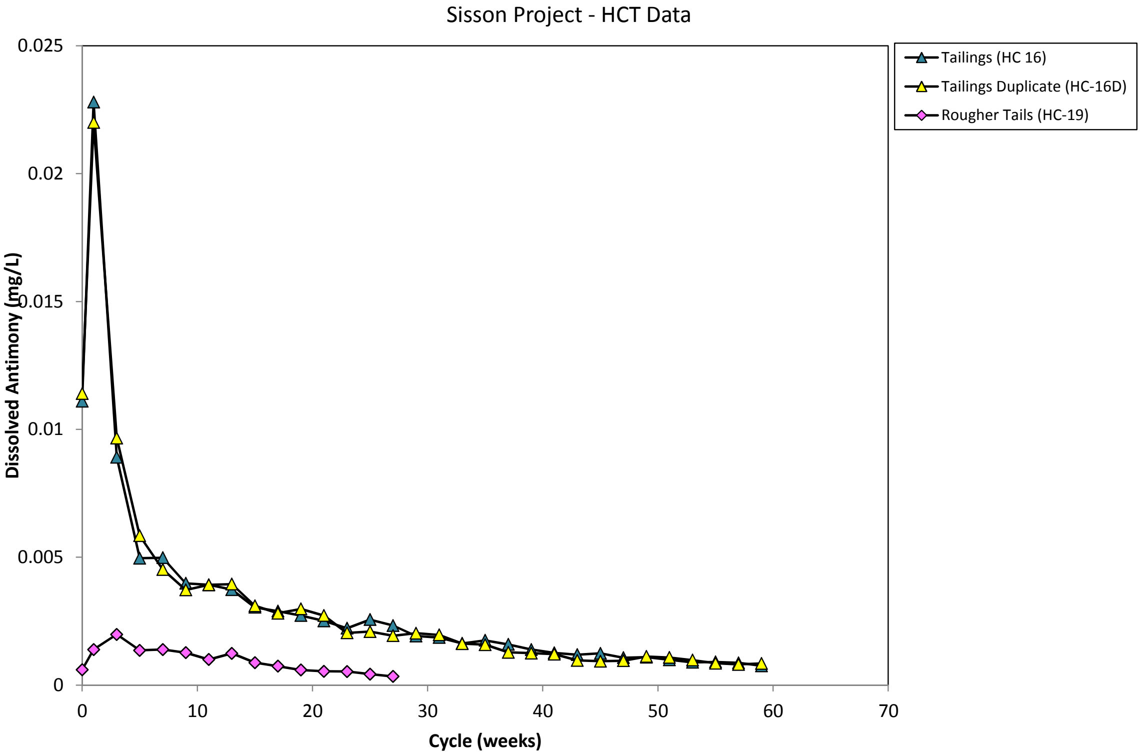

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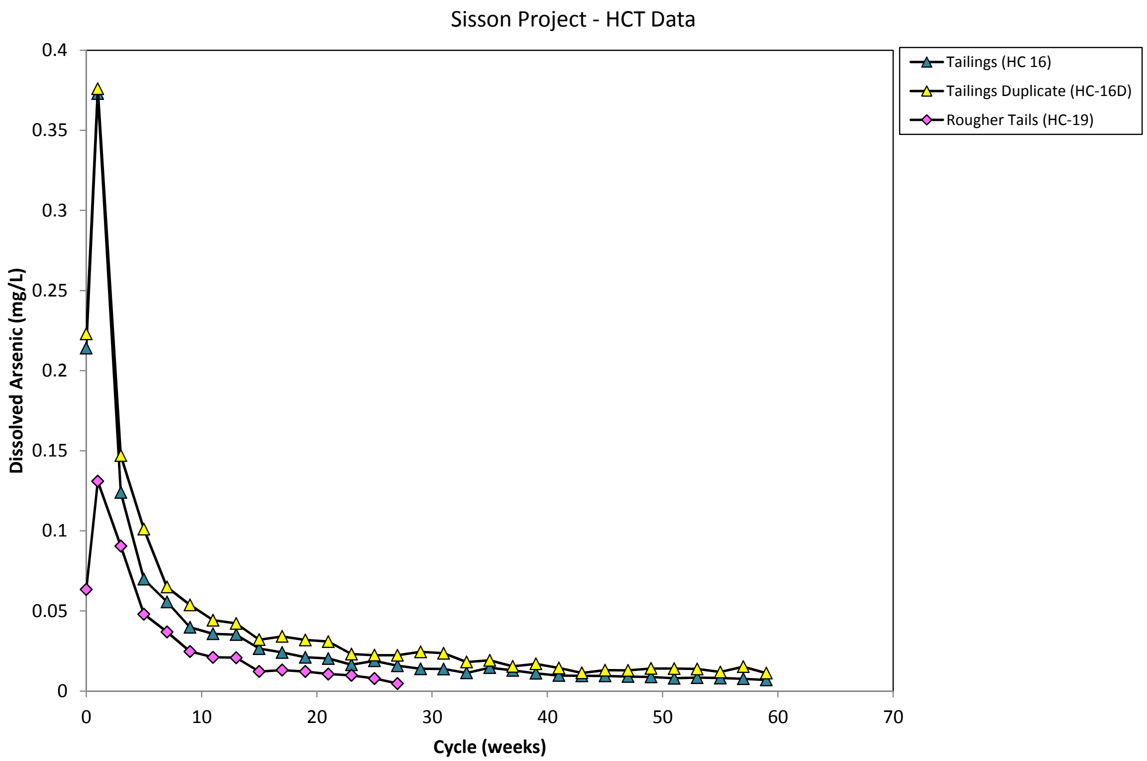

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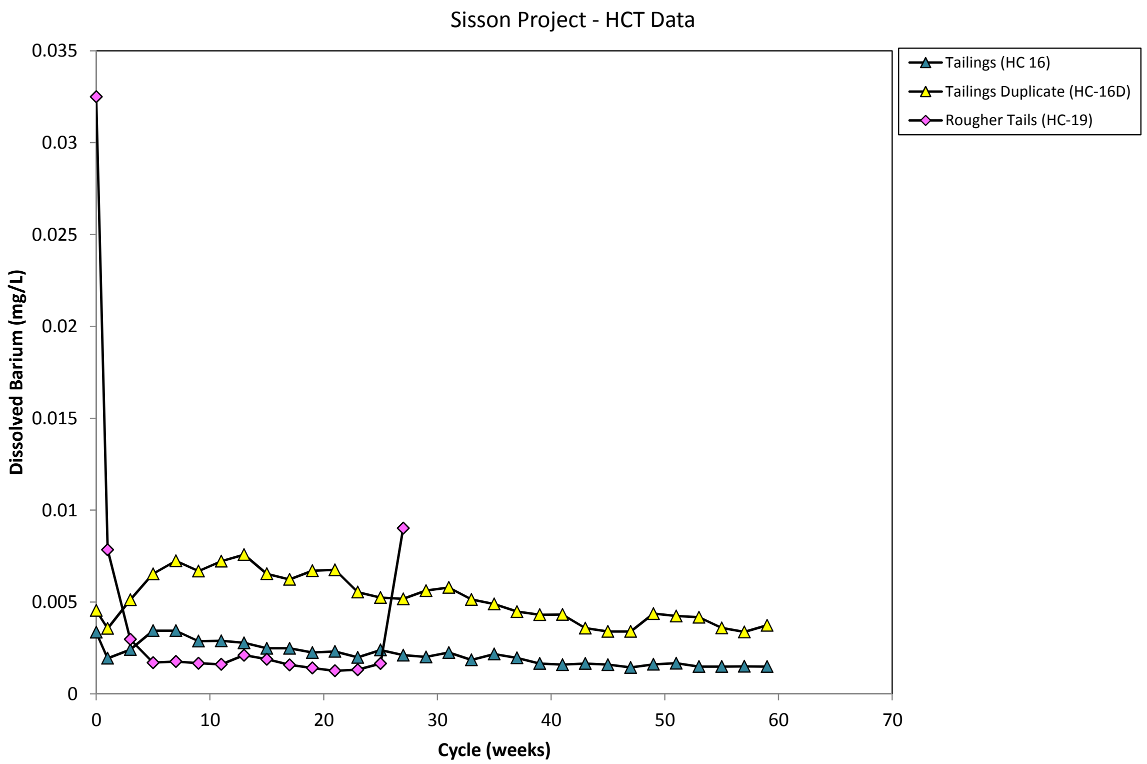

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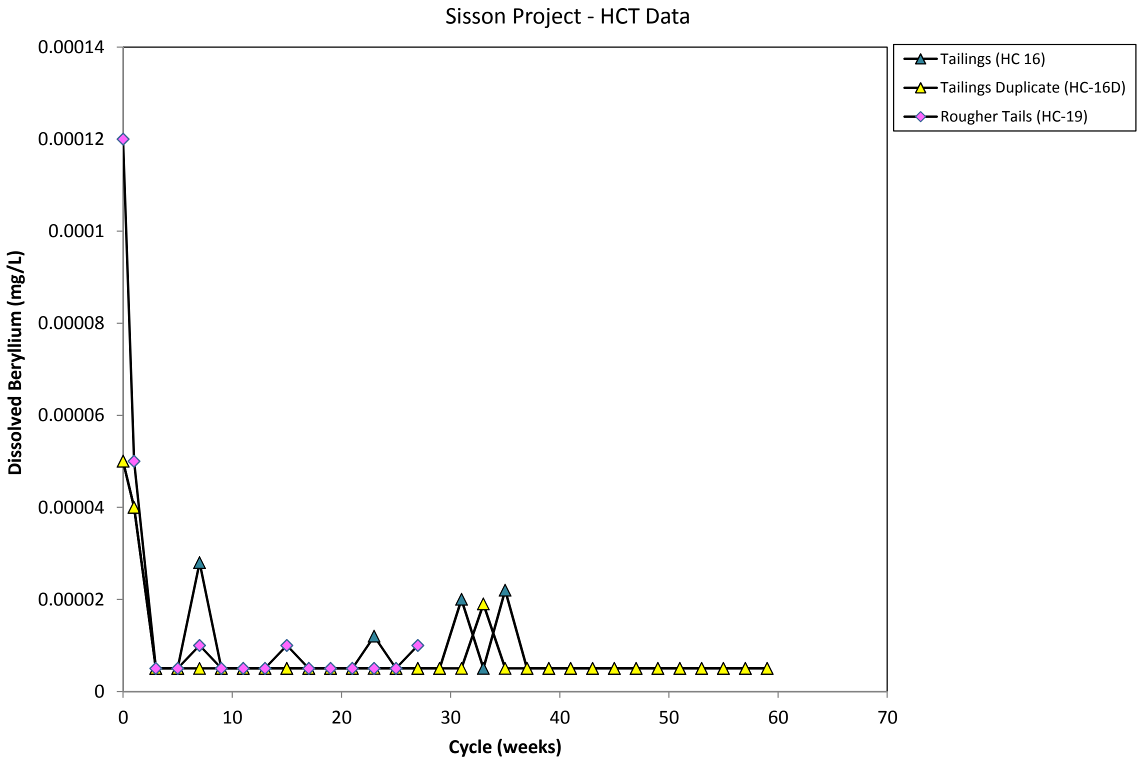

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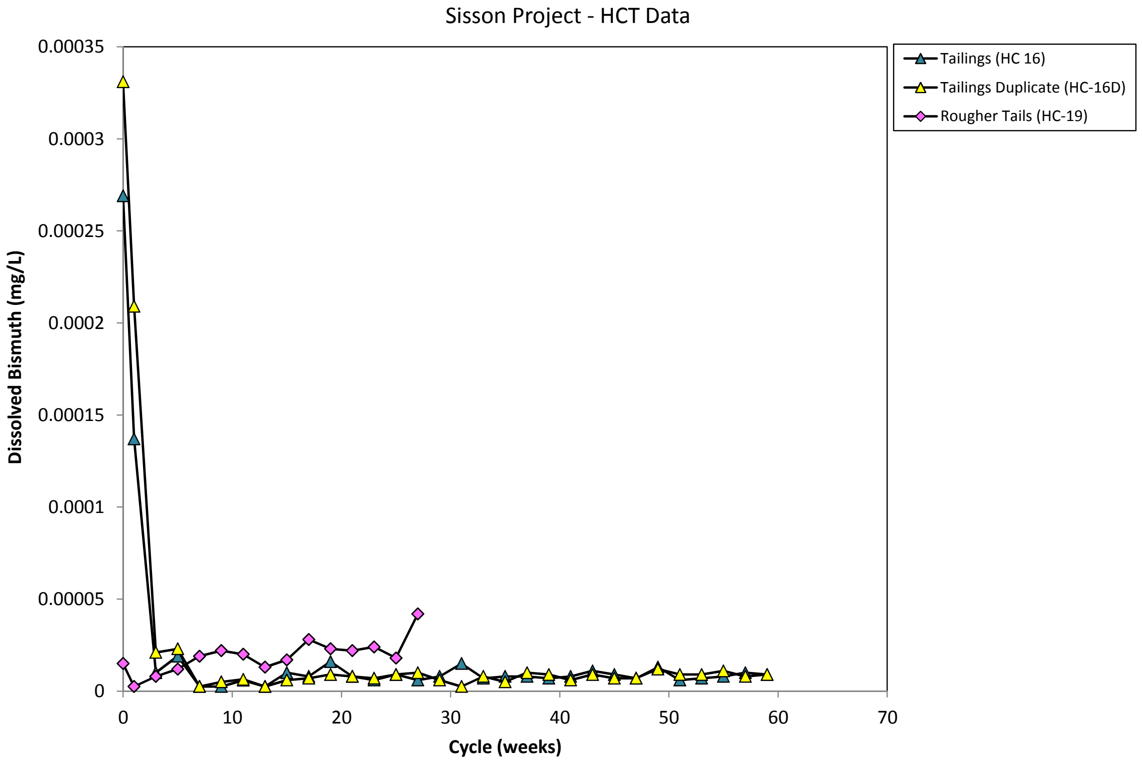

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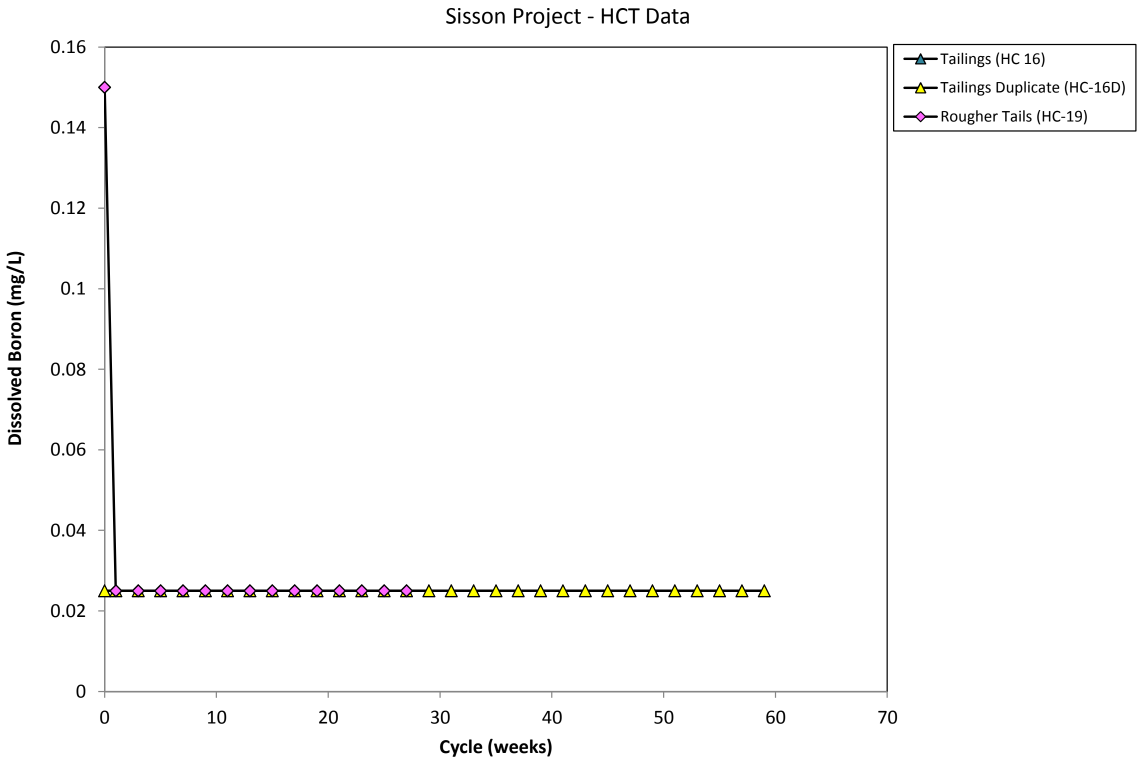

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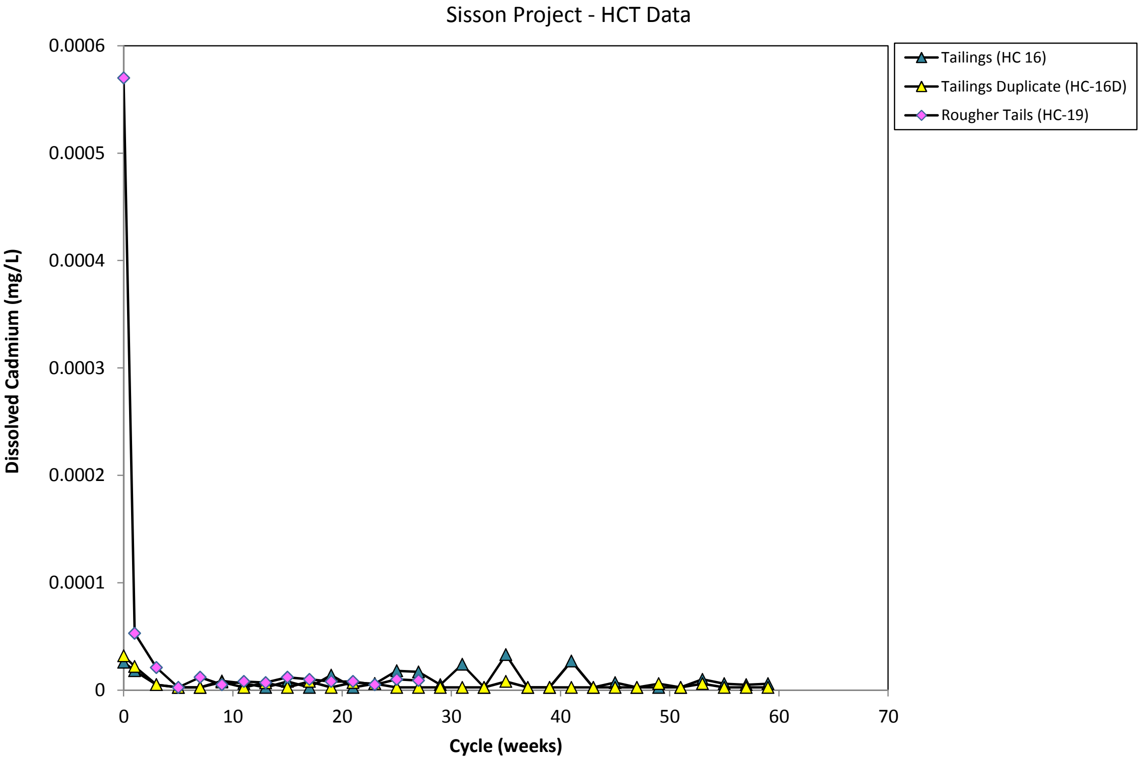

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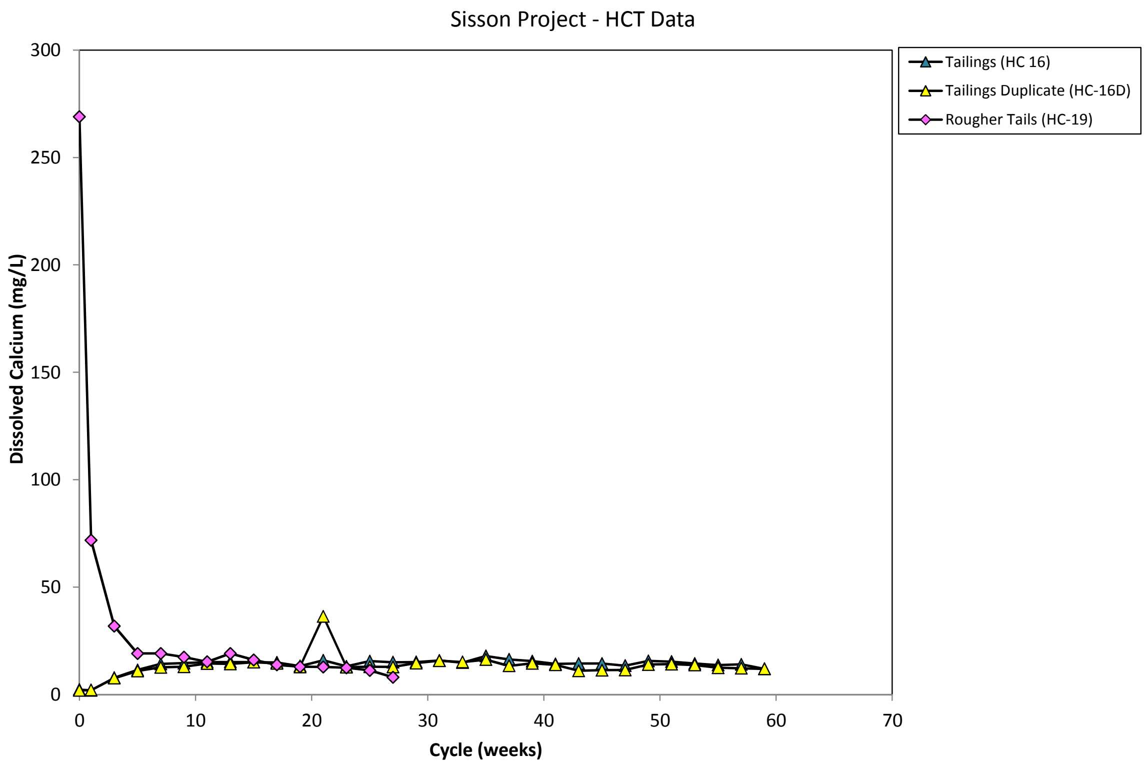

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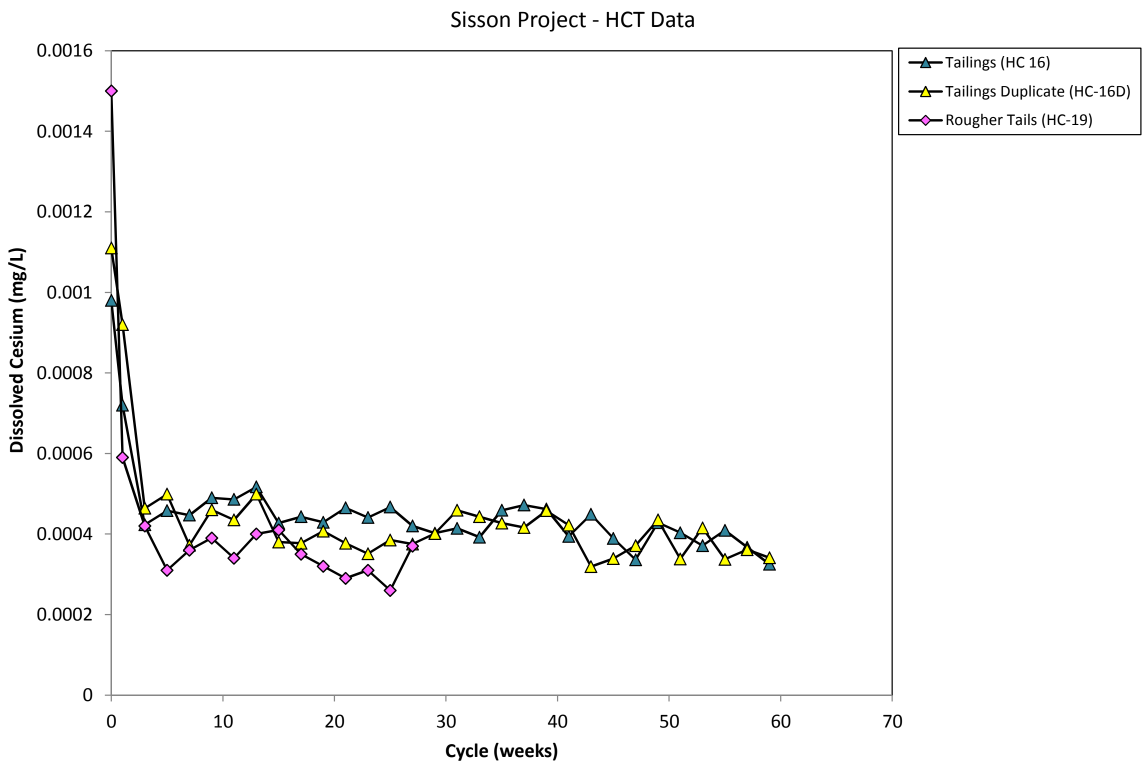

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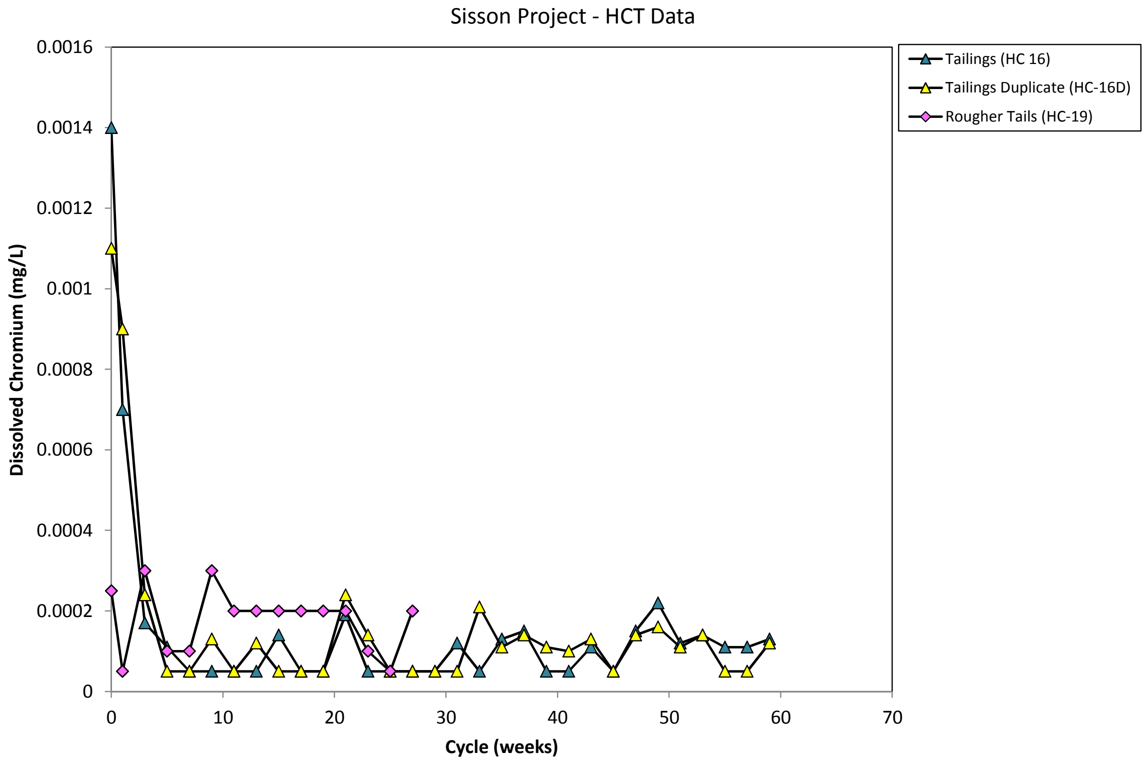

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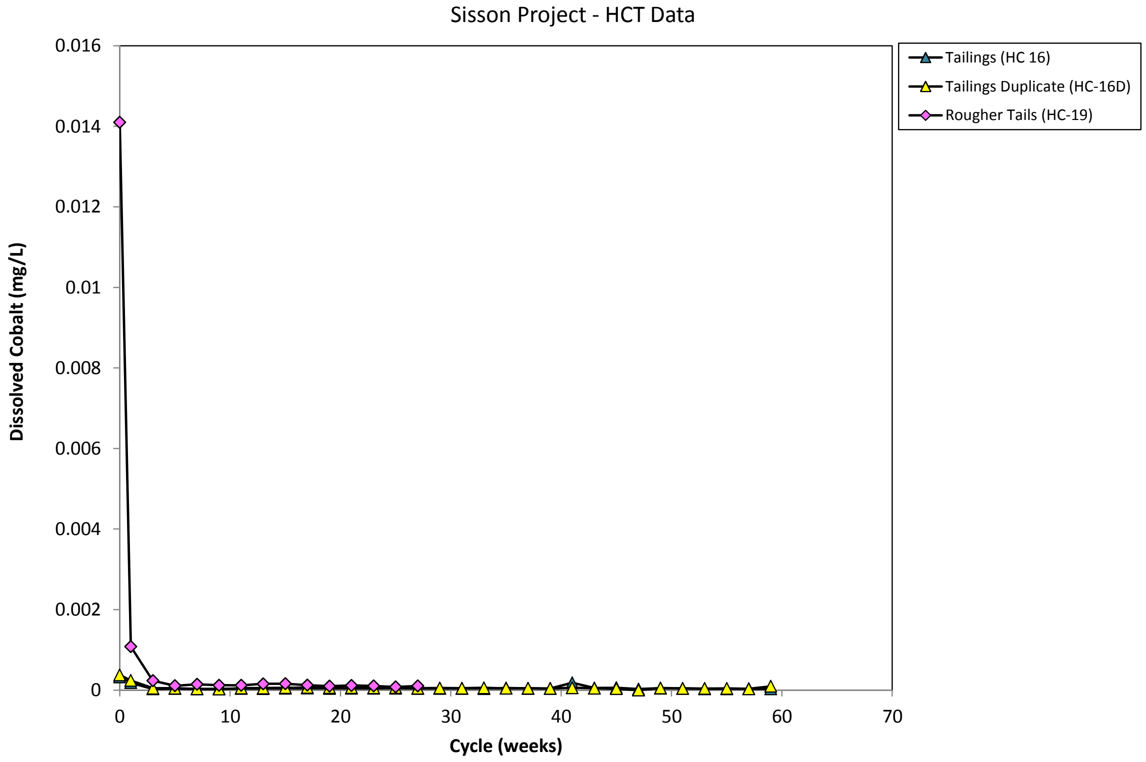

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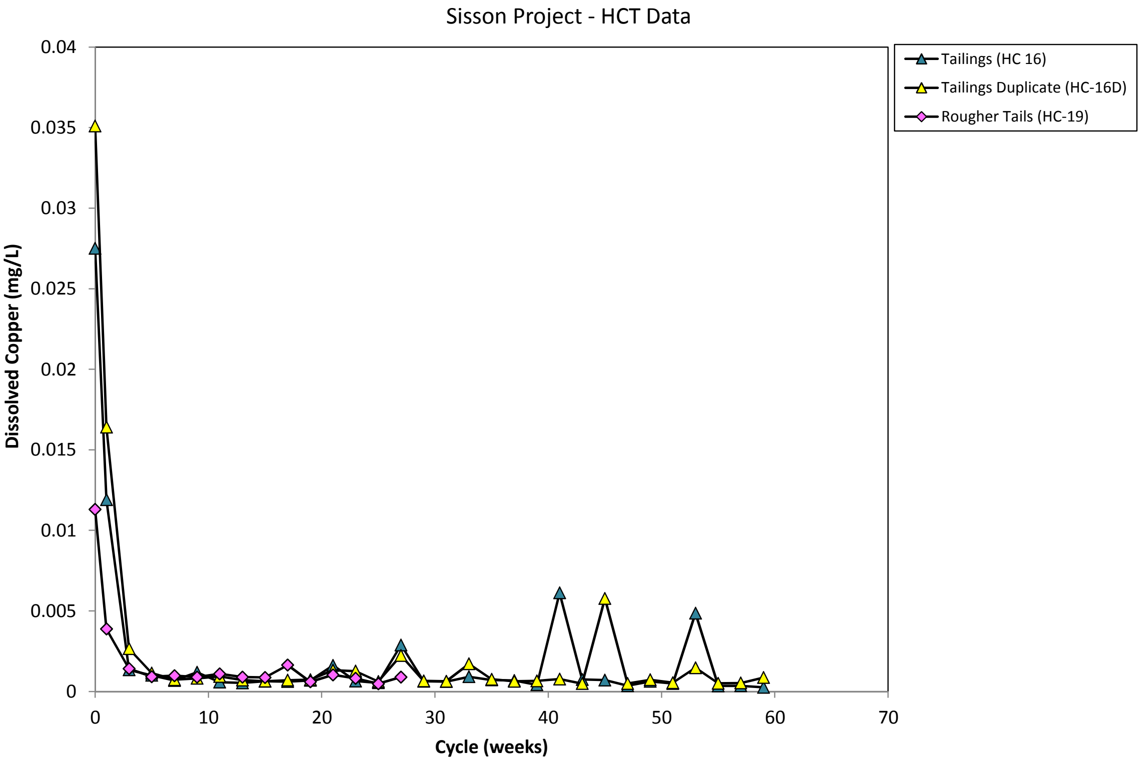

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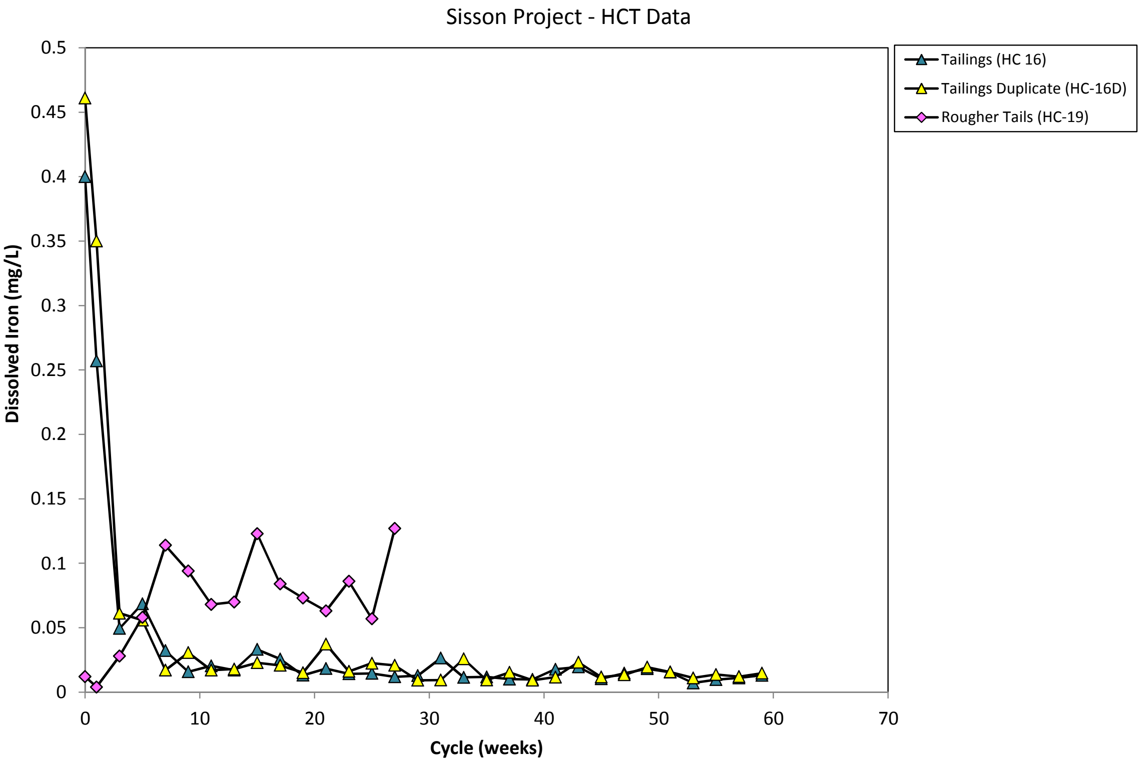

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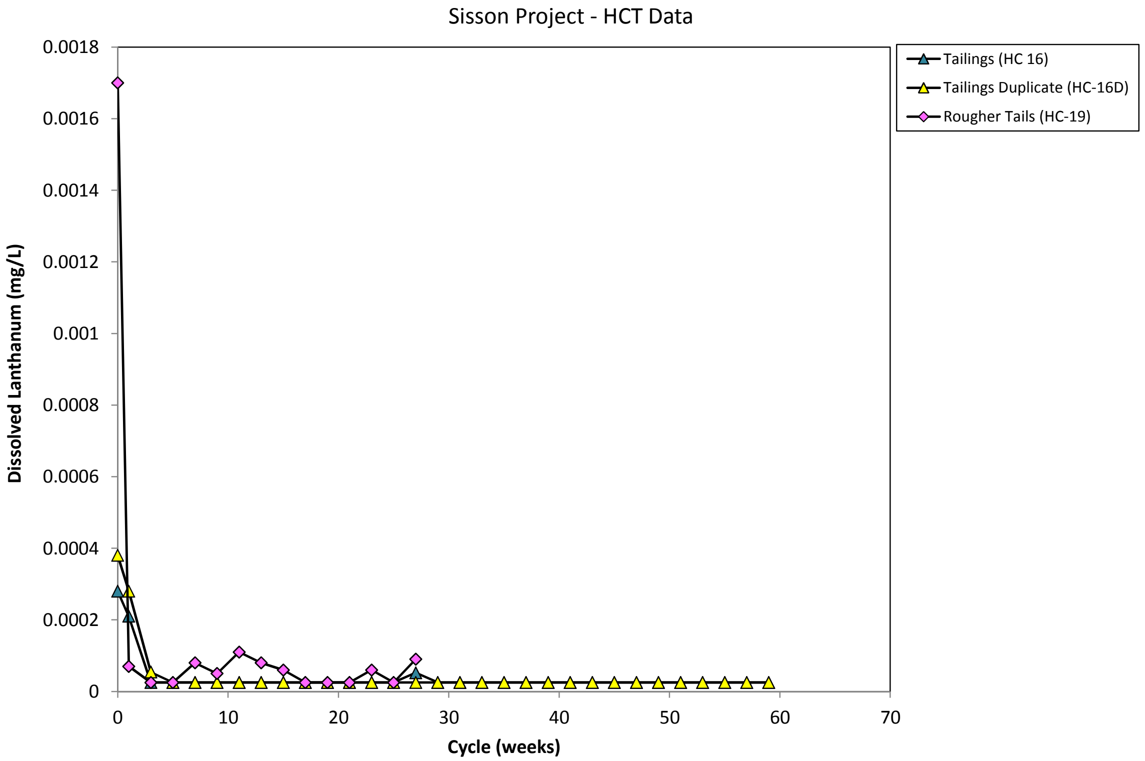

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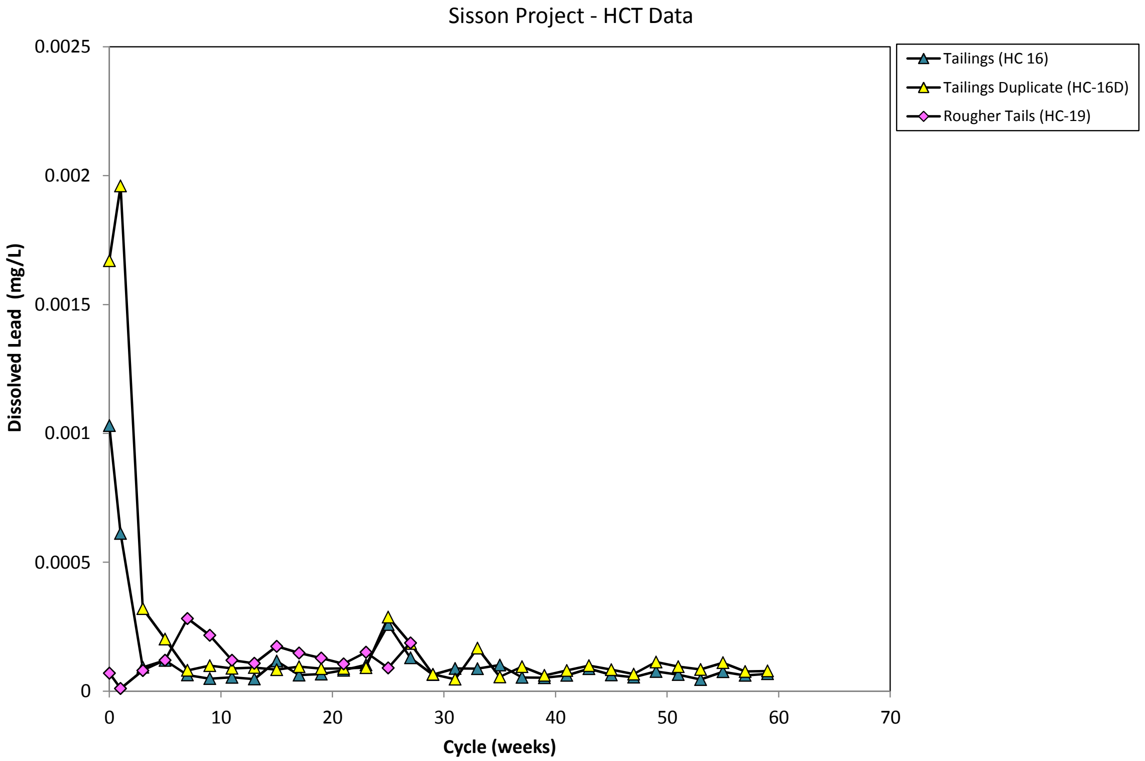

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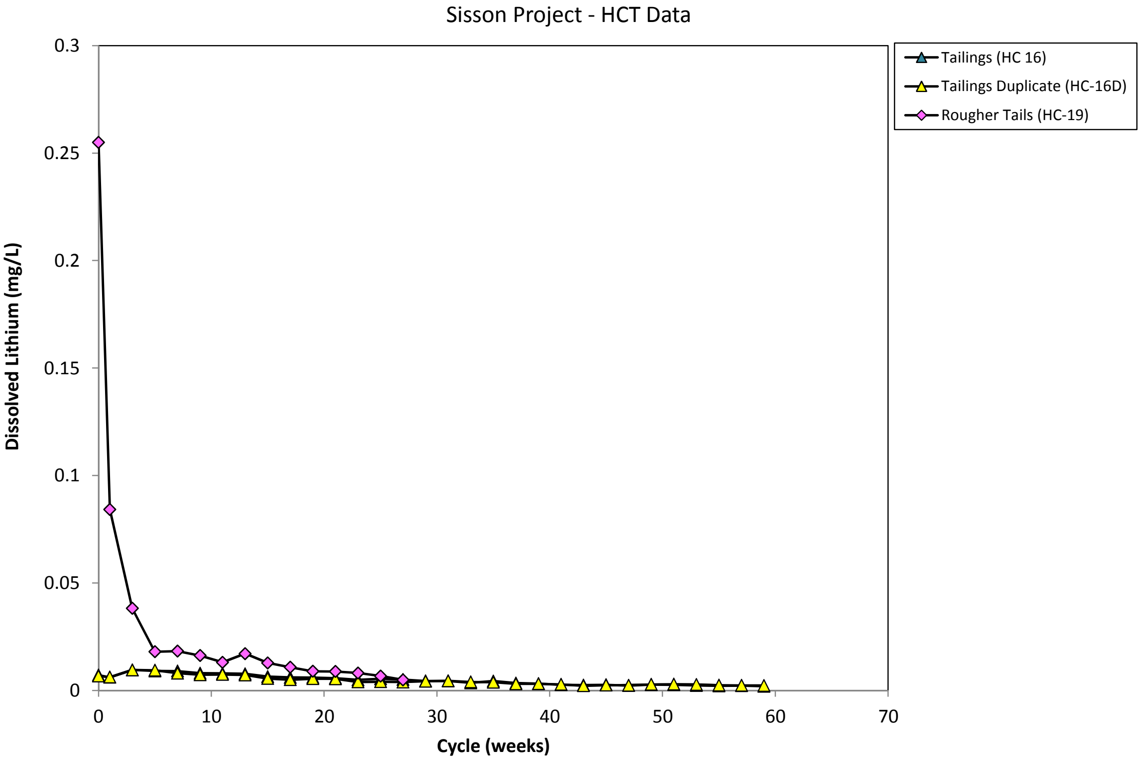

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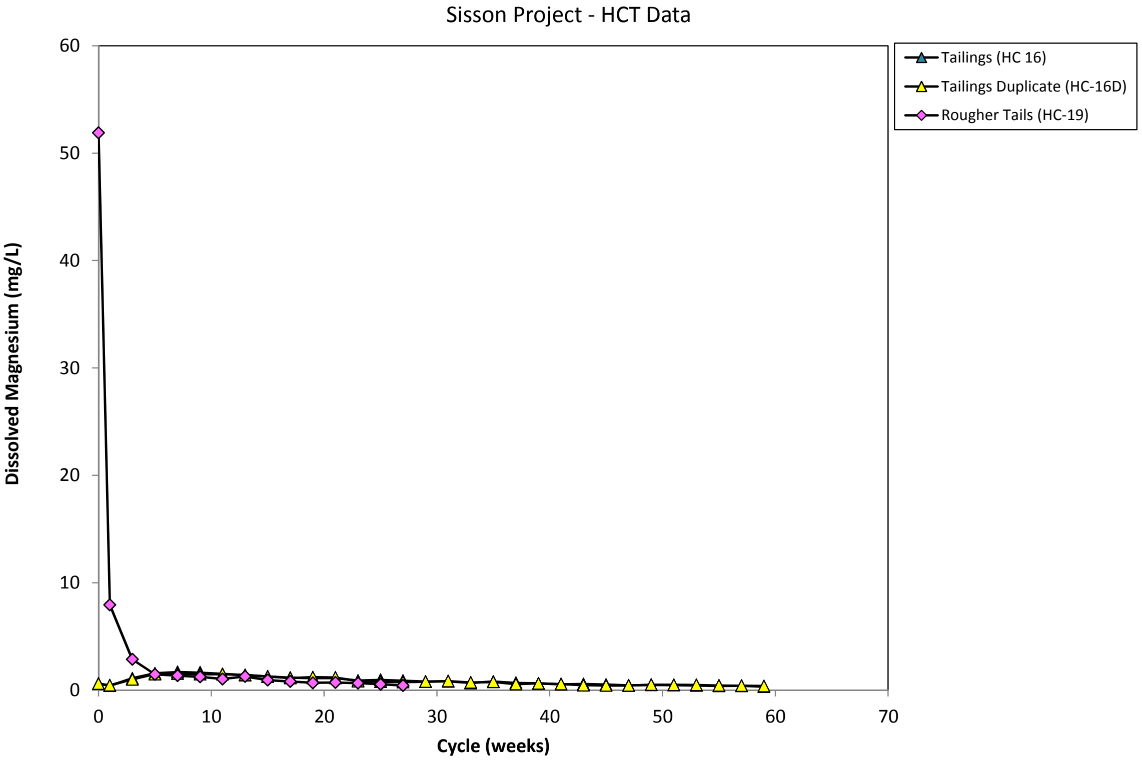

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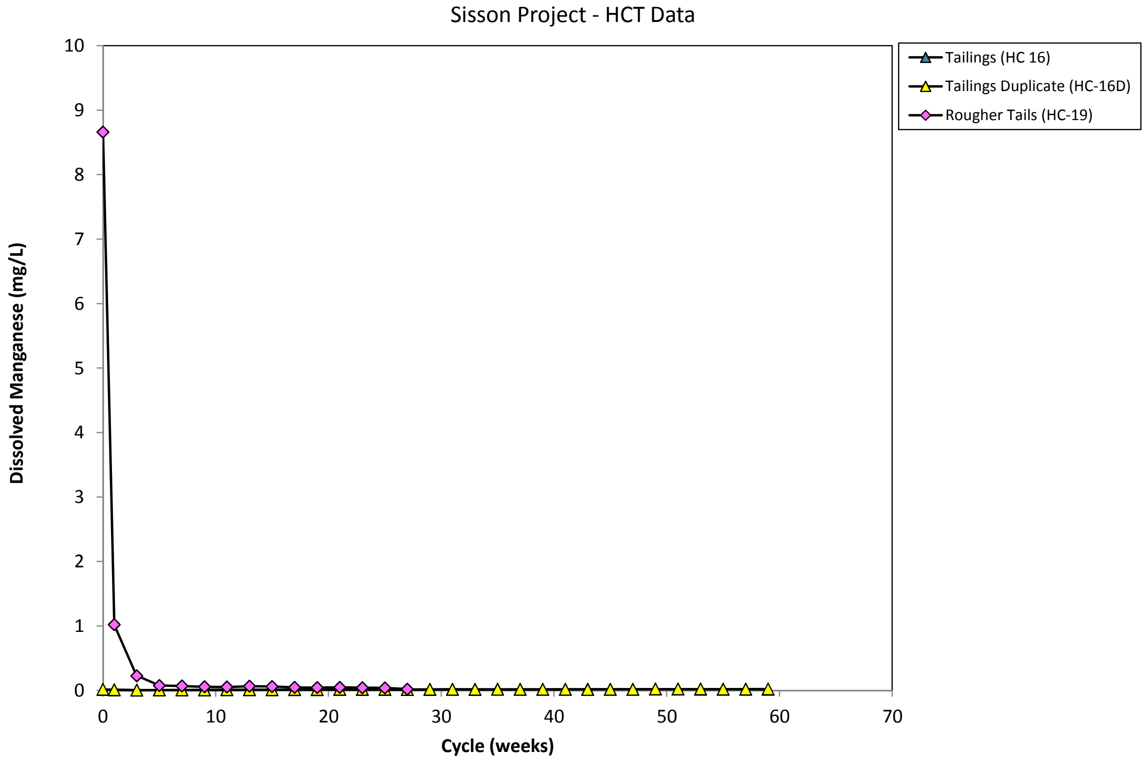

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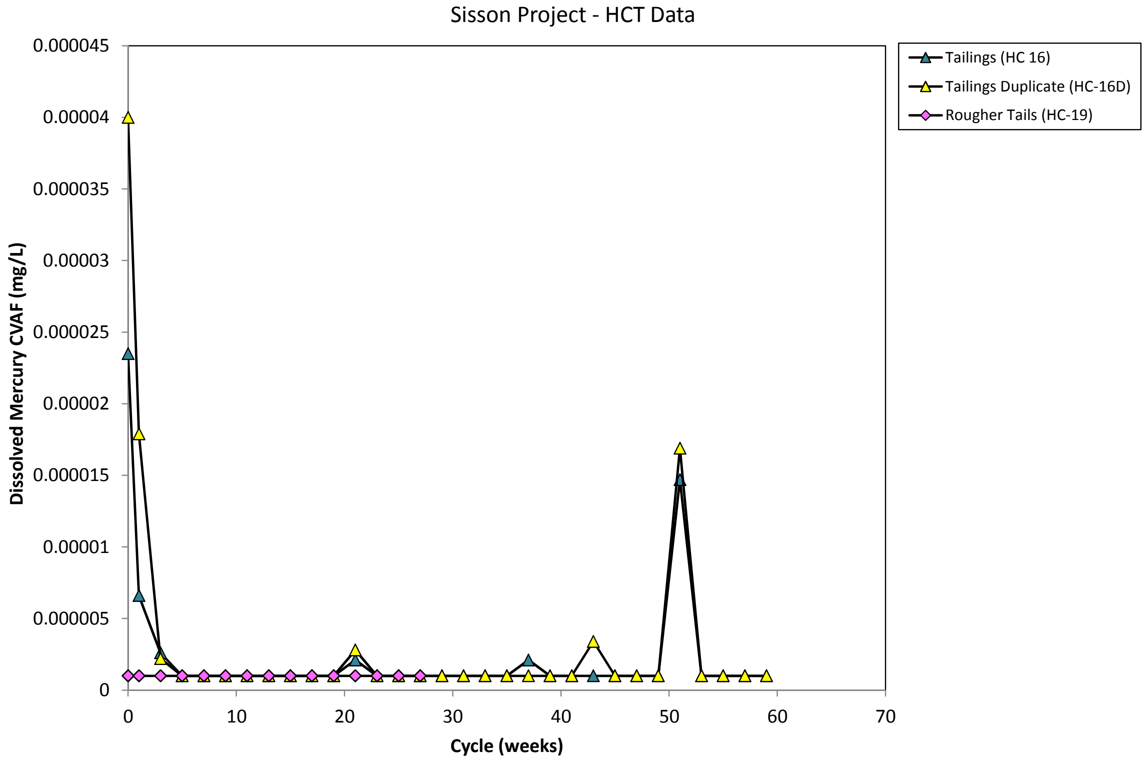

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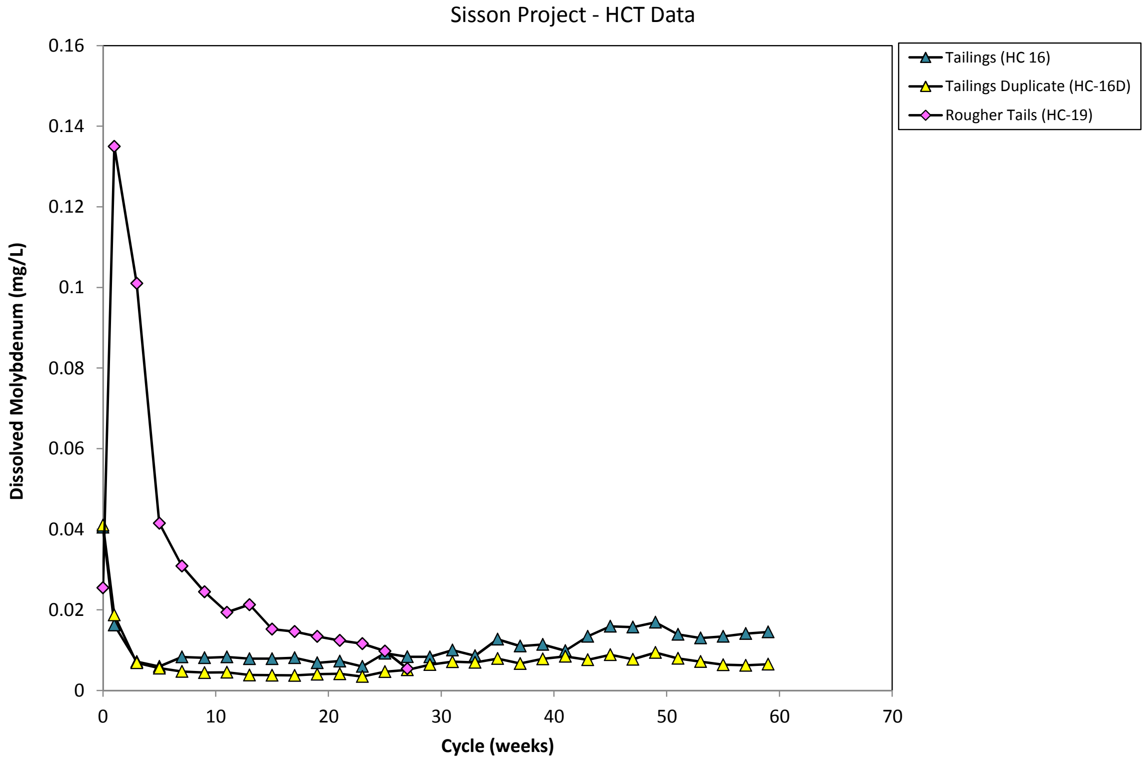

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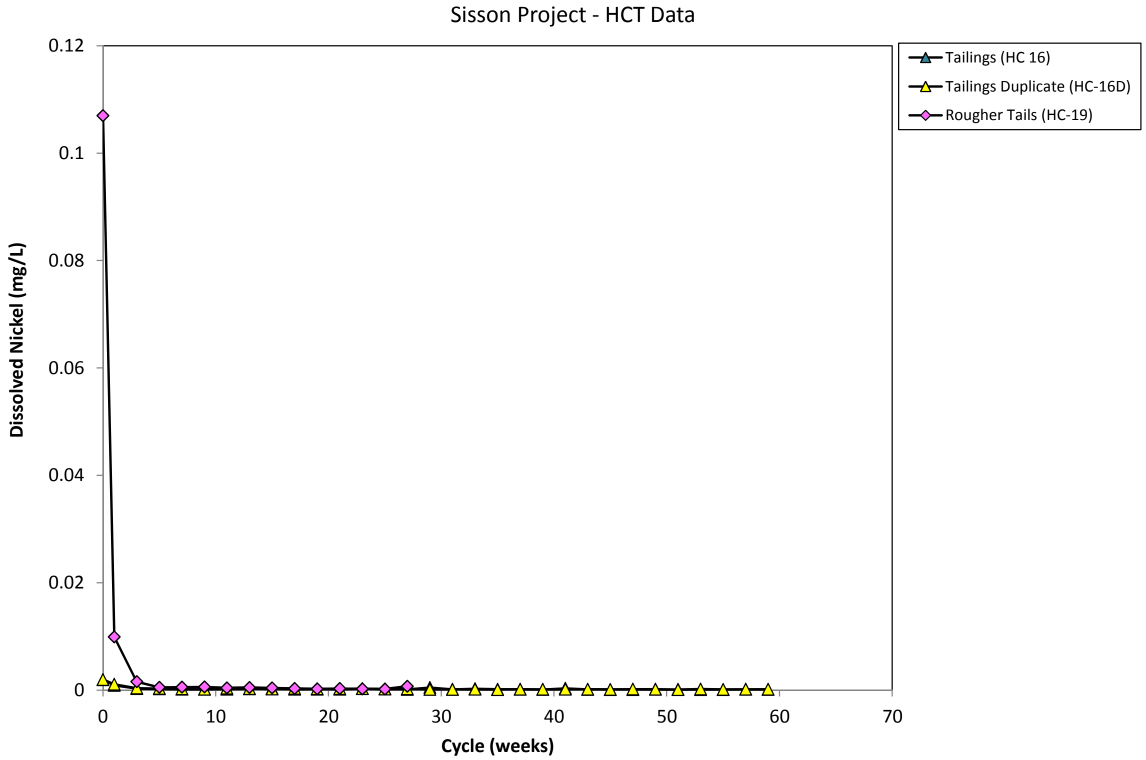

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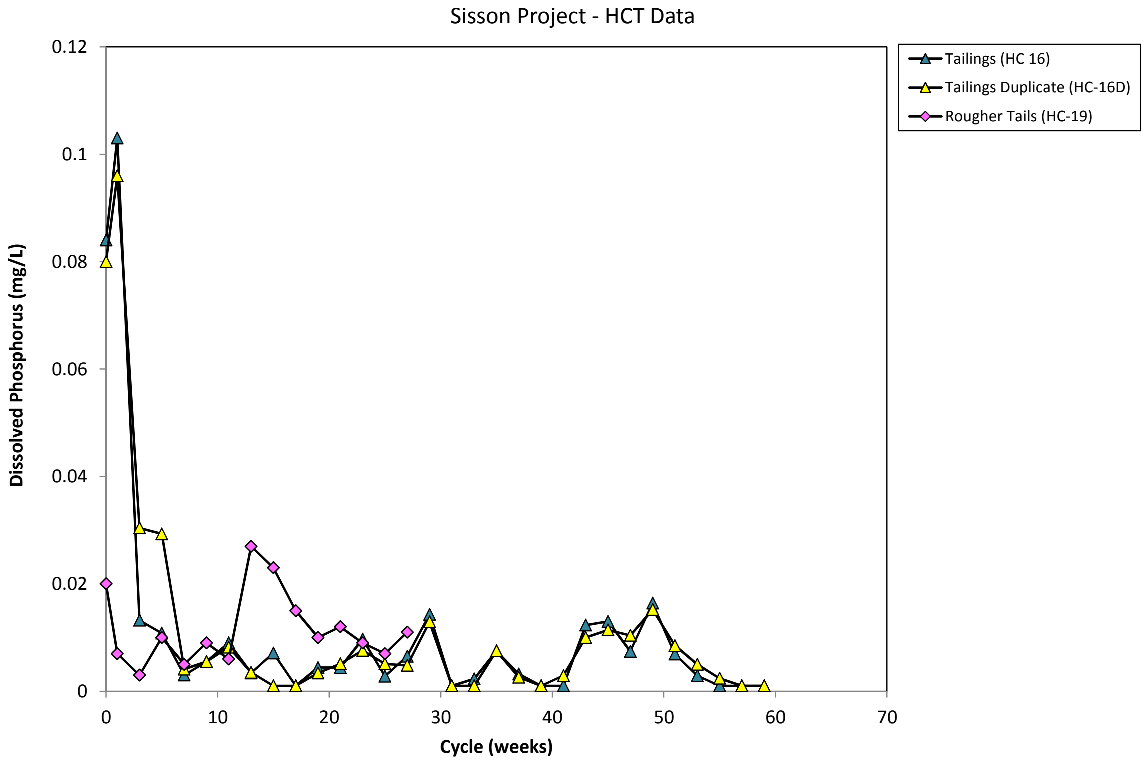

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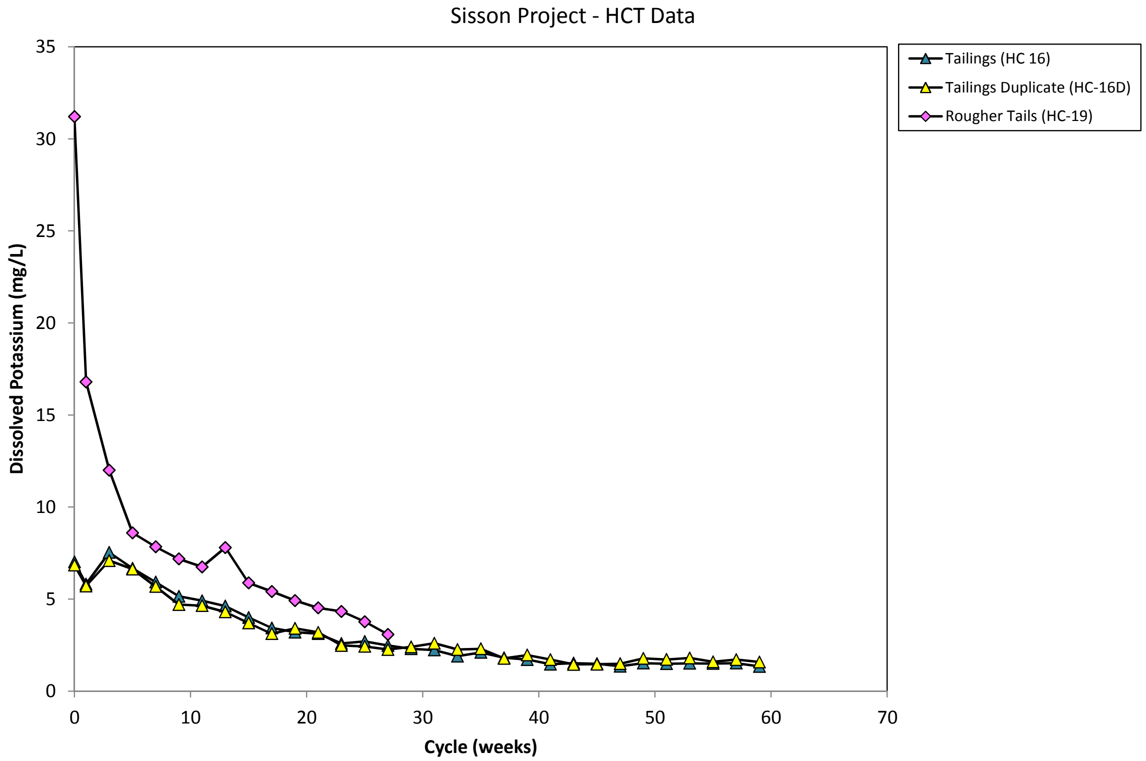

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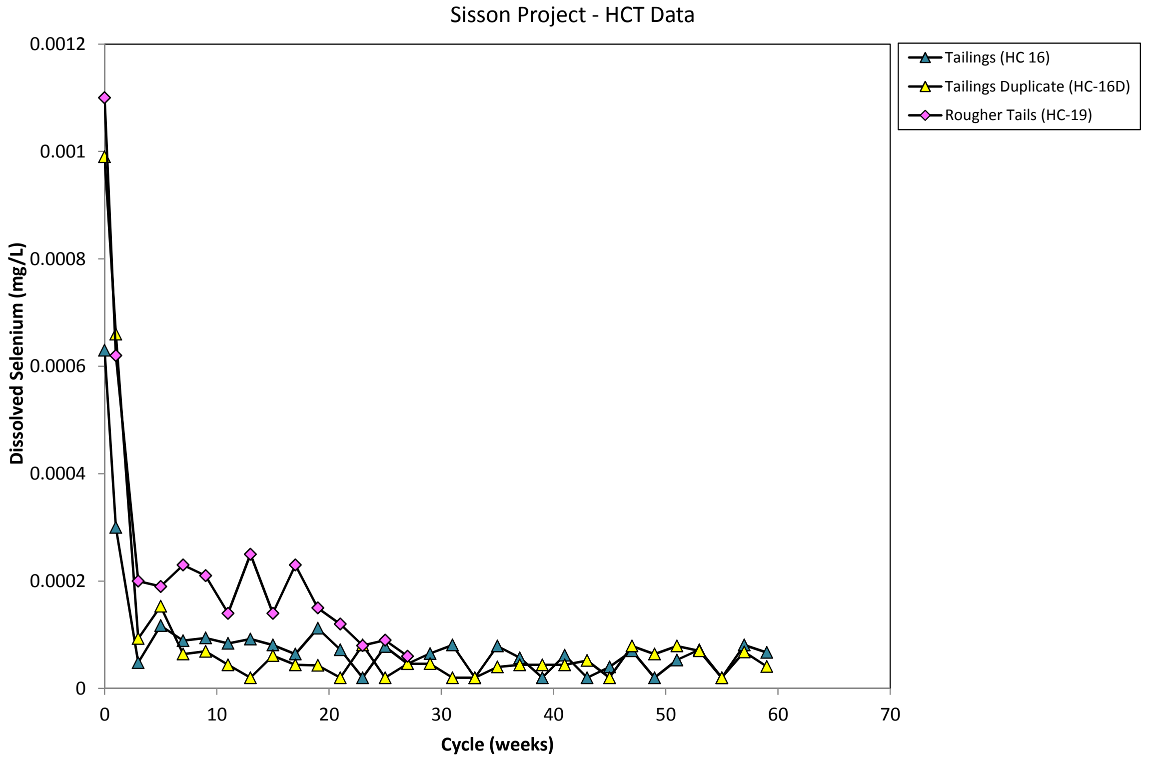

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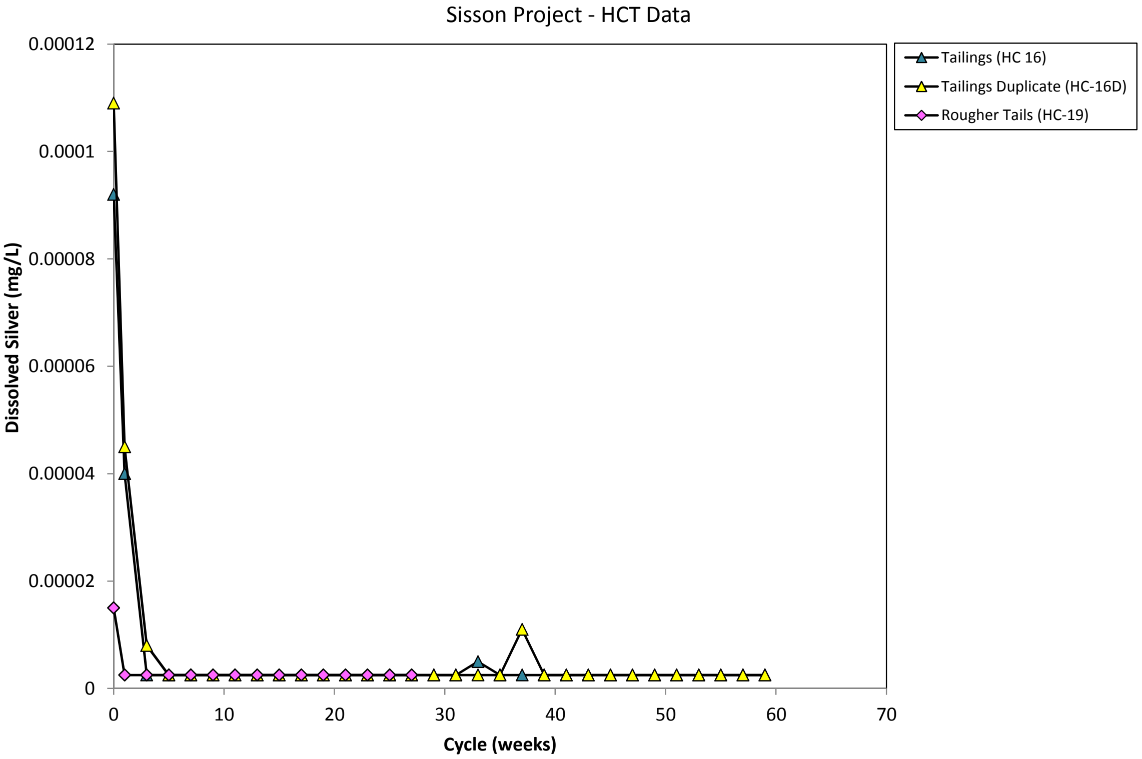

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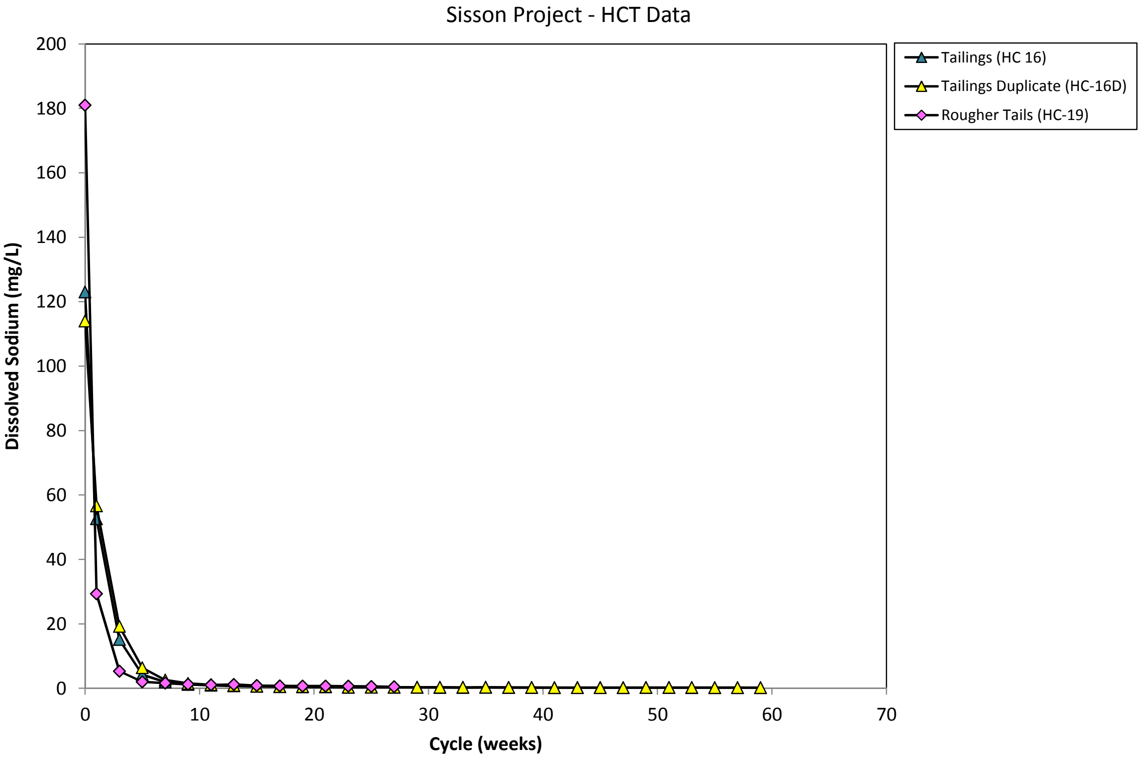

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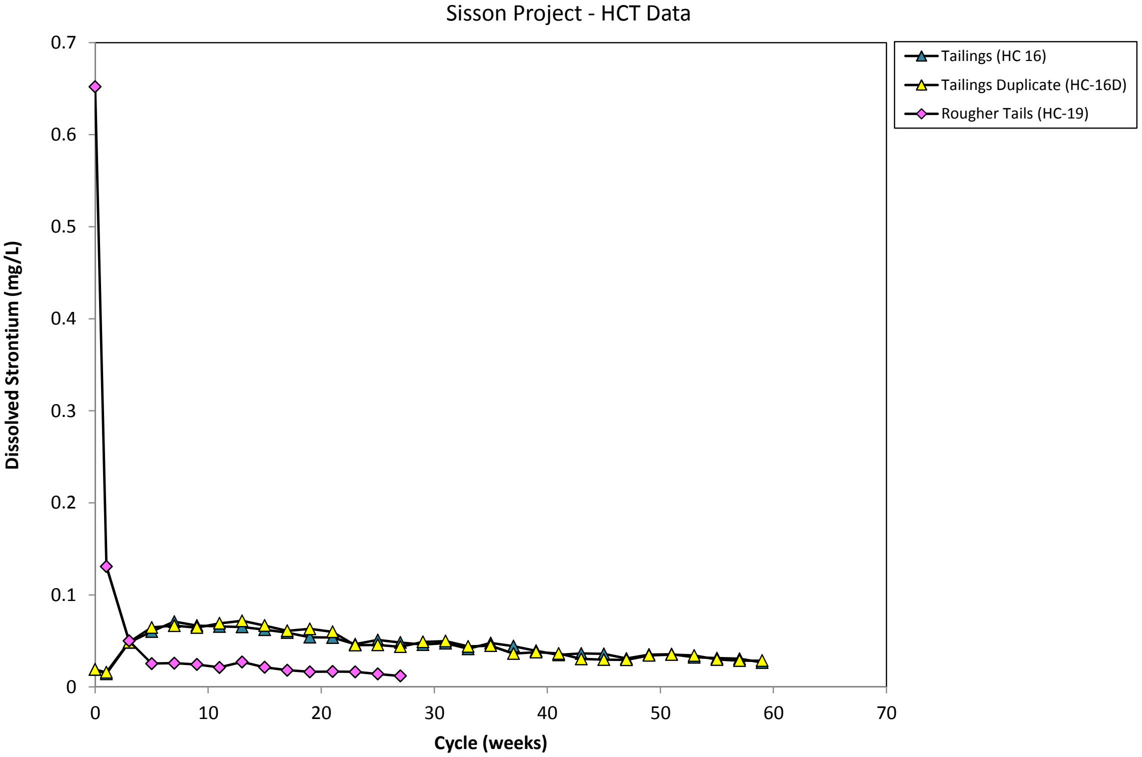

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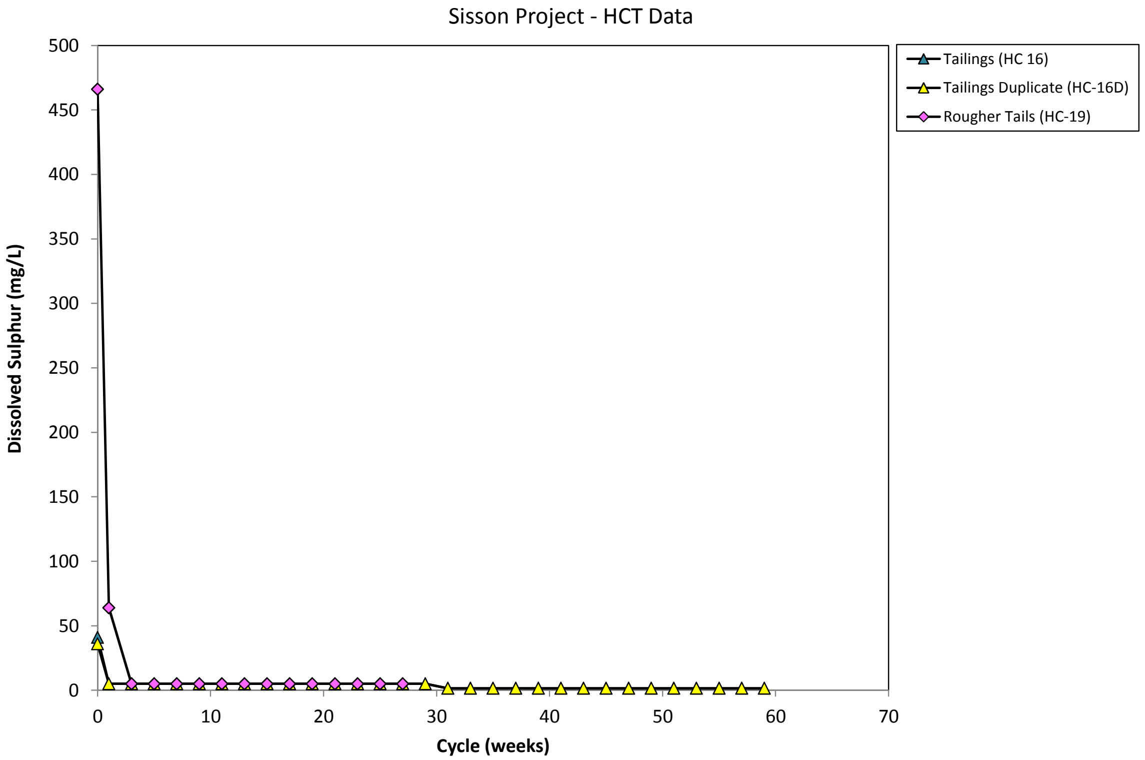

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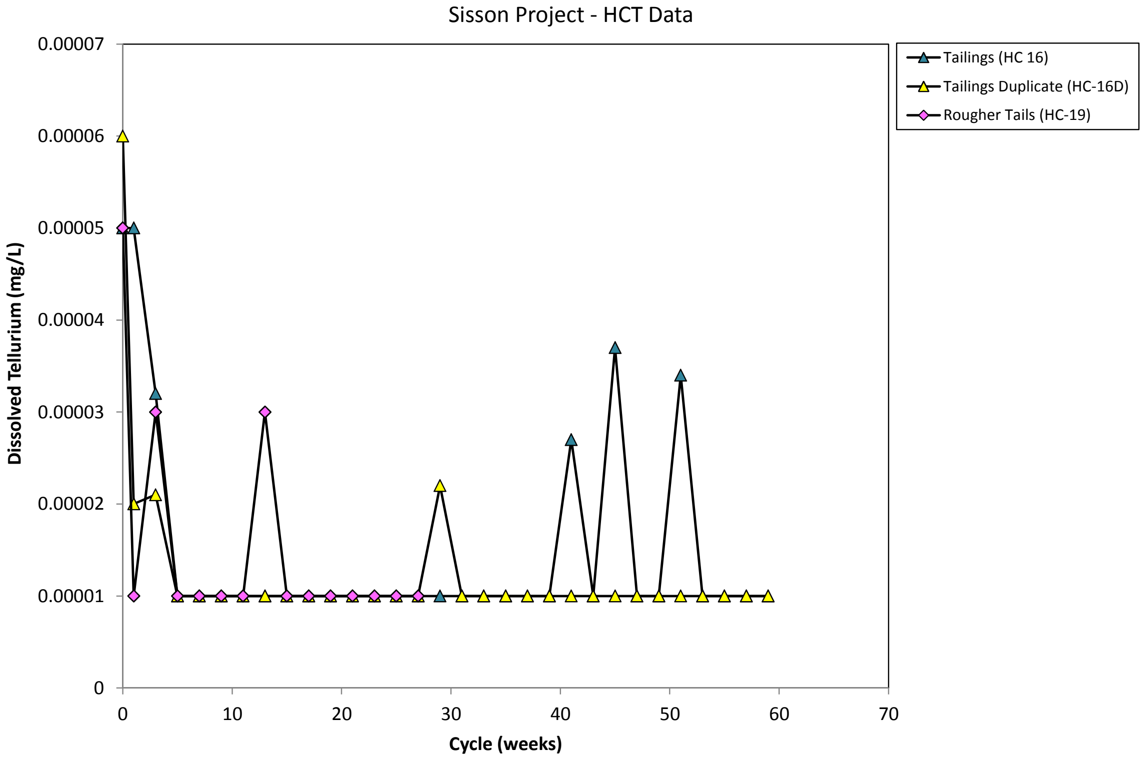

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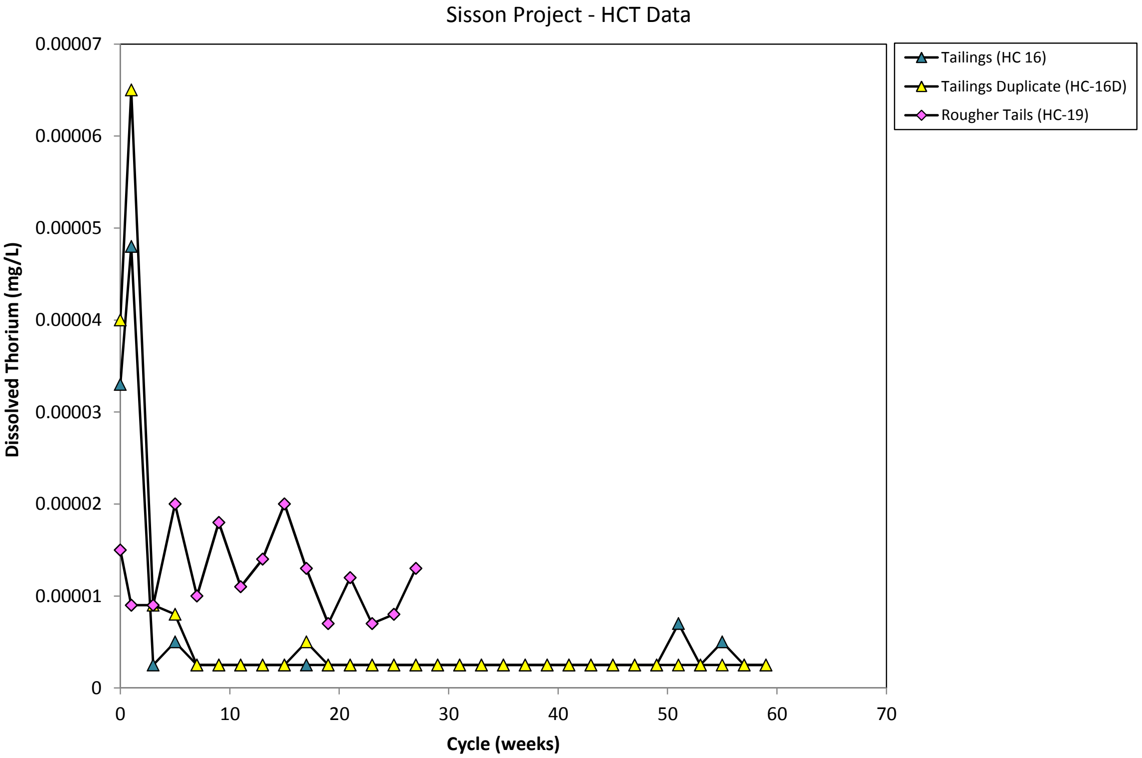

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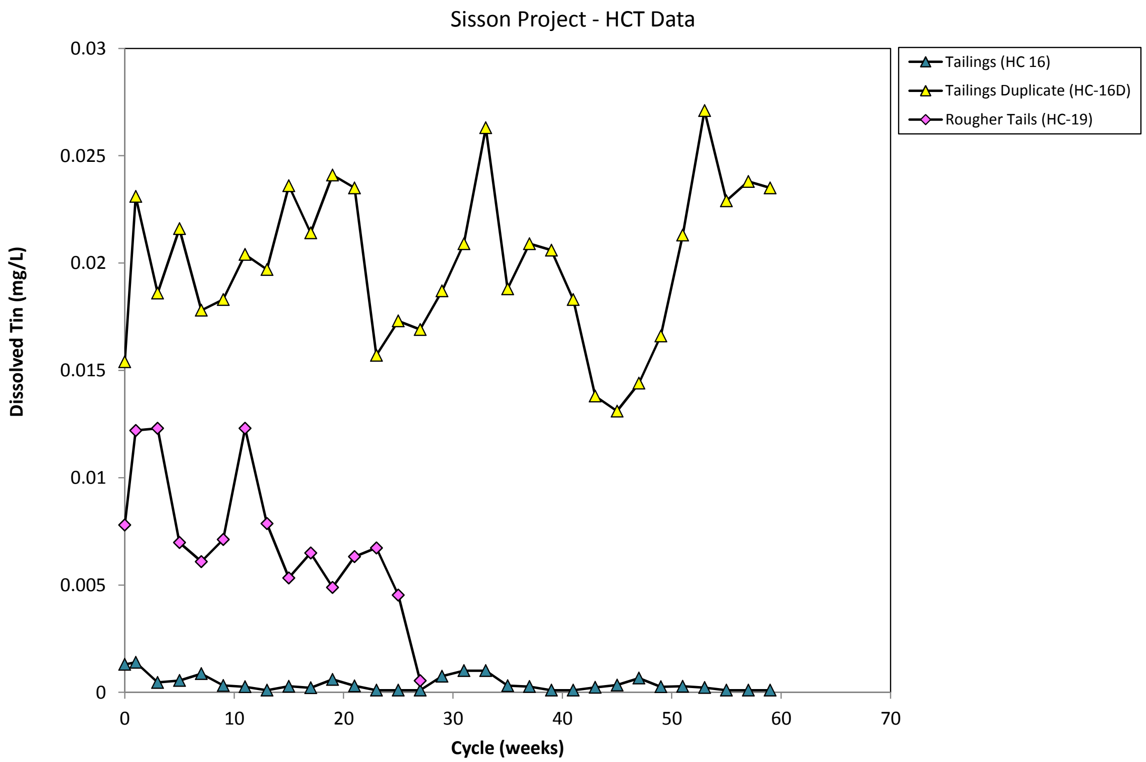

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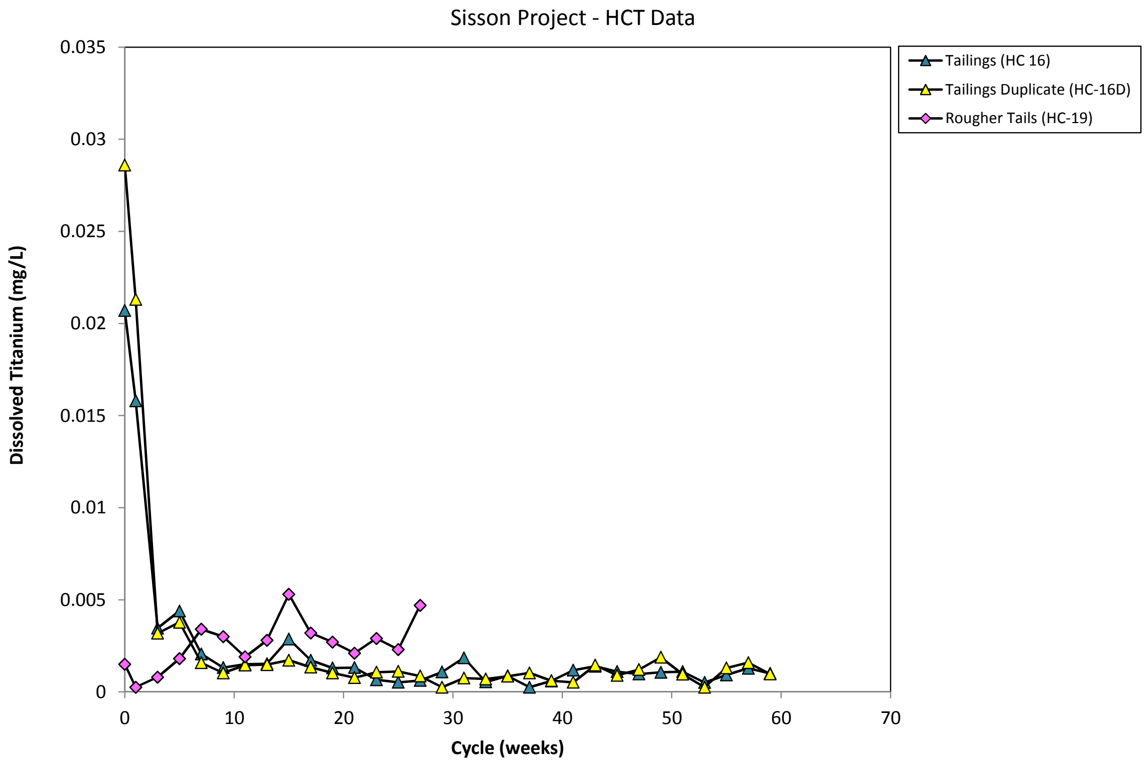

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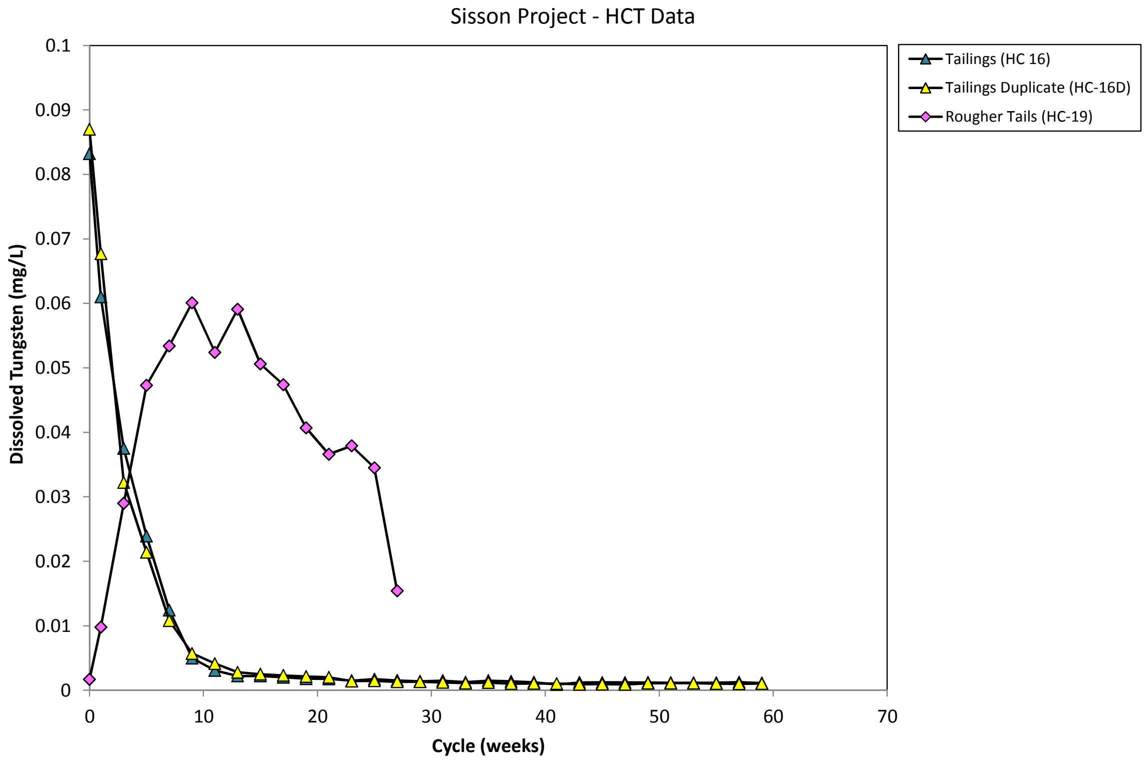

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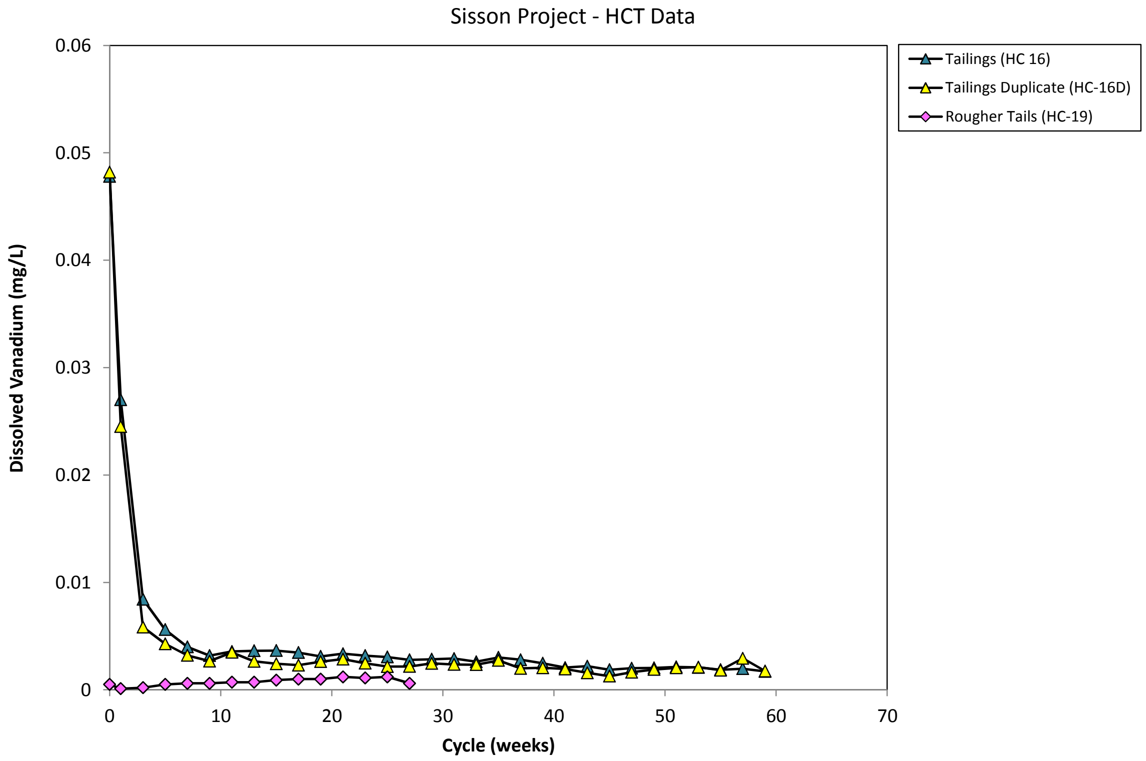

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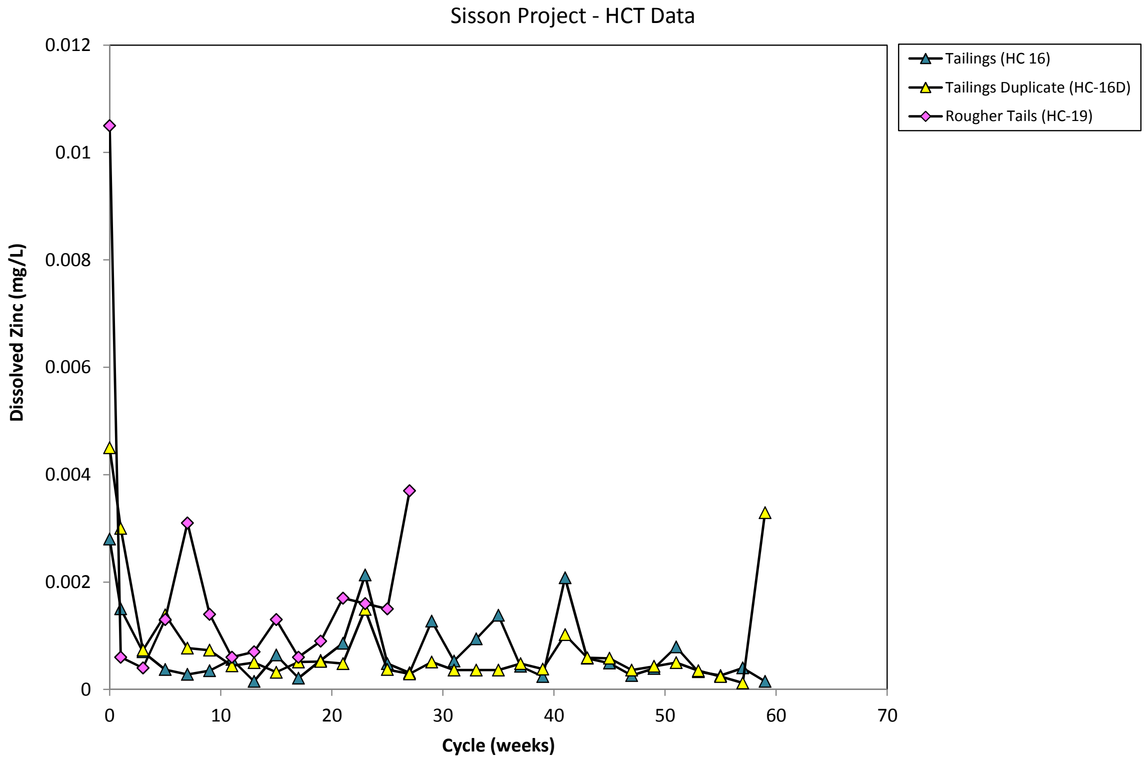

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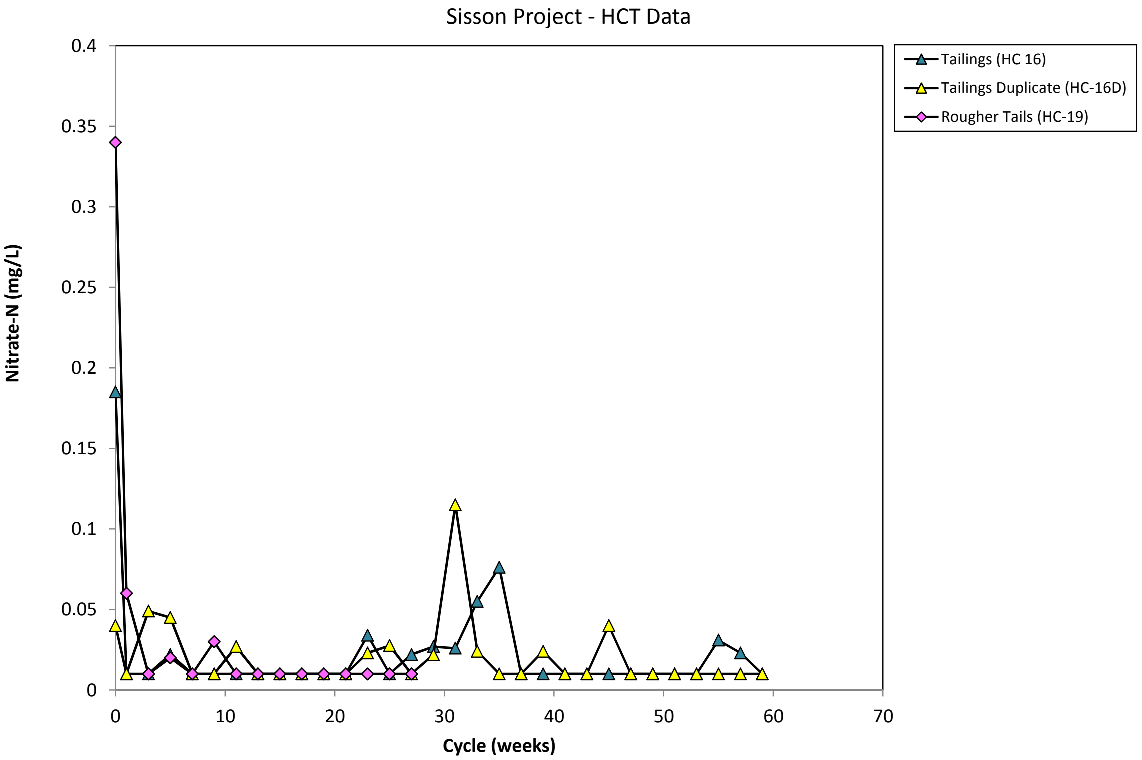

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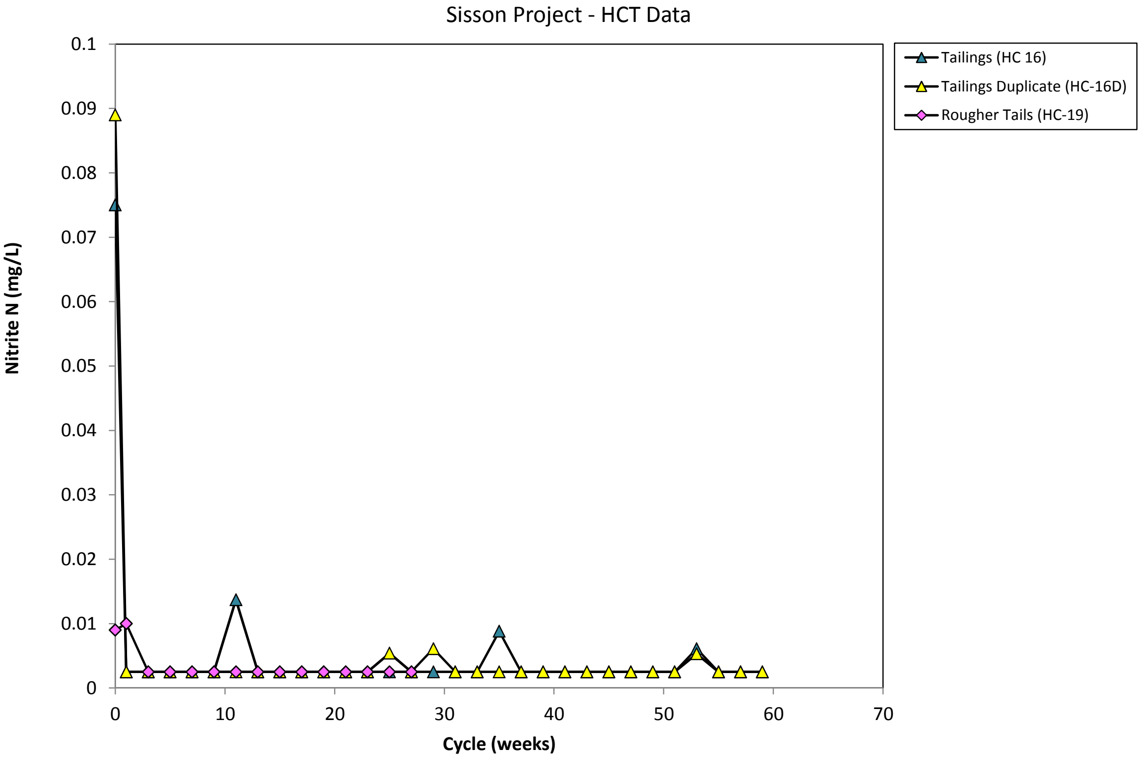

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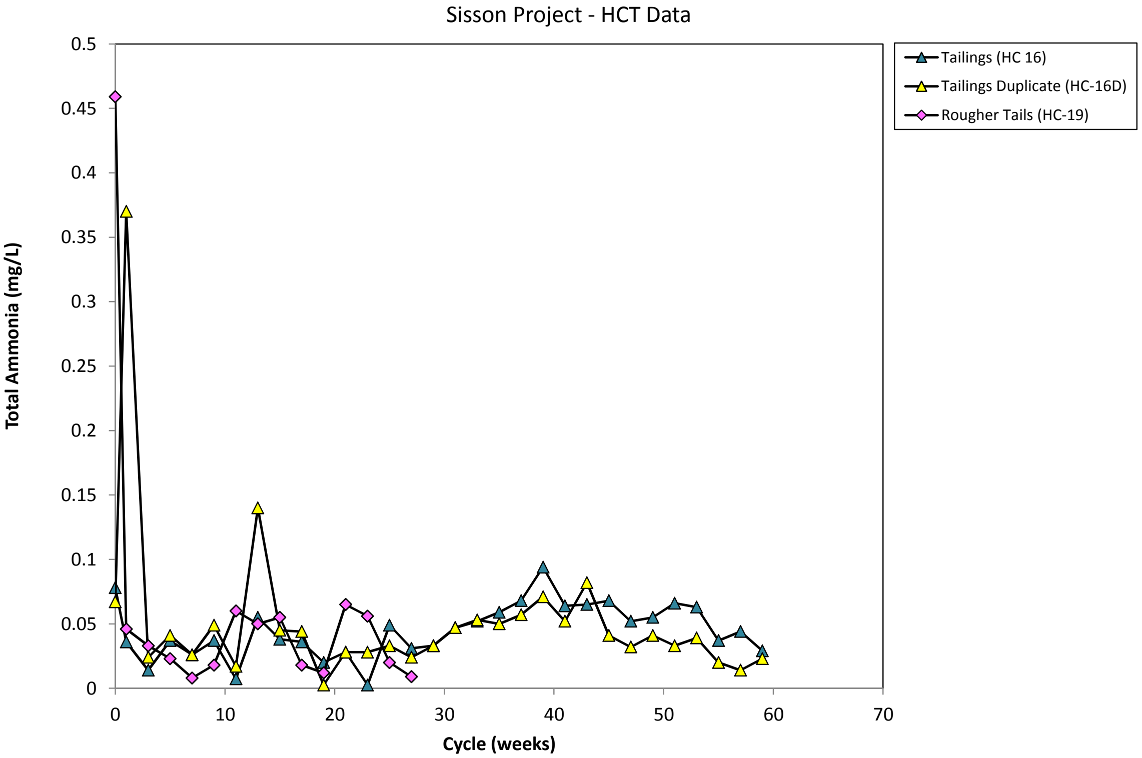

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E7: Process Water Ageing Test Results

Northcliff Holdings (Canada) Ltd.
Maxxam Job #: B331063 Client Project #: 1CN019.000
Report Date: 2013/06/11 Site Location: SISSON-SUPERNATANT RESIDUE TE

RESULTS OF CHEMICAL ANALYSES I

Maxxam ID		GE9857	
Sampling Date			
COC Number		08362438	
	UNITS	**ML13-397**	**RDL**
Parameter			
ORP	mV	40.0	
ANIONS			
Nitrite (N)	mg/L	0.0149	0.0050
Calculated Parameters			
Nitrate (N)	mg/L	<0.020	0.020
Misc. Inorganics			
Fluoride (F)	mg/L	6.20	0.020
Dissolved Hardness (CaCO3)	mg/L	7.91	0.50
Dissolved Organic Carbon (C)	mg/L		
Dissolved Oxygen (O2)	mg/L	5.2	1.0
Alkalinity (Total as CaCO3)	mg/L	936	0.50
Alkalinity (PP as CaCO3)	mg/L	378	0.50
Bicarbonate (HCO3)	mg/L	220	0.50
Carbonate (CO3)	mg/L	453	0.50
Hydroxide (OH)	mg/L	<0.50	0.50
Anions			
Dissolved Sulphate (SO4)	mg/L	131	0.50
Dissolved Chloride (Cl)	mg/L	97	0.50
Nutrients			
Nitrate plus Nitrite (N)	mg/L	<0.020	0.020
Physical Properties			
Conductivity	uS/cm	2240	1.0
pH	pH Units	10.1	
Ion Balance			
Anion Sum	meq/L	24.51	
Cation Sum	meq/L	23.55	
Ion Balance		0.961	

RDL = Reportable Detection Limit
EDL = Estimated Detection Limit
(1) RDL raised due to sample matrix interference.

Northcliff Holdings (Canada) Ltd.
Maxxam Job #: B331063 Client Project #: 1CN019.000
Report Date: 2013/06/11 Site Location: SISSON-SUPERNATANT RESIDUE TESTING

RESULTS OF CHEMICAL ANALYSES II

Maxxam ID		GE9857	
Sampling Date			
COC Number		08362438	
	UNITS	**ML13-397**	**RDL**
ANIONS			
Silica	mg/L	139	2.5
Misc. Inorganics			
Dissolved Hardness (CaCO3)	mg/L		
Dissolved Organic Carbon (C)	mg/L	17.5	0.50
Nutrients			
Ammonia (N)	mg/L	0.023	0.0050
Orthophosphate (P)	mg/L	0.0833	0.0050

RDL = Reportable Detection Limit
EDL = Estimated Detection Limit

Maxxam Job #: B331063
Report Date: 2013/06/11

MERCURY BY COLD VAPOR (WATER)

Maxxam ID		GE9857
Sampling Date		
COC Number		08362438
	UNITS	**ML13-397**
Elements		
Dissolved Mercury (Hg)	ug/L	<0.0020

RDL = Reportable Detection Limit
EDL = Estimated Detection Limit

Maxxam Job #: B331063
Report Date: 2013/06/11

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		GE9857
Sampling Date		
COC Number		08362438
	UNITS	**ML13-397**
Dissolved Metals by ICPMS		
Dissolved Aluminum (Al)	ug/L	1190
Dissolved Antimony (Sb)	ug/L	2.77
Dissolved Arsenic (As)	ug/L	206
Dissolved Barium (Ba)	ug/L	7.5
Dissolved Beryllium (Be)	ug/L	0.22
Dissolved Bismuth (Bi)	ug/L	<1.0
Dissolved Boron (B)	ug/L	<50
Dissolved Cadmium (Cd)	ug/L	0.097
Dissolved Chromium (Cr)	ug/L	4.5
Dissolved Cobalt (Co)	ug/L	1.29
Dissolved Copper (Cu)	ug/L	78.8
Dissolved Iron (Fe)	ug/L	2410
Dissolved Lead (Pb)	ug/L	11.8
Dissolved Manganese (Mn)	ug/L	48.9
Dissolved Mercury (Hg)	ug/L	
Dissolved Molybdenum (Mo)	ug/L	143
Dissolved Nickel (Ni)	ug/L	5.9
Dissolved Selenium (Se)	ug/L	1.24
Dissolved Silicon (Si)	ug/L	69400
Dissolved Silver (Ag)	ug/L	0.091
Dissolved Strontium (Sr)	ug/L	12.2
Dissolved Thallium (Tl)	ug/L	0.075
Dissolved Tin (Sn)	ug/L	<5.0
Dissolved Titanium (Ti)	ug/L	84.3
Dissolved Uranium (U)	ug/L	12.3
Dissolved Vanadium (V)	ug/L	170
Dissolved Zinc (Zn)	ug/L	17.5
Dissolved Zirconium (Zr)	ug/L	0.81
Dissolved Calcium (Ca)	mg/L	1.97
Dissolved Magnesium (Mg)	mg/L	0.728
Dissolved Potassium (K)	mg/L	16.3
Dissolved Sodium (Na)	mg/L	523
Dissolved Sulphur (S)	mg/L	124

RDL = Reportable Detection Limit
EDL = Estimated Detection Limit

ANALYSIS REPORT

DATE: May 31/13
PROJECT No: 4-03-1015

APPROVED BY: ______________________

CLIENT:

Maxxam Analytics
4606 Canada Way
Burnaby, B.C.
V5G 1K5

CONTACT: Ashley Leow/Bonnie Tsang

KEMETCO RESEARCH INC

COMMENTS: Analysis Results for Samples received May 15 & May 22/13

Sample Description	**Carbon Disulfide mg/L**	**Sulfate before Oxidation** mg/L	**Sulfate after Oxidation** mg/L	**Thiosalts as mg/L SO4**	Log #
Maxxam Project Northicliff Sisson					
ML13-397	<0.5	125	270	145	130515C-01

Appendix F: APT Residue

F1: XRD Results

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

Project: SRK – Sisson

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Dept. of Earth, Ocean & Atmospheric Sciences
The University of British Columbia
6339 Stores Road
Vancouver, BC V6T 1Z4

May 14, 2013

EXPERIMENTAL METHOD

The one sample of **Project SRK – Sisson** was reduced to the optimum grain-size range for quantitative X-ray analysis (<10 μm) by grinding under ethanol in a vibratory McCrone Micronising Mill for 7 minutes. Step-scan X-ray powder-diffraction data were collected over a range 3-80°2θ with CoKa radiation on a Bruker D8 Focus Bragg-Brentano diffractometer equipped with an Fe monochromator foil, 0.6 mm (0.3°) divergence slit, incident- and diffracted-beam Soller slits and a LynxEye detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA, using a take-off angle of 6°.

RESULTS

The X-ray diffractogram was analyzed using the International Centre for Diffraction Database PDF-4 and Search-Match software by Bruker. X-ray powder-diffraction data of the sample were refined with Rietveld program Topas 4.2 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinements are given in Table 1. These amounts represent the relative amounts of crystalline phases normalized to 100%. The Rietveld refinement plot is shown in Figure 1.

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

Mineral	**Ideal Formula**	**CaOH Residue**
Actinolite	$Ca_2(Mg,Fe^{2+})_5Si_8O_{22}(OH)_2$	7.3
Apatite	$Ca_5(PO_4)_3(OH,F,Cl)$	55.3
Calcite	$CaCO_3$	4.4
Clinochlore	$(Mg,Fe^{2+})_5Al(Si_3Al)O_{10}(OH)_8$	2.9
Diaspore?	$AlO(OH)$	0.8
Gehlenite	$Ca_2Al(AlSi)O_7$	4.8
Ilmenite	$Fe^{2+}TiO_3$	1.4
Jarosite	$K_2Fe_6^{3+}(SO_4)_4(OH)_{12}$	1.8
Molybdenite	MoS_2	0.4
Muscovite	$KAl_2AlSi_3O_{10}(OH)_2$	9.4
Plagioclase	$NaAlSi_3O_8 – CaAl_2Si_2O_8$	3.1
Portlandite	$Ca(OH)_2$	3.9
Quartz	SiO_2	0.7
Scheelite	$CaWO_4$	1.2
Villamaninite?	$(Cu,Fe)S_2$	2.6
Total		100.0

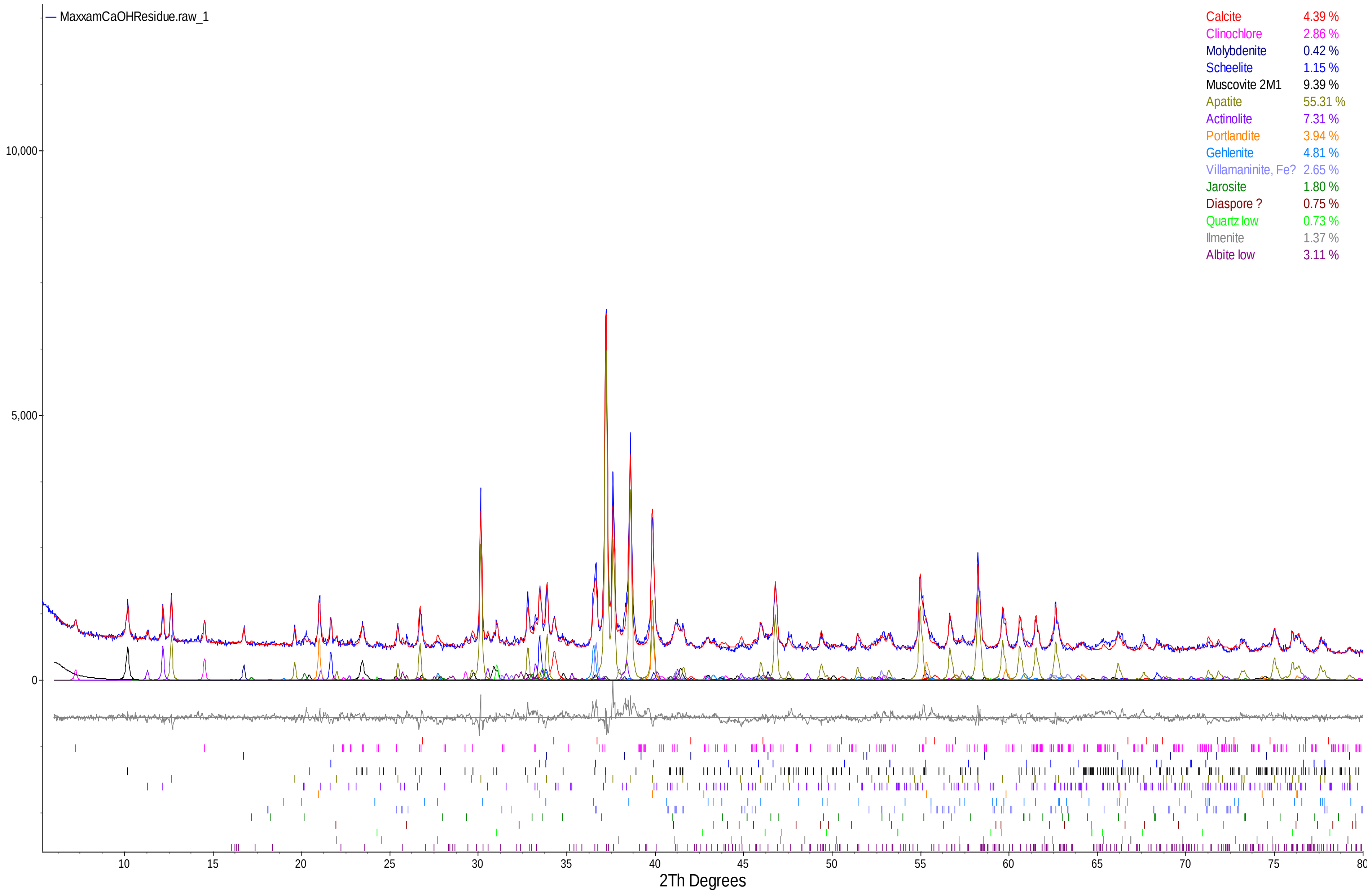

Figure 1. Rietveld refinement plot of sample **CaOH Residue** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below - difference between observed and calculated intensities; vertical bars - positions of all Bragg reflections). Coloured lines are individual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

F2: Acid Base Accounting Results

Appendix F2: Acid Base Account Results

Maxxam

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Client: Northcliff Holdings (Canada)

Table 1: ABA Test Results for project CaOH Residue

Maxxam Sample No	Sample ID	Paste pH	Paste EC	Total Carbon	CO2	CaCO3 Equiv.	Total S	Na2CO3 Extractable Sulphur	HCl Extractable Sulphur	Sulphide Sulphur (by diff.)	Acid Generation Potential	Mod. ABA Neutralization Potential	Fizz Rating	Net Neutralization Potential	Neutralization Potential Ratio
	Units	**pH Units**	**uS/cm**	**wt%**	**wt%**	**Kg CaCO3/T**	**wt%**	**wt%**	**wt%**	**wt%**	**Kg CaCO3/T**	**Kg CaCO3/T**	**N/A**	**Kg CaCO3/T**	**N/A**
GF9733	CAOH (APT) RESIDUE	12.8	28300	0.74	3.07	69.8	1.31	0.14	0.25	1.06	33.1	287.5	SLIGHT	254.4	8.7
GF9734	CAOH (APT) RESIDUE DUP	12.9	29600	0.71	2.63	59.8	1.25	0.32	0.23	1.02	31.9	282.5	SLIGHT	250.6	8.9
Detection Limits		*N/A*	*1*	*0.02*	*0.02*	*0.5*	*0.02*	*0.01*	*0.01*	*0.02*	*0.6*	*0.1*	*N/A*	*0.1*	*N/A*
Maxxam SOP #		*BBY0-00003*	*BBY0-0002*	*Acme*	*Acme*	*Calculation*	*Acme*	*Vison*	*BBY0-00010*	*Calculation*	*Calculation*	*BBY0SOP-00020*	*BY0SOP-0002*	*Calculation*	*Calculation*

Notes:

Lawrence, R.W. 1991. Acid Rock Drainage Prediction Manual

References:

Acid Generation Potential = Sulphide Sulphur (by diff.)*31.25

CaCO3 Equivalency = Carbonate Carbon (CO2)*(100/44)*10

Carbonate carbon (CO2; HCl direct method) by Leco done at Acme Labs.

Fizz Rating - Reference method used is based on NP method.

Net Neutralization Potential = (Modified ABA Neutralization Potential)-(Acid Generation Potential (S-S by diff))

Mod. ABA Neutralization Potential - MEND Acid Rock Drainage Prediction Manual, MEND Project 1.16.1b (pages 6.2-11 to 17), March 1991.

Neutralization Potential Ratio = (Neutralization Potential)/(Acid Generation Potential)

Paste EC - based on Field and Laboratory Methods Applicable to Overburdens and Minesoils, (EPA 600 / 2-78-054, March 1978).

Paste pH - Field and Laboratory Methods Applicable to Overburdens and Minesoils, (EPA 600 / 2-78-054, March 1978).

HCl Extractable Sulphur is based on a modified version of ASTM Method D 2492-02

Sulphide Sulphur = (Total Sulphur)-(Sulphate Sulphur)

Total sulphur, total carbon & carbonate carbon (CO2; HCl direct method) by Leco done at Acme Labs.

F3: Trace Element Analysis Results

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Client: Northcliff Holdings (Canada)

Maxxam Sample No	Sample ID	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Au	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg	Ba	Ti	B	Al	Na	K	W
	Units	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**%**	**ppm**	**ppm**	**ppb**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**%**	**%**	**ppm**	**ppm**	**%**	**ppm**	**%**	**ppm**	**%**	**%**	**%**	**ppm**
GF9733	CAOH RESIDUE	977	483	189	713	2.5	292	30.4	1750	4.45	163	39.2	64.5	164	269	8.1	3.2	44.3	49	30.3	>5.00	661	118	0.60	98	0.169	<20	1.19	2.57	0.28	>100
GF9734	CAOH RESIDUE DUP	996	467	183	702	2.5	277	28.8	1710	4.27	163	37.1	152	152	263	7.8	3.1	43.3	48	29.9	>5.00	640	106	0.58	95	0.153	<20	1.10	2.47	0.27	>100
QAQC																															
Duplicates																															
GF9734 Dup	CAOH RESIDUE DUP	959	480	186	700	2.6	280	28.9	1720	4.40	162	37.4	132	154	268	7.2	3.1	51.3	49	30.0	>5.00	636	113	0.59	91	0.188	<20	1.22	2.51	0.28	>100
Blanks																															
Method Blank										<0.01										<0.01	<0.001			<0.01		<0.001		<0.01	<0.001	<0.01	
Method Blank		<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.1	<1		<0.5	<0.1		<0.1	<1	<0.1	<0.1	<0.1	<2			<1	<1		<1		<20				<0.1
Method Blank													<0.5																		
Method Blank																															
Method Blank																															
Reference Material																															
REF OREAS45EA (%)										22.0										0.0300	0.0250			0.100		0.0820		0.0820	0.0180	0.0500	
True Values REF OREAS45EA										**22.65**										**0.032**	**0.029**			**0.095**		**0.106**		**3.32**	**0.027**	**0.053**	
Percent Difference										-3.0										-6.3	-13.8			5.3		-22.6		-97.5	-33.3	-5.7	
Reference Material																															
REF OREAS45EA PPM		1.20	675	13.2	28.0	0.300	370	51.1	406		8.10	1.70		9.30	3.00	<0.1	0.300	0.300	287			6.00	775		140						
True Values REF OREAS45EA PPM		**1.78**	**709**	**14.3**	**30.6**	**0.311**	**357**	**52**	**400**		**11.4**	**1.73**		**10.7**	**4.05**	**0.03**	**0.64**	**0.26**	**295**			**8.19**	**849**		**148**						
Percent Difference		-32.6	-4.9	-7.7	-8.5	-3.5	3.6	-1.7	1.5		-28.9	-1.7		-13.1	-25.9	-100.0	-53.1	15.4	-2.7			-26.7	-8.7		-5.4						
Reference Material																															
REF OREAS45EA PPB													50.6																		
True Values REF OREAS45EA PPB													**53**																		
Percent Difference													-4.5																		
Reference Material																															
REF DS9%										2.31										0.710	0.0790			0.620		0.103		0.930	0.0790	0.400	
True Values REF DS9%										**2.37**										**0.776**	**0.0844**			**0.6437**		**0.1239**		**0.9915**	**0.0905**	**0.3874**	
Percent Difference										-2.5										-8.5	-6.4			-3.7		-16.9		-6.2	-12.7	3.3	
Reference Material																															
REF DS9 PPM		12.3	104	127	304	1.80	40.0	7.50	573		24.8	3.20		6.20	67.0	2.50	5.10	6.30	37.0			12.0	119		322						3.00
True Values REF DS9 PPM		**12.74**	**104**	**126**	**322**	**1.69**	**39.5**	**7.6**	**586**		**27**	**2.9**		**7.15**	**76.1**	**2.3**	**4.84**	**6.78**	**40**			**15.7**	**119**		**308**						**3**
Percent Difference		-3.5	-0.1	0.6	-5.6	6.5	1.3	-1.3	-2.2		-8.1	10.3		-13.3	-12.0	8.7	5.4	-7.1	-7.5			-23.6	0.0		4.5						0.0
Reference Material																															
REF DS9 PPB													99.3																		
True Values REF DS9 PPB													**118**																		
Percent Difference													-15.8																		
Reference Material																															
REF SO18 %																															
REF SO18 %																															
REF SO18 %																															
True Values REF SO18%																															
Percent Difference																															
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Reference Material																															
REF W107 %																															
True Values REF W107%																															
Percent Difference																															
Detection Limits		*0.1*	*0.1*	*0.1*	*1*	*0.1*	*0.1*	*0.1*	*1*	*0.01*	*0.5*	*0.1*	*0.5*	*0.1*	*1*	*0.1*	*0.1*	*0.1*	*2*	*0.01*	*0.001*	*1*	*1*	*0.01*	*1*	*0.001*	*20*	*0.01*	*0.001*	*0.01*	*0.1*
Acme SOP #		*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*

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Maxxam Sample No	Sample ID	Hg	Sc	Tl	S	Ga	Se	Te	Overlimit P2O5	Overlimit W
	Units	ppm	ppm	ppm	%	ppm	ppm	ppm	%	%
GF9733	CAOH RESIDUE	<0.01	8.9	0.9	1.10	1	<0.5	0.6	18.65	1.128
GF9734	CAOH RESIDUE DUP	<0.01	9.6	0.8	1.09	<1	<0.5	0.7	19.14	1.135
QAQC										
Duplicates										
GF9734 Dup	CAOH RESIDUE DUP	<0.01	9.4	0.9	1.10	1	<0.5	0.6	18.64	1.138
Blanks										
Method Blank					<0.05					
Method Blank		<0.01	<0.1	<0.1		<1	<0.5	<0.2		
Method Blank										
Method Blank									<0.01	
Method Blank										<0.005
Reference Material										
REF OREAS45EA (%)					<0.05					
True Values REF OREAS45EA					**0.044**					
Percent Difference					-100.0					
Reference Material										
REF OREAS45EA PPM		<0.01	71.7	<0.1		12.0	1.10	0.20		
True Values REF OREAS45EA PPM		**0.34**	**78**	**0.072**		**11.7**	**2.09**	**0.11**		
Percent Difference		-100.0	-8.1	-100.0		2.6	-47.4	81.8		
Reference Material										
REF OREAS45EA PPB										
True Values REF OREAS45EA PPB										
Percent Difference										
Reference Material										
REF DS9%					0.140					
True Values REF DS9%					**0.1737**					
Percent Difference					-19.4					
Reference Material										
REF DS9 PPM		0.180	2.30	5.00		4.00	5.60	4.70		
True Values REF DS9 PPM		**0.225**	**2.8**	**5.48**		**4.84**	**5.4**	**5.0**		
Percent Difference		-20.0	-17.9	-8.8		-17.4	3.7	-6.0		
Reference Material										
REF DS9 PPB										
True Values REF DS9 PPB										
Percent Difference										
Reference Material										
REF SO18 %									0.80	
REF SO18 %									0.82	
REF SO18 %									0.74	
True Values REF SO18%									**0.83**	
Percent Difference									-3.6	
Percent Difference									-1.2	
Percent Difference									-10.8	
Reference Material										
REF W107 %										0.433
True Values REF W107%										**0.42**
Percent Difference										3.1
Detection Limits		*0.01*	*0.1*	*0.1*	*0.05*	*1*	*0.5*	*0.2*	*0.01*	*0.005*
Acme SOP #		*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*1DX*	*4A*	*7KP*

Table 3: WRA-ICP (Ba) Test Results for project CaOH Residue

Maxxam Sample No	Sample ID Units	Ba ppm
GF9733	CAOH RESIDUE	86
GF9734	CAOH RESIDUE DUP	93
QAQC		
Duplicates		
GF9734 Dup	CAOH RESIDUE DUP	85
Blanks		
Method Blank		<5
Reference Material		
ARD SPIKE SO18 ppm (6824280)		477
ARD SPIKE SO18 ppm (6824280)		484
True Values ARD SPIKE SO18 ppm		**515**
Percent Difference (6824280)		-7.4
Percent Difference (6824280)		-6.0
Detection Limits		*5*
Acme SOP #		*4A*

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Table 5: Hg-CVAF Test Results for project CaOH Residue

Maxxam Sample No	Sample ID Units	Hg on Solids mg/kg
GF9733	CAOH RESIDUE	<0.010
GF9734	CAOH RESIDUE DUP	<0.010
QAQC		
Duplicates		
GF9733 Dup	CAOH RESIDUE	<0.010
Blanks		
Method Blank		<0.010
Reference Material		
Hg Soil Spike 1 ppm (6794975)		0.845
True Values Hg Soil Spike 1 ppm		**1**
Percent Difference (6794975)		-15.5
Reference Material		
Hg Soil CRM SS-2 (6794975)		0.36
True Values Hg Soil CRM SS-2		**0.33**
Percent Difference (6794975)		10.0
Detection Limits		*0.010*
Maxxam SOP #		*BBY7SOP-00012*

Table 6: F G803 Test Results for project CaOH Residue

Maxxam Sample No	**Sample ID** **Units**	**Fluorine (F)** **%**
GF9733	CAOH RESIDUE	1.96
GF9734	CAOH RESIDUE DUP	2.01
QAQC		
Duplicates		
GF9733 Dup	CAOH RESIDUE	2.00
Blanks		
Method Blank		<0.01
Reference Material		
STD STSD-1		*0.09*
Ture Value STSD-1		**0.095**
Percent Difference		*-5.3*
Reference Material		
STD LIBF		*13.74*
Ture Value LIBF		**13.40**
Percent Difference		*2.5*
Detection Limits		*0.01*
Acme SOP #		*G803*

F4: SFE Results

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Maxxam Sample No	Sample ID	Sample Weight	Volume Used	pH	EC	SO4	Acidity to pH4.5	Acidity to pH8.3	Total Alkalinity	Bicarbonate	Carbonate	Hydroxide	Fluoride	Dissolved Chloride	Nitrate-N	Nitrite-N	Total Ammonia	Hardness CaCO3
	Units	N/A	N/A	pH Units	uS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
GF9733	CAOH RESIDUE	250	750	12.7	8860.0	317	<0.5	<0.5	3000	<5	240	870	4.90	1800	<2	<0.5	<0.05	1110
GF9734	CAOH RESIDUE DUP	250	750	12.8	8870.0	319	<0.5	<0.5	3000	<5	220	880	4.80	1890	<2	<0.5	<0.05	1120
QAQC																		
Duplicates																		
GF9733 Dup	CAOH RESIDUE															<0.5	<0.05	
GF9734 Dup	CAOH RESIDUE DUP						<0.5	<0.5					4.80					
Blanks																		
Method Blank		N/A	750															
Method Blank					0.8													
Method Blank							<0.5	<0.5										
Method Blank																<0.005		
Method Blank																	<0.005	
Method Blank									<0.5	<0.5	<0.5	<0.5						
Method Blank														<0.5				
Method Blank						0.7												
Method Blank													<0.01					
Method Blank																		
Reference Material																		
Acidity 8.3 W-Van (6839787)								103.2										
True Values Acidity 8.3 W-Van								**100**										
Percent Difference (6839787)								3.2										
Reference Material																		
Nitrite Water-Van (6844526)																0.0938		
True Values Nitrite Water-Van																**0.1**		
Percent Difference (6844526)																-6.2		
Reference Material																		
Ammonia-Van (6844549)																	0.0972	
True Values Ammonia-Van																	**0.1**	
Percent Difference (6844549)																	-2.8	
Reference Material																		
Alkalinity W 50-Van (6844760)									50.0									
True Values Alkalinity W 50-Van									**50**									
Percent Difference (6844760)									0.0									
Reference Material																		
Chloride W Kone-Van (6846501)														20.2				
True Values Chloride W Kone-Van														**20**				
Percent Difference (6846501)														1.0				
Reference Material																		
Sulphate W Kone- Van (6846507)						20.0												
True Values Sulphate W Kone- Van						**20**												
Percent Difference (6846507)						0.0												
Reference Material																		
Fluoride water (6856037)													0.52					
True Values Fluoride water													**0.5**					
Percent Difference (6856037)													4.0					
Reference Material																		
CRC ICPMS H2O 10 ppb (6857436)																		
True Values CRC ICPMS H2O 10 ppb																		
Percent Difference (6857436)																		
Detection Limits				N/A	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.01	0.5	0.02	0.005	0.005	0.50
Maxxam SOP #						BBY6SOP-000	BBY6SOP-0003	BBY6SOP-0003	-00026, BBY0S	P-00026, BBY0SO	P-00026, BBY0SO	P-00026, BBY0SO	BBY6SOP-00012	BBY6SOP-00011	BBY6SOP-00010	BBY6SOP-00010	BBY6SOP-00009	Calculation

Maxxam Sample No	**Dissolved Aluminum (Al) mg/L**	**Dissolved Antimony (Sb) mg/L**	**Dissolved Arsenic (As) mg/L**	**Dissolved Barium (Ba) mg/L**	**Dissolved Beryllium (Be) mg/L**	**Dissolved Bismuth (Bi) mg/L**	**Dissolved Boron (B) mg/L**	**Dissolved Cesium (Cs) mg/L**	**Dissolved Cadmium (Cd) mg/L**	**Dissolved Calcium (Ca) mg/L**	**Dissolved Chromium (Cr) mg/L**	**Dissolved Cobalt (Co) mg/L**	**Dissolved Copper (Cu) mg/L**	**Dissolved Lanthanum (La) mg/L**	**Dissolved Iron (Fe) mg/L**	**Dissolved Lead (Pb) mg/L**	**Dissolved Lithium (Li) mg/L**
GF9733	<0.25	<0.010	0	0	<0.0050	<0.0025	<25	<0.025	<0.0025	445	<0.050	<0.0025	0	<0.025	<0.50	0.0	<0.25
GF9734	<0.25	<0.010	0	0	<0.0050	<0.0025	<25	<0.025	<0.0025	448	<0.050	<0.0025	0	<0.025	<0.50	0.1	<0.25
QAQC																	
Duplicates																	
GF9733 Dup																	
GF9734 Dup																	
Blanks																	
Method Blank																	
Method Blank																	
Method Blank																	
Method Blank																	
Method Blank																	
Method Blank																	
Method Blank																	
Method Blank																	
Method Blank																	
Method Blank	<0.00050	<0.000020	0.000	<0.000020	<0.000010	<0.0000050	<0.050	<0.000050	<0.0000050	<0.050	<0.00010	<0.0000050	<0.000050	<0.000050	<0.0010	<0.0000050	<0.00050
Reference Material																	
Acidity 8.3 W-Van (6839787)																	
True Values Acidity 8.3 W-Van																	
Percent Difference (6839787)																	
Reference Material																	
Nitrite Water-Van (6844526)																	
True Values Nitrite Water-Van																	
Percent Difference (6844526)																	
Reference Material																	
Ammonia-Van (6844549)																	
True Values Ammonia-Van																	
Percent Difference (6844549)																	
Reference Material																	
Alkalinity W 50-Van (6844760)																	
True Values Alkalinity W 50-Van																	
Percent Difference (6844760)																	
Reference Material																	
Chloride W Kone-Van (6846501)																	
True Values Chloride W Kone-Van																	
Percent Difference (6846501)																	
Reference Material																	
Sulphate W Kone- Van (6846507)																	
True Values Sulphate W Kone- Van																	
Percent Difference (6846507)																	
Reference Material																	
Fluoride water (6856037)																	
True Values Fluoride water																	
Percent Difference (6856037)																	
Reference Material																	
CRC ICPMS H2O 10 ppb (6857436)	107	1.04	9.99	10.2	10.1	1.01		1.01	10.2		10.2	10.2	10.2	0.977	102	10.3	9.93
True Values CRC ICPMS H2O 10 ppb	**100**	**1**	**10**	**10**	**10**	**1**		**1**	**10**		**10**	**10**	**10**	**1**	**100**	**10**	**10**
Percent Difference (6857436)	7.0	4.0	-1.0	2.0	1.0	1.0		1.0	2.0		2.0	2.0	2.0	-2.3	2.0	3.0	-7.0
Detection Limits	0.00	0.000	0.000	0.000	0.000	0.0000	0	0.000	0.0000	0	0.00	0.0000	0.000	0.000	0.0	0.0000	0.00
Maxxam SOP #	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002

Maxxam Sample No	Dissolved Magnesium (Mg) mg/L	Dissolved Manganese (Mn) mg/L	Dissolved Phosphorus (P) mg/L	Dissolved Molybdenum (Mo) mg/L	Dissolved Nickel (Ni) mg/L	Dissolved Potassium (K) mg/L	Dissolved Rubidium (Rb) mg/L	Dissolved Selenium (Se) mg/L	Dissolved Silicon (Si) mg/L	Dissolved Silver (Ag) mg/L	Dissolved Sodium (Na) mg/L	Dissolved Strontium (Sr) mg/L	Dissolved Sulphur (S) mg/L	Dissolved Tellurium (Te) mg/L	Dissolved Thallium (Tl) mg/L
GF9733	<25	<0.025	<1.0	4	0	<25	0	<0.020	<50	<0.0025	1820	0	<5000	<0.010	<0.0010
GF9734	<25	<0.025	<1.0	3	0	<25	0	<0.020	<50	<0.0025	1850	0	<5000	<0.010	<0.0010
QAQC															
Duplicates															
GF9733 Dup															
GF9734 Dup															
Blanks															
Method Blank															
Method Blank															
Method Blank															
Method Blank															
Method Blank															
Method Blank															
Method Blank															
Method Blank															
Method Blank															
Method Blank	<0.050	<0.000050	<0.0020	<0.000050	<0.000020	<0.050	<0.000050	<0.000040	<0.10	<0.0000050	<0.050	<0.000050	<10	<0.000020	<0.0000020
Reference Material															
Acidity 8.3 W-Van (6839787)															
True Values Acidity 8.3 W-Van															
Percent Difference (6839787)															
Reference Material															
Nitrite Water-Van (6844526)															
True Values Nitrite Water-Van															
Percent Difference (6844526)															
Reference Material															
Ammonia-Van (6844549)															
True Values Ammonia-Van															
Percent Difference (6844549)															
Reference Material															
Alkalinity W 50-Van (6844760)															
True Values Alkalinity W 50-Van															
Percent Difference (6844760)															
Reference Material															
Chloride W Kone-Van (6846501)															
True Values Chloride W Kone-Van															
Percent Difference (6846501)															
Reference Material															
Sulphate W Kone- Van (6846507)															
True Values Sulphate W Kone- Van															
Percent Difference (6846507)															
Reference Material															
Fluoride water (6856037)															
True Values Fluoride water															
Percent Difference (6856037)															
Reference Material															
CRC ICPMS H2O 10 ppb (6857436)		10.3		1.07	10.3			10.7		1.02		10.3		1.02	1.06
True Values CRC ICPMS H2O 10 ppb		**10**		**1**	**10**			**10**		**1**		**10**		**1**	**1**
Percent Difference (6857436)		3.0		7.0	3.0			7.0		2.0		3.0		2.0	6.0
Detection Limits	0	0.000	0.0	0.000	0.000	0	0.000	0.000	0	0.0000	0	0.000	10	0.000	0.0000
Maxxam SOP #	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002

Maxxam Sample No	Dissolved Thorium (Th)	Dissolved Tin (Sn)	Dissolved Titanium (Ti)	Dissolved Tungsten (W)	Dissolved Uranium (U)	Dissolved Vanadium (V)	Dissolved Zinc (Zn)	Dissolved Zirconium (Zr)	Dissolved Mercury (Hg)	Anion Sum	Cation Sum	Balance %
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	N/A	N/A	N/A
GF9733	<0.0025	<0.10	<0.25	51	<0.0010	1	0	<0.050	<0.025	117	102	7.00
GF9734	<0.0025	<0.10	<0.25	23	<0.0010	0	0	<0.050	<0.025	119	103	7.40
QAQC												
Duplicates												
GF9733 Dup												
GF9734 Dup												
Blanks												
Method Blank												
Method Blank												
Method Blank												
Method Blank												
Method Blank												
Method Blank												
Method Blank												
Method Blank												
Method Blank												
Method Blank	<0.0000050	<0.00020	<0.00050	<0.000010	<0.0000020	<0.00020	<0.00010	<0.00010	<0.000050			
Reference Material												
Acidity 8.3 W-Van (6839787)												
True Values Acidity 8.3 W-Van												
Percent Difference (6839787)												
Reference Material												
Nitrite Water-Van (6844526)												
True Values Nitrite Water-Van												
Percent Difference (6844526)												
Reference Material												
Ammonia-Van (6844549)												
True Values Ammonia-Van												
Percent Difference (6844549)												
Reference Material												
Alkalinity W 50-Van (6844760)												
True Values Alkalinity W 50-Van												
Percent Difference (6844760)												
Reference Material												
Chloride W Kone-Van (6846501)												
True Values Chloride W Kone-Van												
Percent Difference (6846501)												
Reference Material												
Sulphate W Kone- Van (6846507)												
True Values Sulphate W Kone- Van												
Percent Difference (6846507)												
Reference Material												
Fluoride water (6856037)												
True Values Fluoride water												
Percent Difference (6856037)												
Reference Material												
CRC ICPMS H2O 10 ppb (6857436)		1.04	9.95		10.3	10.2	11.5		1.05			
True Values CRC ICPMS H2O 10 ppb		**1**	**10**		**10**	**10**	**10**		**1**			
Percent Difference (6857436)		4.0	-5.0		3.0	2.0	15.0		5.0			
Detection Limits	0.0000	0.00	0.00	0.000	0.0000	0.00	0.00	0.00	0.000			
Maxxam SOP #	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	BBY7SOP-00002	Calculation	Calculatio	Calculatio

Notes:

RDL raised due to sample matrix interference.

Calculated parameter based on the concentration of Nitrate plus Nitrite(NO2+NO3) minus Nitrite(NO2)
ve.

References:

Hardness = (Calcium*2.497) + (Magnesium*4.118)

Appendix G: Overburden Results

G1: Overburden Trace Element Data

Final Report
Activation Laboratories

Report Date: 12/9/2011

Analyte Symbol		W	Au	Ag	Cu	Cd	Mo	Mn	Pb	Ni	Zn	As	Ba	Be	Bi	Br	Ca	Co	Cr	Cs	Fe	Hf	Ga	Ge	Hg	In	Li	Mg	Na	Nb	Rb	Re	Sb	Sc
Unit Symbol		%	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppm	ppm
Detection Limit		0.0001	2	0.05	0.2	0.1	0.2	1	0.5	0.5	0.5	0.5	1	0.1	0.02	0.5	0.01	1	2	0.05	0.01	1	0.1	0.1	1	0.1	0.5	0.01	0.01	0.1	0.2	0.001	0.1	0.1
Analysis Method	**Material Type**	INAA	INAA	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	MULT INAA/TD-ICP-MS	MULT INAA/TD-ICP-MS	INAA	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	INAA	TD-MS	INAA	INAA	MULT INAA/TD-ICP-MS	INAA	INAA	TD-MS	TD-MS	INAA	TD-MS	TD-MS	TD-MS	INAA	TD-MS	TD-MS	TD-MS	INAA	INAA
924501	Till	< 0.0001	< 2	0.18	21.5	0.1	1.1	720	32.9	38.7	102	15.7	407	6.8	1.11	< 0.5	0.46	10	72	15.7	3.74	11	29	0.6	< 1	< 0.1	94.2	1	1.43	0.1	238	< 0.001	0.9	13.7
924502	Till	< 0.0001	< 2	0.11	16.2	< 0.1	< 0.2	497	27.5	29	76	10.9	364	5.3	0.7	4.7	0.49	11	54	12.7	2.98	12	22.7	0.6	< 1	< 0.1	88.7	0.76	1.71	0.1	230	< 0.001	0.8	12
924503	Till	< 0.0001	13	0.1	21.1	0.1	< 0.2	590	29.8	35.4	93.3	11.4	395	6.6	1.01	< 0.5	0.57	9	74	12.7	3.3	12	27.3	0.6	< 1	< 0.1	103	0.98	1.6	< 0.1	239	< 0.001	1.1	13.2
924504	Till	< 0.0001	< 2	0.06	8	0.3	2.2	1160	58	10.8	74.3	31.9	355	18.4	3.26	5.4	0.29	10	< 2	15.7	2.01	6	24.5	0.3	< 1	< 0.1	63.2	0.4	2.26	16.3	257	< 0.001	0.9	7.9
924505	Till	< 0.0001	< 2	0.16	14.1	0.2	0.9	582	33.6	15	70.6	43.8	408	5.3	0.87	10.4	0.66	9	26	11.8	3.02	16	22.7	0.4	< 1	< 0.1	61.8	0.64	2	8.6	209	< 0.001	1.6	11.9
924506	Till	< 0.0001	< 2	0.1	17.7	0.1	0.6	481	26.4	21.6	65.8	30.9	341	5.1	1.31	17.4	0.54	10	30	10.8	2.84	14	20.6	0.5	< 1	< 0.1	82.5	0.61	1.73	9.9	201	< 0.001	1.5	10.4
924507	Till	< 0.0001	< 2	0.12	14.1	0.2	1	775	31.8	12.8	83.5	52.7	349	4.9	0.94	< 0.5	0.56	8	< 2	12.7	3.79	23	23.9	0.3	< 1	< 0.1	54.4	0.61	2.01	4.3	106	< 0.001	1.9	15.8
924508	Till	< 0.0001	19	0.11	14.4	0.1	< 0.2	693	30.8	18	66.9	37.7	375	6.3	0.98	< 0.5	0.59	10	27	16.7	2.61	16	21.9	0.3	< 1	< 0.1	66.2	0.64	1.92	1.9	186	< 0.001	2	12.3
924509	Till	0.001	9	0.08	16.6	0.1	< 0.2	693	32.1	28.8	75.4	28.3	357	8.8	1.68	< 0.5	0.52	14	57	15.7	3.4	14	22.9	0.3	< 1	< 0.1	80.3	0.78	1.74	1.3	185	< 0.001	1.7	12.6
924510	#N/A	0.0343	< 2	0.48	332	0.8	117	832	29.1	30	123	69.6	436	6.2	25.1	< 0.5	1.27	12	46	17.3	4.55	8	21.2	0.7	< 1	0.3	41.5	0.98	1.49	12.5	262	< 0.001	2.9	13.1
924511	Till	< 0.0001	< 2	0.09	12.1	0.2	< 0.2	647	32.1	20.8	70.9	29	337	6.8	1.56	< 0.5	0.47	12	59	12.7	2.83	12	22.6	0.4	< 1	< 0.1	66.6	0.64	1.95	0.4	206	< 0.001	1.6	12.3
924512	Till	< 0.0001	< 2	0.09	7.4	0.1	< 0.2	820	40.2	9.6	64.6	15.8	314	9.8	1.95	5.6	0.59	6	< 2	11.8	2.47	21	26.4	0.7	< 1	< 0.1	59.4	0.43	2.44	3.9	218	< 0.001	1.4	11.8
924513	Till	< 0.0001	< 2	0.07	12.9	0.1	< 0.2	704	27.4	20.7	79.2	27.5	490	4.5	0.79	4.4	0.85	12	45	11.8	4.05	22	21	0.5	< 1	< 0.1	65.5	0.78	1.78	0.2	212	< 0.001	1.5	15.8
924514	Till	< 0.0001	< 2	0.06	11.9	< 0.1	< 0.2	603	28.2	18.6	70.8	33.6	456	4.3	0.99	7.3	0.81	11	34	11.8	3.18	21	20.7	0.6	< 1	< 0.1	58	0.74	1.89	< 0.1	194	< 0.001	1.9	13.7
924515	Till	< 0.0001	< 2	0.1	10.2	0.1	< 0.2	567	30.3	16.4	72.4	23.4	431	6.2	0.72	4.6	0.9	11	37	9.8	3.32	20	22.1	0.5	< 1	< 0.1	59.6	0.72	2.27	0.1	210	< 0.001	1	12.6
924516	Till	< 0.0001	< 2	0.1	12	0.1	< 0.2	640	28.7	15.8	69	26.7	421	5.3	0.83	< 0.5	1.23	7	45	13.7	3.37	26	21.2	0.5	< 1	< 0.1	54.5	0.72	2.11	0.5	190	< 0.001	1.4	13.9
924517	Till	< 0.0001	< 2	0.24	13	0.2	< 0.2	840	31	16.7	93.5	74	549	5.2	1.08	< 0.5	1.3	10	49	12.7	4.39	33	23.5	0.5	< 1	0.1	61.1	0.82	1.97	0.2	227	< 0.001	2.2	18.7
924518	Till	< 0.0001	< 2	0.09	9.4	0.2	< 0.2	531	28.8	15.2	64.1	42.3	380	4	0.76	8.6	0.59	9	38	9.63	3.47	21	19.8	0.8	< 1	< 0.1	45.7	0.58	1.95	9.4	103	< 0.001	1	14.1
924519	Till	< 0.0001	< 2	0.09	7.9	0.1	< 0.2	468	26.6	16.3	55.1	21.2	397	3.9	0.7	12.1	0.73	7	42	9	2.35	19	18.7	0.3	< 1	< 0.1	50.8	0.56	1.94	0.3	145	< 0.001	< 0.1	10.5
924520	Till	< 0.0001	< 2	0.09	10.3	0.1	< 0.2	655	30.4	17.2	69.7	22.4	555	3.9	0.56	6	0.68	9	41	16.7	3.61	22	18.8	0.4	< 1	< 0.1	48.9	0.69	1.81	< 0.1	147	< 0.001	1	15.2
924520DUP	#N/A	< 0.0001	< 2	0.08	11.4	0.1	0.2	702	33.8	18	78.9	21.7	591	4.5	0.62	7.2	0.72	9	49	13.7	3.76	24	21.8	0.4	< 1	< 0.1	52.2	0.76	1.81	0.2	173	< 0.001	1	15.2
924521	Till	< 0.0001	< 2	0.13	14.5	0.1	< 0.2	694	33.6	28.1	95	48.6	547	4.8	0.57	21.6	0.87	14	37	15.7	4.14	22	22.4	0.7	< 1	< 0.1	66.3	0.82	1.65	< 0.1	204	< 0.001	0.9	16
924522	Till	< 0.0001	< 2	0.14	10.9	0.2	< 0.2	249	25	21	60.6	27	247	2.2	0.84	17.1	0.25	11	76	9.8	4.4	13	21	0.3	< 1	< 0.1	55.7	0.56	1.05	< 0.1	100	< 0.001	0.7	10.1
924523	Till	0.0013	< 2	0.07	23.3	< 0.1	< 0.2	487	18.3	37.8	71	20.3	335	2.7	0.57	2.7	0.43	13	87	10.8	4.22	15	16.3	0.3	< 1	< 0.1	61.5	0.93	1.37	< 0.1	113	< 0.001	1.1	15.5
924524	Till	< 0.0001	15	0.13	18.3	0.4	< 0.2	561	33.4	22.5	133	22.9	451	5	1.32	< 0.5	0.98	10	50	9.79	3.21	22	18.5	0.6	< 1	< 0.1	51.2	0.75	2.16	< 0.1	175	< 0.001	0.8	13.5
924525	Till	< 0.0001	16	0.09	22.4	< 0.1	< 0.2	543	20.8	36	71.4	20.3	343	4.3	0.92	4.9	0.43	14	84	11.8	3.53	16	19	0.3	< 1	< 0.1	73.8	0.87	1.47	< 0.1	144	< 0.001	< 0.1	13.6
924526	Till	0.001	< 2	0.08	22.1	0.2	< 0.2	571	24.2	35.7	81.1	23.9	361	4.2	1.08	< 0.5	0.48	11	65	12.7	3.75	17	18.7	0.3	< 1	< 0.1	71.9	0.9	1.54	< 0.1	161	< 0.001	0.8	14.1
924527	Till	< 0.0001	< 2	0.12	15.8	0.3	< 0.2	676	42	22.4	103	27.1	364	4.8	0.98	11	1.56	< 1	47	9.36	3.48	23	19.4	0.8	< 1	< 0.1	42.3	0.91	2.3	1.4	116	< 0.001	0.9	14.8
924528	Till	< 0.0001	< 2	0.16	146	0.7	< 0.2	888	38.2	38.6	212	43.5	361	4.4	1.96	7.5	0.84	27	82	19.6	4.04	22	18.4	0.4	< 1	0.2	53.1	0.85	1.93	< 0.1	128	< 0.001	1.1	19.5
924529	Till	< 0.0001	< 2	0.09	12.8	0.2	< 0.2	663	29.1	20.1	69.1	29.6	378	4.6	1.06	< 0.5	0.89	14	57	9.46	3	20	16.9	0.3	< 1	< 0.1	48.6	0.72	2.07	0.2	159	< 0.001	0.8	13.5
924530	#N/A	< 0.0001	115	20.3	1290	36.8	19.9	2880	2670	49.6	3560	977	199	5.9	61.4	< 0.5	1.82	26	103	6.28	5.97	10	16.6	0.7	< 1	1.6	46.8	1.08	1.38	14.3	41.1	< 0.001	68.5	13.4
924531	Till	0.0005	< 2	0.06	11.4	< 0.1	1.2	237	20.6	15	35.9	20.1	198	2.9	0.5	73.1	0.34	< 1	58	6.41	3.21	13	13.1	0.5	< 1	< 0.1	32	0.42	1.16	0.6	71.5	< 0.001	0.6	9.1
924532	Till	0.0007	< 2	0.06	27.6	0.1	< 0.2	550	19.3	46.9	82.5	27	394	4	0.79	< 0.5	0.61	11	78	11.8	4.08	13	19	0.3	< 1	< 0.1	90.9	1.04	1.4	< 0.1	151	< 0.001	1.7	15.7
924533	Till	0.0007	< 2	0.6	216	1.6	0.8	1260	103	56	629	162	407	3.3	1.49	14	0.28	24	85	12.7	4.3	12	17.5	0.5	< 1	0.2	58.3	1	1.25	< 0.1	129	< 0.001	1.7	19
924534	Till	0.0007	< 2	0.17	45.3	1	0.4	697	71.8	43.4	380	63.4	414	4.2	0.95	19.5	0.86	17	65	15.7	4.35	19	21.1	0.6	< 1	0.1	55	1.05	1.54	4	147	< 0.001	0.9	17.7
924535	Till	< 0.0001	< 2	0.18	22.8	0.6	< 0.2	886	41.8	39.3	126	51.7	380	4.9	1.07	< 0.5	0.64	15	83	10.4	3.92	16	19.3	0.4	< 1	< 0.1	56.5	1.03	1.78	< 0.1	154	< 0.001	1	16.1
924536	Till	< 0.0001	< 2	0.25	34.1	0.4	< 0.2	617	61.9	36.3	124	189	376	2.5	1.14	13	0.58	14	87	6.64	3.32	18	14.9	0.3	< 1	0.5	43.7	0.78	1.53	< 0.1	99.9	< 0.001	1	11.5
924537	Till	0.001	< 2	0.3	21.9	0.5	0.8	795	73.5	27.3	129	46.7	332	5.9	2.61	5.4	0.62	10	62	13.5	3.63	14	20.4	0.4	< 1	< 0.1	52.4	0.86	1.98	2.2	140	< 0.001	< 0.1	14.8
924538	Till	< 0.0001	< 2	0.19	22.3	0.4	< 0.2	806	44.7	30.3	109	67.3	386	6.9	1.25	< 0.5	0.68	16	75	14.6	4.32	12	21.7	0.4	< 1	< 0.1	62.8	0.95	1.96	0.3	168	< 0.001	1.2	18.1
924539	Till	0.0009	18	0.11	18.2	0.3	< 0.2	513	29.2	29.5	77.6	30.8	361	5.2	0.72	< 0.5	0.8	15	84	12.5	3.73	21	19.1	0.4	< 1	< 0.1	55.4	0.89	1.86	< 0.1	134	< 0.001	0.8	15.2
924540	Till	< 0.0001	< 2	0.1	25.6	0.2	< 0.2	584	33.5	34.6	89.6	27.1	364	7.4	1.18	< 0.5	0.6	16	74	15.6	4.33	15	21.2	0.6	< 1	< 0.1	77.8	0.88	1.72	< 0.1	191	0.002	0.8	15.4
924540DUP	#N/A	< 0.0001	< 2	0.08	20.9	0.2	< 0.2	561	33.1	32.4	82.2	28.5	347	6.2	1.22	< 0.5	0.57	16	72	13.5	4.01	15	20.5	0.5	< 1	< 0.1	67	0.89	1.71	< 0.1	176	< 0.001	0.5	16
924541	Till	< 0.0001	22	0.16	19.7	0.4	< 0.2	796	47.9	25.7	99.4	78.3	399	8.7	1.15	< 0.5	0.69	14	45	14.6	3.96	16	23.2	0.7	< 1	< 0.1	52.7	0.9	2.08	1.1	195	< 0.001	< 0.1	15.6
924542	Till	0.0015	< 2	0.15	27.1	0.2	< 0.2	782	28.1	35.8	81.1	107	417	5.2	0.74	4.1	0.76	18	73	10.4	4.43	19	20.7	0.5	< 1	< 0.1	54.6	1.1	1.78	< 0.1	155	< 0.001	1.5	17.4
924543	Till	< 0.0001	< 2	0.11	20.2	0.2	< 0.2	790	29.3	24.8	64.6	46.3	374	4.7	0.54	7.4	1.34	17	59	8.36	3.57	26	17.9	0.6	< 1	< 0.1	43.6	0.88	2.23	2.4	150	< 0.001	0.6	15.4
924544	Till	0.0008	< 2	0.1	14.8	0.1	< 0.2	601	26.3	24.4	54.5	38.6	282	3.6	0.58	46.1	0.71	16	81	8.49	3.99	19	17.3	0.4	< 1	< 0.1	50.9	0.72	1.53	2	121	< 0.001	0.6	13.1
924545	Till	< 0.0001	< 2	0.14	10.4	0.4	< 0.2	900	42.3	18.5	77.5	50.8	366	5.2	0.71	7.2	0.94	15	36	11.4	3.62	35	20.8	0.6	< 1	< 0.1	46.1	0.66	2.25	0.3	179	< 0.001	1.4	17.5
924546	Till	< 0.0001	< 2	0.09	6.9	0.2	< 0.2	378	22.1	10.8	37.9	29.2	214	2.9	0.36	< 0.5	0.58	10	49	4.13	3.22	36	10.8	0.6	< 1	< 0.1	28.3	0.35	2.38	1.2	55.3	< 0.001	0.5	15.3
924547	Till	< 0.0001	< 2	0.08	11.3	0.1	< 0.2	582	25.9	24.1	49.1	27.8	266	3.1	0.62	50.8	0.43	9	71	8.54	3.2	16	16.9	0.3	< 1	< 0.1	56.9	0.62	1.51	2.1	101	< 0.001	< 0.1	11.5
924548	Till	< 0.0001	< 2	0.08	15.9	0.1	< 0.2	653	29.1	24.4	74.1	35.3	379	6.2	0.9	< 0.5	0.76	7	54	10.4	3.55	20	20.5	0.6	< 1	< 0.1	76.9	0.85	1.97	1.8	182	< 0.001	< 0.1	15
924549	Till	< 0.0001	< 2	0.09	12	0.2	< 0.2	561	36.9	18	75	27.6	434	6.4	0.98	< 0.5	1.19	9	49	8.73	3.36	33	20.8	0.8	< 1	< 0.1	56.1	0.77	2.29	0.9	184	< 0.001	0.9	15.6
924550	#N/A	0.0317	< 2	0.57	26.6	0.1	< 0.2	467	80.9	36.2	66.6	89.6	344	4	2.28	6.4	0.6	37	64	6.95	3.37	12	18.9	0.6	< 1	< 0.1	49.9	0.77	1.86	0.6	149	< 0.001	5.7	11.9
924551	Till	0.0013	< 2	0.08	10.5	0.1	< 0.2	546	29.9	16	67.1	23.2	476	4.8	0.67	< 0.5	1.22	9	44	9.85	3.85	37	18.4	0.7	< 1	< 0.1	55.8	0.73	2.26	3.3	176	< 0.001	1	15.5
924552	Till	< 0.0001	< 2	0.1	13.3	0.2	< 0.2	708	31.6	20.9	74.7	32.7	415	7.3	1	< 0.5	0.69	11	44	12.5	3.54	20	23.4	0.6	< 1	< 0.1	74.4	0.85	1.97	0.9	202	< 0.001	0.9	15.7
924553	Till	< 0.0001	< 2	< 0.05	13	0.1	< 0.2	624	26.2	21.3	70.5	33.8	425	6	0.68	8.2	0.72	10	50	12.5	3.74	17	20.7	0.8	< 1	< 0.1	73	0.82	2	2.8	195	< 0.001	1.1	14.6
924554	Till	< 0.0001	< 2	< 0.05	14	0.1	< 0.2	732	36.3	14.1	89	78.5	634	5.8	0.68	11.5	1.14	10	53	16.6	4.4	30	23.5	0.8	< 1	0.1	63.5	0.81	2.19	3.5	211	< 0.001	0.7	16.7
924555	Till	0.001	< 2	0.06	14.6	0.1	< 0.2	607	26	25.6	68.3	18.7	451	3.9	0.82	4.9	0.6	11	73	11.4	3.8	23	18.8	0.6	< 1	< 0.1	58.1	0.81	1.76	0.1	146	< 0.001	1.7	15.4
924556	Till	< 0.0001	< 2	0.19	11.3	0.5	< 0.2	572	127	13.1	111	147	447	4.7	1.76	< 0.5	0.86	11	45	8.4	2.59	27	18.4	0.8	< 1	< 0.1	42.9	0.56	2.45	4.1	159	< 0.001	0.6	12.3
924557	Till	0.001	< 2	0.17	13.5	0.2	0.3	646	54.7	20.5	86.7	57.4	349	5.3	1.41	< 0.5	0.5	13	62	9.69	3.56	25	19.7	1.2	< 1	< 0.1	70.1	0.64	1.96	4.1	105	< 0.001	1.5	14.9
924558	Till	< 0.0001	< 2	0.09	28.1	0.1	< 0.2	494	23.5	41	74.2	55.1	345	3.5	0.84	< 0.5	0.6	15	88	9.8	4.78	14	18.3	0.4	< 1	< 0.1	77.7	1.05	1.38	< 0.1	117	< 0.001	1.5	15.7
924559	Till	0.0026	< 2	0.24	9.5	0.2	< 0.2	767	52.6	12.5	68.7	103	337	11	3.28	< 0.5	0.36	7	28	9.8	2.25	7	23.8	0.3	< 1	< 0.1	31.1	0.35	2.84	5.9	148	< 0.001	1.4	8.7
924560	Till	0.0013	< 2	0.2	30	0.1	< 0.2	827	27.8	33.9	82.3	97.2	413	6.5	0.66	< 0.5	0.51	15	76	12.7	3.91	20	21.7	0.7	< 1	< 0.1	56.8	0.88	1.75	< 0.1	175	< 0.001	2.2	14.9
924560DUP	#N/A	0.0015	< 2	0.15	27.6	0.2	< 0.2	825	31.4	32.5	77.4	101	415	5.5	1.06	< 0.5	0.48	18	72	9.8	3.8	22	20.4	0.6	< 1	< 0.1	48.1	0.88	1.86	< 0.1	162	< 0.001	1.9	15.2
924561	Till	< 0.0001	< 2	0.09	23.3	< 0.1	< 0.2	608	19.2	37.8	70.3	21.1	371	3.8	0.6	< 0.5	0.53	13	88	9.47	3.63	19	17.9	0.4	< 1	< 0.1	66	0.93	1.47	< 0.1	132	< 0.001	< 0.1	13.6
924562	Till	0.0019	< 2	0.18	40.3	0.2	< 0.2	1430	39.5	39.3	94.7	77.1	509	6.1	0.82	< 0.5	0.59	20	77	11.8	4.24	26	22.9	0.9	< 1	< 0.1	48.8	0.97	1.64	< 0.1	176	< 0.001	1	16.5

Report Date: 12

Analyte Symbol	Se	Sn	Sr	Ta	Te	Th	Tl	U	V	Y	Zr	La	K	Ce	Pr	Nd	Sm	Eu	Gd	Dy	Tb	Ho	Er	Tm	Yb	Lu	Mass
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	g
Detection Limit	0.1	1	0.2	0.1	0.1	0.1	0.05	0.1	1	0.1	1	0.1	0.01	0.1	0.1	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
Analysis Method	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	MULT INAA/TD-ICP-MS	TD-MS	MULT INAA/TD-ICP-MS	TD-MS	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	INAA
924501	< 0.1	5	91.7	< 0.1	< 0.1	35.1	1.56	18.5	42	42.7	159	76.7	2.8	152	19.2	65.2	12.6	1.73	11.3	8.3	1.6	1.5	3.8	0.6	3.5	0.6	1
924502	< 0.1	6	85.8	< 0.1	< 0.1	41.3	1.29	14.4	36	34.1	173	87.9	2.93	175	20.9	68	12.7	1.27	10.7	7.5	1.5	1.2	3.1	0.4	2.8	0.4	2
924503	0.1	5	106	< 0.1	< 0.1	34.7	1.46	15.3	43	44.7	216	88.6	2.85	176	22.3	74.9	14.2	1.78	11.9	8.7	1.7	1.5	3.9	0.6	3.6	0.6	2
924504	< 0.1	11	51.4	1.8	< 0.1	29.4	1.89	13.8	28	28.2	178	55.8	3.35	114	12.6	40.7	8.3	0.94	7.7	6.2	1.2	1	2.6	0.4	2.4	0.4	2
924505	0.1	5	92.3	0.3	< 0.1	35.7	1.24	7.3	63	39.8	326	70.8	3.18	159	17.9	60.8	11.7	1.34	10	7.8	1.4	1.4	3.5	0.5	3.1	0.5	1
924506	< 0.1	8	83.4	< 0.1	< 0.1	31.3	1.08	7.3	53	28.6	265	61.2	2.76	128	15	49.6	9.6	1.11	8.4	6.2	1.2	1	2.6	0.4	2.3	0.4	1
924507	< 0.1	< 1	57.2	0.2	< 0.1	40.1	1.32	6	78	25	350	33	1.87	91.6	10.6	39.1	8.2	0.78	7.3	6	1.1	1.1	2.9	0.4	2.6	0.4	1
924508	< 0.1	3	90.2	< 0.1	< 0.1	34.1	1.18	8.6	59	38.4	220	70.8	2.16	154	17.5	58.5	10.9	1.33	9.3	7.5	1.4	1.3	3.3	0.5	2.8	0.4	1
924509	< 0.1	6	85.6	< 0.1	< 0.1	34.8	1.22	11.6	58	36.6	127	65.2	2.15	131	15.7	53.9	10.7	1.42	9.6	7.5	1.4	1.3	3.3	0.5	3.1	0.5	1
924510	< 0.1	26	122	0.8	< 0.1	15.7	2.75	5.3	87	27.8	130	43.7	2.71	88.3	10.8	38.3	7.6	1.22	6.8	5.5	1	1	2.9	0.4	2.6	0.4	2
924511	< 0.1	4	78.5	< 0.1	< 0.1	36.3	1.26	8.9	51	42.9	176	68.6	2.35	139	17.1	57.7	12	1.41	9.8	8	1.4	1.4	3.7	0.5	3.4	0.5	1
924512	< 0.1	5	80.7	0.4	< 0.1	68.9	1.49	13.4	33	47.9	191	114	2.83	235	29.3	101	19.5	1.38	16.1	10.6	2.2	1.7	4.3	0.6	4	0.7	1
924513	< 0.1	< 1	99.1	< 0.1	< 0.1	46.9	1.18	12.1	55	52.3	34	99.9	2.86	200	24.5	82.3	15.7	1.73	14.2	10.9	2	1.9	4.9	0.7	3.9	0.6	1
924514	< 0.1	< 1	99.1	< 0.1	< 0.1	36.2	1.13	7.8	42	46.4	27	76.2	2.76	163	18.9	64.8	12.7	1.47	11.3	9.1	1.7	1.6	4.3	0.6	3.7	0.6	1
924515	< 0.1	< 1	109	< 0.1	< 0.1	46.4	1.23	8.5	47	42.1	190	80	2.84	165	19.7	64.9	12.5	1.27	10.4	8.1	1.5	1.4	3.5	0.5	3.1	0.5	1
924516	< 0.1	< 1	108	< 0.1	< 0.1	39.7	1.12	8.2	58	63.2	165	80.5	2.9	172	20.9	74.6	15.9	1.69	14.6	12.1	2.2	2.2	6	0.9	5.2	0.8	2
924517	0.6	< 1	117	< 0.1	< 0.1	56	1.34	12.5	77	88.6	295	105	3.19	216	26.3	91.1	19	2.25	18.5	17.2	2.9	3.2	8.3	1.2	7.2	1.1	1
924518	< 0.1	3	69.1	0.4	< 0.1	39.8	1.06	5	59	31	385	43.5	1.65	99.4	12	41.9	9	0.99	8	6.4	1.2	1.2	3	0.4	2.9	0.5	1
924519	< 0.1	< 1	98.4	< 0.1	< 0.1	35	0.92	6.8	52	38.3	172	75.9	1.92	158	18.8	64.1	12	1.24	9.7	7.6	1.4	1.3	3.5	0.5	2.9	0.5	1
924520	< 0.1	< 1	91	< 0.1	< 0.1	53.2	0.97	9.8	58	50.4	83	106	2.13	204	25.8	88.2	17	1.88	14.5	10.8	2.1	1.9	4.9	0.7	4.1	0.6	1
924520DUP	< 0.1	< 1	105	< 0.1	< 0.1	51.9	1.08	12	71	59.1	58	117	2.48	233	30	104	19.1	2.08	15.9	11.7	2.1	2.1	5.4	0.8	4.6	0.7	1
924521	0.1	2	95.1	< 0.1	< 0.1	48.4	1.2	13.7	50	50.7	86	81.5	3.01	190	19.9	67.1	13.3	1.47	12.5	10.7	1.9	1.9	4.9	0.7	4.1	0.6	1
924522	< 0.1	< 1	62.1	< 0.1	< 0.1	17.9	0.65	3.7	28	16.5	17	35.3	1.29	71.9	8.6	27.9	4.9	0.79	3.8	3	0.5	0.6	1.6	0.2	1.5	0.3	1
924523	< 0.1	< 1	83.2	< 0.1	< 0.1	18.2	0.71	5.9	28	28.3	57	46.1	1.65	97.6	11.9	41.1	8	1.41	6.9	5.5	1	1	2.8	0.4	2.6	0.4	1
924524	< 0.1	1	122	< 0.1	< 0.1	36.7	0.96	7.9	34	40.1	200	82.7	2.91	159	20.1	67.6	12.7	1.58	11.1	8.5	1.6	1.5	3.6	0.5	3.2	0.5	2
924525	< 0.1	1	91.3	< 0.1	< 0.1	22.2	0.86	6.9	23	32.1	22	57	1.93	122	14.8	50.6	9.5	1.49	7.9	6.3	1.1	1.2	3.1	0.5	2.8	0.4	1
924526	< 0.1	< 1	83.6	< 0.1	< 0.1	25.1	0.93	7.9	24	33.4	147	57.1	2.27	118	14.4	50.1	9.9	1.51	8.9	6.9	1.3	1.2	3.2	0.5	2.8	0.5	1
924527	< 0.1	< 1	152	< 0.1	< 0.1	40.3	0.93	6.9	70	39.6	216	63.2	2.02	138	16.6	57.6	11.6	1.49	10.3	8.2	1.5	1.5	3.8	0.5	3.3	0.5	2
924528	< 0.1	2	107	< 0.1	< 0.1	30.8	1.15	7.1	58	50.4	253	73	1.81	161	19.9	68.8	13.7	2.07	11.8	10.6	1.8	2	5.4	0.8	4.9	0.7	1
924529	< 0.1	< 1	103	< 0.1	< 0.1	37.1	0.92	8.3	39	36.2	105	74.2	2.35	155	18.2	61.5	12.1	1.43	10.6	7.6	1.5	1.4	3.4	0.5	3	0.5	2
924530	2.4	18	185	0.9	0.6	13.3	1.11	3	98	19.4	202	19.2	0.87	50.3	5.5	20.1	4.4	0.86	4	3.8	0.6	0.8	2.1	0.3	2.2	0.3	1
924531	< 0.1	< 1	60.6	< 0.1	< 0.1	22.1	0.44	4	53	23.1	26	50.2	1.04	99.6	12.3	41.4	7.8	1.26	6.4	4.8	0.9	0.8	2.2	0.3	1.9	0.3	1
924532	< 0.1	< 1	102	< 0.1	< 0.1	21.4	0.84	7.5	28	34.8	40	52.7	2.14	107	13.4	45.4	8.6	1.52	7.7	6.6	1.1	1.3	3.4	0.5	2.8	0.4	1
924533	< 0.1	3	66.5	< 0.1	< 0.1	30.6	0.99	8.3	55	34.3	140	74.4	2.28	215	19.8	68.7	13.1	1.87	11.4	8.7	1.6	1.5	4	0.6	3.4	0.5	1
924534	< 0.1	2	92.2	0.2	< 0.1	46.7	1	13	74	47.1	223	74.7	2.21	181	19.5	67.6	13.3	1.68	11.6	10	1.8	1.8	4.9	0.7	4.1	0.6	1
924535	< 0.1	1	95.3	< 0.1	< 0.1	25.3	0.97	6.1	36	33.9	146	60.6	2.37	123	15.7	55.1	10.8	1.74	9.6	7.4	1.4	1.3	3.3	0.5	2.9	0.5	1
924536	< 0.1	< 1	108	< 0.1	< 0.1	24.3	0.61	4.5	23	23.8	43	53.7	1.76	118	12.9	43.5	7.6	1.14	6.3	4.8	0.9	0.9	2.4	0.3	2.1	0.3	2
924537	< 0.1	4	84.4	< 0.1	< 0.1	30.6	1.12	8.4	70	34	290	59.5	1.56	131	15.4	54	10.5	1.37	9.2	6.8	1.3	1.2	3.3	0.5	2.9	0.5	1
924538	< 0.1	3	89.1	< 0.1	< 0.1	27.2	1.13	7.9	65	34.1	161	57.6	1.99	115	14	47.3	9.2	1.42	8.6	7	1.3	1.2	3.3	0.5	2.9	0.4	1
924539	< 0.1	1	104	< 0.1	< 0.1	35	0.91	8.2	49	41.9	108	70.7	1.9	145	18.4	64.8	12.7	1.75	11	8.2	1.5	1.5	4	0.6	3.7	0.6	1
924540	< 0.1	4	92.3	< 0.1	< 0.1	30.2	1.1	11.9	35	38	81	66.8	2.5	136	16.7	56.2	11	1.6	9.4	7.8	1.4	1.4	3.7	0.5	3.2	0.5	1
924540DUP	< 0.1	3	87.8	< 0.1	< 0.1	28	1.03	11.6	31	35.9	71	63.8	2.43	130	15.8	55	11	1.67	10.1	7.6	1.4	1.3	3.5	0.5	3	0.5	1
924541	< 0.1	7	95.1	< 0.1	< 0.1	33	1.24	9.1	62	39.3	210	72.8	2.73	144	18.1	62.8	12.2	1.75	10.1	8	1.5	1.4	3.6	0.5	3	0.5	1
924542	< 0.1	1	97.5	< 0.1	< 0.1	37.1	0.98	8.6	51	38.5	178	82.4	2.33	170	21.9	76.9	15.1	2.27	12.8	8.6	1.7	1.5	3.8	0.5	3.3	0.5	1
924543	< 0.1	1	124	< 0.1	< 0.1	53.5	0.87	9.9	69	44.8	180	94.7	2.44	195	24	84.1	15.8	2.06	14	10.1	2	1.7	4.2	0.6	3.4	0.5	1
924544	< 0.1	4	86.5	< 0.1	< 0.1	37.3	0.75	6.6	63	30.3	257	65.4	1.7	140	17	57.8	11	1.5	8.9	6.6	1.3	1.2	2.9	0.4	2.4	0.4	1
924545	< 0.1	< 1	99.2	< 0.1	< 0.1	78.6	1.06	21	52	61.9	124	120	2.63	241	30.8	108	21.3	2.34	19	14.1	2.7	2.5	6.2	0.9	5.4	0.9	1
924546	< 0.1	< 1	61.6	< 0.1	< 0.1	68.8	0.58	4.6	39	24.6	358	42.5	1.06	102	12.2	42	8.5	0.79	7.3	5.6	1	1	2.6	0.4	2.1	0.3	2
924547	< 0.1	3	72.1	< 0.1	< 0.1	23.9	0.77	6	63	26.3	270	46.8	1.4	105	11.7	41.4	8.2	1.23	7.4	5.6	1	1	2.7	0.4	2.4	0.4	1
924548	< 0.1	1	93.3	< 0.1	< 0.1	38.2	1.08	12.2	59	45.1	179	77.9	2.47	159	20.1	69.2	13.9	1.63	12.2	9.4	1.7	1.7	4.4	0.6	3.9	0.6	1
924549	0.1	< 1	123	< 0.1	< 0.1	69.9	1.05	15.2	45	69.4	90	133	2.85	271	35	121	23	2.27	20	14.1	2.7	2.6	6.5	0.9	5.2	0.8	1
924550	< 0.1	1	89.1	< 0.1	< 0.1	22	1.11	7	53	35.1	144	44.8	2.04	96.6	10.9	39.3	7.5	1.03	6.5	6.2	1	1.3	3.8	0.6	4	0.6	2
924551	< 0.1	1	123	< 0.1	< 0.1	69.4	1.02	15.2	61	62.3	65	130	2.84	249	32.4	113	21.9	2.15	19.3	13.8	2.7	2.5	6.1	0.9	5.1	0.8	1
924552	< 0.1	7	93.6	< 0.1	< 0.1	40.2	1.24	13.7	53	47.8	205	93.4	2.72	190	24.2	81.1	15.5	1.87	13.2	9.8	1.8	1.8	4.5	0.7	3.8	0.6	2
924553	< 0.1	5	98.5	< 0.1	< 0.1	35.8	1.1	8.2	50	39.8	102	71.5	2.74	150	17.7	59.1	11.4	1.42	9.9	7.8	1.5	1.4	3.8	0.5	3.1	0.5	1
924554	< 0.1	< 1	114	< 0.1	< 0.1	67.8	1.32	13.4	66	67.5	82	147	3.2	298	37.2	132	24	2.16	20.5	14.2	2.7	2.6	6.6	0.9	5.3	0.8	1
924555	< 0.1	2	86.3	< 0.1	< 0.1	37.9	0.96	7.6	39	41.9	103	85.5	2.27	179	21.5	75.4	14.7	1.74	12.6	9.1	1.7	1.7	4.3	0.6	3.7	0.6	1
924556	< 0.1	1	100	0.2	< 0.1	55	1.13	8.6	42	43	128	95.9	2.92	218	25.3	87.6	16.8	1.62	14.4	9.5	1.9	1.7	4.4	0.6	3.7	0.6	2
924557	< 0.1	< 1	62.7	0.2	< 0.1	51	1.06	8.6	61	28.5	445	56.1	1.64	142	16.1	56.1	11	1.03	9.7	7	1.4	1.3	3.2	0.5	2.8	0.4	1
924558	< 0.1	1	97.8	< 0.1	< 0.1	19.8	0.79	6.2	62	31.7	173	51.6	1.53	106	13.5	48.3	9.1	1.61	7.7	6.2	1.1	1.2	3.2	0.5	2.8	0.4	1
924559	< 0.1	4	58.5	0.3	< 0.1	20.8	1.32	7.8	31	26.5	139	50.2	1.96	102	12.5	42.6	9	1.21	7.7	6	1.2	1	2.6	0.4	2.3	0.3	2
924560	< 0.1	1	88.6	< 0.1	< 0.1	41.2	1.04	9.3	43	39.6	170	107	2.6	218	27.7	95.4	18	2.54	14.1	8.8	1.8	1.5	3.5	0.5	2.7	0.4	1
924560DUP	< 0.1	2	84	< 0.1	< 0.1	43.3	1.08	12.2	32	37.5	153	110	2.57	219	28	99.5	18.9	2.78	16.3	9.4	2	1.5	3.5	0.5	2.8	0.5	1
924561	< 0.1	< 1	104	< 0.1	< 0.1	20.7	0.74	6.1	30	35.5	78	61.4	1.95	130	15.7	54.4	10.3	1.61	8.4	6.7	1.2	1.3	3.5	0.5	2.9	0.5	1
924562	< 0.1	3	82.5	< 0.1	< 0.1	59.8	1.2	12.9	54	48.5	220	163	2.6	330	43.2	152	28.5	4.39	23.3	13	2.9	2	4.3	0.5	3	0.5	1

Report Date: 12/9/2011

Analyte Symbol		W	Au	Ag	Cu	Cd	Mo	Mn	Pb	Ni	Zn	As	Ba	Be	Bi	Br	Ca	Co	Cr	Cs	Fe	Hf	Ga	Ge	Hg	In	Li	Mg	Na	Nb	Rb	Re	Sb	Sc
Unit Symbol		%	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppm	ppm
Detection Limit		0.0001	2	0.05	0.2	0.1	0.2	1	0.5	0.5	0.5	0.5	1	0.1	0.02	0.5	0.01	1	2	0.05	0.01	1	0.1	0.1	1	0.1	0.5	0.01	0.01	0.1	0.2	0.001	0.1	0.1
Analysis Method	**Material Type**	INAA	INAA	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	MULT INAA/TD-ICP-MS	MULT INAA/TD-ICP-MS	INAA	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	INAA	TD-MS	INAA	INAA	MULT INAA/TD-ICP-MS	INAA	INAA	TD-MS	TD-MS	INAA	TD-MS	TD-MS	TD-MS	INAA	TD-MS	TD-MS	TD-MS	INAA	INAA
924563	Till	0.0013	< 2	0.24	65.5	0.1	< 0.2	1450	33.5	39.5	91.6	61.8	396	5.6	0.78	< 0.5	0.31	19	67	17.6	4.53	17	21.4	0.6	< 1	< 0.1	62	0.97	1.37	< 0.1	173	< 0.001	1.8	15.7
924564	Till	0.0015	< 2	0.18	29.7	0.1	< 0.2	940	28.6	42.6	93.7	53.3	404	7.4	0.96	< 0.5	0.56	16	79	13.7	4.37	14	24.7	0.7	< 1	< 0.1	85.5	1.05	1.57	< 0.1	207	< 0.001	1.5	15.9
924565	Till	< 0.0001	< 2	0.16	46.5	0.1	< 0.2	996	32.5	42.8	107	63.6	396	8.3	1.37	< 0.5	0.47	18	78	25.5	5.02	11	27.8	0.8	< 1	< 0.1	88.2	1.09	1.57	< 0.1	212	< 0.001	1.7	17.9
924566	Till	< 0.0001	< 2	< 0.05	22	0.1	0.8	849	31.3	39.3	81.1	51.3	312	6.4	0.9	< 0.5	0.3	14	74	14.7	4.48	13	21.4	0.8	< 1	< 0.1	78.1	0.76	1.72	24.2	93.6	< 0.001	1.9	16.4
924567	Till	0.0005	15	0.18	20.9	< 0.1	0.4	477	22.9	44.9	67.5	67.6	328	4	1.01	9.7	0.35	16	118	18.6	3.97	16	18.8	0.6	< 1	< 0.1	70.4	0.96	1.25	< 0.1	124	< 0.001	1.5	12.8
924568	Till	< 0.0001	< 2	0.06	26	< 0.1	< 0.2	800	26.8	43.5	91.7	32	382	6.3	0.79	< 0.5	0.49	13	81	14.7	4.4	13	23.4	0.6	< 1	< 0.1	91.2	1.06	1.39	< 0.1	192	< 0.001	1.8	16.6
924569	Till	< 0.0001	< 2	0.14	51.7	0.2	< 0.2	1180	43.5	48.6	90.1	75.2	533	6.9	0.96	< 0.5	0.38	22	50	14.7	4.55	23	25.4	0.9	< 1	< 0.1	70.2	0.75	0.91	1.2	155	< 0.001	1.5	14.4
924570	#N/A	0.033	< 2	1.48	145	1.5	18.6	1550	224	66.8	250	71.3	212	3.8	3.02	< 0.5	5.32	33	87	37.3	7.53	3	23	1	< 1	0.3	46	3.1	1.92	0.2	248	< 0.001	1.8	26.3
924571	Till	< 0.0001	< 2	0.08	22.5	0.2	< 0.2	833	31.6	27.2	77.9	23.3	405	6.7	0.79	10.9	1.07	13	46	10.8	4.28	17	22.4	0.8	< 1	< 0.1	59.7	1.02	1.78	6.2	191	< 0.001	1.5	16.2
924572	Till	0.0011	< 2	0.22	14.1	0.1	0.7	605	28.5	20.6	57.7	18.4	345	7.5	0.89	< 0.5	0.68	11	48	8.82	2.61	18	19.6	0.9	< 1	< 0.1	66.3	0.61	2.13	0.2	187	< 0.001	1.5	10.9
924573	Till	< 0.0001	< 2	0.13	23.4	0.1	< 0.2	828	26	27.9	67.5	17.3	339	5	0.69	< 0.5	0.57	15	71	11.8	3.62	16	20.4	0.7	< 1	< 0.1	63	0.82	1.63	< 0.1	173	< 0.001	1.1	13.4
924574	Till	< 0.0001	< 2	0.17	12.8	0.2	< 0.2	1100	37.6	13.1	76.2	18.6	432	4.6	0.75	< 0.5	1.67	10	30	8.82	3.84	28	24.9	0.6	< 1	< 0.1	55.2	0.74	1.94	< 0.1	179	< 0.001	1.7	17.7
924575	Till	< 0.0001	< 2	0.23	11.3	0.2	0.4	707	35.3	14.1	77	31.6	332	4.4	0.87	7.6	0.57	11	31	10.8	3.58	25	23.9	0.8	< 1	< 0.1	53.3	0.59	1.94	3.2	90.2	< 0.001	1.6	15.8
924576	Till	< 0.0001	< 2	0.18	19.3	0.2	1.8	940	38.9	26.1	90	68	307	5	0.99	< 0.5	0.44	16	63	15.7	4.49	19	25.4	0.5	< 1	< 0.1	54.6	0.86	1.63	7.9	133	< 0.001	1.9	18.7
924577	Till	< 0.0001	< 2	0.11	40.2	< 0.1	< 0.2	710	10.5	16.1	47.9	12.1	143	9.8	0.42	< 0.5	1	14	28	22.5	3.48	16	24.8	0.5	< 1	< 0.1	28.5	0.86	0.85	< 0.1	152	< 0.001	0.7	26.3
924578	Till	< 0.0001	< 2	0.08	19.1	0.1	< 0.2	574	27.1	32.3	74.2	25.3	351	4.7	0.72	11.7	0.45	13	74	9.8	3.46	17	20.4	0.6	< 1	< 0.1	67	0.84	1.48	< 0.1	144	< 0.001	1.6	12.9
924579	Till	0.0006	< 2	0.08	12.5	0.2	0.5	1310	47	18.7	89.6	45.2	279	6.5	3.83	< 0.5	0.73	11	29	14.7	3.2	21	25.6	0.7	< 1	< 0.1	59.3	0.51	2.22	0.3	216	< 0.001	1.9	13.3
924580	Till	< 0.0001	< 2	< 0.05	6.8	0.2	1.2	1390	62	10.5	61.9	34.7	308	15	3.34	8.4	0.35	11	19	16.7	2.29	14	25.2	0.6	< 1	< 0.1	58.7	0.38	2.41	11.2	239	< 0.001	1.2	9.8
924580DUP	#N/A	< 0.0001	< 2	< 0.05	8.9	0.2	0.8	1520	60.6	13.1	71.2	39.6	326	17	3.22	5.6	0.36	13	15	15.7	2.83	15	26.9	0.7	< 1	< 0.1	74.8	0.44	2.33	14.2	226	< 0.001	1.8	10.8
924581	Till	< 0.0001	< 2	< 0.05	16.1	0.1	0.4	977	42.7	25.5	87.8	25.1	315	9.8	2.29	10.6	0.4	11	43	17.6	3.34	11	26	0.6	< 1	< 0.1	95.9	0.66	1.9	17.2	232	< 0.001	1.4	16.7
924582	Till	< 0.0001	< 2	< 0.05	9.1	0.1	< 0.2	458	42.4	11.9	86.6	18.8	262	14.7	1.89	< 0.5	0.6	9	31	24.5	2.82	11	33.2	0.7	< 1	0.1	101	0.55	2.18	15.1	240	< 0.001	1.5	12.8
924583	Till	< 0.0001	< 2	< 0.05	21.2	0.1	< 0.2	764	31.7	31.2	94.6	19.3	336	8	1.07	< 0.5	0.45	16	66	16.7	4.09	13	27	0.9	< 1	< 0.1	112	0.93	1.67	7.4	223	< 0.001	1.7	15.3
924584	Till	< 0.0001	< 2	< 0.05	18.4	0.1	< 0.2	492	23.8	32	68.7	22.9	267	3.8	0.66	14.1	0.24	15	63	13.7	3.89	13	18.5	0.6	< 1	< 0.1	89.5	0.71	1.41	12.9	109	< 0.001	1	12.9
924585	Till	< 0.0001	< 2	0.12	16.5	0.3	0.4	960	54.2	9	61.9	15.1	398	9.4	6.22	< 0.5	0.96	9	21	18.6	2.61	22	25.7	0.9	< 1	< 0.1	61.9	0.45	2.76	1.2	177	< 0.001	< 0.1	10.4
924586	Till	< 0.0001	20	< 0.05	13.3	0.1	< 0.2	776	37.6	19.3	68.8	19.7	306	8.7	1.66	< 0.5	0.71	11	69	25.5	3.27	16	23.9	0.7	< 1	< 0.1	85.6	0.64	1.93	0.4	172	< 0.001	1.9	13.3
924587	Till	< 0.0001	< 2	0.07	18.5	0.2	< 0.2	785	29.3	32.8	89.4	28.9	342	8.3	1.04	< 0.5	0.37	13	58	14.7	4.21	12	25	0.8	< 1	< 0.1	97.1	0.87	1.64	< 0.1	203	< 0.001	1.4	16
924588	Till	< 0.0001	< 2	< 0.05	13.6	0.1	< 0.2	696	31.5	24.6	73.5	22.6	311	6.4	0.87	7.9	0.39	13	59	14.7	3.84	13	23.8	0.9	< 1	< 0.1	76.6	0.72	1.87	1.7	190	< 0.001	1.3	13.3
924589	Till	< 0.0001	< 2	< 0.05	16.7	0.2	0.2	942	33.8	26.9	106	36.6	324	9	1.55	< 0.5	0.53	12	54	24.5	5.27	12	28.7	0.8	< 1	0.1	122	0.81	1.85	8.8	260	< 0.001	1.4	16.6
924590	#N/A	0.0383	< 2	0.38	29.2	0.4	< 0.2	491	36.7	18.9	97	109	256	4.2	1.67	4.5	1.78	42	41	5.8	3.33	9	18	0.7	< 1	0.1	44.8	0.85	2.16	0.6	135	< 0.001	1.6	14
924591	Till	< 0.0001	8	< 0.05	20.2	0.1	0.5	796	35.4	23.7	81.4	20.1	315	12.7	1.49	< 0.5	0.47	9	37	18.6	3.83	12	28.1	0.8	< 1	< 0.1	161	0.74	1.99	7.9	221	< 0.001	1.8	14.3
924592	Till	< 0.0001	< 2	0.09	13.4	0.1	< 0.2	289	37.6	11.5	68.4	14.2	266	20.1	1.84	< 0.5	0.73	6	21	21.6	2.23	13	29.4	0.8	< 1	< 0.1	104	0.48	2.61	6.9	211	< 0.001	1.3	12.5
924593	Till	< 0.0001	< 2	< 0.05	10.9	0.2	< 0.2	879	47.7	10.2	66.7	18	309	15.5	2.15	< 0.5	0.55	9	32	16.7	2.96	12	27.8	0.6	< 1	< 0.1	76.3	0.51	2.82	9.9	235	< 0.001	< 0.1	10.5
924594	Till	0.0018	< 2	< 0.05	13.4	0.1	< 0.2	508	32	19.6	78.9	25.4	319	11.3	1.11	< 0.5	0.52	8	42	16.7	3.39	14	26.6	1.2	< 1	< 0.1	98	0.64	2.17	17.6	264	< 0.001	1.4	12.7
924595	Till	< 0.0001	< 2	< 0.05	8.1	0.2	< 0.2	569	43.8	9.5	56.7	15	304	10.5	4	< 0.5	0.57	5	< 2	16.7	1.89	8	26.1	0.7	< 1	< 0.1	81.4	0.43	2.97	3.2	226	0.004	0.7	9.7
924596	Till	< 0.0001	20	< 0.05	9.5	0.2	0.5	677	35.2	14.5	60.2	22	309	10.2	1.27	< 0.5	0.34	7	33	9.8	2.4	14	23.9	0.7	< 1	< 0.1	74.1	0.51	2.53	26.2	162	< 0.001	1	10.5
924597	Till	< 0.0001	17	0.12	11.1	0.2	< 0.2	832	40	11.8	68.2	31.7	267	11.8	2.96	8.9	0.41	9	31	17.6	3.07	15	23.6	0.6	< 1	< 0.1	60.4	0.53	2.3	2.2	131	< 0.001	1.7	12.5
924598	Till	< 0.0001	< 2	0.12	4.5	0.3	< 0.2	879	48.9	4.2	57.5	32.2	237	14	2.96	< 0.5	0.41	< 1	< 2	19.6	2.2	14	28.2	0.7	< 1	< 0.1	65.3	0.32	2.93	15.4	184	< 0.001	< 0.1	10.8
924599	Till	< 0.0001	< 2	0.08	9.7	0.2	1.1	709	49.2	4.8	56.6	48.1	269	16.8	2.2	< 0.5	0.42	< 1	< 2	16.7	2.2	11	23.3	1	< 1	< 0.1	49.8	0.32	3.03	9.1	182	< 0.001	0.9	11.4
924600	Till	< 0.0001	< 2	0.05	4.9	0.2	< 0.2	969	54	6.7	72.6	39.2	327	32.6	3.17	< 0.5	0.47	9	25	17.6	2.92	12	28.8	1	< 1	< 0.1	63.3	0.48	2.76	17.9	210	< 0.001	1.3	12.6
924600DUP	#N/A	< 0.0001	< 2	< 0.05	4.8	0.2	< 0.2	1020	60.1	7.1	76.1	41	315	33.1	3.32	< 0.5	0.44	9	29	17.6	2.74	12	31.2	1.1	< 1	< 0.1	60.8	0.5	2.57	19.6	201	< 0.001	1.7	12.3
924601	Till	0.0008	< 2	0.1	21.4	0.1	< 0.2	594	27.1	31.9	84.1	28.2	356	8.3	1.5	< 0.5	0.41	11	70	15.7	3.79	13	23.6	0.9	< 1	< 0.1	103	0.85	1.72	0.2	193	< 0.001	1.3	14.5
924602	Till	< 0.0001	8	0.19	23.5	0.1	0.6	590	26.1	37	82.1	21.4	355	6.3	1.5	< 0.5	0.54	11	62	11.8	3.64	12	22.5	0.9	< 1	< 0.1	108	0.92	1.54	< 0.1	185	< 0.001	1.1	13.3
924603	Till	< 0.0001	< 2	1.16	259	1.2	< 0.2	738	166	37.3	335	259	340	2.9	6.91	5.6	0.34	27	87	7.9	4.59	16	14.8	0.8	< 1	1.5	43	0.9	1.4	< 0.1	104	< 0.001	2.7	12.4
924604	Till	0.0016	< 2	0.59	200	2	0.5	908	60.6	50.5	320	105	316	3.4	10.3	< 0.5	0.3	22	90	9.3	4.68	14	17.7	1.1	< 1	0.2	57.3	0.99	1.34	15.6	65.6	< 0.001	2	15.7
924605	Till	0.0026	< 2	2.01	442	1	1.1	826	210	42.4	254	291	396	5	59.4	11.5	0.46	26	76	12.7	6.44	17	19.5	0.8	< 1	1.2	57.7	0.81	1.37	0.2	134	< 0.001	4.9	16.3
924606	Till	0.001	< 2	1.02	73.7	0.2	0.4	730	44.5	31.6	85.6	40.5	307	2.7	6.42	16.8	0.64	19	73	9.8	3.6	16	14.2	0.6	< 1	0.1	53.5	0.89	1.51	< 0.1	93.4	< 0.001	1.4	12.3
924607	Till	< 0.0001	< 2	0.26	46.4	0.1	< 0.2	392	25.3	30.9	69.7	46.4	305	2.9	2.35	21.5	0.56	10	75	13.7	3.34	17	14.2	0.7	< 1	< 0.1	57.6	0.85	1.52	< 0.1	96	< 0.001	1.3	11.6
924608	Till	0.0035	< 2	0.28	302	1.3	< 0.2	2040	39.2	53.1	255	77.9	542	3.9	16.8	6.4	0.99	28	70	50	6.58	21	22.8	1.2	< 1	0.2	64.6	1.6	1.24	1.6	181	< 0.001	2.5	21.5
924609	Till	0.0031	< 2	0.24	305	0.3	< 0.2	827	50.3	40	124	34.1	360	3.1	23.1	8.6	0.97	22	81	18.6	4.82	16	17.3	0.9	< 1	0.2	41.8	1.33	1.42	< 0.1	111	< 0.001	1.5	14.5
924610	#N/A	< 0.0001	< 2	0.16	30.3	0.2	< 0.2	588	28.4	41.1	80.7	26	360	2.3	0.9	10.2	0.52	18	110	5.38	4.62	11	16.2	0.5	< 1	< 0.1	29.6	1.01	1.63	< 0.1	95.9	< 0.001	1.6	16.3
924611	Till	0.002	< 2	0.29	734	0.7	1.9	1440	72.1	46.3	205	49.6	390	4.4	10.7	4.6	0.96	43	74	29.4	4.85	13	20.4	1.2	< 1	0.2	65.3	1.29	1.23	0.4	198	< 0.001	2.7	16.8
924612	Till	0.0014	< 2	0.23	123	0.4	< 0.2	830	50.4	34.2	157	61.2	386	4.9	16.2	3.6	0.81	17	72	18	4.51	18	22.2	0.9	< 1	0.2	66.8	1.23	1.54	< 0.1	163	< 0.001	1.2	16.2
924613	Till	0.0026	< 2	0.22	93.7	0.4	< 0.2	707	38.2	28.7	117	43.4	372	4.4	8.92	3.2	0.95	16	71	15.6	4.02	18	19	1	< 1	0.2	60.6	1.06	1.85	< 0.1	165	< 0.001	0.8	15.6
924614	Till	0.0101	< 2	0.09	186	0.4	11.7	638	49.1	24.6	106	77.8	299	4.2	26.3	5.8	0.69	18	64	15.6	3.74	25	17.3	0.7	< 1	0.2	42	0.82	1.97	17.1	74.3	0.013	1.7	13.6
924615	Till	0.0265	< 2	0.27	858	0.4	2.3	1110	28.6	43.4	118	270	397	5.5	42.3	4.3	0.64	29	101	26.4	6.78	17	19.5	0.9	< 1	0.3	65.1	1.3	1.04	1.2	156	< 0.001	3	18.8
924616	Till	0.0115	< 2	0.16	368	0.6	0.5	1400	37.5	47	125	95.3	389	3.3	31.5	< 0.5	0.7	31	89	18	5.02	11	16.8	0.8	< 1	0.1	54.4	1.16	1.49	0.7	117	< 0.001	2.5	16.4
924617	Till	0.031	41	6.16	707	0.5	9.5	657	123	25	83.8	10200	530	5.8	116	15.1	0.26	26	90	24	10	11	26	0.9	< 1	3.2	51.8	0.97	0.53	6.2	229	< 0.001	2.8	19
924618	Till	0.027	< 2	0.92	687	0.5	0.9	1080	41.6	40.6	110	680	697	5.9	84.7	2.9	0.33	31	89	27.6	7.78	12	23.6	1.1	< 1	0.7	55.5	1.24	0.72	0.7	211	< 0.001	1.4	19.1
924619	Till	0.0162	< 2	0.29	397	0.4	< 0.2	871	33.3	41.3	110	206	478	3.8	38.9	5.2	0.47	26	95	16.8	5.46	16	18.1	0.9	< 1	0.3	43	1.09	0.97	< 0.1	150	< 0.001	2.2	16
924620	Till	0.0169	< 2	0.24	390	0.3	< 0.2	956	40	38.4	108	354	540	4	41.8	< 0.5	0.37	25	104	20.4	5.96	17	21	0.9	< 1	0.3	36.6	1.23	0.78	< 0.1	163	< 0.001	1.2	17.9
924620DUP	#N/A	0.0171	< 2	0.28	409	0.3	< 0.2	1000	36.6	41.8	112	356	567	4.3	39.3	< 0.5	0.4	23	95	21.6	6.12	16	20.3	1	< 1	0.3	41.4	1.23	0.73	< 0.1	178	< 0.001	1.3	18.4
924621	Till	0.0137	18	0.26	233	0.2	< 0.2	837	35.7	34.6	98.9	246	408	3.5	23	10.2	0.59	22	83	13.2	4.61	12	17.7	0.8	< 1	0.2	35.3	1.05	1.06	0.1	127	< 0.001	1.3	14
924622	Till	0.0081	< 2	0.25	192	0.4	< 0.2	850	35.9	34.9	105	121	437	3.8	15	< 0.5	0.77	23	83	13.2	4.33	24	16.7	1.1	< 1	0.2	43.4	0.98	1.6	0.1	141	< 0.001	1.3	15.4
924623	Till	0.0076	< 2	0.14	208	0.3	2.6	502	40.3	29.6	92	365	347	2.8	14.8	5.8	0.3	19	88	8.74	4.48	24	16.5	0.9	< 1	0.2	32.4	0.78	1.34	17.1	73.9	< 0.001	0.7	14.5
924624	Till	0.0051	< 2	0.2	174	0.6	< 0.2	923	39.5	36.2	118	266	421	3.6	12.8	< 0.5	0.52	25	84	9.76	5	20	16.9	0.9	< 1	0.2	36.9	1.03	1.24	2.8	109	< 0.001	2.6	15.7

Report Date: 12

Analyte Symbol	Se	Sn	Sr	Ta	Te	Th	Tl	U	V	Y	Zr	La	K	Ce	Pr	Nd	Sm	Eu	Gd	Dy	Tb	Ho	Er	Tm	Yb	Lu	Mass
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	g
Detection Limit	0.1	1	0.2	0.1	0.1	0.1	0.05	0.1	1	0.1	1	0.1	0.01	0.1	0.1	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
Analysis Method	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	MULT INAA/TD-ICP-MS	TD-MS	MULT INAA/TD-ICP-MS	TD-MS	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	INAA
924563	< 0.1	2	60.3	< 0.1	< 0.1	33.4	1.25	9.3	40	35.1	137	85.7	2.61	174	21.4	77.5	14.6	2.6	12.7	8.5	1.7	1.4	3.5	0.5	2.7	0.4	1
924564	< 0.1	4	94.4	< 0.1	< 0.1	31.9	1.24	9	47	39.8	164	76.6	2.76	154	19.1	65.6	12.3	1.84	10.6	8	1.5	1.5	3.7	0.5	3	0.5	1
924565	< 0.1	4	83.6	< 0.1	< 0.1	33.8	1.47	11.1	48	32.9	141	70.7	2.76	146	18.6	64	12.1	1.82	9.9	6.9	1.3	1.3	3.3	0.5	2.9	0.4	1
924566	< 0.1	9	50.9	2.7	< 0.1	35.2	1.15	7.5	76	17.3	252	28.7	1.56	70.8	8.8	32.4	6.9	0.9	6.2	4.6	0.9	0.8	2.2	0.3	2	0.3	1
924567	< 0.1	1	71.7	< 0.1	< 0.1	20.5	0.86	7.4	41	25.2	158	47.1	1.74	114	12.3	42.8	8.3	1.45	7.2	5.4	1	1	2.8	0.4	2.7	0.4	1
924568	< 0.1	2	90.5	< 0.1	< 0.1	28.3	1.15	8.7	46	37.3	55	68.3	2.49	138	17	57.4	10.8	1.6	9.5	7.6	1.4	1.4	3.8	0.5	3.1	0.5	1
924569	< 0.1	3	70.9	< 0.1	< 0.1	57.1	1.2	25.8	61	39.5	233	164	2.36	344	43.2	155	28.9	3.96	23.7	12.3	2.8	1.8	3.6	0.4	2.4	0.4	1
924570	< 0.1	13	603	< 0.1	< 0.1	4.3	2.16	1.5	128	19.8	19	21.4	1.57	45.5	5.8	22.8	4.7	1.38	4.5	3.8	0.6	0.7	2	0.3	1.6	0.2	2
924571	< 0.1	5	100	0.3	< 0.1	36.8	1.15	12	79	42.6	303	76.6	2.78	165	19.3	64.2	12.3	1.71	10.6	8.5	1.6	1.6	4.3	0.6	3.5	0.5	1
924572	< 0.1	4	97.6	< 0.1	< 0.1	52.2	1.12	14.1	30	39.5	225	100	2.66	199	24	80.2	15.2	1.55	12.8	8.6	1.7	1.6	4	0.6	3.2	0.5	1
924573	< 0.1	4	86.9	< 0.1	< 0.1	29.9	1.09	9.2	41	34.4	188	65.5	2.35	136	16	55.4	10.7	1.66	9.9	7.5	1.4	1.4	3.7	0.5	3.1	0.5	1
924574	0.6	< 1	143	< 0.1	< 0.1	45.8	1.08	24.2	78	73.2	270	98.5	2.64	196	24.2	85.4	17	2.38	15.9	14.5	2.5	2.9	7.7	1.1	6.3	0.9	1
924575	< 0.1	< 1	59.8	< 0.1	< 0.1	65.7	1.31	7.8	66	32.2	594	60.2	1.54	144	18.9	69.8	13.9	1.07	11.9	8.4	1.6	1.4	3.8	0.6	3.4	0.5	1
924576	< 0.1	3	55.9	< 0.1	< 0.1	40.7	1.16	9.7	74	48.7	350	92.7	1.56	194	24.1	84.8	16.7	2.08	15.2	10.8	2	2	5.2	0.7	4.1	0.6	1
924577	< 0.1	< 1	64.2	< 0.1	< 0.1	17.5	1.39	6	109	67.4	198	45.4	2.15	69.3	12.8	49.9	11.8	3.23	12.6	12.1	2	2.4	6.5	0.9	5	0.8	1
924578	< 0.1	3	80.3	< 0.1	< 0.1	30	0.99	9.3	35	33.8	73	67.6	2.04	140	17.2	61	11.7	1.64	10.5	7.3	1.4	1.4	3.6	0.5	3	0.5	1
924579	0.1	< 1	70	< 0.1	< 0.1	44.1	1.4	19	41	59.5	66	83.2	2.95	189	21.9	75.2	15.3	1.39	13.9	12.1	2.2	2.3	5.9	0.8	4.5	0.7	1
924580	< 0.1	9	58.7	1.2	< 0.1	72.6	1.69	25.5	27	43.1	211	95	3.41	232	24	80.8	16.7	1.38	14.5	9.7	1.9	1.7	4.2	0.7	4	0.6	1
924580DUP	< 0.1	11	62	1.1	< 0.1	69.8	1.78	25.1	33	43.1	303	91.9	2.93	229	23	77	15.4	1.32	12.5	9.3	1.8	1.7	4.3	0.7	3.9	0.6	1
924581	< 0.1	7	62	1.2	< 0.1	47.1	1.52	23.1	53	36.8	258	77.2	3.12	177	19.2	64.9	13.7	1.56	12.3	8.8	1.7	1.5	3.9	0.6	3.2	0.5	1
924582	< 0.1	6	76.4	0.6	< 0.1	63.3	1.74	27.8	37	49	278	99.9	2.86	215	27.2	91.9	19.9	1.38	16.4	11	2.3	1.8	4.3	0.6	3.5	0.5	1
924583	< 0.1	9	76.5	< 0.1	< 0.1	40.2	1.45	17.7	53	35.2	238	69.9	2.8	143	17.7	60.7	12.1	1.5	10.4	7.4	1.5	1.3	3.5	0.5	3	0.5	1
924584	< 0.1	6	45.3	1.1	< 0.1	27.6	0.94	8.6	64	16.6	244	37.3	1.51	81.4	9.6	33.1	6.5	0.77	5.6	4	0.8	0.7	1.9	0.3	1.6	0.3	1
924585	0.3	< 1	98.4	< 0.1	< 0.1	130	1.34	28.9	31	82.9	461	180	1.9	404	44.6	153	30	2.17	24.8	18.1	3.6	3.1	7.8	1.1	6.5	1	1
924586	0.2	< 1	81.1	< 0.1	< 0.1	67	1.38	36.3	48	56.3	76	114	1.92	225	28.9	99.8	20.8	2.18	18.5	13	2.5	2.3	5.8	0.9	5.1	0.8	1
924587	< 0.1	5	75.2	< 0.1	< 0.1	40.9	1.34	15.5	37	39.9	181	82.2	2.45	165	19.9	68.1	13.1	1.65	11.4	8.2	1.6	1.5	3.9	0.6	3.2	0.5	1
924588	< 0.1	6	80.6	0.1	< 0.1	48	1.35	15.7	40	33.7	133	78.6	2.43	160	20.1	67.8	12.9	1.43	10.4	7.2	1.4	1.3	3.5	0.5	3	0.5	1
924589	< 0.1	13	79.7	0.4	< 0.1	58.1	1.71	26.5	61	45	308	82.9	3.18	172	20.2	69.8	14.5	1.72	13.4	9.8	1.9	1.7	4.4	0.7	3.7	0.6	1
924590	< 0.1	2	113	< 0.1	< 0.1	20.3	0.96	5.9	38	38.3	69	30.1	1.87	67	7.9	29.4	6.6	0.76	6	6.5	1	1.4	4.1	0.6	4.1	0.6	2
924591	< 0.1	11	74.2	0.4	< 0.1	53.4	1.56	19.6	56	40.1	324	86.1	2.77	182	21.8	74.6	14.8	1.53	11.8	8.3	1.6	1.5	3.9	0.6	3.4	0.5	1
924592	< 0.1	3	101	0.1	< 0.1	87.5	1.5	25.3	50	50.5	419	150	2.79	296	36.3	123	23.6	1.85	19.8	12.4	2.6	2	4.9	0.7	4.1	0.6	1
924593	< 0.1	8	78.7	0.7	< 0.1	76.2	1.76	23.8	39	47.8	270	125	2.82	247	30.7	106	20.1	1.92	16.2	10.1	2.1	1.8	4.6	0.7	4	0.6	1
924594	< 0.1	11	80.5	1.6	< 0.1	71.1	1.59	17.8	52	43.4	334	123	3.23	244	30.5	100	18.9	1.55	15.3	9.7	2	1.6	4.1	0.6	3.2	0.5	1
924595	< 0.1	2	67.9	0.2	< 0.1	42.5	1.48	18.2	26	30.3	100	67	3.1	136	16.1	55	11.5	1.13	9.9	7.2	1.4	1.2	3	0.5	2.6	0.4	1
924596	< 0.1	12	57.1	2.9	< 0.1	53.6	1.4	9.9	43	26.6	344	75.4	1.92	165	20.1	68	13	0.94	10	6.2	1.3	1	2.6	0.4	2.2	0.3	1
924597	< 0.1	< 1	53.5	< 0.1	< 0.1	48.8	1.41	10	39	32.6	297	73.2	1.25	158	18.9	66.4	13.5	1.24	11.4	7.8	1.5	1.3	3.4	0.5	2.9	0.5	1
924598	< 0.1	10	51.5	1	< 0.1	67.7	1.4	23.9	19	48.7	364	99.9	2.22	213	26.9	92.3	20.3	1.6	17.2	11.6	2.4	1.9	4.9	0.7	3.7	0.5	1
924599	< 0.1	8	59.4	0.8	< 0.1	77.6	1.25	26.5	23	42.5	268	97.4	2.63	209	25.9	88.8	18.2	1.33	14.6	9.7	2	1.6	3.9	0.6	3.2	0.5	1
924600	< 0.1	12	60.7	1.5	< 0.1	85.8	1.55	29.7	28	58.7	321	128	2.82	261	32.2	108	22.8	1.79	19.2	13.4	2.8	2.3	5.6	0.8	4.4	0.7	1
924600DUP	< 0.1	13	59.5	1.9	< 0.1	86.3	1.61	27.9	30	61.4	372	128	2.73	266	34.2	119	25	1.97	20.6	13.7	2.8	2.3	5.8	0.8	5	0.8	1
924601	< 0.1	5	78.3	< 0.1	< 0.1	27	1.23	9.6	30	33.9	129	63.7	2.59	129	16	53.5	10.7	1.46	9.6	7.2	1.4	1.3	3.5	0.5	2.8	0.4	1
924602	< 0.1	5	97.5	< 0.1	< 0.1	23.2	1.15	9.6	43	31.1	153	57.5	2.51	120	14.8	51.6	9.8	1.42	8.3	6.3	1.2	1.2	3.2	0.5	2.6	0.4	1
924603	< 0.1	3	73.3	< 0.1	< 0.1	32.1	0.84	6.5	41	35.5	190	61.9	1.81	182	16.5	60.3	12.2	1.87	11	7.5	1.4	1.4	3.9	0.6	3.4	0.5	1
924604	< 0.1	10	68.2	1.1	< 0.1	15.9	0.98	3.9	98	17.8	211	18.3	1.61	49.7	6	22.6	4.9	0.9	4.3	3.8	0.6	0.8	2.4	0.3	2	0.3	1
924605	< 0.1	10	82.3	< 0.1	< 0.1	32.4	1.29	7.6	70	31.7	223	69.8	1.99	224	17.5	60.3	11.5	1.62	9.9	7.5	1.4	1.4	3.6	0.5	2.8	0.4	1
924606	< 0.1	< 1	97.6	< 0.1	< 0.1	20.1	0.76	5.2	23	25.2	17	50.5	1.55	119	12.9	45.7	9	1.5	7.8	5.5	1.1	1	2.8	0.4	2.5	0.4	1
924607	< 0.1	< 1	90.5	< 0.1	< 0.1	18.6	0.66	4.6	26	23.8	96	47.3	1.62	95.4	11.7	42.3	8.4	1.36	7.1	5.1	1	1	2.6	0.4	2.3	0.3	1
924608	< 0.1	7	151	< 0.1	< 0.1	31.8	2.35	7.1	74	38.5	212	88.1	2.17	179	20.1	68.5	11.9	2.19	10.5	7.8	1.4	1.5	4	0.6	2.9	0.4	1
924609	< 0.1	5	118	< 0.1	< 0.1	15.1	1.14	6.3	49	26.4	134	43.8	1.47	116	11.5	40.8	7.8	1.54	6.7	5.4	1	1.1	3	0.4	2.6	0.4	2
924610	< 0.1	< 1	81.1	< 0.1	< 0.1	19.1	0.6	3.7	25	24.7	105	35.5	1.66	81.9	8.6	30.8	6.1	1.12	5.3	4.6	0.8	0.9	2.5	0.4	2.5	0.4	1
924611	< 0.1	12	124	< 0.1	< 0.1	20.3	1.76	7.1	81	35.1	175	65.8	2.06	147	16	54.6	9.9	1.85	8.6	7	1.3	1.3	3.6	0.5	2.7	0.4	1
924612	< 0.1	4	114	< 0.1	< 0.1	25.2	1.37	8	55	37.2	182	63.7	2.18	135	17	60.6	11.8	1.77	9.4	7.3	1.3	1.4	3.9	0.6	3.3	0.5	1
924613	< 0.1	5	117	< 0.1	< 0.1	22.4	1.32	6.6	48	33.3	172	62.8	2.31	124	15.3	52.4	9.9	1.53	8.7	6.8	1.2	1.3	3.4	0.5	2.6	0.4	1
924614	< 0.1	11	83.9	1.4	< 0.1	27	1.17	4	79	15.8	312	21	1.48	61.8	6.9	25.4	5.5	0.72	5	3.9	0.7	0.7	2.1	0.3	1.9	0.3	1
924615	< 0.1	2	69.7	< 0.1	< 0.1	21	1.71	9.4	87	34	188	61.2	1.93	157	16.4	57.7	11.4	1.86	9.9	7.5	1.3	1.4	3.7	0.5	2.9	0.4	1
924616	< 0.1	2	98.3	< 0.1	< 0.1	18	1.23	4.8	68	29.8	155	53	1.76	125	13.6	47.3	9.3	1.67	8.4	6.3	1.1	1.2	3.3	0.5	2.7	0.4	1
924617	0.4	64	95.9	< 0.1	0.6	20	3.11	4.8	110	27.4	209	64.2	3.26	146	15.6	53.4	10.2	1.93	8.3	6.2	1.2	1.1	3.2	0.4	2.6	0.4	1
924618	< 0.1	8	70	< 0.1	< 0.1	18.7	2.6	5	75	32.1	73	58.6	2.92	163	15.2	55.5	10.7	1.96	8.4	6.6	1.2	1.3	3.5	0.5	2.8	0.4	1
924619	< 0.1	1	74.4	< 0.1	< 0.1	16.2	1.52	4.9	38	30.3	126	53.1	2.3	137	13.9	50.2	9.9	1.78	8.5	6.5	1.2	1.2	3.4	0.5	2.9	0.4	1
924620	< 0.1	3	67.2	< 0.1	< 0.1	18.2	1.85	4.9	50	31.8	117	55.2	2.57	151	15.6	57.5	11.3	1.98	8.9	6.7	1.2	1.3	3.9	0.6	3.3	0.5	1
924620DUP	< 0.1	2	71.1	< 0.1	< 0.1	19.1	1.8	4.8	47	33.3	109	56.2	2.81	153	15.3	53.9	10.8	1.99	8.8	7	1.3	1.3	3.8	0.5	3.1	0.5	1
924621	< 0.1	< 1	76.6	< 0.1	< 0.1	17.2	1.21	4.1	43	24	24	44.5	2.01	106	11.5	40.8	8	1.37	6.6	4.8	0.9	1	2.7	0.4	2.4	0.4	1
924622	< 0.1	4	93.5	< 0.1	< 0.1	23.2	1.09	5.4	53	28	207	55.2	2.4	125	14.2	50.3	9.6	1.56	8	6.1	1.1	1.1	3.1	0.5	2.6	0.4	1
924623	< 0.1	9	49.3	1.2	< 0.1	21.8	1.07	4.4	82	13.6	289	22.4	1.82	59.5	7.5	28.8	6.1	0.9	5	3.6	0.7	0.7	1.9	0.3	1.7	0.3	1
924624	< 0.1	3	76.8	< 0.1	< 0.1	19	1.07	4.6	70	28.1	258	49	1.69	129	13.5	47.7	9.2	1.53	7.6	5.9	1.1	1.1	3.2	0.5	2.6	0.4	1

Report Date: 12/9/2011

Analyte Symbol		W	Au	Ag	Cu	Cd	Mo	Mn	Pb	Ni	Zn	As	Ba	Be	Bi	Br	Ca	Co	Cr	Cs	Fe	Hf	Ga	Ge	Hg	In	Li	Mg	Na	Nb	Rb	Re	Sb	Sc
Unit Symbol		%	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppm	ppm
Detection Limit		0.0001	2	0.05	0.2	0.1	0.2	1	0.5	0.5	0.5	0.5	1	0.1	0.02	0.5	0.01	1	2	0.05	0.01	1	0.1	0.1	1	0.1	0.5	0.01	0.01	0.1	0.2	0.001	0.1	0.1
Analysis Method	**Material Type**	INAA	INAA	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	MULT INAA/TD-ICP-MS	MULT INAA/TD-ICP-MS	INAA	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	INAA	TD-MS	INAA	INAA	MULT INAA/TD-ICP-MS	INAA	INAA	TD-MS	TD-MS	INAA	TD-MS	TD-MS	TD-MS	INAA	TD-MS	TD-MS	TD-MS	INAA	INAA
924625	Till	0.0046	< 2	0.18	186	0.4	< 0.2	790	37.6	31.7	101	230	490	3.2	10.6	2.8	0.52	28	78	8.63	4.42	23	14.7	0.8	< 1	0.2	29.6	0.97	1.19	< 0.1	115	< 0.001	1.8	14.3
924626	Till	0.0057	< 2	0.12	66.4	0.2	< 0.2	1130	32	57.5	109	43.7	388	3.3	12.6	< 0.5	3.02	22	104	15.6	4.91	17	18	1.1	< 1	< 0.1	65.7	1.36	1.33	3.3	115	< 0.001	2.5	17.4
924627	Till	0.0044	< 2	0.17	81.9	0.4	< 0.2	628	48.9	26.3	125	133	377	4	7.38	5.5	0.7	13	82	14.4	3.89	23	18.3	1	< 1	0.2	49.7	0.95	1.72	< 0.1	142	< 0.001	1.6	14.6
924628	Till	0.0052	< 2	0.35	106	0.5	< 0.2	646	49.7	26.4	155	92.1	391	4.3	11.5	7.6	0.76	14	83	14.4	4.04	24	17.5	0.9	< 1	0.2	52.3	0.97	1.69	< 0.1	149	< 0.001	1.6	14.6
924629	Till	0.0134	17	0.23	98.8	0.4	< 0.2	659	106	20.1	125	181	444	4.6	19.2	< 0.5	1.03	11	71	14.4	4.38	19	19.4	1	< 1	0.3	41	0.98	1.84	< 0.1	164	< 0.001	0.8	16.3
924630	#N/A	< 0.0001	16	0.09	35.2	< 0.1	< 0.2	1590	17.6	80.6	81.9	17.2	513	2.3	0.19	< 0.5	2.23	18	124	5.82	4.94	8	17.9	0.8	< 1	< 0.1	52.1	1.56	1.29	1.2	111	< 0.001	1.2	17.1
924631	Till	0.0113	< 2	0.29	136	0.5	< 0.2	601	101	26.1	190	167	376	4.1	31.7	< 0.5	0.93	13	74	15.6	4.45	30	17.4	1	< 1	0.3	41.6	0.96	1.78	< 0.1	138	< 0.001	2.3	16.6
924632	Till	0.007	< 2	0.8	113	0.3	< 0.2	714	101	23.8	157	136	302	3.5	23.1	24.6	1.05	12	60	15.6	5.1	20	17.6	1.1	< 1	0.2	43.6	1	1.55	< 0.1	106	< 0.001	1.2	16.7
924633	Till	0.0092	< 2	1.16	176	0.7	6.4	874	282	26.6	220	228	319	3.6	28.7	13.9	0.45	20	70	19.2	5.09	20	19.7	0.4	< 1	0.4	43.4	0.88	1.58	19.9	97.4	0.002	2.6	14.3
924634	Till	0.0022	5	0.32	186	0.3	0.7	543	38.9	24.2	88.5	48.6	345	3.6	12.2	4.8	0.55	13	77	13.2	3.61	20	19.6	0.3	< 1	0.2	44.5	0.88	1.67	1.2	148	0.004	1.2	13.6
924635	Till	0.0022	< 2	0.31	326	0.4	< 0.2	754	45.3	30	114	68.2	384	3.4	17.4	5.2	0.63	23	72	13.2	3.77	23	19.5	0.2	< 1	0.2	46	0.85	1.56	0.2	142	0.002	1.1	14
924636	Till	0.0029	< 2	0.23	196	0.4	< 0.2	695	55.5	34.9	181	231	396	4.1	33.5	5.8	0.91	14	78	22.8	5.2	14	21.3	0.3	< 1	0.2	42.7	1.29	1.52	< 0.1	180	0.005	1.9	17.3
924637	Till	< 0.0001	8	0.18	106	0.4	< 0.2	748	51.5	23.7	123	113	424	3.4	8.53	< 0.5	0.91	16	68	12	4.15	19	20.3	0.2	< 1	0.2	32.8	1.05	1.6	< 0.1	145	0.004	1.3	15.6
924638	Till	0.0019	< 2	0.18	101	0.7	< 0.2	819	52.9	27.9	149	181	447	3.5	7.17	< 0.5	1.03	13	70	12	4.27	20	21	0.5	< 1	0.2	34.4	1.1	1.58	< 0.1	155	0.002	0.8	17.5
924639	Till	0.0016	< 2	0.18	117	0.4	< 0.2	1020	32.9	21.9	125	114	427	3	5.08	3.8	1.1	17	73	9.89	5.08	18	20.2	0.2	< 1	0.2	22.7	1.13	1.4	< 0.1	130	0.009	0.6	18.5
924640	Till	0.0025	< 2	0.18	146	0.9	0.3	1360	44.8	54.6	248	218	446	3.4	3.77	6.5	1.1	28	78	22.8	4.87	16	21.5	0.6	< 1	0.2	42.7	1.3	1.4	1	146	0.003	1.3	19.1
924640DUP	#N/A	0.0023	< 2	0.18	139	0.8	< 0.2	1290	46.8	48.5	235	214	431	3.3	3.93	4.8	0.93	26	78	20.4	4.91	17	20.8	0.5	< 1	0.2	39.6	1.3	1.45	0.2	137	0.003	1.8	19.2
924641	Till	0.0034	< 2	0.21	189	0.7	< 0.2	940	47.6	37.5	174	477	399	2.8	4.85	5.9	0.85	19	84	13.2	4.43	19	18.3	0.2	< 1	0.2	31.7	1.04	1.48	< 0.1	135	0.003	1.2	16.2
924642	Till	0.0021	< 2	0.26	100	0.8	0.3	1100	46.1	44.7	188	123	410	3.4	3.12	4.7	0.9	26	90	15.6	4.7	12	20.9	0.6	< 1	0.2	37.1	1.41	1.48	1.3	139	0.002	1.7	17.9
924643	Till	0.0014	< 2	0.14	82.1	0.4	1.6	617	60.8	29.2	149	654	327	2.9	5.07	16	0.53	18	79	8.49	4.86	18	17.9	0.5	< 1	0.2	32.9	0.85	1.56	19	87.9	0.004	0.5	15
924644	Till	0.0033	< 2	0.16	126	0.6	0.5	681	57.5	32.6	170	381	372	3.2	4.96	14.9	0.78	18	76	14.4	4.5	18	18.4	0.2	< 1	0.2	35.2	0.96	1.54	0.9	128	0.002	1.4	14.9
924645	Till	0.002	< 2	0.32	79.1	0.7	2.1	964	72.8	35.2	218	444	341	3.6	3.74	26.5	0.66	22	64	15.6	4.62	16	19.9	0.4	< 1	0.2	41.1	0.89	1.39	5.1	130	0.003	1	13.8
924646	Till	< 0.0001	< 2	0.19	55.1	0.5	< 0.2	735	70.9	23.6	178	195	447	3.3	1.88	7.4	0.91	14	68	9.84	4.39	19	19.1	0.3	< 1	0.2	31.8	1.01	1.63	0.1	140	0.003	0.8	15.7
924647	Till	< 0.0001	< 2	0.13	54.7	0.6	< 0.2	724	72.1	31.7	283	193	453	3.2	1.57	6.6	0.84	12	70	12	4.45	22	20.9	0.3	< 1	0.2	36.5	1.05	1.51	< 0.1	139	0.004	2.3	16.6
924648	Till	< 0.0001	< 2	0.14	39	1	< 0.2	640	61.3	34.1	253	74.1	391	3.5	1.58	< 0.5	0.68	12	66	15.6	4.09	18	20.6	0.3	< 1	0.1	54.5	1	1.55	< 0.1	160	0.003	1.7	16.6
924649	Till	< 0.0001	< 2	0.11	43.3	0.4	< 0.2	921	28.9	24.2	144	73.1	387	3	0.77	4.9	1.47	19	59	8.02	4.52	14	18.7	0.2	< 1	0.1	27.5	1.3	1.75	< 0.1	109	0.003	0.8	19.8
924650	#N/A	0.0012	120	45.6	1200	32.8	20.5	2850	2670	50.3	3310	949	142	6.6	63.3	6.1	1.87	24	82	7.16	5.18	9	17	0.7	< 1	1.5	45.6	1.23	1.38	14	94.5	0.004	61.8	12.7
924651	Till	< 0.0001	< 2	0.1	33.9	0.4	< 0.2	702	49.8	28.4	144	74.3	398	3.3	1.28	6	0.8	16	65	9.77	3.64	23	19.6	0.3	< 1	0.1	42.5	0.93	1.66	< 0.1	151	0.002	1.2	14.3
924652	Till	< 0.0001	11	0.1	65	0.6	< 0.2	863	60.9	33	201	101	476	3.3	1.35	4.4	0.74	19	77	15.6	4.08	17	20	0.2	< 1	0.2	37.3	1.03	1.46	< 0.1	155	0.001	1.4	15.4
924653	Till	< 0.0001	< 2	0.11	34.8	0.3	< 0.2	735	43.5	28	138	132	422	3	1.08	8.8	1.01	16	67	7.43	3.64	17	18.4	0.2	< 1	0.1	33.5	1.05	1.7	< 0.1	130	0.004	0.7	15.1
924654	Till	< 0.0001	< 2	< 0.05	47.1	0.4	0.6	743	53.6	32.6	172	118	399	3.2	0.95	5.3	0.55	19	65	7.93	4.13	18	19.3	0.8	< 1	0.1	38.4	0.98	1.58	20.4	102	0.001	0.8	16
924655	Till	0.0012	< 2	0.14	101	1.9	< 0.2	1740	118	43.9	438	515	524	3.5	2.5	< 0.5	0.43	34	96	21.6	4.62	19	22.3	0.2	< 1	0.6	35.6	1.09	0.89	0.2	183	0.002	4.6	18.2
924656	Till	< 0.0001	< 2	0.12	35.8	0.5	< 0.2	770	57.5	27.5	141	128	400	3.2	1.04	3.8	0.64	14	70	9.63	3.71	18	17.9	0.2	< 1	0.2	35.9	0.87	1.57	0.2	145	0.002	2	14
924657	Till	< 0.0001	< 2	0.15	54.6	0.5	< 0.2	800	63.4	29.4	152	209	431	3.2	1.3	7.3	0.65	17	61	9.49	3.6	18	18.9	0.6	< 1	0.2	37.5	0.93	1.49	0.5	150	0.005	2.4	13
924658	Till	< 0.0001	< 2	0.12	32.2	0.5	0.3	786	50.8	26.7	139	72.2	403	3.4	1.05	6	0.64	14	55	9.29	3.54	19	19.8	0.4	< 1	< 0.1	43.3	0.89	1.8	1.8	155	0.002	1	13.4
924659	Till	< 0.0001	< 2	0.22	60.5	0.5	< 0.2	680	73.2	28.8	156	379	414	3.2	1.84	11	0.59	18	74	9.35	3.92	20	19.1	0.4	< 1	0.2	40.3	0.92	1.52	< 0.1	148	0.002	1.3	13.3
924660	Till	< 0.0001	< 2	0.19	69.1	0.7	< 0.2	816	76	36.2	190	655	538	3.3	1.47	6.7	0.47	17	82	12	4.74	14	21.1	0.3	< 1	0.2	32.9	1.22	0.96	< 0.1	154	0.003	1.3	15.7
924660DUP	#N/A	< 0.0001	< 2	0.14	68.9	0.7	0.2	821	76.9	34.5	185	692	533	3.5	1.66	6.8	0.48	17	83	12	4.93	16	20.8	0.2	< 1	0.2	33.7	1.22	0.96	0.2	148	0.003	1.3	16
924661	Till	< 0.0001	< 2	0.63	135	4.9	< 0.2	925	374	55.4	582	1780	601	3.6	5.77	< 0.5	0.44	14	106	13.2	5.65	11	23	0.3	< 1	1.4	34.3	1.62	0.49	0.3	166	0.006	2.4	17.8
924662	Till	< 0.0001	< 2	0.21	70.3	0.4	< 0.2	1160	53.5	39.9	160	185	700	3.5	0.92	5.8	0.27	16	92	9.81	5.71	11	22.9	0.2	< 1	0.2	28.9	1.33	0.42	< 0.1	158	0.002	3.2	18.6
924663	Till	0.0014	< 2	0.19	54.9	0.5	2.2	782	96.9	23.2	139	204	429	3.2	2.29	7.6	0.78	18	71	7.86	4.16	31	20.2	0.7	< 1	0.2	30.6	0.88	1.9	21.2	74.9	0.001	1.1	15.4
924664	Till	0.0014	< 2	0.18	40.3	0.2	< 0.2	683	57.7	25.1	146	91.8	429	3	1.39	9.6	0.93	17	72	12	4.2	22	19.5	0.4	< 1	0.2	33.9	1.12	1.8	0.4	132	0.002	1.3	15.8
924665	Till	0.0016	30	0.21	175	1.3	1.7	900	318	26.7	641	1250	414	4.1	11.3	8.5	0.87	19	65	21.6	5.8	30	21.5	0.4	< 1	0.6	40.8	0.91	1.61	11.6	179	0.004	11.2	18.2
924666	Till	0.0005	< 2	0.11	49.5	0.5	1.6	857	45.2	28.5	149	171	420	3.4	2.52	10.6	0.77	17	60	9.83	3.74	22	21.1	0.6	< 1	0.2	44.1	0.88	1.78	24.2	118	0.002	0.7	13.8
924667	Till	0.0006	< 2	0.32	90.5	0.6	1.5	1110	44.7	44.8	161	99	471	3.6	9.09	6.9	0.94	32	70	13.7	4.79	21	21.7	0.5	< 1	0.2	40.6	1.15	1.57	0.7	156	0.005	1.5	16.5
924668	Till	0.0009	6	0.24	43.9	0.4	0.3	864	67.3	29.1	182	68.5	408	3.1	1.63	8	1.05	17	65	10.8	3.78	25	20.2	0.4	< 1	0.2	44.4	1.06	1.83	0.4	155	0.004	1.5	14.5
924669	Till	0.0004	< 2	0.14	18.2	0.2	< 0.2	524	25.5	30.9	86	28.2	331	3.5	1.01	< 0.5	0.36	11	63	11.8	3.72	13	20.2	0.1	< 1	< 0.1	54.9	0.91	1.51	1.3	111	0.002	1.1	14.2
924670	#N/A	0.0317	< 2	0.58	322	0.9	120	831	28	29.9	119	78.9	426	6.2	23	< 0.5	1.26	15	44	20.3	4.79	7	21.5	0.7	< 1	0.2	41.6	0.95	1.51	13.5	247	< 0.001	2.8	13.8
924671	Till	0.0006	< 2	0.2	144	1.3	< 0.2	1700	66.1	57.2	450	45.4	368	4.1	1.56	8.4	1.29	42	73	24.5	6.18	12	23.5	0.3	< 1	0.1	65.1	1.85	1.28	< 0.1	145	0.002	2	24.6
924672	Till	< 0.0001	< 2	0.28	83.4	0.8	< 0.2	1460	137	66.2	377	65.8	372	4	1.72	5.2	1.29	36	100	17.6	5.08	13	22.2	0.4	< 1	0.2	57.1	2.01	1.54	0.1	149	0.006	2.2	21.9
924673	Till	0.0006	6	0.21	59.9	1.1	0.3	1560	104	61.4	355	129	337	3.2	1.59	3.4	1.76	33	102	17.6	6.13	14	22.5	0.8	< 1	0.2	50.6	2.2	1.46	0.5	144	0.003	2.5	22.6
924674	Till	< 0.0001	< 2	0.15	11.4	0.3	0.3	608	36.5	16.9	73.1	23.9	413	4.3	1.03	4.3	1.3	8	44	8.4	2.67	26	19	0.2	< 1	< 0.1	34.8	0.78	2.29	3.1	158	0.002	1.1	11.6
924675	Till	< 0.0001	< 2	0.14	17.6	0.3	0.3	675	43.7	22.3	118	26.3	432	4.7	1.24	11.6	1.18	11	44	15.7	3.4	16	22.4	0.3	< 1	< 0.1	46.5	0.92	2.1	2.1	184	0.001	1.1	13.6
924676	Till	0.0026	5	0.23	78.6	0.3	< 0.2	561	46.5	18.9	82.3	99	347	2.9	12.1	22.4	0.7	11	67	12.7	4.39	16	19	0.3	< 1	0.2	31.7	0.82	1.4	0.2	116	0.003	0.8	13.3
924677	Till	0.0069	< 2	0.33	166	0.3	0.9	667	51.4	25.7	104	347	405	3.3	24.9	27.2	0.79	12	65	13.7	5.05	15	20.2	0.5	< 1	0.2	33.8	1.04	1.42	0.3	138	0.002	1.1	16.2
924678	Till	0.0027	< 2	0.35	99.4	0.4	0.3	650	49.9	22.9	110	221	408	3.1	11.4	16.1	0.98	10	68	11.8	4.24	20	18.9	0.5	< 1	0.2	33.3	0.88	1.6	0.3	133	0.003	0.9	15.5
924679	Till	0.0016	< 2	0.25	151	0.5	< 0.2	831	49.7	32.1	151	499	402	3.1	6.71	9.3	0.89	20	68	15.7	4.56	18	18.1	0.2	< 1	0.2	31.9	0.96	1.45	< 0.1	129	0.004	1.2	16.1
924680	Till	0.0014	< 2	0.2	105	0.5	< 0.2	883	35.7	29.8	126	180	410	2.8	4.65	5.7	0.79	18	70	13.7	4.82	14	19.1	0.2	< 1	0.1	26.4	1.02	1.29	< 0.1	113	0.002	0.8	17.2
924681	Till	0.0013	< 2	0.18	133	0.4	1	663	45.5	28.7	129	763	365	3	5.04	17.9	0.7	15	54	11.8	4.04	13	18.6	0.1	< 1	0.2	32.5	0.83	1.54	2.1	116	0.002	0.6	13.3
924682	Till	0.0011	< 2	0.24	126	0.5	< 0.2	818	37.2	31.1	148	376	418	3.5	4.3	7.7	0.63	15	71	12.7	4.31	18	19.4	0.3	< 1	0.1	31	1.05	1.23	< 0.1	142	0.001	1	14.5
924683	Till	0.001	< 2	0.16	101	0.4	< 0.2	842	36.3	36.4	153	185	462	2.9	3	5.2	0.51	25	68	9.87	4.72	14	19.2	0.2	< 1	0.1	27.1	1.15	0.95	< 0.1	144	0.003	1.4	14.4
924684	Till	0.0013	< 2	0.21	99.4	0.5	< 0.2	745	46.6	27	140	486	412	2.7	4.64	5	0.61	14	68	8.57	4.16	17	16.6	0.2	< 1	0.2	23.7	0.94	1.19	< 0.1	125	0.003	1	13.1
924685	Till	0.0009	9	0.18	70.1	0.5	< 0.2	726	41.4	23.5	119	267	420	2.7	3.55	3.9	0.79	11	57	7.64	3.56	20	16.8	0.3	< 1	0.1	26.1	0.87	1.5	< 0.1	91.7	0.003	1.1	12.4
924686	Till	0.0014	< 2	0.32	131	0.6	< 0.2	832	62.1	34.6	166	620	510	3.2	6.44	4.4	0.51	16	74	12.7	4.87	13	20.7	0.3	< 1	0.2	35	1.12	1.07	< 0.1	159	0.005	1.5	15.4
924687	Till	0.0012	< 2	0.89	141	0.6	1.6	690	43.9	38.9	166	546	384	3	4.72	23.1	0.56	18	69	14.7	4.42	16	18.9	0.4	< 1	0.2	35.6	0.88	1.11	4.3	122	0.004	1.2	12.3

Report Date: 12

Analyte Symbol	Se	Sn	Sr	Ta	Te	Th	Tl	U	V	Y	Zr	La	K	Ce	Pr	Nd	Sm	Eu	Gd	Dy	Tb	Ho	Er	Tm	Yb	Lu	Mass
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	g
Detection Limit	0.1	1	0.2	0.1	0.1	0.1	0.05	0.1	1	0.1	1	0.1	0.01	0.1	0.1	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
Analysis Method	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	MULT INAA/TD-ICP-MS	TD-MS	MULT INAA/TD-ICP-MS	TD-MS	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	INAA
924625	< 0.1	2	77.6	< 0.1	< 0.1	19.4	0.95	4.8	48	31.2	132	54.7	2.02	136	14.6	53.4	10.5	1.82	9.2	6.7	1.2	1.2	3.3	0.5	2.8	0.4	1
924626	< 0.1	1	172	0.1	< 0.1	17.4	0.88	3.7	58	32.4	164	46.4	1.93	99.7	12.3	45.3	9.1	1.5	7.5	6.2	1.1	1.2	3.6	0.5	2.9	0.5	1
924627	< 0.1	1	90.9	< 0.1	< 0.1	25.1	1.12	6.7	35	32.7	83	64.4	2.26	135	16.7	59.8	11.6	1.65	9.7	6.8	1.3	1.3	3.4	0.5	3	0.5	1
924628	< 0.1	2	94.1	< 0.1	< 0.1	23.2	1.18	6	42	28.2	170	59.4	2.36	128	15.1	52.4	10	1.47	8.5	6	1.2	1.1	3	0.4	2.3	0.4	1
924629	< 0.1	3	111	< 0.1	< 0.1	29.6	1.29	7	43	35.3	120	76.2	2.57	158	19.7	69.9	13.5	1.93	10.3	7.6	1.4	1.4	3.8	0.6	3.2	0.5	1
924630	< 0.1	< 1	153	< 0.1	< 0.1	11.9	0.61	2.6	45	26.4	105	39.7	2.22	80.5	9.7	34.8	6.8	1.39	5.6	5.1	0.8	1	2.8	0.4	2.5	0.4	1
924631	< 0.1	4	98.1	< 0.1	< 0.1	29.5	1.15	6.1	33	32.8	117	68	2.28	144	17.5	64	12.7	1.83	10.6	7.4	1.4	1.3	3.6	0.5	3	0.5	2
924632	< 0.1	3	94.6	< 0.1	< 0.1	21.4	0.92	4.6	47	32.8	84	56	1.69	125	14.1	50.6	10	1.58	8.5	6.7	1.2	1.3	3.5	0.5	2.7	0.4	1
924633	1.5	15	70	1.6	0.6	22.2	1.27	4.4	86	20.5	279	24.5	1.91	87.6	7.8	30	6.5	1.03	5.9	5.2	0.9	1	2.8	0.4	2.6	0.4	1
924634	1	4	88.7	< 0.1	< 0.1	27.5	1.1	6.6	62	28.3	287	62	2.2	141	15.6	56.1	10.7	1.36	8.7	6.1	1.2	1.1	2.9	0.4	2.6	0.4	1
924635	0.9	2	99.1	< 0.1	< 0.1	23.8	1.03	6.1	45	32.7	238	66	2.23	144	16.3	57.7	11.4	1.72	9.7	7.2	1.4	1.3	3.4	0.5	3	0.5	1
924636	0.7	2	109	< 0.1	< 0.1	17.6	1.26	4.8	69	32.3	92	53.1	2.51	130	13.4	49.2	9.9	1.73	8.4	6.7	1.2	1.2	3.4	0.5	2.9	0.4	1
924637	0.8	1	106	< 0.1	< 0.1	24	1.17	5.7	42	32.6	120	66.4	2.4	146	16.2	59.3	11.7	1.85	9.9	7.1	1.4	1.3	3.4	0.5	3	0.5	1
924638	0.9	5	120	< 0.1	< 0.1	23.9	1.1	5.4	57	40.1	141	73.4	2.49	163	18.1	66.4	12.8	2.06	11.2	8.1	1.5	1.5	3.9	0.5	3.3	0.5	1
924639	0.4	2	99.9	< 0.1	< 0.1	18.7	1.07	4.5	51	36.9	110	56.9	2.33	133	14.5	54.4	11.1	2.02	10	7.4	1.4	1.4	3.6	0.5	3.2	0.5	1
924640	0.7	6	113	< 0.1	< 0.1	17.8	1.23	4.5	69	36.1	163	55.6	2.25	149	13.5	49.8	10	1.86	9	7.1	1.3	1.3	3.6	0.5	3.1	0.5	1
924640DUP	0.5	6	101	< 0.1	< 0.1	17.6	1.21	4.5	63	34.2	145	54.8	2.15	148	13.6	50.7	10	1.87	9.1	6.9	1.3	1.3	3.6	0.5	3.2	0.5	1
924641	0.6	2	103	< 0.1	< 0.1	19.7	0.95	4.3	53	33.4	143	55.6	2.18	130	13.8	50.9	9.8	1.74	8.6	6.6	1.2	1.2	3.4	0.5	2.9	0.4	1
924642	0.8	6	106	< 0.1	< 0.1	16.1	1.06	4.2	75	31.7	157	53.6	2.26	122	13.4	49.5	9.7	1.71	8.1	6.2	1.1	1.2	3.2	0.5	2.9	0.4	1
924643	0.8	9	68.2	1.5	< 0.1	23.5	0.83	4.1	82	17.8	268	27.8	1.93	69.2	8.3	31.7	6.5	1.02	5.8	4.4	0.8	0.8	2.1	0.3	2	0.3	1
924644	0.8	4	96.7	< 0.1	< 0.1	21.6	0.97	4.4	81	28.8	203	54.2	2.12	123	13.1	47	9.1	1.52	7.9	5.9	1.1	1.1	2.9	0.4	2.6	0.4	1
924645	1.5	6	86.9	0.3	< 0.1	22.1	1.01	5.3	82	29.3	212	51.5	2.06	163	12.9	47.9	9.7	1.6	8.7	6.4	1.2	1.2	3.1	0.4	2.8	0.4	1
924646	0.7	2	106	< 0.1	< 0.1	22.9	0.91	5.2	51	35	122	59.9	2.5	138	14.7	53.2	10.7	1.73	9.3	7.4	1.4	1.3	3.5	0.5	3.1	0.4	1
924647	0.6	2	100	< 0.1	< 0.1	25.2	0.93	5.7	61	37.2	187	63.4	2.51	147	16.1	59.2	11.8	1.87	10.2	7.7	1.4	1.4	4	0.6	3.6	0.6	1
924648	0.6	2	96.1	< 0.1	< 0.1	23.8	1	5.6	46	38.3	157	68.5	2.45	137	16.6	60.2	11.8	1.8	10.3	7.7	1.4	1.4	3.8	0.5	3.3	0.5	1
924649	0.3	< 1	120	< 0.1	< 0.1	15.6	0.78	3.7	46	37.8	118	50.1	1.89	108	12.8	47.5	9.6	1.76	9	7.2	1.3	1.4	3.8	0.5	3.3	0.5	2
924650	2.3	18	193	0.7	1	13.9	1.09	3.8	101	25.2	191	37.6	1.53	87.6	9.8	35	6.9	1.28	5.6	4.7	0.8	0.9	2.5	0.4	2.5	0.4	2
924651	0.5	2	100	< 0.1	< 0.1	27.8	0.97	6.5	41	35.2	145	70.2	2.38	151	17	61.3	11.8	1.65	10.2	7.3	1.4	1.3	3.4	0.5	3	0.5	1
924652	0.6	< 1	94.7	< 0.1	< 0.1	21.6	1.12	5	40	32.2	103	60.6	2.55	137	14.8	53.3	10.5	1.69	9	6.8	1.2	1.2	3.3	0.5	3	0.5	2
924653	0.9	< 1	114	< 0.1	< 0.1	19.1	0.79	4.1	35	31.1	82	53.7	2.3	114	12.9	47.5	9.1	1.54	8.2	6.1	1.1	1.1	3	0.4	2.7	0.4	1
924654	0.6	8	75.3	1.7	0.1	21.2	0.94	4.6	91	19.8	284	32.5	2.25	84	9.6	35.4	7.1	1.05	6	4.7	0.9	0.9	2.5	0.4	2.3	0.4	1
924655	0.6	2	63.3	< 0.1	< 0.1	20.6	1.16	4.7	48	35	155	60.2	3.14	132	15.3	56.8	11.3	2.14	9.8	7.3	1.4	1.4	3.8	0.6	3.7	0.6	1
924656	0.2	1	88.2	< 0.1	< 0.1	22	0.9	4.7	43	28.4	181	53.1	2.48	115	13.2	47.2	9.2	1.5	8.1	6	1.1	1.1	2.9	0.4	2.5	0.4	1
924657	0.5	6	98.4	< 0.1	< 0.1	22.1	0.92	5	58	31.8	218	62.1	2.52	134	15	53.5	10.5	1.59	8.6	6.3	1.2	1.2	3.1	0.5	2.8	0.4	1
924658	0.4	6	96.1	< 0.1	< 0.1	26.9	1	6	61	32.1	278	67.2	2.48	144	16.5	60.3	11.7	1.56	10	6.7	1.3	1.2	3.2	0.5	2.9	0.5	1
924659	0.5	3	92.6	< 0.1	< 0.1	24.4	0.9	5.3	45	31	171	63.9	2.48	135	15.5	55.7	10.7	1.59	8.9	6.4	1.2	1.2	3.1	0.5	2.8	0.5	1
924660	0.3	2	78.3	< 0.1	< 0.1	20.2	0.92	4.4	47	30.9	103	55.7	2.79	119	13.7	49.8	9.8	1.72	8.5	6.3	1.2	1.2	3.1	0.5	2.9	0.4	1
924660DUP	0.3	5	79.1	< 0.1	< 0.1	20.3	0.93	4.5	86	30.6	221	57.3	2.52	122	14.1	51	9.9	1.73	8.2	6.2	1.2	1.1	3.2	0.5	2.9	0.5	1
924661	0.9	3	84.1	< 0.1	< 0.1	18	1.22	4.5	91	35.6	178	65.5	2.82	144	16	57.4	10.9	2.05	9.2	7.2	1.3	1.3	3.7	0.5	3.3	0.5	1
924662	0.6	1	78.2	< 0.1	< 0.1	17.6	1	4.1	50	31.4	106	56	2.97	145	13.1	47.2	9.1	1.76	8.1	6.4	1.2	1.2	3.3	0.5	3	0.4	1
924663	0.4	10	106	1.7	< 0.1	30.6	0.96	5.3	85	26.3	366	42.2	2.43	113	12.8	48.6	10.4	1.46	9.2	7.1	1.3	1.3	3.3	0.5	3.1	0.5	1
924664	0.9	3	109	< 0.1	< 0.1	22.9	0.93	4.2	45	29.4	163	51.7	2.55	110	12.9	47.4	9.2	1.41	8.4	6.1	1.1	1.1	3	0.4	2.5	0.4	1
924665	1.2	18	107	0.7	< 0.1	36.6	1.5	12.5	87	46.6	377	73.4	2.71	180	19.9	71.2	14.7	2.15	12.5	10.3	1.9	1.9	4.9	0.7	4.4	0.7	1
924666	0.5	9	115	1.9	< 0.1	32.9	1.01	5.7	80	28	362	44.7	2.51	124	12.8	47.7	10.1	1.4	9.1	6.8	1.3	1.2	3.2	0.5	3	0.5	1
924667	0.8	6	129	< 0.1	< 0.1	31.5	1.23	7.6	83	40.8	277	83.8	2.6	206	20.4	74.8	14.6	2.27	12.6	8.9	1.7	1.6	4.2	0.6	3.8	0.6	1
924668	0.5	7	131	< 0.1	< 0.1	35.2	0.99	6.4	61	40.1	244	76	2.49	174	18.3	65.9	12.8	1.76	11.7	8.4	1.6	1.5	3.9	0.6	3.4	0.5	1
924669	0.5	2	74.2	< 0.1	< 0.1	24	0.92	4.9	50	26.6	232	44.6	1.76	98.2	11.6	42.1	8.2	1.23	7.3	5.4	1	1	2.7	0.4	2.6	0.4	1
924670	< 0.1	25	122	0.9	0.3	15.1	2.66	5.2	86	27.6	125	42.2	2.56	87.8	10.3	36.4	7.4	1.14	6.4	5.3	1	1	2.8	0.4	2.7	0.4	2
924671	0.7	1	125	< 0.1	< 0.1	20.3	1.44	6.2	116	44.9	155	55.5	2.11	141	14.2	52.5	11	2.12	10.9	9.2	1.6	1.7	4.8	0.7	4.2	0.6	1
924672	0.5	4	123	< 0.1	< 0.1	20.4	1.28	5.8	76	44	159	57.2	2.19	131	15.1	55.1	11.6	2.13	10.9	9.4	1.7	1.7	4.8	0.7	4.2	0.6	1
924673	0.6	14	138	< 0.1	< 0.1	19.5	1.39	5	116	43	170	51	2.1	118	13.3	49.6	10.5	2.04	9.9	8.3	1.5	1.6	4.4	0.6	3.9	0.6	1
924674	0.6	1	141	< 0.1	< 0.1	37.7	0.88	6.9	60	42.7	374	78.7	2.77	167	19.1	68.1	13.8	1.71	12.5	8.9	1.7	1.6	4.1	0.6	3.5	0.6	1
924675	0.5	7	137	< 0.1	< 0.1	29.2	1.02	5.8	70	35.8	246	63.5	2.9	131	14.9	52.6	9.9	1.57	9	6.9	1.3	1.3	3.4	0.5	2.9	0.4	1
924676	0.5	5	92.1	< 0.1	< 0.1	21.4	0.93	4.6	54	26.2	148	53.6	1.86	118	13.1	47.3	9.2	1.47	7.8	5.5	1.1	1	2.8	0.4	2.4	0.4	1
924677	1.1	6	94.8	< 0.1	< 0.1	24	1.03	4.5	69	28.2	147	50.5	2.31	139	12.2	44.2	9.1	1.62	8.3	6	1.1	1.1	3	0.4	2.6	0.4	1
924678	0.8	7	112	< 0.1	< 0.1	28.2	0.95	5.4	66	37.1	194	65	2.27	162	16.3	58.8	11.8	1.9	10.7	8	1.5	1.4	3.8	0.6	3.4	0.5	1
924679	0.4	2	93.9	< 0.1	< 0.1	25.9	1.01	4.8	43	32.6	28	60.1	2.21	158	15.1	54.8	10.9	1.81	9.8	7	1.4	1.3	3.4	0.5	3.1	0.5	1
924680	0.6	2	84.5	< 0.1	< 0.1	19.9	1.05	3.8	63	30.1	130	43.5	2.08	99	11.4	42.7	8.6	1.65	8	6.2	1.2	1.2	3.2	0.5	2.9	0.4	1
924681	1	6	84.6	< 0.1	< 0.1	20.9	0.95	4.1	76	24.3	216	42.4	1.91	93.1	10.5	38.1	7.5	1.28	6.9	5.1	1	0.9	2.4	0.4	2.2	0.4	1
924682	0.8	1	94.1	< 0.1	< 0.1	25.4	1.03	4.8	53	37.3	91	61.8	2.38	170	15.4	56.5	10.9	1.9	9.8	7.6	1.4	1.4	3.8	0.5	3.4	0.5	1
924683	< 0.1	< 1	78.9	< 0.1	< 0.1	20.1	0.96	3.8	33	29.1	30	50.9	2.52	127	12.5	46.2	9	1.61	8.2	5.8	1.1	1	2.9	0.4	2.6	0.4	1
924684	< 0.1	2	82.5	< 0.1	< 0.1	23.8	0.9	4.4	32	30.1	45	56	2.19	149	14.1	51.5	10.1	1.69	8.7	6.2	1.2	1.1	3	0.5	2.8	0.5	1
924685	0.6	2	95.4	< 0.1	< 0.1	26.5	0.91	4.9	41	31.7	84	61.2	1.65	140	14.8	53.8	10.7	1.71	9.8	6.7	1.3	1.2	3.2	0.5	3	0.5	1
924686	0.5	3	81.9	< 0.1	< 0.1	21.1	1.06	4.4	49	34.5	152	58.2	2.67	133	14.2	51.5	10.1	1.89	9.5	6.9	1.3	1.3	3.5	0.5	2.9	0.5	1
924687	1.1	8	85.8	< 0.1	< 0.1	21.4	0.9	4.1	80	31.7	241	59.6	2.05	152	14.4	51.8	10	1.67	8.8	6.3	1.2	1.1	3	0.4	2.6	0.4	1

Report Date: 12/9/2011

Analyte Symbol		W	Au	Ag	Cu	Cd	Mo	Mn	Pb	Ni	Zn	As	Ba	Be	Bi	Br	Ca	Co	Cr	Cs	Fe	Hf	Ga	Ge	Hg	In	Li	Mg	Na	Nb	Rb	Re	Sb	Sc
Unit Symbol		%	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppm	ppm
Detection Limit		0.0001	2	0.05	0.2	0.1	0.2	1	0.5	0.5	0.5	0.5	1	0.1	0.02	0.5	0.01	1	2	0.05	0.01	1	0.1	0.1	1	0.1	0.5	0.01	0.01	0.1	0.2	0.001	0.1	0.1
Analysis Method	**Material Type**	INAA	INAA	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	MULT INAA/TD-ICP-MS	MULT INAA/TD-ICP-MS	INAA	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	INAA	TD-MS	INAA	INAA	MULT INAA/TD-ICP-MS	INAA	INAA	TD-MS	TD-MS	INAA	TD-MS	TD-MS	TD-MS	INAA	TD-MS	TD-MS	TD-MS	INAA	INAA
924688	Till	0.0016	< 2	0.27	61.7	0.4	< 0.2	572	31.3	23.5	93.1	97.9	325	2.8	5.36	4.8	0.6	12	68	8.11	3.4	20	16	0.3	< 1	0.1	32.4	0.81	1.64	0.4	120	0.004	1.9	12.7
924689	Till	0.002	< 2	0.25	132	0.5	0.2	1020	42.5	39.6	166	366	521	3.5	6.27	7.7	0.38	31	86	16.7	4.9	12	21.2	0.5	< 1	0.2	38.3	1.14	0.91	1	166	0.002	1.3	16.1
924690	#N/A	0.0396	< 2	0.38	41.3	0.4	1.3	597	41.2	23	98.8	107	316	4.9	2.04	< 0.5	2.16	43	45	6.96	3.39	9	19.8	0.7	< 1	0.1	53.9	1	2.16	1.2	169	< 0.001	2.6	14.5
924691	Till	0.002	< 2	0.44	100	0.5	0.4	1230	51.8	35.9	149	345	423	3.3	5.99	22.4	0.44	25	73	13.7	4.6	12	19.9	0.4	< 1	0.2	36.9	0.91	0.95	0.4	135	0.001	1.4	13.5
924692	Till	0.0005	< 2	0.08	14.2	0.1	1.6	617	33.1	18.7	79.5	38.9	389	3.9	1.01	4.6	0.52	10	48	12.7	3.68	21	21.2	0.2	< 1	< 0.1	49.2	0.83	1.85	9.1	139	0.002	1.2	15.5
924693	Till	< 0.0001	9	0.16	17.7	0.1	< 0.2	575	24.5	31.8	83.5	22.5	384	3.4	1.16	< 0.5	0.42	13	77	14.7	3.71	14	19.9	0.2	< 1	< 0.1	61.1	0.86	1.44	0.2	155	0.002	1.3	15
924694	Till	< 0.0001	< 2	0.12	10.6	0.1	0.5	553	31.8	15.4	56.9	23.9	401	3	1.96	17	0.63	9	46	8.97	2.99	22	18.5	0.2	< 1	< 0.1	37.1	0.63	1.97	1.3	132	0.004	1.1	11.2
924695	Till	< 0.0001	< 2	0.11	12.8	0.1	< 0.2	546	29.6	18	71.2	19.8	396	3.2	0.95	9.2	0.59	9	50	9.44	2.96	19	19	0.4	< 1	< 0.1	45.1	0.72	1.89	< 0.1	157	0.003	0.9	12
924696	Till	0.0004	< 2	0.09	11.1	< 0.1	< 0.2	559	29.4	16.8	64.3	23.6	362	3.4	1.45	7.1	0.66	10	46	9.11	3.03	21	18.2	0.3	< 1	< 0.1	45	0.71	2.04	0.2	160	0.001	1	12.3
924697	Till	0.001	< 2	0.14	33.9	0.2	< 0.2	1010	27.5	43.3	117	20.6	454	3.2	0.58	< 0.5	1.62	19	99	12.7	5.72	18	26.9	0.4	< 1	< 0.1	54.5	1.67	1.36	0.4	140	0.003	1.2	22.2
924698	Till	0.0004	< 2	0.13	21.1	0.1	< 0.2	852	26.2	29.7	93.8	23	420	3.7	1.23	< 0.5	0.67	13	71	13.7	4.32	16	22.9	0.6	< 1	< 0.1	60.9	1.02	1.56	0.4	176	0.002	1.1	16.9
924699	Till	0.0008	< 2	0.13	21.4	0.2	< 0.2	732	26.8	30.1	88.2	23.8	435	3.6	1.17	< 0.5	0.88	14	66	13.7	4.3	17	22.7	0.6	< 1	< 0.1	58	1.06	1.73	3.1	165	0.001	1.2	17.4
924700	Till	< 0.0001	< 2	0.36	10.3	0.2	1.1	387	30.5	9.6	57	56.9	519	6.2	0.64	< 0.5	1.34	10	20	14.7	3.35	28	26.3	0.2	< 1	< 0.1	46.8	0.76	2.18	0.6	196	0.004	1	15.1
924701	Till	< 0.0001	< 2	0.13	8.4	0.2	0.6	884	50.9	9.9	96.2	53.8	294	22.2	5.18	< 0.5	0.46	8	< 2	13.9	2.78	13	27.8	0.2	< 1	< 0.1	67.6	0.54	2.58	33.8	192	0.002	0.6	13.1
924702	Till	0.0004	7	0.19	27.8	0.1	< 0.2	1370	29.6	29.7	104	70.7	485	5.8	1.01	< 0.5	2.88	26	69	8.76	5.58	23	24.2	0.5	< 1	< 0.1	60.2	1.61	1.77	0.7	161	0.002	0.9	23.9
924703	Till	< 0.0001	< 2	0.17	7	0.2	0.4	612	42.4	8.6	72.9	42.9	352	11.1	2.25	< 0.5	0.62	7	22	12.4	2.77	14	23.4	0.1	< 1	< 0.1	50.9	0.57	2.59	3	206	< 0.001	0.6	12.4
924704	Till	0.0007	< 2	0.23	15	0.1	1.1	971	31.8	15.6	124	28.2	480	5.7	0.86	< 0.5	1.78	15	41	10.2	4.73	27	24.5	0.4	< 1	< 0.1	66.5	1.2	1.97	1	223	0.005	0.6	18.8
924705	Till	< 0.0001	< 2	0.22	20.2	0.2	1	868	33.8	21.3	104	30.3	682	4.4	0.71	4.2	1.34	16	59	13.1	5.09	40	25.6	0.5	< 1	0.1	62.6	1.23	1.76	4.5	235	0.004	0.8	21.8
924706	Till	< 0.0001	7	0.15	16.3	< 0.1	0.5	629	29.4	16.3	55.8	12.7	331	4.8	0.91	6.9	1.03	9	60	8.61	2.46	22	19.3	0.4	< 1	< 0.1	38.8	0.74	2.3	1.2	173	0.004	0.5	11.8
924707	Till	0.0008	< 2	0.18	17.7	0.1	0.3	735	46.5	19.6	79.4	19.6	339	4.6	0.64	3.9	0.88	11	67	9.95	2.9	19	19.7	0.5	< 1	< 0.1	40.2	0.82	2.06	1.4	179	0.005	0.7	13.1
924708	Till	0.0008	< 2	0.15	38.1	0.1	0.3	690	25.8	23.6	78.9	20.1	375	4.1	1.47	2.9	0.96	13	69	9.49	3.59	20	21	0.5	< 1	< 0.1	49.2	0.95	1.92	1.1	188	0.002	0.9	16.4
924709	Till	< 0.0001	< 2	0.18	27.9	0.1	0.4	941	30.7	32.7	73.2	35.1	402	3.9	0.65	2.6	1.26	15	81	8.03	3.87	26	21.9	0.4	< 1	< 0.1	37.4	1	2.07	1.3	179	0.002	0.7	18.2
924710	#N/A	0.033	< 2	1.4	154	1.5	88.5	1640	247	69.2	262	76.2	214	3.9	3.22	< 0.5	5.38	33	97	35	7.58	< 1	24.4	1.1	< 1	0.3	46	3.12	1.88	7.8	101	< 0.001	2.1	26
924711	Till	< 0.0001	7	0.44	23.2	0.2	0.5	788	31.5	24.2	60.8	19.6	350	4.4	0.76	< 0.5	1.06	15	80	8.36	3.6	42	19.1	0.4	< 1	< 0.1	34.1	0.73	2.29	3.2	83.2	0.008	0.6	15.4
924712	Till	< 0.0001	< 2	0.23	12.7	0.1	0.3	721	31.6	18.3	50.1	12.3	379	4.4	0.8	4.4	1.17	9	64	7.97	2.46	34	19.1	0.3	< 1	< 0.1	41	0.69	2.4	0.3	183	0.001	0.5	11.5
924713	Till	0.0004	< 2	0.12	17	0.1	< 0.2	721	31.8	25.4	66.8	20.1	357	4	0.8	5.9	0.68	12	82	8.03	3.05	18	19.7	0.4	< 1	< 0.1	56	0.85	1.91	0.3	166	0.002	0.8	13
924714	Till	< 0.0001	< 2	0.13	13.3	0.1	< 0.2	589	28.6	20.2	57.1	13.5	393	4.5	0.76	2.3	1.18	8	71	8.52	2.59	32	18.7	0.5	< 1	< 0.1	41.6	0.82	2.26	0.5	177	0.003	0.7	12.6
924715	Till	0.0004	< 2	0.12	21.4	0.1	< 0.2	815	32.1	23.3	81.2	24.8	388	4.7	0.62	5.2	0.89	12	74	8.76	3.1	22	20.1	0.4	< 1	< 0.1	44.5	0.85	2.1	< 0.1	156	0.004	0.8	13.9
924716	Till	0.0009	< 2	0.2	33.1	0.2	< 0.2	1300	37.1	32.5	94.3	51.8	437	5.4	0.75	< 0.5	0.68	15	91	13.9	4.03	21	23	0.6	< 1	< 0.1	51	0.9	1.99	0.5	188	0.002	0.9	16.4
924717	Till	< 0.0001	< 2	0.31	25.9	0.1	< 0.2	913	31.2	39.9	96.1	28.6	383	5.6	1.32	< 0.5	0.56	15	109	11.7	3.99	13	23.5	0.5	< 1	< 0.1	70.7	1.01	1.53	0.2	189	0.002	1.3	16.2
924718	Till	< 0.0001	< 2	0.27	64.8	0.6	< 0.2	1060	56.8	36	169	116	438	4.8	1	< 0.5	0.74	16	100	10.9	4.14	20	22.1	0.6	< 1	< 0.1	49.7	1.04	1.66	0.3	178	0.006	1.2	17.3
924719	Till	< 0.0001	< 2	0.2	27.4	0.3	< 0.2	666	65.7	30.2	128	63.5	353	3.4	0.97	14.8	0.43	14	97	8.03	3.53	18	20.2	0.4	< 1	< 0.1	46.1	0.8	1.44	1	145	0.003	1.2	12.6
924720	Till	< 0.0001	< 2	0.12	22.6	0.4	< 0.2	666	32.1	33.7	120	42	343	4	0.89	9.4	0.31	15	107	10.2	3.82	15	19.9	0.5	< 1	< 0.1	48.7	0.89	1.48	0.2	149	0.003	1.5	15.4
924721	Till	0.0006	< 2	0.15	43.6	0.9	< 0.2	630	41	40.1	217	74.5	368	3.2	1.71	3.9	0.29	15	104	10.9	4.17	16	19.6	0.3	< 1	< 0.1	48.9	0.92	1.42	3	102	0.003	1.2	16.6
924722	Till	< 0.0001	< 2	0.09	21.2	0.2	0.9	1000	35.4	15.9	108	16.7	488	3.9	4.61	< 0.5	1.44	15	54	10.9	5.08	34	25.8	0.4	< 1	< 0.1	55.2	1.04	2.14	7.9	165	0.002	0.7	22.3
924723	Till	< 0.0001	< 2	0.09	26.6	0.1	0.2	570	32.5	16.3	70.8	14.5	463	3.4	2.07	2.6	0.61	11	53	8.76	3	23	20.9	0.2	< 1	< 0.1	47.5	0.7	2.14	0.5	166	0.006	0.7	14.3
924724	Till	< 0.0001	< 2	0.07	10.5	0.1	< 0.2	523	31.6	12.2	62.2	21.7	495	3.8	2.7	< 0.5	0.79	9	39	9.45	2.81	21	18.7	0.3	< 1	< 0.1	44.2	0.56	2.29	0.9	178	0.004	< 0.1	12.4
924725	Till	< 0.0001	< 2	0.09	9.5	< 0.1	< 0.2	556	30.6	13.3	63.1	17.4	454	3.5	1.68	< 0.5	0.76	7	33	8.94	3.18	23	19.3	0.3	< 1	< 0.1	44	0.64	2.44	< 0.1	169	0.004	1.4	12.5
924726	Till	< 0.0001	< 2	0.08	11.1	< 0.1	< 0.2	581	31.2	14	63.6	17.5	489	4	2.43	6.8	0.84	12	40	9.46	2.79	24	19.9	0.5	< 1	< 0.1	45.7	0.6	2.32	1.3	183	0.007	1.3	12
924727	Till	< 0.0001	< 2	0.06	12.6	0.1	0.4	396	31.6	13.4	60.9	20.1	491	3.6	1.08	6.8	0.88	7	25	9.06	2.85	23	20.6	0.5	< 1	< 0.1	42.4	0.63	2.28	4.9	178	0.005	1	11.4
924728	Till	< 0.0001	< 2	0.12	13.9	0.1	< 0.2	619	32.3	16.1	78.7	18	507	4.3	0.96	< 0.5	0.86	9	46	9.45	3.22	22	22.7	0.4	< 1	< 0.1	54.5	0.75	2.22	1	204	0.001	< 0.1	14
924729	Till	< 0.0001	< 2	0.08	12.6	0.1	0.3	557	29.9	17.4	78.8	22.3	434	4.1	1.54	< 0.5	0.52	9	40	13.6	3.65	17	23	0.6	< 1	< 0.1	58.7	0.77	2.04	2.6	189	0.003	1.9	15.5
924730	#N/A	0.029	23	0.37	25.3	< 0.1	0.6	440	76.2	33.4	64.8	80.8	320	3.7	1.76	8.2	0.56	36	61	6.8	3.36	11	17.5	0.5	< 1	< 0.1	47.7	0.7	1.8	0.4	116	< 0.001	6	11.4
924731	Till	< 0.0001	< 2	0.1	11.3	0.1	< 0.2	563	29.2	17.2	66.1	16.4	429	3.6	1.15	5.6	0.54	6	46	10.5	2.73	18	20.8	0.6	< 1	< 0.1	55.1	0.63	2.11	2.4	187	0.003	1.5	11.7
924732	Till	< 0.0001	< 2	0.06	15	0.1	0.9	581	32.9	14.9	74.5	21.1	490	3.6	1.09	< 0.5	0.54	8	35	12.6	3.32	26	22.3	0.2	< 1	< 0.1	46.1	0.62	2.14	6.1	155	0.004	1.8	15.3
924733	Till	< 0.0001	< 2	0.09	14.4	0.1	< 0.2	585	30.8	14.8	96.1	19.2	492	4.2	1.41	< 0.5	0.74	12	48	11.6	4.56	17	24.6	0.2	< 1	< 0.1	59	0.84	2.04	0.8	156	0.002	1.5	17.6
924734	Till	< 0.0001	< 2	0.07	13.6	0.1	0.5	740	31.9	15.5	86.3	22	563	3.5	1.15	7.1	1.06	13	37	11.6	4.19	28	22.9	0.2	< 1	< 0.1	56.6	0.86	2	0.1	176	0.005	< 0.1	17.6
924735	Till	< 0.0001	< 2	0.05	15.8	0.1	< 0.2	760	30.1	21.7	97.7	23.3	487	3.9	1.02	< 0.5	0.79	11	48	12.6	4.76	23	24.5	0.3	< 1	< 0.1	70.4	0.9	1.76	0.7	210	0.002	< 0.1	18.4
924736	Till	< 0.0001	< 2	0.05	16.2	0.1	< 0.2	772	33.2	16.4	97.8	23.5	568	3.7	1	< 0.5	0.96	14	38	12.6	4.71	25	24.4	0.6	< 1	< 0.1	60.8	0.87	2.06	1.1	201	0.003	1.4	19.1
924737	Till	< 0.0001	< 2	0.23	11.3	< 0.1	1.4	742	33.6	12.9	84.4	19.7	626	4.1	1.66	< 0.5	1.3	13	37	13.6	4.2	40	23.4	0.4	< 1	< 0.1	55.6	0.79	2.28	0.4	200	0.002	1.3	18.5
924738	Till	0.0014	< 2	0.13	11.6	0.1	0.6	648	30.7	16.6	53.4	17	435	3.7	0.89	3	0.7	11	43	11.6	2.74	19	19.5	0.3	< 1	< 0.1	49	0.71	2.49	1.4	192	0.003	1	12.1
924739	Till	< 0.0001	< 2	0.09	15	< 0.1	< 0.2	551	29.3	18.9	64.4	19.2	408	3.9	0.94	< 0.5	0.61	8	50	11.6	3.01	17	21.3	0.5	< 1	< 0.1	55.5	0.75	2.31	0.6	194	0.002	1.3	12.6
924740	Till	< 0.0001	< 2	0.1	17.8	< 0.1	< 0.2	618	29.3	21.1	69.7	23.2	419	4.2	1.03	4.1	0.68	12	43	11.6	3.45	15	20.1	0.6	< 1	< 0.1	53.5	0.84	2.22	1.4	181	0.005	1.2	13.9
924741	Till	< 0.0001	< 2	0.18	12.4	0.1	0.7	584	26.5	17.3	53.3	13.6	374	3.9	0.72	< 0.5	0.61	8	45	9.13	2.59	15	18.5	0.1	< 1	< 0.1	47.5	0.66	2.45	0.5	182	0.003	1.2	11.3
924742	Till	< 0.0001	< 2	0.11	20.1	0.1	0.5	568	24.8	19.5	63.4	16.7	364	3.7	0.73	< 0.5	0.59	11	46	10.5	2.91	13	19.7	0.2	< 1	< 0.1	56.8	0.79	2.11	0.3	177	0.005	< 0.1	12.4
924743	Till	< 0.0001	< 2	0.11	23.6	0.1	< 0.2	491	28.6	23.4	81.2	23.4	421	4	0.75	< 0.5	0.53	11	61	10	3.31	16	20	0.2	< 1	< 0.1	45.7	0.81	2.05	0.5	180	0.003	1.4	13.4
924744	Till	< 0.0001	< 2	0.11	70.3	0.2	< 0.2	675	123	33.9	127	211	469	4.3	1.04	< 0.5	0.35	20	76	13.6	5.52	17	24.5	0.5	< 1	< 0.1	45.7	1.05	1.58	0.2	203	0.013	2.5	18.3
924745	Till	< 0.0001	< 2	0.11	45	0.1	< 0.2	462	36.7	33.5	105	48.4	456	4.5	0.9	< 0.5	0.37	8	74	14.7	4.71	17	24.5	0.4	< 1	< 0.1	53.5	0.99	1.53	0.3	209	0.002	1.8	16.6
924746	Till	< 0.0001	< 2	0.1	30.5	0.1	< 0.2	484	37.4	21.4	76.5	39.5	458	3.8	0.74	7.2	0.55	11	66	11.6	4.27	16	22.1	0.4	< 1	< 0.1	43	0.96	1.74	0.2	187	0.004	1.7	14.9
924747	Till	< 0.0001	16	0.1	32.6	0.1	< 0.2	428	47.4	17	65.7	48.1	482	3.8	0.8	6.6	0.46	7	58	9.75	4.16	16	20	0.5	< 1	< 0.1	37.9	0.85	1.77	0.1	180	0.003	1.3	13.8
924748	Till	< 0.0001	< 2	0.1	37.9	0.1	0.2	577	42.5	20.8	78.7	34.8	444	3.3	0.75	< 0.5	0.57	12	64	9.45	4.59	16	20.6	0.4	< 1	< 0.1	42.4	0.93	1.85	0.2	166	0.001	1.4	16
924749	Till	< 0.0001	< 2	0.08	23	0.1	< 0.2	479	27.6	20.6	74.1	23.9	387	3.5	0.56	7.6	0.54	9	61	9.03	3.6	14	19.2	0.4	< 1	< 0.1	41.3	0.83	1.94	< 0.1	169	0.003	1	13.4
924750	#N/A	< 0.0001	< 2	0.08	33.4	< 0.1	< 0.2	1520	17.4	75.5	80.4	12.8	487	2.1	0.16	3.1	2.12	24	124	5.7	4.71	9	19	0.7	< 1	< 0.1	49.3	1.57	1.31	0.8	105	< 0.001	< 0.1	17.3
924751	Till	< 0.0001	< 2	0.09	20.8	0.2	< 0.2	909	32.2	22.4	114	13.4	512	3.7	0.57	< 0.5	1.02	19	61	13.6	5.63	27	24.6	0.4	< 1	< 0.1	57.9	1.3	1.76	< 0.1	157	0.006	2.4	23.9
924752	Till	< 0.0001	< 2	0.12	43.9	0.5	< 0.2	790	111	38	212	51.9	396	4.5	0.94	< 0.5	0.36	23	83	21	6.54	20	27.8	0.3	< 1	0.2	56	1.31	1.1	3.6	75.2	0.001	2.2	23.8

Report Date: 12

Analyte Symbol	Se	Sn	Sr	Ta	Te	Th	Tl	U	V	Y	Zr	La	K	Ce	Pr	Nd	Sm	Eu	Gd	Dy	Tb	Ho	Er	Tm	Yb	Lu	Mass
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	g
Detection Limit	0.1	1	0.2	0.1	0.1	0.1	0.05	0.1	1	0.1	1	0.1	0.01	0.1	0.1	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
Analysis Method	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	MULT INAA/TD-ICP-MS	TD-MS	MULT INAA/TD-ICP-MS	TD-MS	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	INAA
924688	0.8	3	88.7	< 0.1	< 0.1	25.8	0.8	4.4	39	25.9	204	49.9	1.92	112	12.4	44.5	8.6	1.31	7.6	5.4	1	1	2.7	0.4	2.4	0.4	1
924689	0.5	5	74.8	< 0.1	< 0.1	20.5	1.25	4.4	66	27.7	169	53.3	2.64	125	12.6	45.4	8.8	1.63	7.9	5.9	1.1	1.1	2.8	0.4	2.6	0.4	1
924690	< 0.1	2	134	< 0.1	< 0.1	20.9	1.06	7	39	45.2	103	36.1	2.4	80.1	9.4	33.8	7.6	0.9	7.3	8	1.3	1.6	4.8	0.7	4.7	0.7	2
924691	1.1	6	80.2	0.2	< 0.1	19.1	1.05	4.1	69	26.9	161	49.4	2.13	147	12	42.8	8.3	1.47	7.3	5.4	1	1	2.8	0.4	2.5	0.4	1
924692	0.4	4	76	0.3	< 0.1	38.6	1.01	6.7	65	34.1	346	65.2	2.16	143	16.4	59.6	11.6	1.39	10.2	7.2	1.4	1.2	3.4	0.5	3.1	0.5	1
924693	0.4	2	83.7	< 0.1	< 0.1	27.6	0.92	5.6	49	33.2	211	65.7	2.23	133	15.7	54.8	10.2	1.48	9.2	6.7	1.3	1.2	3.3	0.5	2.9	0.4	1
924694	0.2	< 1	88.7	< 0.1	< 0.1	40.4	0.86	5.9	50	36.5	104	75.5	2.31	161	18.2	64.5	12.6	1.5	11.3	7.9	1.6	1.4	3.6	0.5	3.3	0.5	1
924695	0.3	2	92.6	< 0.1	< 0.1	35.9	0.92	6.3	23	33.5	10	72.2	2.56	154	17.2	60.7	11.5	1.41	10.4	7.1	1.4	1.3	3.3	0.5	3	0.5	1
924696	0.5	2	90.9	< 0.1	< 0.1	38.1	0.95	6.3	33	34.2	44	65.4	2.48	137	16	57.5	11.2	1.32	10	7.2	1.4	1.3	3.4	0.5	2.9	0.5	1
924697	0.5	4	185	< 0.1	< 0.1	33.2	0.81	6.7	91	49.6	188	83.5	2.14	172	20.7	74.1	14.1	2.44	13.2	9.5	1.8	1.8	4.8	0.7	4	0.6	1
924698	0.6	4	103	< 0.1	< 0.1	33	0.96	6.7	57	39.6	202	78.1	2.59	157	18.5	66.5	12.5	1.85	11.4	8.1	1.6	1.5	3.9	0.5	3.3	0.5	1
924699	0.6	6	126	< 0.1	< 0.1	32.7	0.93	6	80	41.6	247	71.5	2.62	146	17.5	62.4	12	1.78	11.1	8.4	1.6	1.5	4	0.6	3.4	0.5	1
924700	< 0.1	< 1	156	< 0.1	< 0.1	44	1.11	23.1	80	31.9	394	89.8	2.8	152	17.9	55.7	8.6	2.06	7.4	5.2	1	1	3.2	0.5	3.8	0.8	1
924701	0.3	15	65	5.6	< 0.1	77	1.39	24.6	39	45.6	343	94.5	2.25	203	22.8	78.4	16.4	1.22	14.5	9.9	2.1	1.6	4.2	0.6	3.7	0.6	1
924702	0.1	< 1	142	< 0.1	< 0.1	39.5	0.94	20.9	98	52.8	122	74.3	2.3	157	18	64.8	12.9	2.17	12.6	9.8	1.8	1.8	5.3	0.8	4.9	0.8	1
924703	0.2	2	77.5	< 0.1	< 0.1	61	1.3	19.2	40	43.8	249	90.4	2.64	185	21.4	72.1	14.6	1.51	13.3	9.6	1.9	1.6	4.1	0.6	3.4	0.5	1
924704	1	1	132	< 0.1	< 0.1	52	1.21	9.8	82	52.4	105	101	2.97	202	22.5	76.6	13.7	2.31	12.6	9.5	1.8	1.8	5.1	0.8	4.9	0.8	1
924705	1.4	4	122	< 0.1	0.1	74.5	1.29	15.6	99	57.9	642	119	3.02	244	28.6	97.7	17.4	2.32	15.3	11.2	2.2	2.1	6	0.9	5.9	0.9	1
924706	1.2	3	102	< 0.1	< 0.1	45.3	1	8.8	53	40.7	324	86.6	2.71	180	21.2	74.8	14.9	1.63	13.6	8.7	1.8	1.5	3.9	0.6	3.5	0.6	2
924707	0.8	5	95.4	< 0.1	< 0.1	41.5	1.01	7.8	63	39	303	83.1	2.75	169	19.3	68.2	13.3	1.72	12.5	8.4	1.7	1.4	3.8	0.6	3.4	0.5	1
924708	0.9	5	96.8	< 0.1	< 0.1	37.5	1	8	67	42.7	258	79.4	2.73	161	18.8	64.5	12.5	1.75	11.8	8.4	1.6	1.5	4.1	0.6	3.7	0.6	1
924709	0.3	3	124	< 0.1	< 0.1	54.5	0.98	15.1	93	50.4	355	131	2.72	270	31.8	116	22.3	2.96	19.6	12	2.6	2	4.7	0.6	3.8	0.6	1
924710	< 0.1	17	600	0.4	< 0.1	2	2.49	1.2	212	14.2	32	11.9	1.27	31.8	3.7	15.2	3.5	1.03	3.4	3.1	0.5	0.6	1.6	0.2	1.5	0.2	2
924711	1.9	< 1	104	< 0.1	< 0.1	90.1	0.9	21.2	72	48.3	484	122	2.18	289	36.7	139	28.2	3.75	25.7	14.8	3.3	2.2	5.1	0.7	3.9	0.6	2
924712	0.8	< 1	125	< 0.1	0.1	68.5	0.96	17.3	58	58.2	465	146	3.01	326	35.6	124	23.9	2.39	21	13.1	2.8	2.1	5.2	0.7	4.4	0.7	2
924713	0.3	3	102	< 0.1	< 0.1	33.8	0.97	7.8	43	33	61	69.8	2.42	147	16.8	59.6	11.4	1.6	10.2	7	1.4	1.2	3.3	0.5	3	0.5	1
924714	1	< 1	127	< 0.1	< 0.1	59	0.92	15.2	58	49.4	327	122	2.98	251	29.8	104	20.3	2.23	18.6	11.4	2.4	1.9	4.6	0.6	4	0.6	2
924715	0.3	2	109	< 0.1	< 0.1	42	1.01	8.8	45	37.9	88	95.5	2.44	195	23.7	83.5	16.1	2.17	13.9	8.7	1.8	1.4	3.5	0.5	3.2	0.5	2
924716	0.4	4	101	< 0.1	< 0.1	43.7	1.09	8.5	59	33.3	204	95.7	2.95	195	23.5	83.8	16	2.55	14.3	8.1	1.8	1.2	2.9	0.4	2.3	0.4	1
924717	0.5	4	96.8	< 0.1	< 0.1	28.1	1.09	8.5	54	36.9	177	58.5	2.64	120	14.4	51.5	10.1	1.69	9.5	7.1	1.4	1.3	3.5	0.5	3.3	0.5	1
924718	0.5	3	117	< 0.1	< 0.1	35	1.01	8.8	69	39.5	207	89.4	2.69	177	21.6	76.8	14.4	2.42	13.1	8.5	1.7	1.4	3.7	0.5	3.2	0.5	1
924719	0.5	5	83.3	< 0.1	< 0.1	30.6	0.92	6.1	63	26.1	221	65.1	2.15	136	15.8	56.3	10.6	1.51	9.1	5.9	1.2	1	2.7	0.4	2.5	0.4	1
924720	0.6	3	69.2	< 0.1	< 0.1	28.9	0.9	5.5	46	24.1	150	54.1	2.17	115	12.9	46.2	8.8	1.34	7.7	5.3	1.1	0.9	2.4	0.4	2.3	0.4	1
924721	0.4	2	67.3	0.1	< 0.1	25.9	0.92	5.3	63	22.9	239	36	1.85	81.4	9.5	33.9	6.5	1.15	6.5	4.8	0.9	0.9	2.4	0.4	2.1	0.3	1
924722	0.8	1	124	0.4	< 0.1	48.3	1.01	9.7	108	68.7	354	87.8	2.64	191	22.3	80.8	16.9	2.23	17	13.5	2.5	2.6	7.2	1	6.1	1	1
924723	0.3	< 1	89.1	< 0.1	< 0.1	45.7	1	8.3	49	39.6	175	95.7	2.76	192	23.5	83.9	15.3	1.77	13.4	8.8	1.8	1.5	4.1	0.6	3.6	0.5	1
924724	0.5	< 1	102	< 0.1	< 0.1	47.6	0.93	10	41	47.4	85	101	3.2	211	24.8	86.8	16	1.7	13.9	9.8	2	1.7	4.4	0.6	3.9	0.6	1
924725	0.6	< 1	102	< 0.1	< 0.1	44.4	0.97	7.5	29	42.5	168	96.5	3.04	196	23.6	85.2	16	1.67	13.9	9.1	1.9	1.6	4.1	0.6	3.6	0.6	1
924726	0.4	3	107	< 0.1	< 0.1	56.3	0.98	9.1	39	48.2	147	118	3.31	252	29.3	104	19.3	1.88	16.6	10.8	2.2	1.8	4.5	0.6	3.7	0.6	1
924727	0.9	4	110	0.3	< 0.1	52.1	1.02	7.8	46	47.7	225	115	3.26	238	28.2	102	19.1	1.69	16.8	10.4	2.1	1.8	4.6	0.6	4	0.6	1
924728	0.4	5	114	< 0.1	< 0.1	50.4	1.07	9.9	50	51.2	359	111	3.34	220	27.3	95.9	18	2.02	16.3	10.9	2.2	1.8	4.8	0.7	4.1	0.6	1
924729	0.3	6	86	< 0.1	< 0.1	41.1	1.05	7.2	52	34	268	80.4	3.1	165	20.3	72.3	14	1.68	12	7.8	1.6	1.3	3.5	0.5	3.1	0.5	1
924730	< 0.1	2	81.2	< 0.1	< 0.1	21.6	1.06	6.2	49	32.1	150	40.4	1.26	87.4	9.8	34.2	6.8	0.89	5.9	6	1	1.2	3.6	0.6	3.7	0.6	2
924731	0.7	5	89.1	< 0.1	< 0.1	37.9	1	6	42	29.4	261	75	3.2	158	18.3	63.4	11.7	1.37	10	6.4	1.3	1.1	2.8	0.4	2.5	0.4	1
924732	0.7	6	85.7	0.2	< 0.1	61.2	0.97	8.5	49	43.5	412	106	2.58	226	26.2	93.4	17.3	1.82	14.8	9.5	1.9	1.6	4.3	0.6	3.9	0.6	1
924733	0.4	< 1	90.8	< 0.1	< 0.1	45	1.08	6.7	51	42.7	285	83.6	2.21	174	20.6	75	14.2	1.69	13.4	9.3	1.9	1.7	4.3	0.6	3.5	0.5	1
924734	0.7	< 1	103	< 0.1	< 0.1	72.6	1.08	8.9	67	65.7	174	136	2.62	286	33.4	122	23.1	2.18	21.5	14.2	2.8	2.5	6.4	0.9	5.2	0.8	1
924735	0.1	3	101	< 0.1	< 0.1	50.2	1.09	7.8	67	54.8	21	105	3.02	212	26	93.7	18	2.13	16.1	11.3	2.2	2	5.1	0.7	4.3	0.6	1
924736	0.8	2	104	< 0.1	< 0.1	64.3	1.16	8.9	42	61.9	34	133	3.05	271	32.6	116	21.7	2.2	19.3	12.5	2.6	2.2	5.9	0.8	4.8	0.7	1
924737	0.9	< 1	114	< 0.1	< 0.1	74.3	1.12	15.8	62	85.1	195	144	3.22	302	36.3	133	26.1	2.35	24.4	17.1	3.3	3	8.1	1.1	6.7	1	1
924738	0.5	5	111	< 0.1	< 0.1	32.7	1.05	6.8	49	31.7	250	67.1	3.32	144	16.3	58.1	11.4	1.55	10.1	7	1.4	1.2	3.2	0.4	2.9	0.4	1
924739	0.5	5	99.9	< 0.1	< 0.1	32.4	1.11	6.7	40	32.3	220	67.6	3.04	135	16.9	59.7	11.4	1.54	9.6	6.7	1.3	1.2	3.2	0.5	2.8	0.4	1
924740	0.4	5	104	< 0.1	< 0.1	29.2	1.05	6	53	29.2	192	52.2	3.11	118	13.5	48.1	9.6	1.4	8.5	6.6	1.3	1.2	3.1	0.4	2.8	0.4	1
924741	< 0.1	2	96	< 0.1	< 0.1	28.9	0.98	5.8	36	28	225	56.6	3.08	117	13.9	49.5	9.8	1.34	9	6.2	1.2	1.1	2.8	0.4	2.5	0.4	1
924742	0.3	2	96.4	< 0.1	< 0.1	26	0.98	5.5	46	31.9	196	55.8	2.66	112	13.6	48.7	9.5	1.48	9	6.4	1.2	1.1	3.1	0.4	2.7	0.4	1
924743	0.7	2	91.2	< 0.1	< 0.1	29.6	1.04	7.1	47	37.7	115	69.1	3.04	141	18.7	66.7	12.7	1.85	11	7.7	1.5	1.3	3.4	0.5	2.8	0.4	1
924744	0.7	2	78.7	< 0.1	< 0.1	44.1	1.08	9.2	60	47.5	220	97.4	3.31	200	24.9	90.8	18.2	2.95	16.5	10.6	2.2	1.9	4.8	0.7	4.2	0.6	1
924745	0.8	2	87.8	< 0.1	< 0.1	36.3	1.22	7.9	49	36.8	187	90.3	3.35	189	22.8	81.1	15.6	2.4	13.5	8.3	1.8	1.4	3.6	0.5	3.2	0.5	1
924746	0.3	2	96.4	< 0.1	< 0.1	33.4	1.06	6.9	48	30.3	174	76	3.26	160	19.1	68.8	13.7	2	11.8	7.1	1.5	1.2	3	0.4	2.6	0.4	2
924747	1.2	2	104	< 0.1	< 0.1	36.4	1.07	7.2	64	29.5	208	98.8	3.13	199	24.5	87.2	16.2	2.19	13	7.7	1.7	1.2	2.8	0.4	2.4	0.4	2
924748	0.5	3	99.8	< 0.1	< 0.1	32.4	0.94	5.9	58	30	155	69.9	3.04	141	17.3	62	12	1.85	10.7	6.9	1.4	1.1	2.9	0.4	2.6	0.4	1
924749	0.6	3	88.1	< 0.1	< 0.1	27.1	0.97	5.5	45	25.2	152	59.9	2.78	124	14.9	54.5	10.6	1.49	9.1	5.6	1.2	1	2.5	0.4	2.1	0.3	1
924750	< 0.1	< 1	149	< 0.1	< 0.1	11.4	0.56	2.5	42	26	112	37.9	2.1	79.4	9.6	35.5	6.8	1.42	5.7	4.8	0.8	0.9	2.7	0.4	2.7	0.4	1
924751	0.5	< 1	143	< 0.1	< 0.1	39.4	0.86	6.6	60	62.1	74	90.2	2.72	189	21.9	80.5	15.7	2.74	15.9	11.8	2.2	2.2	6.1	0.9	5.2	0.8	1
924752	0.7	3	53.5	< 0.1	< 0.1	32.2	1.25	5.3	97	36.8	285	44.9	1.93	117	13.9	52.7	10.5	1.85	9.9	7.6	1.4	1.4	3.9	0.6	3.4	0.5	1

Final Report
Activation Laboratories

Report Date: 12/9/2011

Analyte Symbol		W	Au	Ag	Cu	Cd	Mo	Mn	Pb	Ni	Zn	As	Ba	Be	Bi	Br	Ca	Co	Cr	Cs	Fe	Hf	Ga	Ge	Hg	In	Li	Mg	Na	Nb	Rb	Re	Sb	Sc
Unit Symbol		%	ppb	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	ppm	ppm	ppm
Detection Limit		0.0001	2	0.05	0.2	0.1	0.2	1	0.5	0.5	0.5	0.5	1	0.1	0.02	0.5	0.01	1	2	0.05	0.01	1	0.1	0.1	1	0.1	0.5	0.01	0.01	0.1	0.2	0.001	0.1	0.1
Analysis Method	**Material Type**	INAA	INAA	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	MULT INAA/TD-ICP-MS	MULT INAA/TD-ICP-MS	INAA	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	INAA	TD-MS	INAA	INAA	MULT INAA/TD-ICP-MS	INAA	INAA	TD-MS	TD-MS	INAA	TD-MS	TD-MS	TD-MS	INAA	TD-MS	TD-MS	TD-MS	INAA	INAA
924753	Till	0.0009	< 2	0.14	40.7	0.8	< 0.2	658	165	24.4	258	230	390	4.7	2.02	< 0.5	0.36	12	65	16.8	5.28	16	25.5	0.2	< 1	0.3	45.8	1.05	1.47	0.2	128	0.001	3	21
924754	Till	< 0.0001	< 2	0.14	24.2	0.5	< 0.2	577	51.3	22.3	156	38.1	440	3.7	0.77	< 0.5	0.84	19	53	9.3	3.63	19	19.6	0.3	< 1	< 0.1	41	0.85	2.04	0.1	155	0.002	1.5	15
924755	Till	< 0.0001	< 2	0.18	45.7	0.9	< 0.2	772	304	20.1	228	295	493	3.5	1.35	9.2	0.82	12	63	10.5	5.23	16	22.2	0.3	< 1	0.3	37.8	1.16	1.61	< 0.1	163	0.003	0.8	18.1
924756	Till	< 0.0001	< 2	0.11	32.1	0.3	< 0.2	573	93.3	18.2	115	64.2	487	3.3	1.29	< 0.5	0.83	9	64	9.51	4.15	19	19.7	0.3	< 1	0.1	34.6	0.85	1.93	< 0.1	151	0.006	1	15.4
924757	Till	< 0.0001	< 2	0.15	40.2	0.5	< 0.2	614	69.2	28.2	190	47.1	433	3.9	1	< 0.5	0.71	16	75	14.7	4.98	14	22.1	0.3	< 1	0.1	54.6	1.09	1.65	< 0.1	171	0.003	1.2	18.3
924758	Till	< 0.0001	< 2	0.15	35	0.5	< 0.2	662	78.9	26.4	167	84.8	457	3.7	0.86	4.9	0.82	14	60	10.5	4.45	15	22.1	0.3	< 1	0.1	43.9	1.11	1.82	< 0.1	161	0.002	< 0.1	17.9
924759	Till	0.0013	< 2	0.14	33.1	0.4	< 0.2	639	60.9	25.8	140	49.2	443	3.8	0.84	6.6	0.83	18	57	10.5	3.91	17	21.6	0.5	< 1	0.1	51	0.94	1.85	0.2	178	0.001	< 0.1	14.4
924760	Till	0.0009	< 2	0.12	28.7	0.3	< 0.2	614	60.4	21.1	129	44.1	422	3.3	0.73	< 0.5	0.8	17	69	9.15	3.57	15	19.4	0.3	< 1	< 0.1	39.8	0.88	2.04	0.1	154	0.003	1.2	14.6
924761	Till	< 0.0001	< 2	0.37	28.7	0.5	< 0.2	702	116	24.4	201	69.2	405	3.3	0.75	9.9	1.2	22	68	8.04	3.42	15	18.1	0.3	< 1	< 0.1	33.7	0.9	1.94	< 0.1	145	0.001	1.6	13.4
924762	Till	< 0.0001	< 2	0.17	32.5	0.3	0.6	693	61.8	22.8	111	40.6	367	2.6	0.53	5.9	0.99	13	63	5.39	3.82	14	16.3	0.2	< 1	< 0.1	25.1	0.85	1.81	1.6	64.5	0.003	1.2	14.1
924763	Till	< 0.0001	< 2	0.16	30	0.4	< 0.2	693	65.8	19.6	132	94.1	421	3.3	0.76	6.4	1.14	15	58	6.57	3.38	16	17.3	0.2	< 1	< 0.1	30.1	0.9	1.94	0.4	137	0.002	1.4	13.1
924764	Till	< 0.0001	< 2	0.11	32.2	0.8	< 0.2	818	65.1	28.5	181	105	435	3.3	0.9	3.8	0.77	17	59	7.99	3.82	15	17.6	0.2	< 1	0.1	36.3	0.9	1.73	< 0.1	144	0.003	1.9	14.1
924765	Till	< 0.0001	< 2	0.06	13.7	< 0.1	< 0.2	520	24.5	21.2	66.9	20.3	372	3.3	0.84	< 0.5	0.74	9	66	9.59	3.11	17	19	0.2	< 1	< 0.1	51	0.85	2.01	0.3	151	0.003	0.5	13.2
924766	Till	< 0.0001	< 2	0.06	21.6	< 0.1	< 0.2	940	26.4	17	131	6.8	645	3.1	0.32	< 0.5	2	16	46	12.6	7.13	37	26.1	0.4	< 1	< 0.1	64.6	1.52	1.86	< 0.1	136	0.002	1.4	29.9
924767	Till	< 0.0001	< 2	0.07	40.7	0.1	< 0.2	765	30.1	22.9	77.9	19.2	432	3.6	1.2	< 0.5	0.9	14	59	13.6	3.94	17	22	0.4	< 1	< 0.1	54.8	1.02	1.94	0.1	164	0.014	1.5	16.3
924768	Till	< 0.0001	< 2	0.25	18.8	0.1	0.8	705	28.8	28.4	78.6	16.2	435	4.7	1.31	7.7	0.67	9	54	11.6	3.57	15	23.9	0.9	< 1	< 0.1	68.6	0.91	1.95	0.5	152	< 0.001	0.8	15.4
924769	Till	< 0.0001	< 2	0.18	24.7	0.2	0.5	824	30.1	32.2	84.6	19.1	482	4.3	2.48	8.1	1.21	14	64	9.45	3.63	18	25.4	0.9	< 1	< 0.1	60.8	1.17	2.15	2.7	178	< 0.001	1.2	16.3
924770	#N/A	< 0.0001	< 2	0.09	38	0.2	< 0.2	696	33.5	50.2	93.1	29.5	434	2.7	0.95	8.2	0.64	18	97	6.59	4.49	11	19.2	0.6	< 1	< 0.1	35.2	1.25	1.6	< 0.1	112	< 0.001	0.9	16.6
924771	Till	< 0.0001	< 2	0.12	19.6	0.1	< 0.2	775	30.1	27.5	76.4	14.6	463	4.2	1.13	8.9	0.99	13	49	11.6	3.51	19	23.6	0.9	< 1	< 0.1	62.8	1.04	2.18	0.1	152	< 0.001	1.2	14.6
924772	Till	< 0.0001	< 2	< 0.05	21.4	0.2	0.4	683	30.1	26.9	83.7	18.3	375	4.3	3.14	3.2	0.39	14	47	15.8	4.08	16	24.8	0.9	< 1	< 0.1	62.8	0.81	2.06	14.7	76.6	< 0.001	1.5	16.8
924773	Till	< 0.0001	< 2	0.09	11.4	0.1	< 0.2	556	26.3	18.1	62.3	16.1	414	3.7	1.27	6.8	0.62	12	43	9.06	3.1	19	18.9	0.6	< 1	< 0.1	49.9	0.65	2.18	0.4	127	< 0.001	0.8	13.2
924774	Till	< 0.0001	< 2	0.09	17.9	0.1	< 0.2	768	30.2	30	77.7	13.8	421	4.3	2.73	9.3	1.14	15	64	11.6	3.64	17	24.2	0.7	< 1	< 0.1	56.8	1.15	2.25	0.3	133	< 0.001	0.6	16.2
924775	Till	< 0.0001	< 2	0.14	55.8	0.1	< 0.2	561	48.6	26.1	73.4	88.9	450	3.5	0.94	8.6	0.6	11	69	9.38	5.71	15	19.3	0.9	< 1	< 0.1	33.5	0.91	1.74	< 0.1	124	< 0.001	0.9	14.2
924776	Till	< 0.0001	< 2	0.07	53.1	0.1	< 0.2	469	40.1	32.1	114	60.6	416	4.1	0.75	8.2	0.53	13	53	9.45	4.37	14	19.5	0.8	< 1	< 0.1	43.4	0.81	1.78	< 0.1	116	< 0.001	0.7	13.8
924777	Till	0.0014	< 2	0.09	35.6	0.1	< 0.2	550	32.2	30.2	80.4	30.8	396	3.6	0.74	3.7	0.74	15	49	9.67	3.45	17	18.7	0.7	< 1	< 0.1	39.8	0.75	2.03	< 0.1	122	< 0.001	1.5	12.3
924778	Till	< 0.0001	< 2	0.07	24.2	< 0.1	< 0.2	415	28.8	32.5	73.8	22.3	404	4.2	0.8	5.8	0.65	12	55	10.5	3.26	16	21.1	0.7	< 1	< 0.1	53.4	0.82	1.9	< 0.1	140	< 0.001	1.2	12
924779	Till	0.0013	< 2	0.09	29.4	< 0.1	< 0.2	379	35.5	20.7	56.7	19.4	415	3.9	0.84	5.5	0.55	7	60	9.14	3.71	17	20.7	0.8	< 1	< 0.1	39.2	0.71	2	< 0.1	132	< 0.001	0.9	12.3
924780	Till	< 0.0001	< 2	0.06	21.4	< 0.1	< 0.2	423	26.9	25	51.7	18.4	378	3.5	0.64	5.4	0.8	12	48	6.81	2.81	17	16.6	0.7	< 1	< 0.1	36.5	0.63	2.15	< 0.1	126	< 0.001	0.7	10.3
924781	Till	0.0013	< 2	0.1	27.5	< 0.1	< 0.2	500	26.9	28.3	66.5	19.8	363	3.6	0.65	8.2	0.89	14	60	7.87	3.23	18	17.9	0.7	< 1	< 0.1	40.4	0.76	2.04	< 0.1	125	< 0.001	< 0.1	11.4
924782	Till	0.0009	< 2	0.08	27.7	< 0.1	< 0.2	726	30.2	30.6	69.5	16.7	332	3.6	0.69	6	0.71	18	59	7.11	3.09	16	18	0.5	< 1	< 0.1	39.6	0.69	2.15	2	73.6	< 0.001	0.9	11.4
924783	Till	< 0.0001	< 2	0.09	27.5	< 0.1	< 0.2	780	23.1	26.9	64.2	21.8	369	3.4	0.55	7.2	1.26	16	51	6.55	3.4	17	17.7	0.6	< 1	< 0.1	32.2	0.92	2.08	< 0.1	117	< 0.001	0.8	13.1
924784	Till	< 0.0001	< 2	< 0.05	19.7	0.1	< 0.2	639	25.6	37.2	90.7	16.7	360	3.4	0.64	11.4	0.99	14	52	7.45	3.08	14	17.3	0.6	< 1	< 0.1	39.5	0.79	1.97	0.9	122	< 0.001	0.6	11.1
924785	Till	< 0.0001	11	0.09	33.7	< 0.1	< 0.2	754	25.8	28.1	64.6	17.3	423	3.1	0.41	5.3	1.03	14	64	8.22	3.78	12	18.1	1	< 1	< 0.1	30.1	0.92	1.86	2.6	118	< 0.001	1.4	13.8
924786	Till	< 0.0001	< 2	0.12	63.4	0.2	< 0.2	743	37.6	29.9	92.1	19.3	389	3.2	0.41	< 0.5	1.03	13	71	7.15	3.28	15	16.9	0.7	< 1	< 0.1	29.1	0.93	2.1	< 0.1	111	< 0.001	0.9	13.4
924787	Till	< 0.0001	< 2	0.12	10.2	< 0.1	< 0.2	254	20.1	17.1	45.1	11	288	2.5	0.56	23.3	0.41	5	55	9.75	2.38	15	19	0.5	< 1	< 0.1	50.8	0.52	1.54	< 0.1	125	< 0.001	0.8	9.1
924788	Till	< 0.0001	< 2	0.09	22.7	0.1	< 0.2	477	29.2	22.2	48.8	19.9	332	2.8	0.4	< 0.5	0.86	12	51	5.45	2.94	15	14.7	0.5	< 1	< 0.1	28.7	0.69	2.12	< 0.1	75.8	< 0.001	0.4	11.6
924789	Till	< 0.0001	< 2	0.12	32.4	0.1	< 0.2	634	25.2	31.4	66.1	23.2	411	3.6	0.53	< 0.5	1.05	12	64	7.91	3.13	12	18.5	0.6	< 1	< 0.1	42.8	0.95	2.01	< 0.1	127	< 0.001	1.3	13.5
924790	#N/A	0.037	< 2	0.37	320	0.9	119	791	25.8	29.3	115	80.1	425	6.1	19.8	< 0.5	1.25	14	53	18.1	5.21	7	20.5	0.8	< 1	0.2	41	0.92	1.55	12.6	227	< 0.001	3.3	14.4
924791	Till	< 0.0001	< 2	0.13	33.8	0.3	< 0.2	667	62.1	41.4	101	60	419	3.4	0.53	< 0.5	1.02	13	97	8.36	3.41	16	18.1	0.8	< 1	< 0.1	38.9	1.05	1.86	0.1	144	< 0.001	< 0.1	13.2
924792	Till	< 0.0001	< 2	1.07	16.9	0.2	< 0.2	315	131	23.4	97.4	477	287	2.1	0.52	31	0.5	10	86	13	2.98	14	16.6	0.8	< 1	< 0.1	47.5	0.59	1.2	1.3	109	< 0.001	1.3	9

Final Report
Activation Laboratories

Report Date: 12

Analyte Symbol	Se	Sn	Sr	Ta	Te	Th	Tl	U	V	Y	Zr	La	K	Ce	Pr	Nd	Sm	Eu	Gd	Dy	Tb	Ho	Er	Tm	Yb	Lu	Mass
Unit Symbol	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	g
Detection Limit	0.1	1	0.2	0.1	0.1	0.1	0.05	0.1	1	0.1	1	0.1	0.01	0.1	0.1	0.1	0.1	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
Analysis Method	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	MULT INAA/TD-ICP-MS	TD-MS	MULT INAA/TD-ICP-MS	TD-MS	MULT INAA/TD-ICP-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	TD-MS	INAA
924753	0.9	2	65.6	< 0.1	< 0.1	34.4	1.16	7.9	69	59.1	220	72	1.69	159	19.3	71.7	15.4	1.98	14.6	12.1	2.1	2.3	6.7	1	6.5	1	1
924754	0.3	2	113	< 0.1	< 0.1	34.7	0.87	6.1	39	39.1	192	71.8	2.78	146	17.6	63.3	12.4	1.72	11.4	8.3	1.6	1.5	4	0.6	3.4	0.5	2
924755	0.5	2	117	< 0.1	< 0.1	28.2	1.12	6.1	58	32.6	122	70.2	2.88	153	16.5	58.9	11.1	1.81	9.8	7.2	1.4	1.3	3.5	0.5	3.3	0.5	2
924756	0.5	< 1	107	< 0.1	< 0.1	34.1	0.85	6.1	35	33.4	76	73.3	2.83	146	18.1	64.5	12.7	1.86	11.3	7.7	1.5	1.3	3.4	0.5	3.2	0.5	2
924757	0.5	3	92.2	< 0.1	< 0.1	27.1	1.01	6.3	50	33.8	117	63.4	2.69	135	15.6	55.6	10.8	1.7	9.8	7.1	1.4	1.3	3.5	0.5	3.1	0.5	1
924758	0.4	2	96.7	< 0.1	< 0.1	26.4	0.99	5.7	48	32.8	126	60.6	2.84	126	15.2	55.3	11	1.8	10	7.1	1.4	1.2	3.3	0.5	3.1	0.5	1
924759	0.5	4	108	< 0.1	< 0.1	30	0.95	5.7	64	33.8	201	64	2.91	137	16.2	56.8	10.8	1.62	9.7	7.1	1.3	1.2	3.3	0.5	2.9	0.4	1
924760	0.5	2	98.8	< 0.1	< 0.1	24.7	0.95	5	42	29.1	172	56.4	2.85	116	14.1	52.1	10.2	1.59	9.5	6.4	1.3	1.1	3	0.4	2.7	0.4	2
924761	0.3	< 1	117	< 0.1	< 0.1	27.4	0.84	5	34	35.1	8	62.8	2.61	131	15.6	57	11.3	1.71	10.1	7.2	1.4	1.3	3.4	0.5	3	0.5	2
924762	0.6	2	92.2	< 0.1	< 0.1	19.3	0.65	3.7	70	22.9	230	30	1.73	73.7	9	34.8	7.5	1.25	7	5.3	1	0.9	2.6	0.4	2.3	0.4	2
924763	0.6	2	116	< 0.1	< 0.1	25.4	0.78	5.1	53	35.6	242	62.1	2.57	134	15.8	56.8	11.5	1.73	10.2	7.3	1.4	1.3	3.4	0.5	3.2	0.5	2
924764	0.4	< 1	96	< 0.1	< 0.1	26	0.89	5.6	32	31.1	147	57.8	2.58	135	14.8	53.9	10.7	1.72	9.4	6.6	1.3	1.2	3.2	0.4	2.9	0.4	1
924765	0.3	1	111	< 0.1	< 0.1	30.7	0.9	5.5	24	35.2	154	62.8	2.57	124	15.5	56.2	11.2	1.56	10.1	7.3	1.4	1.3	3.5	0.5	3.2	0.5	2
924766	0.8	< 1	197	< 0.1	< 0.1	40.5	0.74	5.2	62	75.7	67	76.8	2.69	171	20.3	76.6	16.6	3.18	17.1	14.2	2.5	2.8	7.6	1	6.5	1	1
924767	0.2	3	133	< 0.1	< 0.1	34.2	0.94	6.3	57	38.8	105	68.1	2.58	157	16.8	60.8	11.6	1.76	10.2	7.7	1.4	1.4	3.9	0.6	3.4	0.5	1
924768	< 0.1	3	104	< 0.1	< 0.1	33.4	1.1	8.9	49	42.6	227	87.5	2.23	161	21	74.1	13.9	1.74	11.7	8.9	1.6	1.6	4.2	0.6	3.7	0.5	1
924769	< 0.1	7	146	< 0.1	< 0.1	32.7	1.12	8.9	89	40.5	305	78	2.96	162	18.9	66.2	12.9	1.73	10.7	8.5	1.5	1.6	4.1	0.6	3.7	0.6	1
924770	< 0.1	< 1	99.6	< 0.1	< 0.1	16	0.71	4.6	36	30.9	116	44.9	1.94	100	10.6	38.7	7.5	1.36	6.7	5.9	1	1.1	3.1	0.5	3.1	0.5	2
924771	< 0.1	3	156	< 0.1	< 0.1	30.8	1.11	7.6	57	37.6	199	67.2	2.46	153	16.9	59.5	12.1	1.79	10	7.9	1.4	1.5	3.8	0.6	3.5	0.5	1
924772	0.4	7	71.8	1.1	< 0.1	37.8	1.08	8.2	79	31.6	307	46.5	1.24	100	12.8	48.1	10.1	1.28	9	7	1.3	1.3	3.5	0.5	3.3	0.5	1
924773	< 0.1	2	88	< 0.1	< 0.1	41.4	0.91	8	36	34.6	223	82.2	1.72	173	19.7	69.3	12.9	1.4	10.5	7.7	1.5	1.4	3.5	0.5	3.2	0.5	1
924774	< 0.1	2	141	< 0.1	< 0.1	33.8	0.98	7.5	62	42.4	257	73	1.75	168	17.9	65.2	12.6	1.62	10.7	8.6	1.5	1.6	4.2	0.6	3.9	0.6	1
924775	< 0.1	< 1	90.7	< 0.1	< 0.1	29.6	0.97	6.6	54	26.9	89	77.7	2.33	166	18.6	66.9	12.7	1.84	10.3	6.7	1.4	1.1	2.6	0.4	2.4	0.4	2
924776	< 0.1	< 1	85.1	< 0.1	< 0.1	29.9	1	8.1	38	28	20	78.8	1.85	160	19.1	67.2	12.6	1.8	10.3	6.8	1.4	1.1	2.6	0.4	2.3	0.4	1
924777	< 0.1	< 1	94.8	< 0.1	< 0.1	32.9	1.04	8.2	34	33.3	106	79.1	2.07	167	19.7	70.5	14.1	1.83	11.1	7.5	1.5	1.3	3.2	0.5	3	0.5	1
924778	< 0.1	1	94.2	< 0.1	< 0.1	33.2	1.03	7.9	38	34.6	89	82.1	2.3	161	20.1	70.9	13.7	1.73	11.5	7.8	1.5	1.3	3.3	0.5	2.9	0.5	2
924779	< 0.1	< 1	91.8	< 0.1	< 0.1	34.5	1.13	8.2	31	30.1	183	89.7	2.26	186	22	79.8	15.5	1.87	11.8	7.4	1.5	1.2	3.1	0.4	2.8	0.4	2
924780	< 0.1	< 1	101	< 0.1	< 0.1	29.9	0.9	7	32	31	118	68.7	2.25	142	16.5	58.6	11.8	1.48	9.9	7	1.3	1.2	2.9	0.4	2.6	0.4	2
924781	< 0.1	< 1	103	< 0.1	< 0.1	30.6	0.89	7	39	34	111	72.8	2.12	154	18.2	64.7	12.9	1.56	10.4	7.3	1.4	1.3	3.2	0.5	2.9	0.4	2
924782	< 0.1	3	90	< 0.1	< 0.1	31.1	0.98	6.9	60	26.5	294	45.5	1.32	109	13.2	48.9	10.3	1.29	8.6	6.6	1.2	1.1	2.9	0.4	2.8	0.4	1
924783	< 0.1	< 1	117	< 0.1	< 0.1	24.6	0.77	5.4	43	34.8	134	60.9	1.9	128	14.9	55	11.4	1.67	9.6	7.2	1.4	1.3	3.4	0.5	3.1	0.5	2
924784	< 0.1	1	108	< 0.1	< 0.1	25.3	0.82	5.5	52	31.1	99	61.2	1.78	129	14.7	51.7	10.4	1.36	8.9	6.6	1.3	1.2	3	0.4	2.7	0.4	2
924785	< 0.1	3	108	< 0.1	< 0.1	23.2	0.81	6.7	80	33.4	56	55.9	2.15	122	14.1	52.2	10.4	1.66	8.9	7	1.3	1.3	3.3	0.5	3.1	0.5	2
924786	< 0.1	1	105	< 0.1	< 0.1	24.9	0.75	5	46	29.9	54	55.5	2.04	117	13.9	50.7	10.1	1.55	8.8	6.4	1.2	1.1	2.9	0.4	2.7	0.4	2
924787	< 0.1	< 1	78.9	< 0.1	< 0.1	16.2	0.78	10	19	19.4	24	40.2	1.94	79.6	9.5	33.3	6.2	0.92	5.1	3.8	0.7	0.7	1.9	0.3	2	0.3	2
924788	< 0.1	< 1	96	< 0.1	< 0.1	24.3	0.74	5	32	26.8	76	51.5	1.28	105	12.6	45.5	9	1.29	7.8	5.7	1.1	1	2.7	0.4	2.6	0.4	2
924789	< 0.1	< 1	114	< 0.1	< 0.1	23	0.83	5.9	33	33.9	134	59.9	2.1	123	14.4	52.3	10.2	1.57	9.3	6.9	1.3	1.2	3.1	0.4	2.8	0.5	2
924790	< 0.1	24	117	0.9	0.2	18.1	2.57	5	84	27	125	41.9	2.34	86.7	10.1	35.3	7.1	1.09	6.3	5.3	0.9	1	2.8	0.4	2.5	0.4	2
924791	< 0.1	1	106	< 0.1	< 0.1	30.7	0.95	6.5	48	36.6	108	74.9	2.4	155	18.7	66.4	13.5	1.84	11.3	7.9	1.5	1.4	3.7	0.5	3.5	0.5	2
924792	< 0.1	3	85.2	< 0.1	< 0.1	15.8	0.9	4.2	54	21.4	144	48.1	1.61	95.7	11.2	40.1	7.6	1.09	6	4.4	0.8	0.8	2.1	0.3	2.1	0.3	1

Appendix H: Quarry Borrow Results

H1: XRD Results

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

Project: SRK – Sisson Quarry Samples

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October 11, 2012

EXPERIMENTAL METHOD

The two samples of **Project SRK – Sisson Quarry Samples** were reduced to the optimum grain-size range for quantitative X-ray analysis (<10 μm) by grinding under ethanol in a vibratory McCrone Micronising Mill for 7 minutes. Step-scan X-ray powder-diffraction data were collected over a range 3-80°2θ with CoKa radiation on a Bruker D8 Focus Bragg-Brentano diffractometer equipped with an Fe monochromator foil, 0.6 mm (0.3°) divergence slit, incident- and diffracted-beam Soller slits and a LynxEye detector. The long fine-focus Co X-ray tube was operated at 35 kV and 40 mA, using a take-off angle of 6°.

RESULTS

The X-ray diffractograms were analyzed using the International Centre for Diffraction Database PDF-4 and Search-Match software by Bruker. X-ray powder-diffraction data of the samples were refined with Rietveld program Topas 4.2 (Bruker AXS). The results of quantitative phase analysis by Rietveld refinements are given in Table 1. These amounts represent the relative amounts of crystalline phases normalized to 100%. The Rietveld refinement plots are shown in Figures 1 – 2.

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

Mineral	**Ideal Formula**	**1-HC 17**	**2-HC 18**
Quartz	SiO_2	35.6	27.8
Clinochlore	$(Mg,Fe^{2+})_5Al(Si_3Al)O_{10}(OH)_8$	1.0	3.4
Muscovite 2M, 1M	$KAl_2(AlSi_3O_{10})(OH)_2$	8.7	5.7
Biotite	$K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$	2.4	5.8
K-Feldspar	$KAlSi_3O_8$	22.0	13.5
Plagioclase	$NaAlSi_3O_8$ – $CaAl_2Si_2O_8$	30.0	42.1
Calcite	$CaCO_3$		1.4
Ankerite-Dolomite	$Ca(Fe^{2+},Mg,Mn)(CO_3)_2/CaMg(CO_3)_2$	0.2	0.3
Total		100.0	100.0

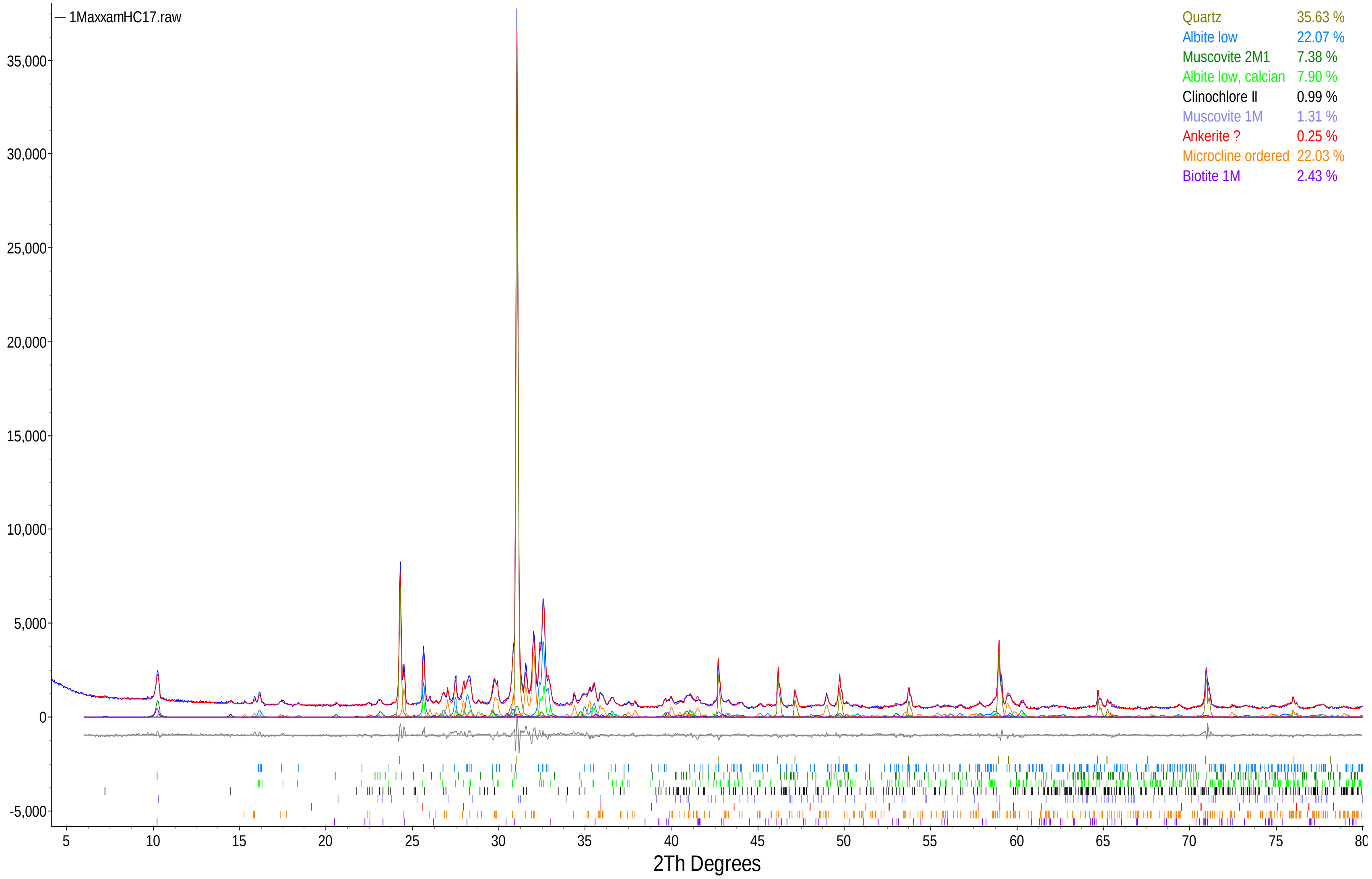

Figure 1. Rietveld refinement plot of sample **"1- HC 17"** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

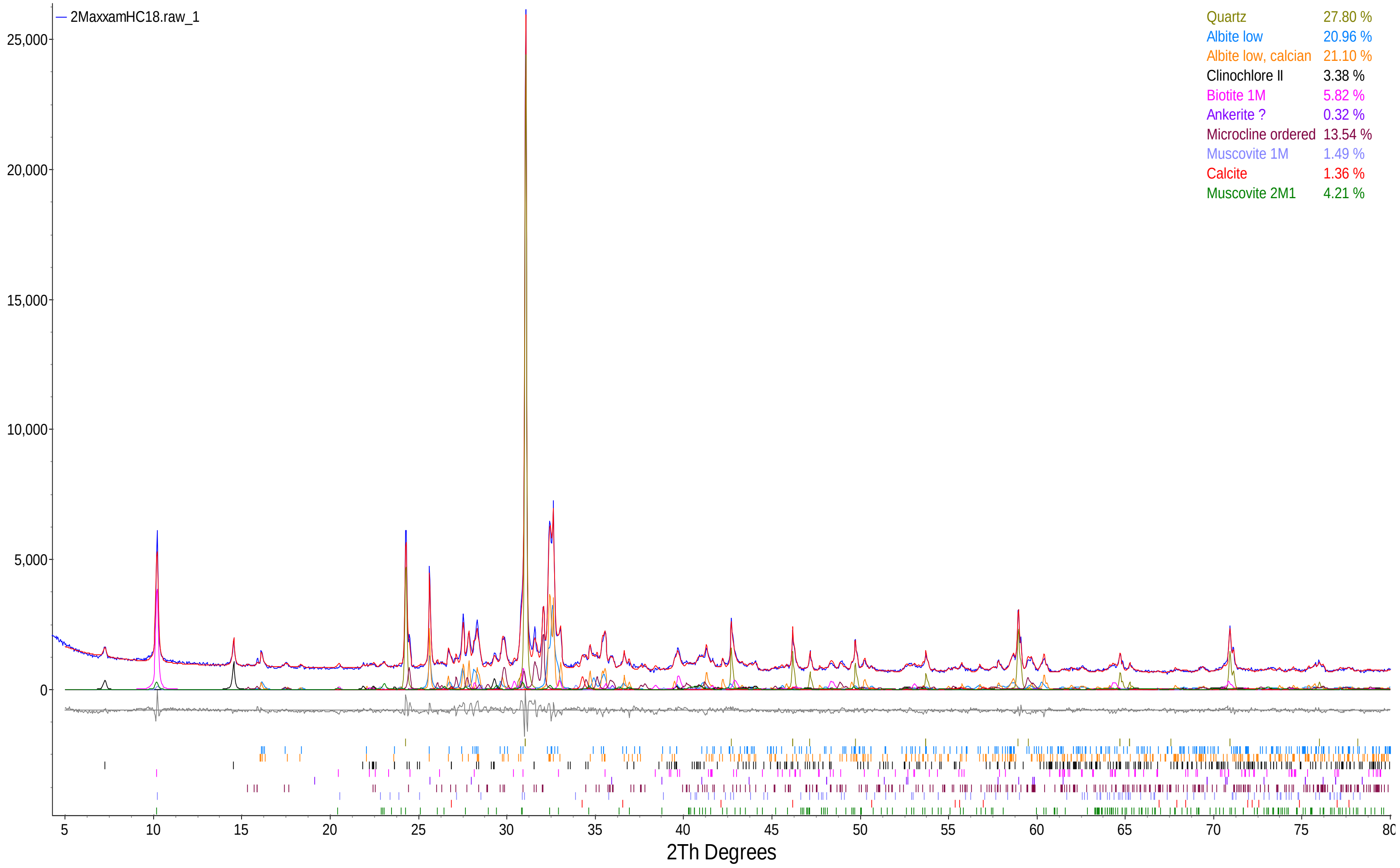

Figure 2. Rietveld refinement plot of sample **“2- HC 18”** (blue line - observed intensity at each step; red line - calculated pattern; solid grey line below – difference between observed and calculated intensities; vertical bars, positions of all Bragg reflections). Coloured lines are individual diffraction patterns of all phases.

H2: Acid Base Accounting Results

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Client: Northcliff Resources

Maxxam Sample No	Sample ID	Paste pH	Paste EC	Total Carbon	CO2	CaCO3 Equiv.	Total S	Na2CO3 Extractable Sulphur	HCl Extractable Sulphur	Sulphide Sulphur (by diff.)	Acid Generation Potential	Mod. ABA Neutralization Potential	Fizz Rating	Net Neutralization Potential	Neutralization Potential Ratio
	Units	pH Units	uS/cm	wt%	wt%	Kg CaCO3/T	wt%	wt%	wt%	wt%	Kg CaCO3/T	Kg CaCO3/T	N/A	Kg CaCO3/T	N/A
EF4934	924800(5.5-8.8M)	8.85	68	0.02	<0.02	<0.5	<0.02	<0.01	<0.01	<0.02	<0.6	1.3	NONE	1.3	#N/A
EF4935	924801(15.1-18.37M)	9.27	74	0.03	<0.02	<0.5	<0.02	<0.01	<0.01	<0.02	<0.6	3.8	NONE	3.8	#N/A
EF4936	924802(31.7-35.3M)	9.34	191	0.07	0.14	3.2	<0.02	<0.01	<0.01	<0.02	<0.6	6.5	NONE	6.5	#N/A
EF4937	924803(7.3-11M)	9.67	170	0.04	0.04	0.9	<0.02	<0.01	<0.01	<0.02	<0.6	8.8	NONE	8.8	#N/A
EF4938	924804(19.3-21.54M)	9.30	82	0.28	0.81	18.4	0.05	<0.01	<0.01	0.05	1.6	23.0	SLIGHT	21.4	14.7
EF4939	924805(25.25-28.90M)	9.64	197	0.14	0.29	6.6	0.04	<0.01	<0.01	0.04	1.3	13.8	SLIGHT	12.6	11.0
Detection Limits		*N/A*	*1*	*0.02*	*0.02*	*0.5*	*0.02*	*0.01*	*0.01*	*0.02*	*0.6*	*0.1*		*0.1*	*0.1*
Maxxam SOP #		*7160*		*Leco*	*Leco*	*Calculation*	*Leco*		*Calculation*	*Calculation*	*Calculation*	*7150*	*7150*	*Calculation*	*Calculation*

References:

Acid Generation Potential = Sulphide Sulphur (by diff.)*31.25

CaCO3 Equivalency = Carbonate Carbon (CO2)*(100/44)*10

Fizz Rating - Reference method used is based on NP method.

Net Neutralization Potential = (Modified ABA Neutralization Potential)-(Acid Generation Potential (S-S by diff))

Mod. ABA Neutralization Potential - MEND Acid Rock Drainage Prediction Manual, MEND Project 1.16.1b (pages 6.2-11 to 17), March 1991.

Neutralization Potential Ratio = (Neutralization Potential)/(Acid Generation Potential)

Paste EC - based on Field and Laboratory Methods Applicable to Overburdens and Minesoils, (EPA 600 / 2-78-054, March 1978).

Paste pH - Field and Laboratory Methods Applicable to Overburdens and Minesoils, (EPA 600 / 2-78-054, March 1978).
HCl Extractable Sulphur is based on a modified version of ASTM Method D 2492-02
Sulphide Sulphur = (Total Sulphur)-(Sulphate Sulphur)

Maxxam

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Sample Reference	**HC17**	**HC18**
Selected Samples	924800 (5.5 - 8.8 m)	924803 (7.3 -11 m)
	924801 (15.1 - 18.37 m)	924804 (19.3 - 21.54 m)
	924802 (31.7 -35.3 m)	924805 (25.24 -28.90 m)
No. Samples in Composite	3	3
Total Mass of composite(g)	1500	1500
Required Mass of Each Sample(g)	500	500

H3: Trace Element Analysis Results

Maxxam Analytics 4606 Canada Way, Burnaby, BC Canada V5G 1K5 Tel: 604 734 7276 Fax: 604 731 2386 www.maxxam.ca

Client: Northcliff Resources

Maxxam Sample No	Sample ID	Mo	Cu	Pb	Zn	Ag	Ni	Co	Mn	Fe	As	U	Au	Th	Sr	Cd	Sb	Bi	V	Ca	P	La	Cr	Mg
	Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppb	ppm	ppm	ppm	ppm	ppm	ppm	%	%	ppm	ppm	%
EF4934	924800(5.5-8.8M)	0.4	8.2	5.5	33	<0.1	6.4	2.8	276	1.24	<0.5	2.7	<0.5	14.1	7	<0.1	<0.1	0.6	11	0.15	0.038	23	98	0.23
EF4935	924801(15.1-18.37M)	0.5	6.5	6.2	34	<0.1	6.8	3.0	279	1.33	0.5	2.5	<0.5	15.4	7	<0.1	<0.1	0.6	12	0.20	0.042	25	121	0.25
EF4936	924802(31.7-35.3M)	0.4	5.6	7.2	37	<0.1	6.2	2.7	294	1.22	0.6	2.7	1.3	14.9	7	<0.1	<0.1	0.7	9	0.25	0.041	22	85	0.23
EF4937	924803(7.3-11M)	1.8	10.2	4.6	70	<0.1	7.6	8.1	434	3.48	<0.5	4.6	2.6	14.8	10	<0.1	<0.1	0.2	53	0.64	0.110	59	91	0.73
EF4938	924804(19.3-21.54M)	0.6	2.2	7.4	35	<0.1	5.3	4.4	328	1.80	1.2	3.1	1.3	14.1	10	<0.1	<0.1	0.2	23	0.95	0.046	27	80	0.37
EF4939	924805(25.25-28.90M)	1.1	10.3	4.4	63	<0.1	8.1	7.6	438	3.16	1.3	4.1	2.0	8.6	9	<0.1	<0.1	0.6	47	0.71	0.105	21	96	0.67
QAQC																								
Duplicates																								
EF4938 Dup	924804(19.3-21.54M)	0.7	2.4	7.4	37	<0.1	6.1	4.6	342	1.83	1.0	5.0	<0.5	14.4	10	<0.1	<0.1	0.3	23	0.96	0.047	27	83	0.38
Blanks																								
Method Blank										<0.01										<0.01	<0.001			<0.01
Method Blank													<0.5											
Method Blank		<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.1	<1		<0.5	<0.1		<0.1	<1	<0.1	<0.1	<0.1	<2			<1	<1	
Reference Material																								
SPIKE DS8 (%) (6205044)										2.29										0.690	0.0810			0.610
True Values SPIKE DS8										**2.46**										**0.7**	**0.08**			**0.6045**
Percent Difference (6205044)										-6.91										-1.43	1.25			0.91
Reference Material																								
SPIKE DS8 PPB (6205046)													108											
True Values SPIKE DS8 PPB													**107**											
Percent Difference (6205046)													1.03											
Reference Material																								
SPIKE DS8 PPM (6205047)		11.8	104	112	292	1.60	39.1	6.90	584		25.3	2.50		5.50	68.0	2.20	4.50	5.20	37.0			12.0	110	
True Values SPIKE DS8 PPM		**13.44**	**110**	**123**	**312**		**38.1**	**7.5**			**26**	**2.8**		**6.89**	**67.7**	**2.38**	**4.8**	**6.67**	**41.1**			**14.6**	**115**	
Percent Difference (6205047)		-12.20	-5.36	-9.27	-6.41		2.62	-8.00			-2.69	-10.71		-20.17	0.44	-7.56	-6.25	-22.04	-9.98			-17.81	-4.35	
Reference Material																								
REFMAT OREAS45CA (%) (6205044)										14.9										0.430	0.0390			0.130
True Values REFMAT OREAS45CA										**15.69**										**0.4265**	**0.0385**			**0.1358**
Percent Difference (6205044)										-4.84										0.82	1.30			-4.27
Reference Material																								
REFMAT OREAS45CA PPB (6205046)													38.3											
True Values REFMAT OREAS45CA PPB													**43**											
Percent Difference (6205046)													-10.93											
Reference Material																								
REFMAT OREAS45CA PPM (6205047)		0.700	485	18.4	58.0	0.300	239	87.4	911		2.90	1.00		6.70	15.0	0.100	0.100	0.100	215			15.0	658	
True Values REFMAT OREAS45CA PPM		**1**	**494**	**20**	**60**		**240**	**92**			**3.8**	**1.2**		**7**	**15**	**0.1**	**0.13**	**0.19**	**215**			**15.9**	**709**	
Percent Difference (6205047)		-30.00	-1.88	-8.00	-3.33		-0.50	-5.00			-23.68	-16.67		-4.29	0.00	0.00	-23.08	-47.37	0.00			-5.66	-7.19	
Detection Limits		0.1	0.1	0.1	1	0.1	0.1	0.1	1	0.01	0.5	0.1	0.5	0.1	1	0.1	0.1	0.1	2	0.01	0.001	1	1	0.01
Maxxam SOP #		1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX

Maxxam Sample No	Sample ID Units	Ba ppm	Ti %	B ppm	Al %	Na %	K %	W ppm	Hg ppm	Sc ppm	Tl ppm	S %	Ga ppm	Se ppm	Te ppm
EF4934	924800(5.5-8.8M)	24	0.096	21	0.77	0.043	0.39	0.2	<0.01	2.5	0.5	<0.05	5	<0.5	<0.2
EF4935	924801(15.1-18.37M)	28	0.101	21	0.80	0.054	0.39	0.2	<0.01	2.7	0.4	<0.05	5	<0.5	<0.2
EF4936	924802(31.7-35.3M)	21	0.046	<20	0.70	0.036	0.30	<0.1	<0.01	2.1	0.2	<0.05	4	<0.5	<0.2
EF4937	924803(7.3-11M)	231	0.346	<20	1.75	0.067	1.18	0.2	<0.01	10.5	0.5	<0.05	10	<0.5	<0.2
EF4938	924804(19.3-21.54M)	30	0.061	<20	0.85	0.035	0.23	0.1	<0.01	3.8	0.1	<0.05	5	<0.5	<0.2
EF4939	924805(25.25-28.90M)	773	0.274	<20	1.54	0.064	0.89	0.2	<0.01	8.2	0.4	<0.05	9	<0.5	<0.2
QAQC															
Duplicates															
EF4938 Dup	924804(19.3-21.54M)	31	0.063	<20	0.86	0.036	0.23	0.1	<0.01	4.2	0.1	<0.05	5	<0.5	<0.2
Blanks															
Method Blank			<0.001		<0.01	<0.001	<0.01					<0.05			
Method Blank															
Method Blank		<1		<20				<0.1	<0.01	<0.1	<0.1		<1	<0.5	*<0.2*
Reference Material															
SPIKE DS8 (%) (6205044)			0.100		0.910	0.0790	0.390					0.150			
True Values SPIKE DS8			**0.113**		**0.93**	**0.0883**	**0.41**					**0.1679**			
Percent Difference (6205044)			-11.50		-2.15	-10.53	-4.88					-10.66			
Reference Material															
SPIKE DS8 PPB (6205046)															
True Values SPIKE DS8 PPB															
Percent Difference (6205046)															
Reference Material															
SPIKE DS8 PPM (6205047)		304		<20				2.60	0.190	2.50	5.40		4.00	5.10	*5.00*
True Values SPIKE DS8 PPM		**279**		**2.6**				**3**		**2.3**	**5.4**		**4.7**	**5.23**	**5**
Percent Difference (6205047)		8.96		100.00				-13.33		8.70	0.00		-14.89	-2.49	*0.00*
Reference Material															
REFMAT OREAS45CA (%) (6205044)			0.136		3.45	0.00900	0.0700					0.0500			
True Values REFMAT OREAS45CA			**0.128**		**3.592**	**0.0075**	**0.0717**					**0.021**			
Percent Difference (6205044)			6.25		-3.95	20.00	-2.37					138.10			
Reference Material															
REFMAT OREAS45CA PPB (6205046)															
True Values REFMAT OREAS45CA PPB															
Percent Difference (6205046)															
Reference Material															
REFMAT OREAS45CA PPM (6205047)		155		<20				0.100	0.0300	43.6	<0.1		18.0	0.500	*0.200*
True Values REFMAT OREAS45CA PPM		**164**								**39.7**	**0.07**		**18.4**	**0.5**	**0.06**
Percent Difference (6205047)		-5.49								9.82	100.00		-2.17	0.00	*233.33*
Detection Limits		1	0.001	20	0.01	0.001	0.01	0.1	0.01	0.1	0.1	0.05	1	0.5	*0.2*
Maxxam SOP #		1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	1DX	*1DX*

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Maxxam Sample No	Sample ID Units	Ba ppm
EF4934	924800(5.5-8.8M)	0.03
EF4935	924801(15.1-18.37M)	0.03
EF4936	924802(31.7-35.3M)	0.05
EF4937	924803(7.3-11M)	0.09
EF4938	924804(19.3-21.54M)	0.04
EF4939	924805(25.25-28.90M)	0.07
QAQC		
Duplicates		
EF4939 Dup	924805(25.25-28.90M)	0.07
Detection Limits		*0.01*
Maxxam SOP #		*G803*

Maxxam Sample No	**Sample ID** **Units**	**F** **%**
CP4558	PW-1	0.12
CP4559	PW-2	0.13
CP4560	PW-3	0.11
CP4561	PW-4	0.09
CP4562	PW-5	0.15
CP4626	PW-71	0.06
QAQC		
Duplicates		
CP4565 Dup	PW-8	0.14
Detection Limits		*0.01*
		G803

Maxxam Sample No	Sample ID Units	Hg on Solids mg/kg
EF4934	924800(5.5-8.8M)	*<0.01*
EF4935	924801(15.1-18.37M)	*<0.01*
EF4936	924802(31.7-35.3M)	*<0.01*
EF4937	924803(7.3-11M)	*<0.01*
EF4938	924804(19.3-21.54M)	*<0.01*
EF4939	924805(25.25-28.90M)	*<0.01*
QAQC		
Duplicates		
EF4934 Dup	924800(5.5-8.8M)	*<0.01*
Blanks		
Method Blank		*<0.01*
Reference Material		
Hg Soil Spike 1 ppm (6159143)		*1.07*
True Values Hg Soil Spike 1 ppm		**1**
Percent Difference (6159143)		*7*
Reference Material		
Hg Soil CRM SS-2 (6159143)		*0.33*
True Values Hg Soil CRM SS-2		**0.33**
Percent Difference (6159143)		*0*
Detection Limits		*0.01*
Maxxam SOP #		*65-C-015-03*

Sample Reference	**HC17**	**HC18**
Selected Samples	924800 (5.5 - 8.8 m)	924803 (7.3 -11 m)
	924801 (15.1 - 18.37 m)	924804 (19.3 - 21.54 m)
	924802 (31.7 -35.3 m)	924805 (25.24 -28.90 m)
No. Samples in Composite	3	3
Total Mass of composite(g)	1500	1500
Required Mass of Each Sample(g)	500	500

Appendix I: Water Treatment Plant Conceptual Design

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Memo

To:	John Boyle, VP Environment and Sustainability	**Client:**	Northcliff Resources Ltd.
From:	Max Nodwell Soren Jensen	**Project No:**	1CN019.000
Cc:	Chris Kennedy, Lindsey Curtis (SRK)	**Date:**	August 6, 2013
Subject:	Scoping Level Water Treatment Estimate for the Sisson Project - FINAL		

1 Introduction

SRK Consulting (Canada) Inc. (SRK) was retained by Northcliff Resources Ltd. to evaluate water treatment processes for the Sisson Project located in New Brunswick. Source terms, water and load balance data were provided by Knight Piésold. These data were used as a basis for developing estimates of water quality and constituent concentrations in the tailings storage facility (TSF) discharge and in the open pit during mine operations and post-closure.

The purpose of this document is to:

- Outline the objectives of the Sisson water treatment,
- Propose water treatment methodologies that are likely to be appropriate for implementation at the Sisson Project, and
- Estimate the quality of treated effluent.

2 Requirements

The Sisson project is a tungsten and molybdenum mine under development in New Brunswick. SRK was retained to evaluate water management options for the project as a positive water balance is anticipated throughout the year. The mine property will have an open pit and a TSF as surface water reservoirs. The mill will reclaim water from the TSF for processing ore. Due to the addition of sodium silicate in the milling process, the TSF reclaim water must be partially treated with lime and CO_2 to precipitate silica solids and mitigate build-up. The mill reclaim is insufficient to alter the water balance and some portion of the TSF inflow must be discharged from the site. This memo describes a facility that would treat the discharge stream fed from the mill reclaim water plant.

2.1 Mine-impacted water quality predictions

Table 1 presents the predicted TSF water quality data from Knight-Piésold for the mine operations phase. These values are based on the water and load balance developed for the Sisson project. No direct post-closure water quality data are available in this data set, however because the TSF will overflow to and fill the open-pit after closure, the values in Table 1 are considered representative of the post-closure water as well.

Table 1: TSF Water quality predictions

Parameter	TSF Average (mg/L)	TSF Maximum (mg/L)
Al (dissolved)	0.5	0.6
Mo (total)	0.34	1.14
Sb (total)	0.075	0.16
As (total)	0.69	1.3
Cd (total)	0.0004	0.001
Cr (total)	0.051	0.21
Cu (total)	0.054	0.15
Pb (total)	0.002	0.006
Mn (total)	0.54	1.52
Se (total)	0.01	0.04

Source: S:\1CN019.000_Sisson_Project_MLARD\Task1700_WaterTreatment\Water_Treatment_Performance
SRK_KP_Sisson_Source_terms_with_Effluent_Predictions_1CN019 000_20130121_CBK_LCC

Based on the preliminary water quality effects assessment by Stantec, these water quality data indicate that water treatment for arsenic and antimony is likely to be required for the TSF and open-pit discharge prior to release to environment. In addition, fluoride was identified as a potential constituent of concern upon release and dilution in Napadogan Brook.

SRK was directed to investigate water treatment processes for removal of arsenic and antimony only. No other elements were considered in the process described herein, although the treatment may result in other metals removal for a net water quality benefit.

2.2 Design Flow Rates

During operations, the TSF average flowrate will be approximately 700 m^3/hr with peaks up to 2,200 m^3/hr. The mill reclaim (lime and CO_2) water treatment facility is sized to meet the peak mill water demand of 2,200 m^3/hr. However, to meet discharge demands, we have sized the ferric co-precipitation facility to meet the average flowrate only, as the TSF may be used for water storage and flow equalization.

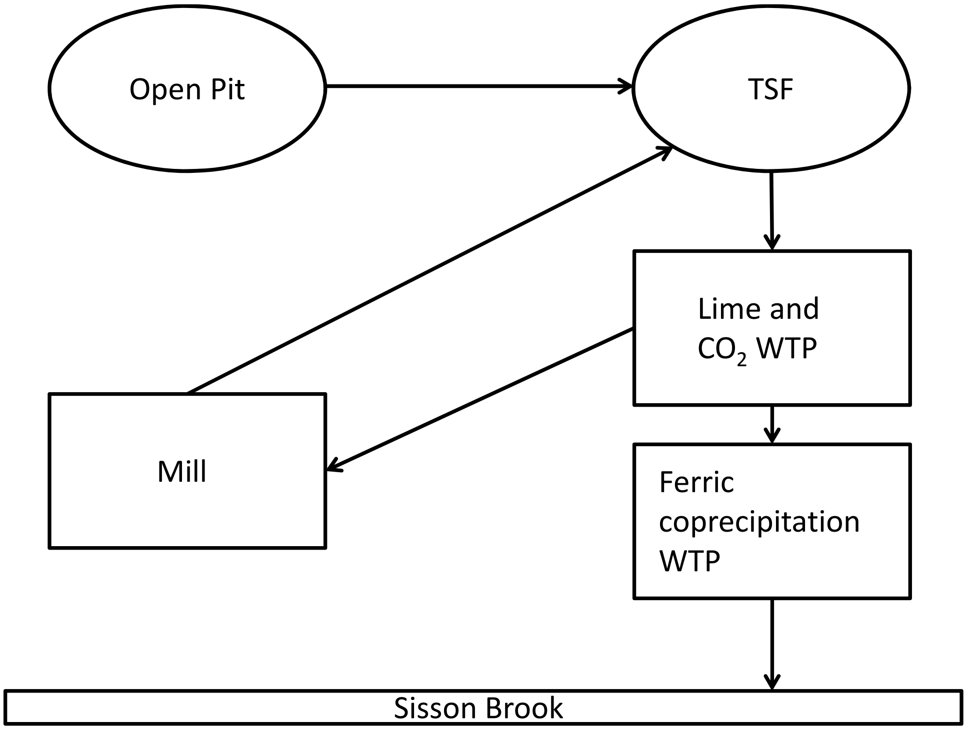
Post-closure, the TSF/open pit will discharge an average of 1,280 m^3/hr, with seasonal peaks of up to 4,200 m^3/hr. This memo assumes that the TSF and open pit may be used for water storage and flow equalization, and that a combination of in-pit ferric iron addition (for arsenic and antimony co-precipitation) and the existing retrofitted mill reclaim water treatment facility will be sufficient for the average post-closure flow rates. However, if the 4,200 m^3/hr peak flows must be treated, then a duplicate lime treatment facility must be implemented at closure.

3 Process Description

The water treatment process described herein is based on an evaluation of general capabilities of water treatment technologies. Performance of water treatment technologies is dependent on site specific factors. Bench and pilot scale tests are required in order to verify the efficacy of the proposed water treatment process.

3.1 Operations Phase Water Treatment

The general mine water flow schematic during mine operations is presented in Figure 1.



Source: \\VAN-SVR0\Projects\01_SITES\Sisson_Brook\1CN019.000_Sisson_Project_MLARD\Task1700_WaterTreatment\Deliverables\3_Further_Updates_WTP_REV02\Figures\General PFD schematics (Ops and post-closure).pptx

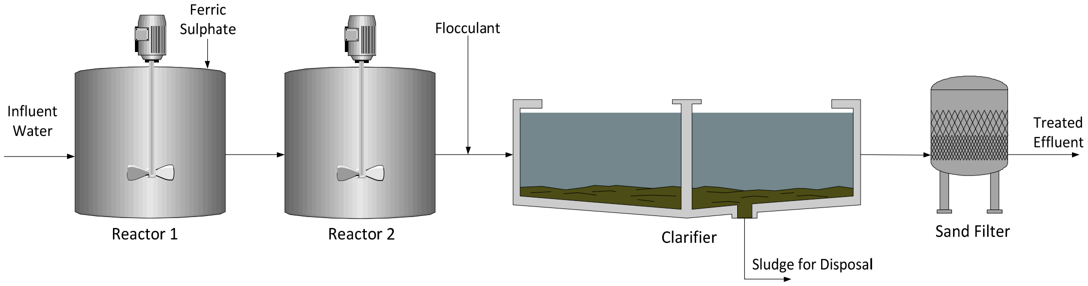
Figure 1: Sisson water flow schematic – Operations phase

During operations of the Sisson mine, reclaim water from the TSF will be treated with lime and carbon dioxide in order to settle fine tailings solids and silica minerals. In the proposed water management process, the TSF water would be treated for discharge after the mill reclaim water treatment. The discharge treatment stage would use ferric co-precipitation for removal of arsenic and antimony. Ferric iron is commonly applied as a coagulant in treatment of arsenic as the precipitated ferric hydroxide solids have high absorptive capacity for these metal and others.

Figure 2 shows a process flow diagram of the ferric co-precipitation facility. Feed water enters Reactor 1 where ferric sulphate and sulphuric acid are added and the pH drops to approximately 5 or 6. In the reactor, ferric hydroxide precipitates are formed, which adsorb and co-precipitate arsenic, antimony and other metals (USEPA 2005). A second reaction tank extends the retention/reaction time to ensure that the adsorption reaction is complete.

The ferric sludge produced in the process will be collected in a clarifier. A portion of the produced solids from the clarifier underflow will be recycled back to the reactor tanks to provide seed for the ongoing precipitation process. The balance of ferric sludge will be pumped for disposal to a holding cell within the TSF.

The final effluent will flow from the clarifier overflow to a sand filtration unit before it is released to Sisson Brook.

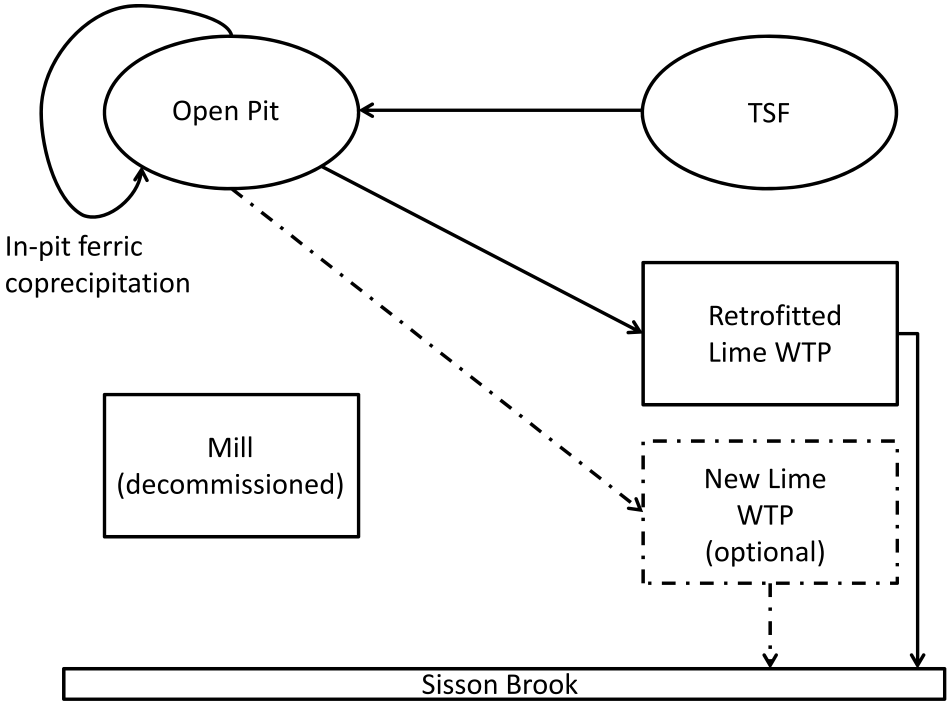


Source: \\VAN-SVR0\Projects\01_SITES\Sisson_Brook\1CN019.000_Sisson_Project_MLARD\Task1700_WaterTreatment\Ferric_Coprecipitation_PFD_Sisson_1CN019.000_Rev00_LCC.vsd

Figure 2: Ferric Co-precipitation Process Flow Diagram

3.2 Closure Water Treatment

The general mine water flow schematic for post-mine-closure is presented in Figure 3.



Source: \\VAN-SVR0\Projects\01_SITES\Sisson_Brook\1CN019.000_Sisson_Project_MLARD\Task1700_WaterTreatment\Deliverables\3_Further_Updates_WTP_REV02\Figures\General PFD schematics (Ops and post-closure).pptx

Figure 3: Sisson water flow schematic – Post-closure phase

Following closure, water will flow from the TSF to the open pit, which will gradually flood. During this time, mine water will not be actively discharged from the site. After approximately 35 years, when the pit has been flooded, the combined water from the TSF and open pit will report to the mine water treatment facilities. The treated effluent will report to Sisson Brook and from there to Napadogan Brook. Water treatment will be limited to the open water season.

At this time, water treatment for arsenic, antimony and dissolved metals will likely be required for the combined open pit and TSF water. For the closure phase it is envisioned that in-pit ferric co-precipitation will be implemented for arsenic and antimony, followed by in-plant lime treatment for pH and other dissolved metals.

In-pit water treatment for arsenic and antimony will be implemented after the spring melt each year. Pit water will be pumped to a mixing tank on shore where ferric sulphate will be added from a reagent stock tank. After reacting with ferric sulphate, the process water will flow to a section of the pit lake that is enclosed with an open-bottom floating baffle curtain made of impermeable liner material. The enclosed section of the pit lake will allow ferric solids to settle to the bottom of the pit for permanent disposal. Arsenic and antimony will tend to adsorb and precipitate with the ferric solids, which will leave the clarified water depleted in arsenic.

Lime treatment in the post-closure phase will occur in mill reclaim water lime/CO_2 treatment facility as used during operations. This facility will require refurbishment and/or retrofitting after 35 years of mine closure, but the major equipment is sized for hydraulic capacity up to 2,200 m^3/hr, greater than the anticipated average flow from the TSF and open pit. The lime treatment consists of pumping arsenic-depleted water from the in-pit floating baffle curtain to a pair of reactor vessels. Lime is added to the first of the reactors in order to raise the pH in both tanks to approximately 8.5, suitable for discharge. The elevated pH will also cause dissolved metals (such as iron and copper) to precipitate as hydroxide solids. The precipitated metal hydroxides will be recovered as sludge in the clarifier. The sludge produced in the lime treatment facility will be sent for disposal in a purpose-built cell within the TSF.

3.3 Limitations and Risks

3.3.1 Water Treatment

The proposed ferric co-precipitation process is primarily intended to remove arsenic and antimony but will have a limited ability to remove aluminum, selenium, molybdenum. However, sodium and fluoride concentrations will be unaffected by the proposed treatment.

In the event that water treatment for sodium or fluoride is required or if effluent metal concentrations must be lower than those achievable by ferric and lime treatment then the water treatment process proposed here will not be adequate.

3.3.2 Sludge Generation

The ferric hydroxide sludge produced in the ferric co-precipitation facility during operations will be disposed of in a holding cell within the TSF. The sludge is expected to remain stable provided that reducing conditions do not develop. Reducing conditions can arise if a source of organic carbon is either present in, or subsequently added to the sludge. Organic carbon can induce aerobic microbial growth, which can deplete oxygen and in turn give rise to anaerobic and reducing conditions.

Ferric hydroxide sludge produced during the post-closure in-pit ferric co-precipitation treatment will sink to the bottom of the flooded pit. A monitoring program will be in place to assist adaptive management of the final sludge and to ensure that the metals to not re-dissolve.

The post-closure metal hydroxide sludge will also be disposed of in a dedicated holding cell within the TSF. This cell can be constructed by placing berms around an appropriately sized area within the TSF. The top of the berms should be above the ultimate water level of the TSF and constructed with a spill-way that connects the holding cell to the rest of the TSF. It is envisioned that sludge will be pumped to – and allowed to settle within – the area behind the berm. Excess water will flow through the spillway to the TMF. Thus, the area behind the berm will act as a settling pond or lagoon for sludge from the water treatment plant.

The sludge stored within the holding cell is expected to remain stable provided that acidic conditions to not develop. The sludge is anticipated to have little potential for acid generation, as acidic conditions typically only arise in the presence of iron sulphide minerals and bacterial catalysts, neither of which are expected in the TSF.

4 Performance Predictions

Estimates of effluent water quality from the combined treatment process are based on a pilot scale test for ferric co-precipitation at a Northern Canadian mine site (name withheld for confidentiality).

As presented in Section 2.1, Table 1 shows the predicted average and maximum water quality parameter concentrations in the flooded open pit after mine closure. Results of the ferric co-precipitation pilot plant trial completed in 2011 are summarized in Table 2. The average and maximum predicted values for the Sisson TSF (Table 1) are in most cases lower than the feed water used for the pilot. However, concentrations are of a similar order of magnitude and were therefore considered to be a reasonable analog for use in estimating the quality of treated effluent at Sisson.

Table 2: Pilot Plant Results, Northern Canadian Site

Water quality parameter	Pilot Plant Trial	
	Influent (mg/L)	Treated (mg/L)
Al (dissolved)	<0.010	<0.010
Mo (total)	0.012	0.0042
Sb (total)	0.045	0.018
As (total)	15	0.059
Cd (total)	0.0029	0.0026
Cr (total)	<0.010	<0.010
Cu (total)	0.014	0.0091
Pb (total)	0.0015	<.0005
Mn (total)	0.22	0.45
Se (total)	<0.050	<0.050

Source: S:\1CN019.000_Sisson_Project_MLARD\Task1700_WaterTreatment\Water_Treatment_Costs\Supporting_Info\
SRK_KP_Sisson_Source_terms_with_Effluent_Predictions_1CN019 000_20130121_CBK_LCC

The 2011 pilot trial operated at a process pH of 5.8 and utilized a Fe:As ratio of 1.8:1. The Fe:As ratio is a key process parameter for ferric co-precipitation. A larger Fe:As ratio is likely to result in greater arsenic removal because of the increase in ferric hydroxide surface area available for adsorption. However, increasing the ratio increases operating costs due to the higher reagent demand. The US EPA recommends a dosage ratio of 20:1 (USEPA 2005). Since the Fe:As ratio proposed for the Sisson Project is approximately 10 times greater than the ratio used for the pilot trial, the arsenic and antimony concentrations in the treated effluent are expected to be lower than was demonstrated in the pilot. However, due to the variability in the removal efficiency governed by site-specific water quality and process conditions, test work is required to verify the effluent quality estimates and optimal operating conditions for the Sisson project.

Table 3 shows the estimated performance of the Sisson water treatment processes (estimated effluent quality) based on the performance of typical lime plants and the pilot trial data listed in Table 2. The estimates in Table 3 apply to both the operations and closure phase of the mine. As discussed above, bench and pilot scale tests are required to validate the listed effluent water quality estimates.

Table 3: Estimated Performance of the Proposed Water Treatment Process for the Sisson Project

Model parameter	Expected Effluent Water Quality (mg/L)
Al (dissolved)	0.20
Mo (total)	0.05
Sb (total)	0.01
As (total)	0.01
Cd (total)	0.0005
Cr (total)	0.01
Cu (total)	0.002
Pb (total)	0.0005
Mn (total)	0.10
Se (total)	0.015

Source: S:\1CN019.000_Sisson_Project_MLARD\Task1700_WaterTreatment\Water_Treatment_Costs\Supporting_Info\SRK_KP_Sisson_Source_terms_with_Effluent_Predictions_1CN019 000_20130121_CBK_LCC

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Appendix J: Tailings Oxygen Diffusion Assessment

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Project Memo

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Attention:	Chris Kennedy	**From:**	Andrew Garvie
Project No:	SRKNAC – Task 034	**Revision No:**	2
Project Name:	Northcliff Resources, Sisson Project		
Subject:	Oxygen consumption in the proposed tailings storage facility of Northcliff Resources Ltd's Sisson Project		

1 Purpose

This memorandum presents estimates of the rate of oxygen consumption in the unsaturated tailings portion of the proposed tailings storage facility of Northcliff Resources Ltd's Sisson Project. The Project is located approximately 100 km north of Fredericton, NB. Rates of oxygen consumption were evaluated to refine sulfide oxidation rates as part of SRK's geochemical source term predictions for the project.

2 Estimation Methods

Oxygen transported to the sulfide reaction sites in the Sisson tailings storage facility (TSF) would come from the atmosphere. The three potential oxygen transport mechanisms in porous media are convection, advection and diffusion. Convection is fluid flow driven by pressure gradients established by temperature differences, advection is flow driven by pressure gradients established by other means such as variations in atmospheric pressure. Oxygen diffusion is driven by oxygen concentration gradients.

The convective and advective supply of oxygen has been assumed to be less than the supply by diffusive transport within the TSF. This is because convection and advection of gas are limited by the intrinsic permeability of the tailings and tailings typically have relatively low intrinsic permeabilities (e.g. 10^{-11} m^2, whereas sand ranges from 10^{-9} to 10^{-7} m^2). Therefore, in this study it was assumed that there was no oxygen transport into the tailings due to convection or advection of gas.

The diffusion of oxygen in tailings is dependent on the degree of saturation of the tailings (θ) (i.e. the fraction of the non-solid volume filled with water). Empirical relationships between θ and the oxygen diffusion, D_{O2}, of soils and tailings have been determined by fitting of mathematical functions to the measurement results. Generally the oxygen diffusion coefficient decreases as θ increases, with the rate of decrease becoming larger at larger values of the θ values (notably for $\theta > 0.8$). This finding is illustrated further in Section 4.

Consumption of oxygen in the tailings establishes oxygen concentration gradients which drives oxygen diffusion towards regions of lower concentration. In a tailings dam the diffusion flux direction would generally be downward to greater depths. Oxygen diffuses down gradient in accordance with Fick's Law:

$F = -D_{O2}\frac{d[O_2]}{dz}$ (in one-dimension)

where F is the oxygen flux, $[O_2]$ is the oxygen concentration, D_{O2} is the oxygen diffusion coefficient and z is the spatial dimension in the vertical direction.

The depth to which oxygen penetrates before being consumed and the flux of oxygen through the top surface of the tailings, depend on the intrinsic oxidation rate of sulfidic minerals and the oxygen diffusion coefficient. Thus, the rate of oxygen consumption by sulfides and the oxygen diffusion coefficient must be estimated to enable calculations of an overall tailings oxidation rate.

The intrinsic oxidation rate is the local rate of oxygen consumption. It is dependent on a number of parameters including the sulfide concentration, temperature and oxygen concentration. The intrinsic oxidation rate is integrated over a volume to obtain the overall oxidation rate.

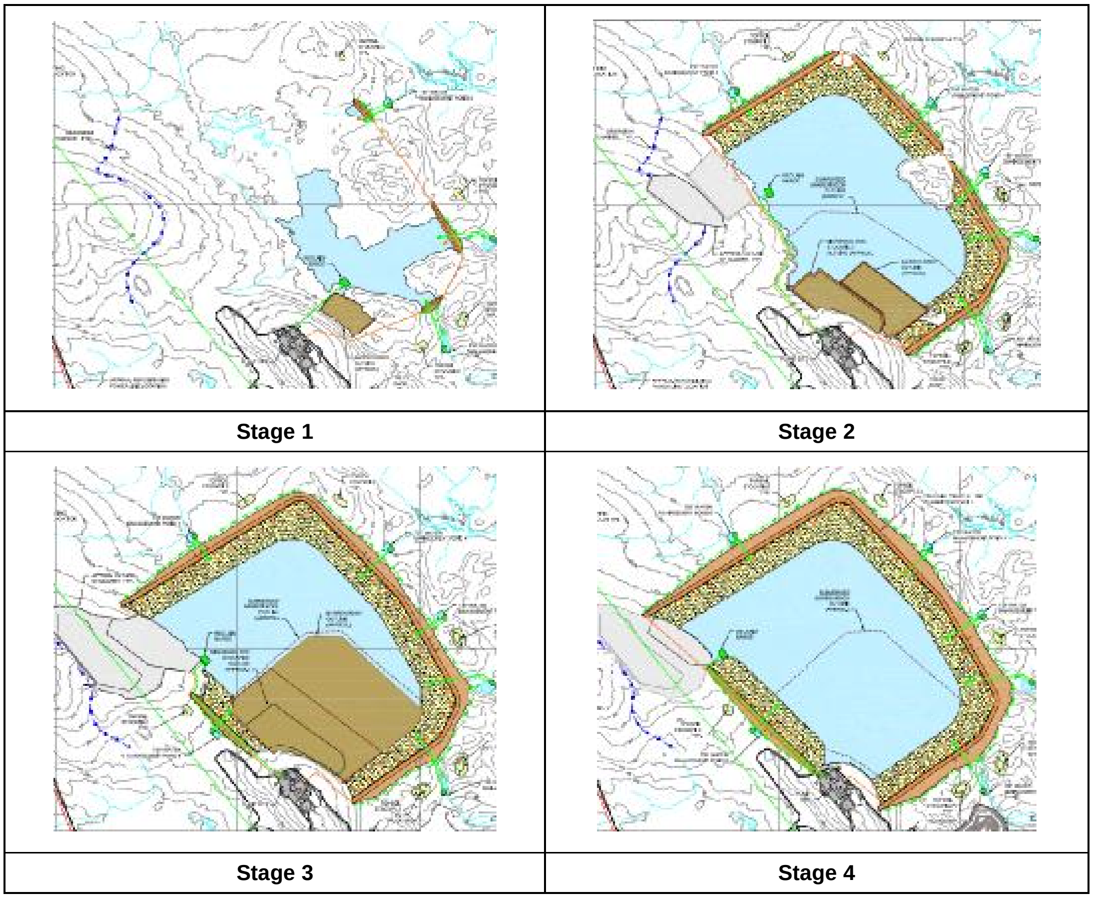
3 Tailings Storage Facility Design

The Sisson TSF would be constructed in a shallow valley and have a final width and surface area of approximately 1600 m and 215 ha, respectively. Construction would commence with three starter dams followed by raising the dam wall by an upstream construction method over a period of 27 years. Plan views of four stages of development are presented in Figure 3-1.

The four stages of construction were assumed to be completed in years 1, 7, 17 and 27.

The construction method would result in the top edge of the dam progressively moving towards the centre of the dam by a total amount of less than 20 m. A schematic representation of a cross-section of the TSF at Stage 4 is presented in Figure 3-2. (A design of a typical embankment cross-section is presented in Appendix A).

The estimated position of the phreatic surface (Knight Piesold, 2013) is indicated by the blue dashed line of Figure 3-2. To the left and below this line the tailings are assumed to be saturated. The tailings to the right are assumed to be unsaturated. In modelling described below a simplified geometry was adopted in which the phreatic surface was assumed to be vertical at the edge of the ponded surface water and horizontal at base of the tailings.



Stage 1

Stage 2

Stage 3

Stage 4

Figure 3-1: The four stages of development of the Sisson TSF

Source: Knight Piesold Consulting.

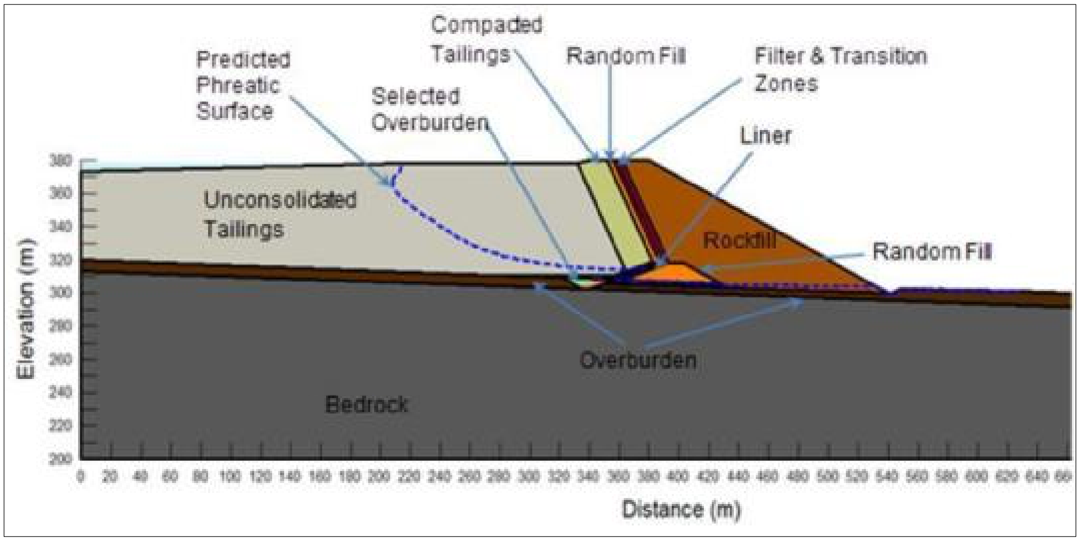


Figure 3-2: Section 1, Stage 4D

Source: Knight Piesold Consulting (Friedman, 2013).

The presence of a mid-grade ore stockpile and barren rock within the TSF during Stages 2 and Stage 3 was taken into account by reducing the dam wall length. (It is understood that the oxidation of mid-grade ore and barren rock was considered in a separate study (Kennedy, 2013).) The assumed length of the dam wall embankments is given in Table 3-1.

Table 3-1: Length of the dam wall sections over time

Year	Embankment	Length	Year	Embankment	Length
		m			m
1	Starter	358			
	Northeast	-	17	Northeast	2,951
	Southeast	-		Southeast	1,207
	Northwest	-		Northwest	1,923
	Southwest	-		Southwest	-
7	Northeast	3,130	27	Northeast	2,951
	Southeast	1,162		Southeast	1,252
	Northwest	1,386		Northwest	2,057
	Southwest	-		Southwest	1,341

The distance from the dam wall to the outer edge of the phreatic surface on the top of the tailings (i.e. the tailings beach width, W in Figure 3-1) is expected to fluctuate with time; however, for the calculations presented herein, the distance, W, was assumed to be equal for all embankments and constant over the modelling period. Calculations were undertaken for a range of W values, from 40 to 300 m (Section 6).

4 Degree of saturation

In general the degree of saturation of tailings is determined by their soil water characteristics, the initial water content, the boundary conditions of the TSF impoundment and the elapsed time since tailings deposition.

Soil water characteristics are the relationships between a) the volumetric water content and the matric suction and b) the hydraulic conductivity and matric suction. The first of these paired parameters was measured for the tailings (Friedman, 2013) and the relationship is shown in Figure 4-1. In the work by SRK, Van Genuchten's (1980) empirical relationship between volumetric water content and matric suction was fitted to the measurement results using the code RETC (van Genuchten et al., 1991). The resulting van Genuchten parameters were subsequently used to represent the hydraulic properties of the tailings in numerical modelling software. The modelling software used was HYDRUS 2D (Simunek et al., 2005) and the van Genuchten-Mualem relations were used to represent relationships between water content and matric suction and permeability and matric suction.

Four TSF development stages of the TSF were modelled. In each case the:

a) tailings were assumed to be homogenous

b) base of the TSF was kept saturated

c) height of the thickness of the tailings was set equal to the height of the TSF dam wall at the end of the four development stages (26, 46, 70 and 90 m for Stages 1, 2, 3 and 4, respectively)

d) saturated hydraulic conductivity was assumed to be 1.73 cm/day (Friedman, 2013)

e) tailings were assumed to be saturated initially and then allowed to drain for a period equal to the time taken to raise the dam wall to the height being modelled. For example, in modelling Stage 3 the full 70 m of tailings were initially saturated and they were allowed to drain for 17 years.

The last assumption may be conservative in the sense that during the TSF development tailings may deposited continuously and therefore the water content may not decrease to the extent assumed in the modelling.

Figure 4-2 shows (a) the volumetric water content, and (b) the equivalent degree of saturation for the four cases modelling. In all four cases, after the tailings drained the volumetric water content at the surface was less than 0.25. Further, the water content gradually increased until a depth a few metres from the base of the tailings. Beyond that depth the volumetric water content increased rapidly until the pores were completely filled with water (saturated) at the base of the tailings.

Figure 4-2(b) shows that the degree of saturation is less than 0.8 at positions more than 2 m above the base of the tailings.

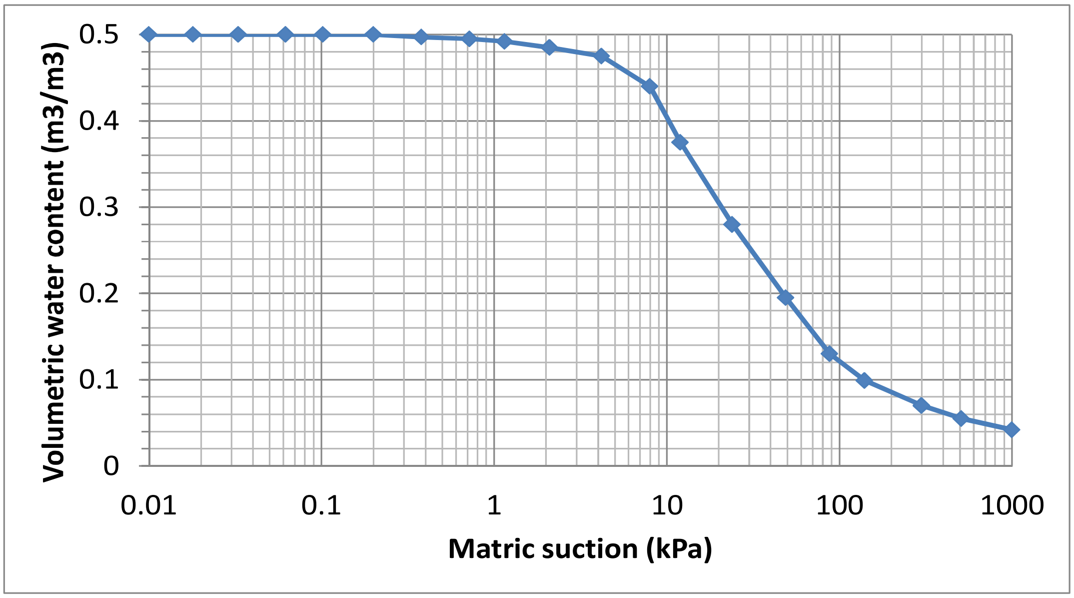
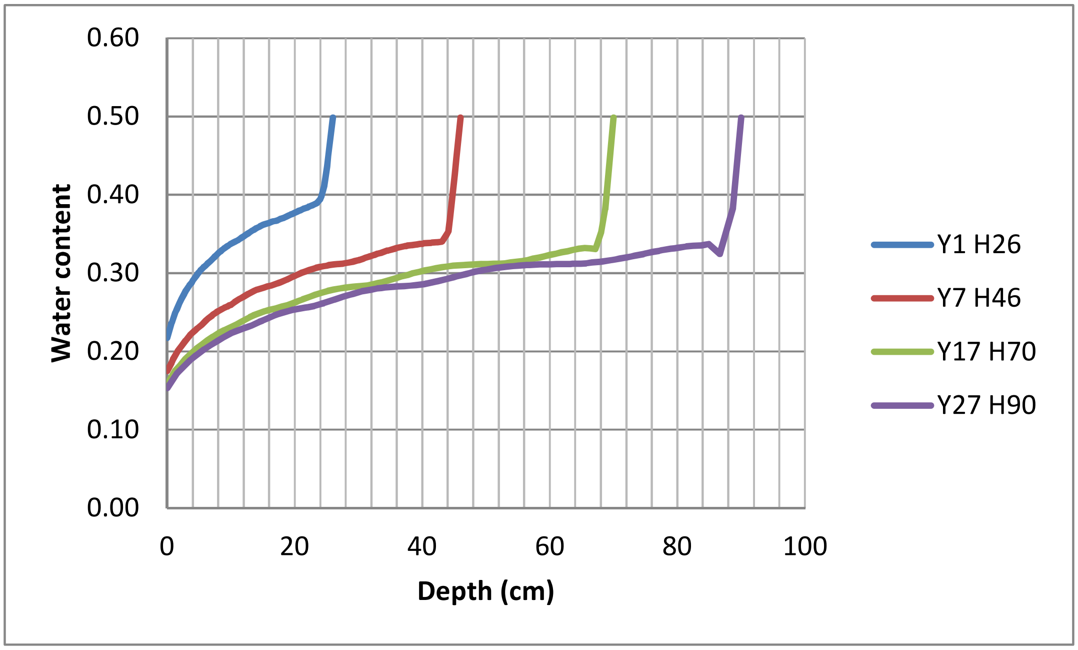
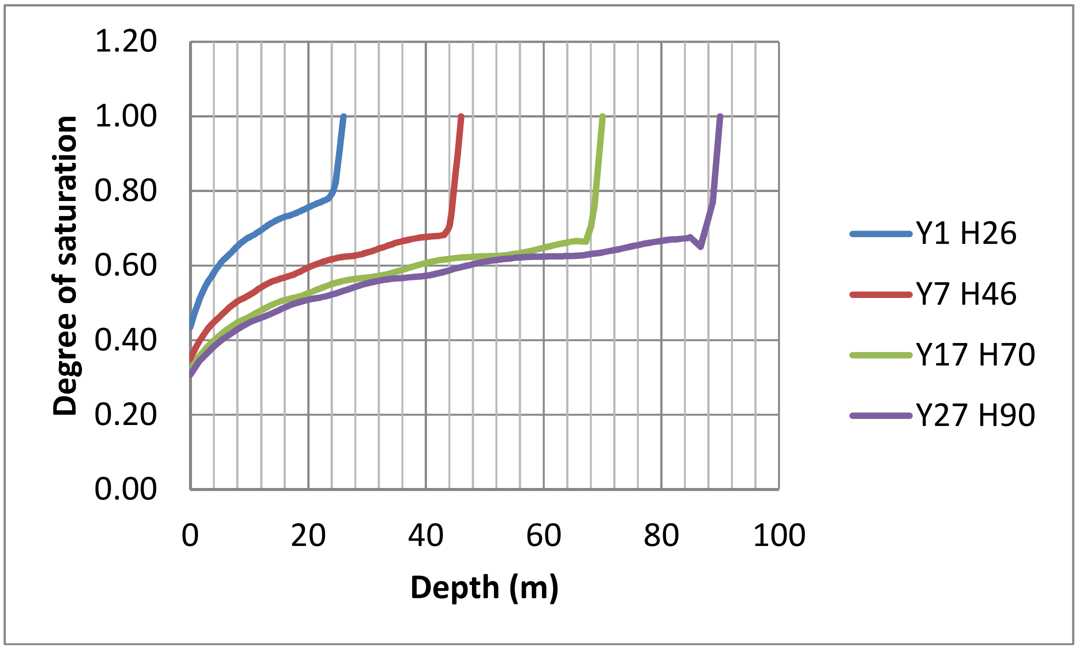


Figure 4-1: Soil water characteristic curve for tailings



a)



b)

Figure 4-2: a) Volumetric water content and b) degree of saturation as a function of depth

Notes:
Results are presented for four times (Yi) since the beginning of dam construction and for the corresponding nominal thickness of the tailings (Hj). For example, Y7 H46 in the legend corresponds to year 7 when the nominal height of the dam wall is 46 m.

5 Oxygen diffusion coefficient

Various empirical relationships have been developed that relate the oxygen diffusion coefficient and the degree of saturation of soils and tailings. Collin and Rasmuson (1988) provided an alternative relationship that is useful at higher water contents. Figure 5-1 provides a graphical example of Collin and Rasmuson's relationship.

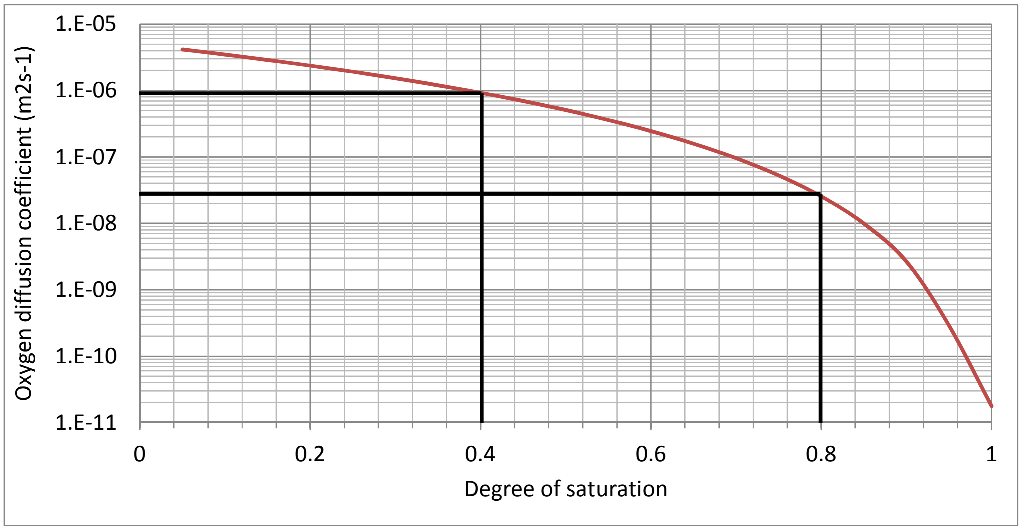


Figure 5-1: Relationship between degree of saturation and oxygen diffusion coefficient

Note:
Based on empirical relationship of Collin and Rasmuson (1988) and measured results for Quirke, Ontario mill tailings (Blowes et al., 2003).

The degree of saturation for the majority of the Sisson tailings as predicted by the Hydrus modelling was between 0.4 and 0.8 (Figure 4-2a). For these degrees of saturation the oxygen diffusion coefficient ranges between 1 x 10^{-6} and 3 x 10^{-8} m^2s^{-1} (Figure 5-1).

A mid-range value was selected to represent the diffusion coefficient of the Sisson tailings was 5 x 10^{-7} m^2s^{-1}. Clearly this is a simplification and does not account for variation in the degree of saturation with position and time.

6 Oxygen consumption

The oxygen consumption rate was estimated using the Constant Intrinsic Oxidation Rate model (Ritchie, 1995). This model assumes that oxygen diffusion in the gas filled pore space is the only mechanism transporting oxygen into a sulfide bearing pile and that the oxidation rate of the sulfides is constant.

In the constant intrinsic oxidation rate model the time to consume all the sulfides in an oxygenated volume of tailings is:

$$\tau = \frac{\varepsilon_0 \rho_s}{S} \qquad \text{Eq 1}$$

The depth oxygen would penetrate into the tailings before being consumed is:

$$x_f = \sqrt{\frac{2D_{O2}C_0}{S}} \qquad \text{Eq 2}$$

The global oxidation rate, which is equivalent to the flux of oxygen through the top surface ($kg(O_2)m^{-2}s^{-1}$), is given by:

$$G = \sqrt{2D_{O2}C_0S} \qquad \text{Eq 3}$$

The parameters are defined in Table 6-1 and the values used in the modelling are given.

Table 6-1: Definitions of parameters used in the constant Intrinsic Oxidation Rate model

Parameter	Description	Value	Units
ε_0	O_2 to S stoichiometric ratio	1.75	
ρ_s	bulk density of tailings	1600	kgm^{-3}
D_{O2}	Oxygen diffusion coefficient in tailings	5×10^{-7}	m^2s^{-1}
C_o	Oxygen concentration in the atmosphere	0.265	$kg(O_2)m^{-3}$
S	Intrinsic oxidation rate	2.7×10^{-10}	$kg(O_2)m^{-3}s^{-1}$

Note:
Although assumed constant for the purposes of the calculations presented herein, actual values of S will vary with time, oxygen concentration in the pore space and temperature.

In Stage-4 calculations it was assumed that the tailings extended from the height of the TSF dam wall to the base of the TSF. That is, no allowance was made for the displacement of tailings due to the presence of the mid-grade ore stockpile and barren rock. The effects of removal of these materials should be assessed further.

Estimates of oxidation rates were made for D_{O2} values of 5×10^{-8} and 5×10^{-7} m^2s^{-1} with corresponding depths of oxygen penetration of 10 and 31.3 m. The rates for all of the tailings above the phreatic surface at four time periods and multiple beach widths are provided in Table 6-2 and Table 6-3.

Table 6-2: Estimated oxygen consumption rates (D_{O2} value of $5x10^{-8}m^2s^{-1}$)

W	**Year**			
m	**1**	**7**	**17**	**27**
	Estimate of total oxidation rate			
	kg(O2)/week			
40	23	368	394	492
50	29	460	492	615
100	58	919	984	1,230
150	87	1,379	1,476	1,846
200	116	1,838	1,969	2,461
250	145	2,298	2,461	3,076
300	174	2,757	2,953	3,691

Note:
D_{O2} is the oxygen diffusion coefficient, W is the beach width.
Depth of oxygen penetration from surface is 10 m.

Table 6-3: Estimated oxygen consumption rates (D_{O2} value of $5x10^{-7}m^2s^{-1}$)

W	Year			
m	1	7	17	27
	Estimate of total oxidation rate			
	kg(O_2)/week			
40	61	1,163	1,245	1,556
50	76	1,453	1,556	1,945
100	152	2,907	3,113	3,891
150	228	4,360	4,669	5,836
200	304	5,813	6,225	7,782
250	380	7,267	7,782	9,727
300	456	8,720	9,338	11,672

Note:
D_{O2} is the oxygen diffusion coefficient, W is the beach width.
Depth of oxygen penetration from top surface is 31.3 m.

The total oxidation rates are a function of the oxygen diffusion coefficient of the tailings. With all other conditions being equal, lower oxygen diffusion coefficients result in lower total oxidation rates. Illustrative calculations conducted show that decreasing D_{O2} from 5 x 10^{-7} to 5 x 10^{-8} m^2s^{-1} reduces the total oxidation rate by about a factor of about three. For example, with W equal to 250 m the total oxidation rate decreases from 9,727 to 3,076 kg (O_2)/week in Year 27.

Yours faithfully

SRK Consulting (Australasia) Pty Ltd

Signed by: **Signed by:**

Andrew Garvie Claire Linklater

Andrew Garvie
Principal Consultant
(Water and Environment)

Claire Linklater
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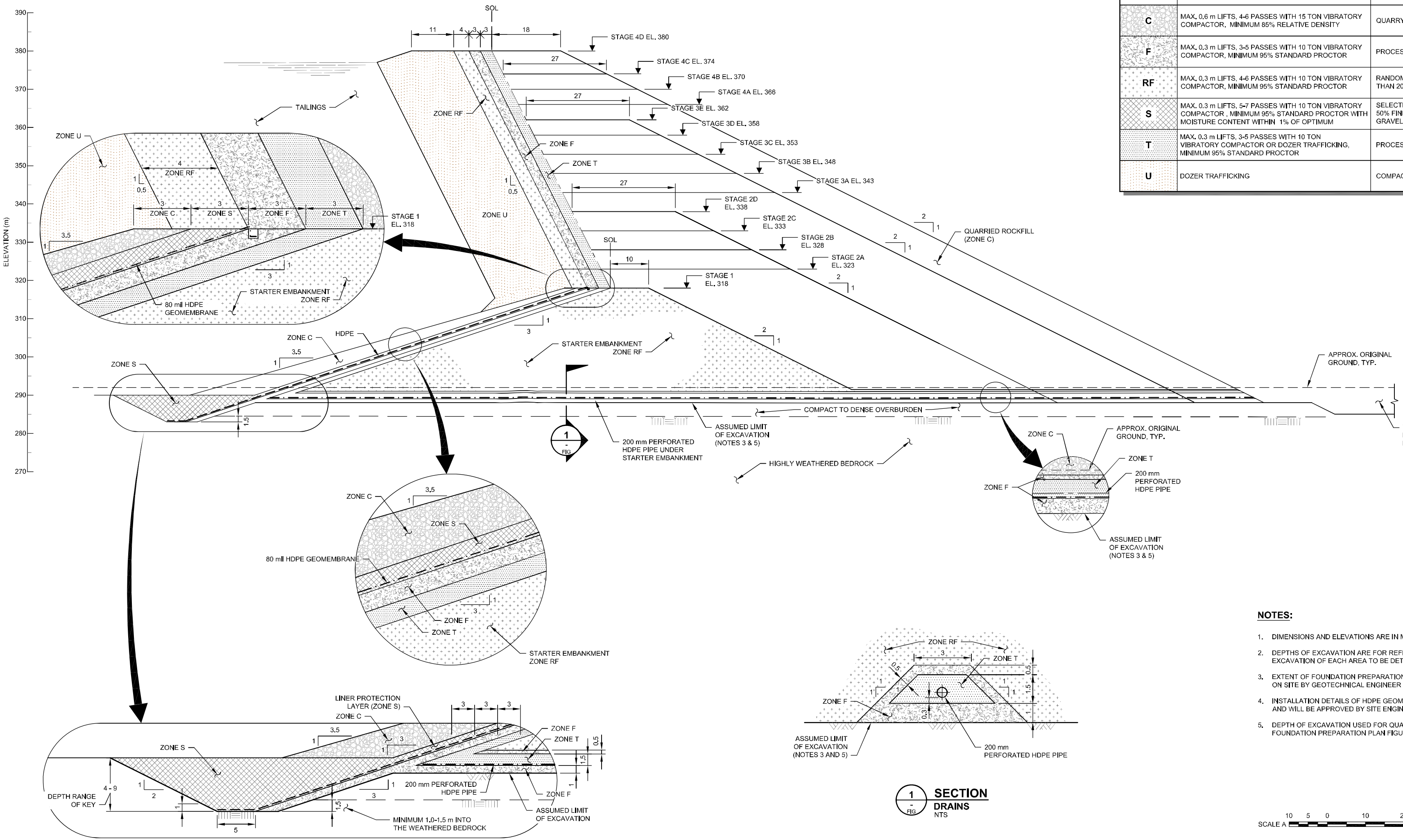
Appendices

Appendix A: Dam Wall Cross Section

ZONE	PLACEMENT AND COMPACTION	MATERIAL DESCRIPTION
C	MAX. 0.6 m LIFTS, 4-6 PASSES WITH 15 TON VIBRATORY COMPACTOR, MINIMUM 85% RELATIVE DENSITY	QUARRY ROCKFILL
F	MAX. 0.3 m LIFTS, 3-5 PASSES WITH 10 TON VIBRATORY COMPACTOR, MINIMUM 95% STANDARD PROCTOR	PROCESSED CLEAN SAND AND GRAVEL
RF	MAX. 0.3 m LIFTS, 4-6 PASSES WITH 10 TON VIBRATORY COMPACTOR, MINIMUM 95% STANDARD PROCTOR	RANDOM FILL / SELECT OVERBURDEN LESS THAN 20% FINES (SAND AND GRAVEL)
S	MAX. 0.3 m LIFTS, 5-7 PASSES WITH 10 TON VIBRATORY COMPACTOR , MINIMUM 95% STANDARD PROCTOR WITH MOISTURE CONTENT WITHIN 1% OF OPTIMUM	SELECTED OVERBURDEN WITH 20% T0 50% FINES (SILTY CLAYEY SAND AND GRAVEL)
T	MAX. 0.3 m LIFTS, 3-5 PASSES WITH 10 TON VIBRATORY COMPACTOR OR DOZER TRAFFICKING, MINIMUM 95% STANDARD PROCTOR	PROCESSED QUARRY ROCK
U	DOZER TRAFFICKING	COMPACTED TAILINGS



1 SECTION
DRAINS
NTS

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.
2. DEPTHS OF EXCAVATION ARE FOR REFERENCE ONLY. THE ACTUAL DEPTHS OF EXCAVATION OF EACH AREA TO BE DETERMINED ON SITE.
3. EXTENT OF FOUNDATION PREPARATION COMPACTED AREA TO BE DETERMINED ON SITE BY GEOTECHNICAL ENGINEER BASED ON EXCAVATION CONDITIONS.
4. INSTALLATION DETAILS OF HDPE GEOMEMBRANE TO BE PROVIDED BY SUPPLIER AND WILL BE APPROVED BY SITE ENGINEER.
5. DEPTH OF EXCAVATION USED FOR QUANTITY ESTIMATION IS SHOWN ON FOUNDATION PREPARATION PLAN FIGURES 4.9 TO 4.12.

SCALE A 10 5 0 10 20 30 40 50 m

NORTHCLIFF RESOURCES LTD.

SISSON PROJECT

TAILINGS STORAGE FACILITY
TYPICAL EMBANKMENT SECTION
WITH STARTER

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-447/2	7

FIGURE 4.7 REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	26MAR'13	ISSUED FOR DISCUSSION	AC	TAM	AA	KJB

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XREF FILE(S): IMAGE FILE(S):

Appendix K: Source Term Predictions

Source Term	1	2	5	6	7	8	9	13	14	17	18	19	20	21	23	24
Description	Operational Pit Sump	Milled Ore	Mid grade ore stockpile	Barren rock dump in TSF	Submerged barren rock	TSF beaches - run-off	TSF beaches - infiltration	TSF - Quarry Embankment	Quarry walls	Plant site	Overburden	Soil stockpiles	Dams for water management ponds	Haul roads	Pit walls	Water treatment plant
Units	mg/day	mg/L	mg/L	mg/L	mg/tonne rock	mg/m^2/week	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sulphate	780000000	9.5	520	230	53000	20	27	270	270	270	270	270	270	270	160	--
Alkalinity	480000000	3	50	100	23000	110	290	56	56	56	56	56	56	56	100	--
Chloride	25000000	0.09	7.4	6	1400	1.4	110	80	80	80	80	80	80	80	5.1	--
Fluoride	30000000	0.34	31	7.1	1600	4.4	70	3.8	3.8	3.8	3.8	3.8	3.8	3.8	6.2	--
Al	3500000	0.014	7.7	0.86	200	0.61	#N/A	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.72	0.2
Sb	20000	0.00061	0.0069	0.003	0.69	0.005	1.6	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.0042	0.01
As	53000	0.000031	0.21	0.0065	1.5	0.037	0.33	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.011	0.01
Ba	83000	0.0009	0.1	0.021	4.8	0.0058	2.6	0.0093	0.0093	0.0093	0.0093	0.0093	0.0093	0.0093	0.017	--
Be	***300***	***0.0000032***	***0.0051***	***0.000085***	***0.019***	***0.00003***	0.41	***0.0006***	***0.0006***	***0.0006***	***0.0006***	***0.0006***	***0.0006***	***0.0006***	***0.000061***	--
Bi	970	0.00032	0.0034	0.00017	0.039	0.000029	***0.0015***	0.00033	0.00033	0.00033	0.00033	0.00033	0.00033	0.00033	0.0002	--
B	1500000	0.0073	0.4	0.39	90	0.078	0.002	3.1	3.1	3.1	3.1	3.1	3.1	3.1	0.3	--
Cd	2700	0.000055	0.011	0.00023	0.052	0.000041	5.4	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.00057	0.0005
Ca	440000000	4.6	200	110	26000	49	0.0028	71	71	71	71	71	71	71	90	--
Cr	80000	0.00012	0.0086	0.021	4.7	0.0014	28	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.016	0.01
Co	28000	0.000095	0.066	0.0075	1.7	0.0002	0.021	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0059	--
Cu	62000	0.00032	0.18	0.018	4.1	0.0044	0.014	0.071	0.071	0.071	0.071	0.071	0.071	0.071	0.013	0.002
Fe	380000	0.0015	1.8	0.086	20	0.048	0.31	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.00011	0.079	--
La	0.0003	0.000013	0.0082	0.00041	0.094	0.000078	0.000092	0.0071	0.0071	0.0071	0.0071	0.0071	0.0071	0.0071	0.0003	--
Pb	4300	0.000038	0.0084	0.00071	0.16	0.00024	0.0054	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.00089	0.0005
Li	120000	0.001	0.087	0.034	7.7	0.011	0.016	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.024	--
Mg	61000000	0.28	13	19	4300	2.1	0.74	25	25	25	25	25	25	25	13	--
Mn	3600000	0.085	9.1	0.43	98	0.05	110	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.75	0.1
Hg	0.061	0.00000032	0.000000017	0.000016	0.0038	0.0000072	3.5	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014	0.00014	0.000013	--
Mo	170000	0.00013	0.0016	0.023	5.3	0.034	0.0005	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.035	0.05
Ni	38000	0.00014	0.12	0.0086	2	0.00057	2.4	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0078	--
P	300000	0.002	0.078	0.08	18	0.013	0.04	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.063	--
K	66000000	0.91	41	17	3900	5.7	0.9	130	130	130	130	130	130	130	14	--
Rb	380000	0.0032	0.21	0.098	22	0.032	15	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.078	--
Se	7100	0.00048	0.021	0.0012	0.28	0.00015	2.2	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0028	0.0015	0.015
Si	70000000	0.41	27	16	3600	8.1	0.01	68	68	68	68	68	68	68	14	--
Ag	150	0.00000073	0.000098	0.000039	0.009	0.0000089	88	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.000031	--
Na	12000000	0.1	5.4	3.4	770	0.74	0.00062	21	21	21	21	21	21	21	2.5	--
Sr	1400000	0.017	0.8	0.42	97	0.13	8.8	0.77	0.77	0.77	0.77	0.77	0.77	0.77	0.3	--
Te	***670***	***0.0000033***	***0.00017***	***0.00018***	***0.041***	***0.000038***	9	***0.0012***	***0.0012***	***0.0012***	***0.0012***	***0.0012***	***0.0012***	***0.0012***	***0.00014***	--
Tl	2300	0.0000099	0.00081	0.00079	0.18	0.00011	***0.0027***	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.00048	--
Th	***150***	***0.00000073***	***0.000055***	***0.000041***	***0.0095***	***0.0000078***	0.0079	***0.0003***	***0.0003***	***0.0003***	***0.0003***	***0.0003***	***0.0003***	***0.0003***	***0.000032***	--
Sn	***16000***	***0.000058***	***0.0033***	***0.004***	***0.9***	***0.0013***	***0.00054***	***0.03***	***0.03***	***0.03***	***0.03***	***0.03***	***0.03***	***0.03***	***0.0032***	--
Ti	20000	0.00012	0.004	0.0049	1.1	0.003	***0.094***	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.0041	--
W	83000	0.0017	0.016	0.018	4.1	0.004	0.21	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.017	--
U	25000	0.00042	0.0047	0.0042	0.96	0.0025	0.28	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024	0.0051	--
V	43000	0.000045	0.0024	0.014	3.3	0.009	0.17	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.009	--
Zn	100000	0.0016	0.78	0.032	7.3	0.0027	0.65	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.022	--
NO3	260000	--	--	--	--	0.19	8.3	--	--	--	--	--	--	--	--	--
NO2	--	--	--	--	--	0.023	1.0	--	--	--	--	--	--	--	--	--
NH3	--	--	--	--	--	0.44	19	--	--	--	--	--	--	--	--	--

Notes: ***less than detection limit in laboratory test work***
less than 10X detection limit in laboratory test work