REPORT ON THE METALLURGICAL TESTING OF SAMPLES FROM THE THIERRY MINE PROPERTY

PREPARED FOR

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Introduction

Core samples from Thierry K 1-1 Cu/Ni deposit were submitted to SGS-Lakefield for flotation testwork to evaluate flotation flowsheet approaches and production of marketable concentrates. The testwork completed consisted of the following:
-sample preparation
-mineralogy characterization
-flotation testing
Results of the analysis are presented in Appendix A.

Property Description and Location

The Thierry mine is located 11.5 km NW of Pickle Lake, Ontario (Figure 1). The township of Pickle Lake is located approximately 350 km NW of the city of Thunder Bay, Ontario. The K1-1 deposit lies roughly 3km due east of the Thierry Mine, immediately to the north of the main mine access road.

The Thierry Mine property consists of 27 mining leases and patented claims (Table 1), and covers roughly 11,500 acres (4,670 hectares) (Figure 2). The property is located in the Dona Lake, Ponsford Lake, Tarp Lake, and Kapkichi Lake areas in the Patricia Mining District, northwestern Ontario. Union Miniere Exploration (UMEX) surveyed these properties prior to and during their operation of the Thierry Mine in the 1970s and 80s. In addition to the mining leases, there are 3 unpatented claims, totalling 752 hectares. The combined property area totals to 5,422 ha.

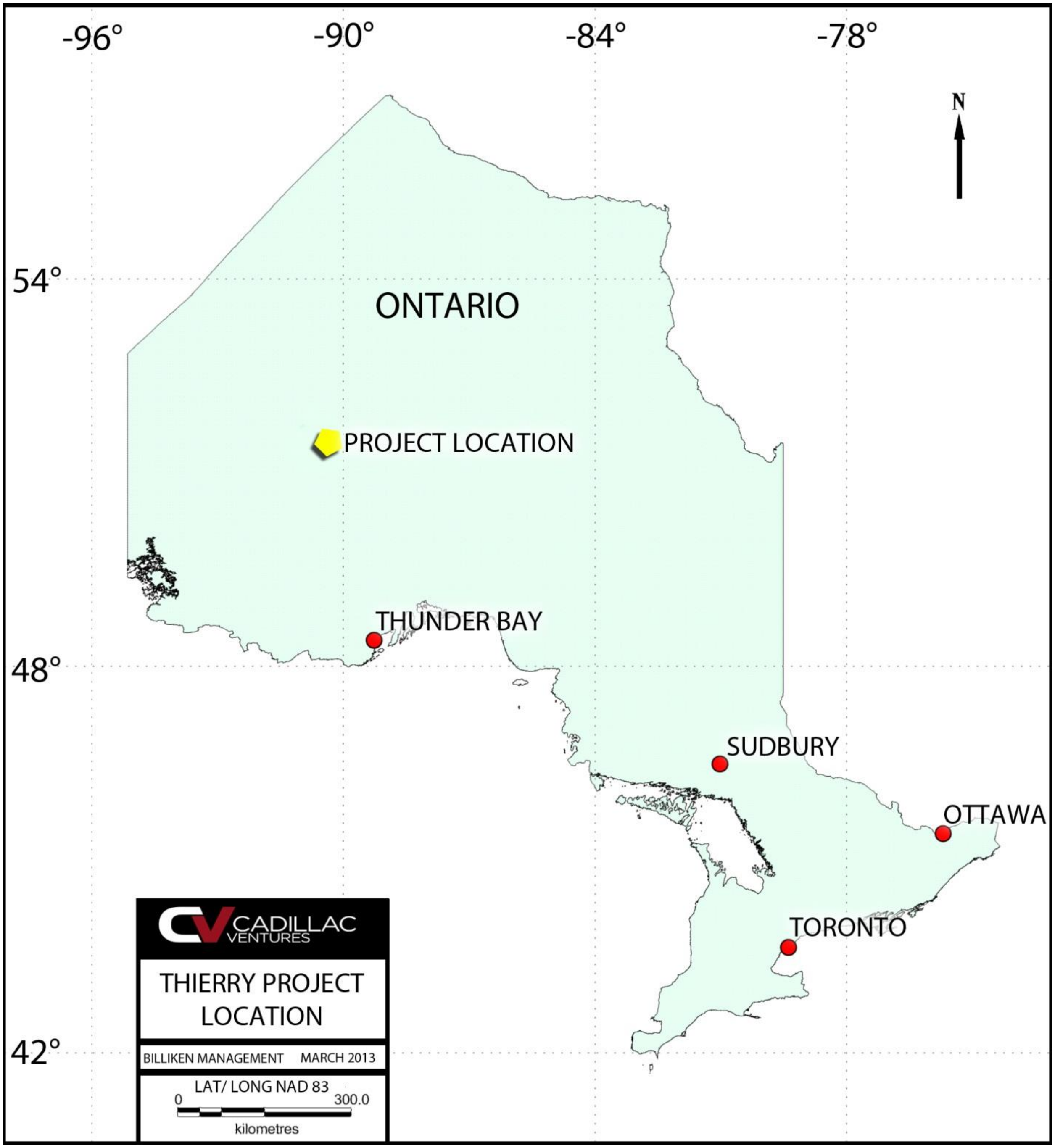

Figure 1 Thierry Project Location

Table 1 Thierry Mine Property Claims

Lease	Anniversary	Owner
CLM 198	31-Aug-17	Cadillac Ventures Holdings Inc.
CLM 200	31-Aug-17	Cadillac Ventures Holdings Inc.
CLM 199	31-Aug-17	Cadillac Ventures Holdings Inc.
CLM 197	31-Aug-17	Cadillac Ventures Holdings Inc.
CLM 195	31-Aug-17	Cadillac Ventures Holdings Inc.
CLM 194	31-Aug-17	Cadillac Ventures Holdings Inc.
CLM 196	31-Aug-17	Cadillac Ventures Holdings Inc.
CLM 193	31-Aug-17	Cadillac Ventures Holdings Inc.
CLM 192	31-Aug-17	Cadillac Ventures Holdings Inc.
CLM 214	31-Aug-21	Cadillac Ventures Holdings Inc.
CLM 215	31-Aug-21	Cadillac Ventures Holdings Inc.
CLM 213	31-Aug-21	Cadillac Ventures Holdings Inc.
CLM 212	31-Aug-21	Cadillac Ventures Holdings Inc.
CLM 211	31-Aug-21	Cadillac Ventures Holdings Inc.
CLM 320	30-Nov-28	Cadillac Ventures Holdings Inc.
PA 17490	31-Oct-33	Cadillac Ventures Holdings Inc.
PA 20880	31-Oct-33	Cadillac Ventures Holdings Inc.
PA 20875	31-Oct-33	Cadillac Ventures Holdings Inc.
PA 20876	31-Oct-33	Cadillac Ventures Holdings Inc.
PA 20891	31-Oct-33	Cadillac Ventures Holdings Inc.
PA 20894	31-Oct-33	Cadillac Ventures Holdings Inc.
PA 20895	31-Oct-33	Cadillac Ventures Holdings Inc.
PA 20896	31-Oct-33	Cadillac Ventures Holdings Inc.
PA 21124	31-Oct-33	Cadillac Ventures Holdings Inc.
PA 15461	31-Oct-33	Cadillac Ventures Holdings Inc.
PA 15462	31-Oct-33	Cadillac Ventures Holdings Inc.
PA 15464	31-Oct-33	Cadillac Ventures Holdings Inc.
4247646	21-Apr-14	Cadillac Ventures Holdings Inc.
4247647	21-Apr-14	Cadillac Ventures Holdings Inc.
4247648	21-Apr-14	Cadillac Ventures Holdings Inc.

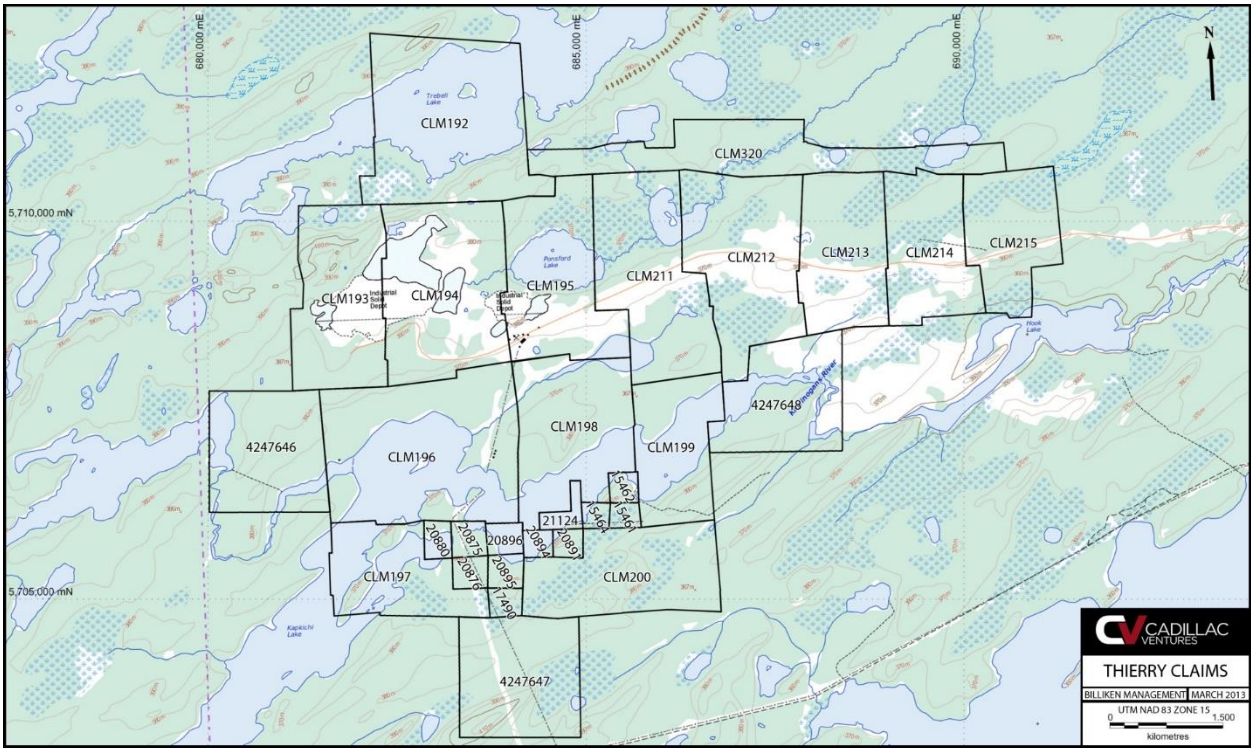

Figure 2 Thierry Claims

Accessibility, Climate, Local Resources, Infrastructure and Physiography

The Thierry mine site is accessible by all-weather roads from the town of Pickle Lake, Ontario. Pickle Lake is accessed by Provincial Highway No. 599 North, roughly 300 km north of the town of Ignace, situated on the Trans-Canada Highway (Highway 17). The Canadian National Railway passes through the Town of Savant Lake, on Highway 599, approximately 170 km southwest of Pickle Lake

The general climate of the area is typical of northern regions with short, warm to hot and humid summers and long winters. Summer temperatures can reach highs of 30°C and in winter can reach -40°C. The property's terrain is characterized by gentle topography, with relatively flat lying ground to gentle rolling hills. Topographic lows tend to be marshy with thick mossy ground cover ("muskeg"). The surrounding area is covered with old-growth boreal forest, often with dense deadfall. The overburden has a large glacial component.

The town of Pickle Lake and its population are familiar with mining, and many of the town's services are geared towards mining and exploration support. The town hosts a small number of hotels, guest houses, shops and restaurants as well as light and heavy equipment contractors.

History

Since its initial discovery in the late 1930's, the Thierry Mine property and the surrounding area have been extensively explored. Detailed accounts of the Pickle Lake region and of the Thierry Mine/K1-1 area are taken from Puritch et al. (2012), as well as other reports as shown in the reference section. The reader is referred to these references for additional information. The historical exploration work for the Thierry Mine region is summarized in Table 2.

After its discovery via geophysics in 1969, UMEX explored the K1-1 deposit in the late 1970s, coincident with their exploration and later development of the Thierry mine deposit. Since the property passed from UMEX, drilling exploration of K1-1 has been undertaken by PGM Ventures and Cadillac Ventures.

Table 2 History of Exploration Work in the Thierry Mine

Company	Year	Exploration
	1928-1929	Pickle Lake became the transportation center for gold exploration
Pickle Crow Gold Mines	1934-1951	Pickle Crow gold Mine produced 2,969,720 tonnes of ore grading 15.4g Au/t
Central Patricia Gold Mines Ltd.	1935-1966	Central Patricia gold mine produced 1,520,000 tonnes of ore grading 12.5 g Au/t
Central Patricia Gold Mines Ltd.	1946-1950	Central Patricia Gold Mines Ltd. conducted drilling on Cu-Ni prospects in the Kapkichi Lake area
Albany River, Crowshore Patricia, and Norpic Gold Mines	1946-1947	Albany River Gold Mines sunk a shaft but did not go into production. Pickle Crow took over Albany River Gold Mines in 1946. Pickle Crow sunk a 550ft shaft ~5km east of Pickle Crow, but it never reached production stage and closed down in 1947. Norpic Gold Mines drilled extensively on their property, located north of Pickle Crow. In 1979, Dona Lake Gold Mines took an option on the property and conducted more exploration drilling.
Kapkichi Nickel Mines Ltd.	1956-1966	Kapkichi Nickel Mines Ltd. Conducted geophysical surveys and diamond drilling (1956-1958). Gold exploration in the Pickle Lake area ceased by 1966.
UMEX Inc.	1969	Joint-venture agreement between UMEX and Kapkichi Nickel Mines. Mag and EM ground geophysical surveys conducted on 12 claims contained within the agreement. Follow-up drilling led to the discovery of low grade Cu-Ni mineralization underlying Kapkichi Lake. UMEX discovered K1-1, K2-1, G and J anomalies.
UMEX Inc.	1970	Thierry Mine site discovered; drilling intersected 20ft of sulphides grading 1.24% Cu and 0.14% Ni. 77 DDHs, totalling to 45,000ft.
UMEX Inc.	1971-1976	UMEX reported 11,500,000 tons averaging 1.68% Cu and 0.18% Ni from drilling
UMEX Inc.	1976-1982	UMEX records indicate production of approximately 5,800,000 tons of ore with an average grade of 1.13% Cu and 0.14% Ni. UMEX drilled to test the large low-grade zone of K1-1 anomaly, which reported an average grade of

		0.31% Cu and 0.1% Ni at a cut-off of 0.2% Cu.
UMEX Inc.	1987-1989	UMEX implemented re-sampling and assaying of selected DDH, which revealed higher grade Cu-Ni zones were coincident with anomalous PGE's. In 1989, UMEX tried to re-evaluate the economic potential of the Thierry mine site. However, due to the corporate re-organization, they failed to come to an agreement. In 1988, an airborne geophysical survey (EM, Resistivity, Mag, VLF) was flown over the Kibler Lake Stock.
Etruscan Resources Inc.	1990-1995	In 1990, Etruscan bought the Thierry mine property and contracted Watts, Griffis and McOuat (WGM) Limited for an economic evaluation for the reactivation of the Thierry mine. WGM reported diluted underground mineral reserves of 2,700,000 tons averaging 1.78% Cu and 0.25% Ni
PGM Ventures Inc.	2000-2003	PGM Ventures obtained 100% interest option from Etruscan in 2000. PGM completed 25 DDH to test the Thierry deposit and totaled to 8952 m. Numerous anomalies were outlines in the airborne geophysical surveys (TDEM, MAG) flown by JVX.
Richview Resources Inc.	2004-2005	Richview launched a multi-phased drill program, focusing on in-fill drilling and exploration drilling. Richview completed 49 DDHs, totalling to 74,985 ft.
Richview Resources Inc.	2006	A NI 43-101 compliant resource estimate with an effective date of February 1, 2006, was undertaken by P&E Mining Consultant Inc., and Billiken Management Services Inc. The resource consisted of 4,623,000 tonnes of Measured Indicated material at a grade of 1.81% Cu, 0.20% Ni, along with 4,366,000 tonnes of Inferred material at a grade of 1.71% Cu and 0.18% Ni.
Richview Resources Inc.	2007	Richview implemented a program which focused on evaluating the historical open pit and underground mineralization of the Thierry Mine and K1-1 open pit project. These involved a 45,900 ft drilling program designed to validate the down dip and strike continuity of the known deposit, and also, conducted surface drilling at K1-1 open pit area to confirm and validate the historic drilling by UMEX and to further define the open pit potential of the near surface.
Richview Resources Inc.	2008	Richview initiated a summer work program, which included excavation, geological mapping, prospecting and geochemical sampling. The company completed its 45,900 ft deep drill hole program. A Mobile Metal Ion (MMI) geochemical survey of the Thierry property was conducted. An airborne orthophotographic digital elevation model survey was conducted over the area by Aero Geometrics.
Richview Resources Inc.	2009	Richview suspended high cost field activities in order to protect corporate assets and shareholder value.
Cadillac Ventures Inc.	2010	Cadillac Ventures Inc. assumed 100% control of the Thierry property from Richview Resources Inc. Cadillac completed 3 deep drill holes totaling to 10,926 ft.

Cadillac Ventures Inc.	2011	Cadillac drilled 3 DDH to extend the mineralization to the west of the known deposit. 6 DDH were drilled to extend the eastern strike of the Thierry Mine. On behalf of Cadillac, Billiken Management was contracted and conducted in-fill drilling on the K1-1 deposit.
Cadillac Ventures Inc.	2012	Billiken Management, through Cadillac, implemented a small in-fill drilling program in the summer of 2012.

Current Work

The current work is comprised of a metallurgical analysis of samples taken from the K 1-1 deposit. There were two different composites created from drill core from recent drill programs on the K 1-1 deposit. There was an 'Inside Pit' sample and an 'Outside Pit' composite.

The inside pit composite consists of ¼ drill core from 4 drill holes that intersected the mineralized zone that was constrained within the optimized Whittle pit outline created in Gemcom. The outside pit composite consists of ¼ cut drill core that intersected the mineralized zone that lies outside of the current Whittle pit outline.

The holes that we used for the outside pit met samples: K-11-21, K-11-19, 23, and 26. The samples used for the inside pit met samples are from holes K-11-5, 9, 13, K-12-46 (Figure 3).

Table 3 Intervals for Metallurgical Testing

Drill Hole #	Interval for Metallurgical Testing		
Inside Pit	from	to	length
K-11-5	280	520	240
K-11-9	193	460	267
K-11-13	515	610.9	95.9
K-12-46	240	310	70
Outside Pit			
K-11-19	341	485	144
K-11-21	190	300	110
K-11-23	430	555	125
K-11-26	690	955	265

The samples were cut, bagged and sealed at the site by our project geologist who was in the field for the entire drill program. The samples were then delivered to the Manitoulin Transport depot in Thunder Bay and sent to SGS Laboratories in Lakefield, Ontario. For the analysis of samples please see the attached report from SGS Laboratories.

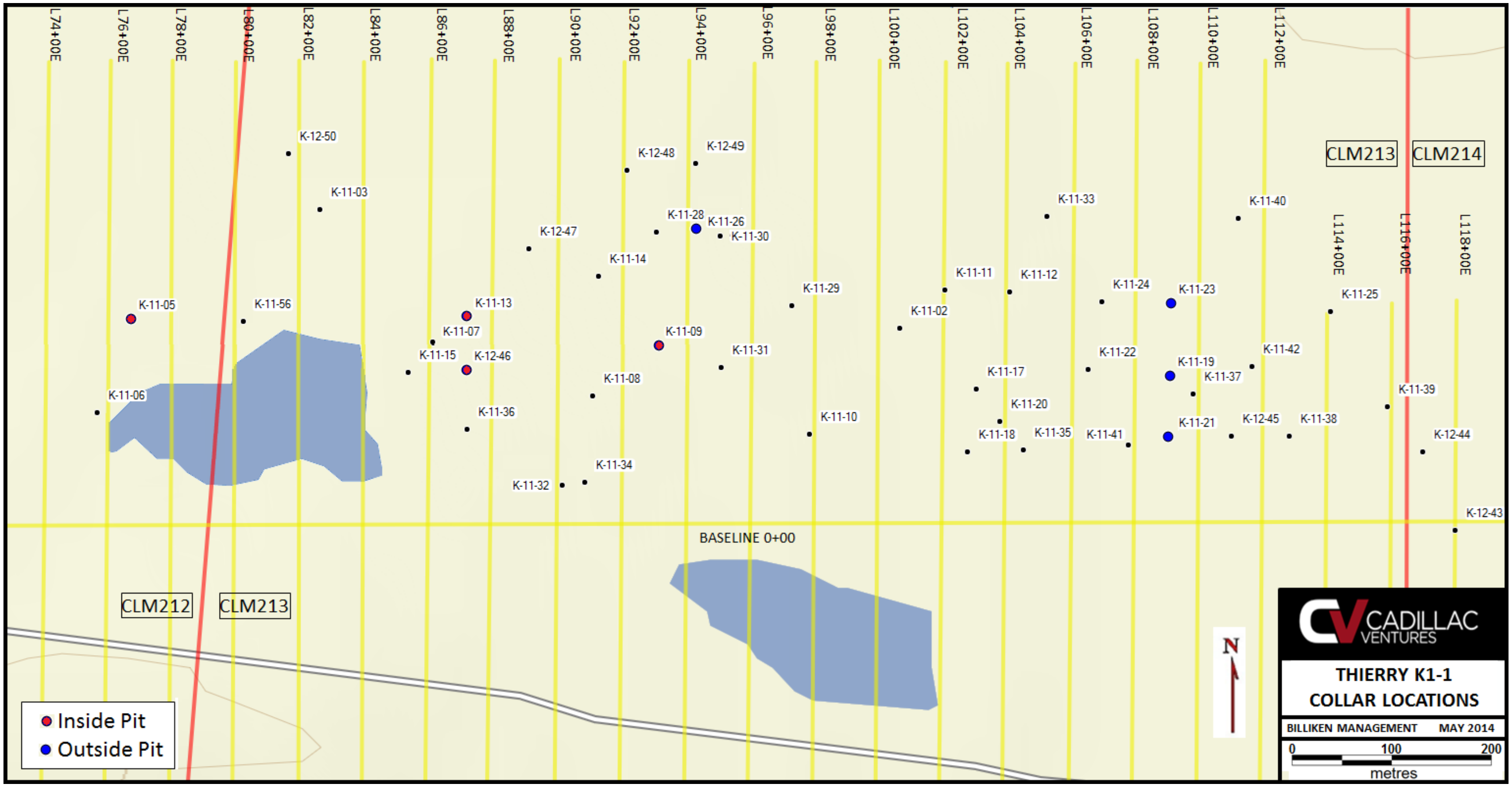

Figure 3 Thierry Collar Locations

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CERTIFICATE of AUTHOR

I, Brian H Newton, B.Sc. Geology, P. Geo. Do hereby certify that:

1. I currently reside at 1518 Jasmine Crescent, Oakville ON L6H 3H3.

2. This certificate applies to the report entitled "Report On The Metallurgical Testing Of Samples From The Thierry Mine Property".

3. I am a graduate of McMaster University, with a B.Sc. in Geology (1984) and I have practiced my profession continuously since that time.

4. I am a member of the Association of Professional Engineers and Professional Geoscientists of Ontario (Since 2007; Membership Number 1330).

5. I am a geologist and an employee of Billiken Management Services, Inc., a firm of consulting geologists based in Toronto, Ontario.

6. I am a qualified person for the purposes of this "Report".

7. I am responsible for all sections of the "Report".

8. I am independent of Cadillac Ventures Inc.

9. I have had no prior involvement with the property that is the subject of the Report.

10. As of the date of this certificate, to the best of my knowledge, information and belief, the Report contains all scientific and technical information that is required to be disclosed to make the Report not misleading.

Signed by,

PROFESSIONAL GEOSCIENTIST
BRIAN H. NEWTON
PRACTISING MEMBER
1330
ONTARIO

Brian H Newton, P. Geo.

April 1, 2014

Appendix A

An Investigation into

FLOTATION FLOWSHEET APPROACHES FOR THE THIERRY-K1-1 CU/NI DEPOSIT

prepared for

BILLIKEN MANAGEMENT LTD

Project 13563-001 Final Report
November 8, 2013

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Executive Summary

Testwork was completed on two composites prepared from ¼ core intervals from Inside Pit (IP) and Outside Pit (OP) of the Thierry-K1-1 Cu/Ni deposit. The two composites graded 0.52% Cu, 0.11% Ni, 0.068% Ni(S), 0.31 g/t PGM (Pt+Pd+Au), and 2.6 g/t Ag for the IP sample, and 0.46% Cu, 0.092% Ni, 0.058% Ni(S), 0.60 g/t PGM, and 2.0 g/t Ag for the OP sample. Testwork included mineralogical characterization and flotation testing on the two composites.

Mineralogical analysis on both composites found that the IP and OP composites had similar mineral content. The dominant mineral in both composites was Mg-hornblende, accounting for 27.0 wt% and 33.0 wt%, respectively. The contents of the other minerals were as follows:

Minerals	Wt %	
	IP Comp	OP Comp
Ca-Fe-Amphibole	17.0	15.0
Micas	16.0	17.0
Plagioclase	13.0	14.0
Orthopyoxene	8.63	8.53
Chlorites	3.60	2.75
Clinopyroxene	3.39	1.54
Fe Oxides	2.94	1.04
Chalcopyrite	1.76	1.44
Pentlandite	0.33	0.15
Pyrite	1.05	0.58
Pyrrhotite	0.84	1.06

At a P_{80} of ~205 µm for IP and ~191 µm for OP, QEMSCAN determined that Cu-sulphides (occurring primarily as chalcopyrite) were ~78% liberated (>=80% mineral-of interest area percent) in IP and ~72% liberated in OP. Ni-sulphides (occurring primarily as pentlandite) were ~53% liberated in IP and ~46% liberated in OP.

Electron microprobe analysis determined that most of the copper was carried by chalcopyrite, at ~98% in the IP composite and ~96% in the OP composite. The major Ni-carrier was pentlandite, accounting for 75.5% in IP and 58.0% in OP. Silicates carried 16.5% (IP) and 31.1% (OP) of the nickel, while pyrrhotite and pyrite carried ~8.0% and ~10.5% of the Ni in IP and OP, respectively. The nickel carried by silicates and iron sulphides is expected to lead to poor nickel recovery. The electron microprobe analysis also determined a high nickel content in pyrrhotite and pyrite at ~1.5% (IP) and at ~1.0% (OP), suggesting that recovering pyrrhotite and pyrite intentionally by flotation is likely able to improve nickel recovery.

A total of twenty flotation tests were completed on the two composites. Three rougher kinetics tests were performed to evaluate primary grind particle size, and a P_{80} of ~90 µm was selected for the remaining tests. Seventeen cleaner tests were conducted to investigate reagents, dosages, regrind fineness, and flowsheet configurations. Cleaner test F19 on the IP composite (using optimised conditions) produced a

Cu 3rd cleaner concentrate grading 26.3% Cu at a recovery of ~86% and a Ni 3rd cleaner concentrate grading 1.71% Ni at a recovery of ~12%. There was also ~14% of the nickel reporting to the Cu cleaner concentrate. Cleaner test F20 on the OP composite produced a Cu 3rd cleaner concentrate grading 28.4% Cu at a recovery of ~83% and a Ni 3rd cleaner concentrate grading 1.84% Ni at a recovery of ~10%. The nickel reporting to the copper cleaner concentrate was ~10%.

Locked cycle tests (LCT1 and LCT2) were completed applying the flowsheet and conditions from tests F19 and F20, respectively. The conditions applied in the locked cycle tests were as follows:

Test ID	Circuit	P_{80}	Reagent, g/t				Froth Time	pH
		(µm)	Lime	Flex 31	Na_2SO_3	MIBC	(min)	
LTC1	Cu Rougher	92	480	15		50	9	9.5
	Cu Cleaner	65	930	2.5	100	35	7	12
	Ni Scavenger			70		55	15	8.8-9.4
	Ni Cleaner	12	240	50		30	9	10.5
	Sum		1650	137.5	100	170	40	
LTC2	Cu Rougher	85	470	15		50	9	9.5
	Cu Cleaner	63	940	2.5	100	25	7	12
	Ni Scavenger			70		45	15	9-9.5
	Ni Cleaner	16	230	50		35	9	10.5
	Sum		1640	137.5	100	155	40	

The metallurgical projection (cycles D-F) is presented in the following table:

Test ID	Product	Grade, %, g/t			Recovery, %	
		Cu	Ni	PGM*	Cu	Ni
LCT1	Cu Concentrate	28.5	0.52	9.96	92.0	8.0
	Ni Concentrate	1.97	2.12	3.75	5.0	25.0
LCT2	Cu Concentrate	30.1	0.38	9.96	91.0	6.0
	Ni Concentrate	3.15	2.05	6.20	6.0	20.0

* Pt+Pd+Au

LCT1 had recoveries ~5% (Cu) and ~12% (Ni) higher than F19, while LCT2 had recoveries ~7% (Cu) and ~10% (Ni) higher than F20. There was 9.96g/t PGM (Pt+Pd+Au) contained in the Cu concentrate from both locked cycle tests. The Ni concentrate contained 3.75g/t PGM for LCT1 and 6.20g/t PGM LCT2.

QEMSCAN balk mineral analysis on the Cu and Ni concentrates from the locked cycle tests revealed that the Cu concentrate consists mainly of chalcopyrite at ~81 wt% for IP Comp (LCT1) and ~87 wt% for OP Comp (LCT2). The Ni concentrate consists mainly of iron sulphides at ~50 wt% (pyrite+ pyrrhotite) for IP Comp and ~53 wt% for OP Comp. The pentlandite recovered to the concentrates accounts for ~10 wt% (IP) and ~8 wt% (OP).

The Ni(S) assay analysis on the IP and OP head samples revealed that ~38% (IP) and ~37% (OP) of the nickel in the head samples was carried by non-sulphides. This amount of nickel would be considered as unrecoverable. The Ni(S) assay analysis on the Ni scavenger tails and Ni 1st cleaner tails from the locked cycle tests determined that a total of 51.5% (LCT1) and 43.9% (LCT2) of the Ni(S) were recovered to the Cu and Ni cleaner concentrates. A significant amount of the Ni(S); ~41% (LCT1) and ~50% (LCT2), reported to the Ni 1st cleaner tails. This was likely due to the rejection of pyrrhotite and pyrite in the stage. There were only 7.5% (LCT1) and 5.7% (LCT2) of the Ni(S) lost to the Ni scavenger tails.

Introduction

Core samples from the Thierry-K1-1 Cu/Ni deposit were submitted to SGS – Lakefield for flotation testwork to evaluate flotation flowsheet approaches and production of marketable concentrates. The testwork completed consisted of the following:

- Sample preparation
- Mineralogy characterization
- Flotation testing

Test data were issued and discussed on a regular basis with Mr. Brian H. Newton from Billiken Management.

Liping Gu
Project Metallurgist

Dan Imeson, MSc.
Manager, Mineral Processing

Experimental work by: Yashashree Chaugule, Charlene Caza
Report preparation by: Liping Gu
Reviewed by: S. McKenzie, D. Lascelles, D. Imeson

Testwork Summary

1. Sample Receipt and Preparation

1.1. Sample Receipt

In May of 2012, two rice bags of samples were received at the SGS Lakefield site and assigned receipt number 0076-MAY12. A total of two samples were received in the form of ¼ drill core intervals, and identified as IP (Inside Pit) and OP (Outside Pit) composite.

1.2. Sample Preparation

The material in the two bags was weighed, and at a total weight of 34.6 kg for IP and 38.4 kg for OP composite. Each composite was stage crushed to 100% passing 10 mesh. Two 150 gram samples were removed from each composite for head assay and mineralogy analysis including QEMSCAN analysis in Particle Mineral Analysis (PMA) model and EMP (Electron, Microprobe Analysis) for Ni deportment. The minus 10 mesh material was then rotary split into 1 kg charges. A total of 32 x 1 kg charges and 36 x 1 kg charges were prepared from the IP composite (IP Comp) and the OP composite (OP Comp), respectively. All charges were placed in freezer storage. All rejects from the composites were also stored.

1.3. Chemical Head Analyses

The head samples from the IP Comp and OP Comp were submitted for chemical head analysis for Cu, Ni, S, Au, Ag, Pt, Pd, and WRA (Whole Rock Analysis). The results are summarised in Table 1. The IP Comp graded 0.52% Cu, 0.11% Ni, 0.068% Ni(S), 0.31g/t PGM (Pt+Pd+Au), 2.6 g/t Ag, and 1.35% S. The OP Comp graded 0.46% Cu and 0.092% Ni, 0.058% Ni(S), 0.60 g/t PGM, 2.0 g/t Ag, and 1.14% S. There was ~62% of the total nickel occurring as sulphides in the IP Comp and ~63% in the OP Comp. The ratio of copper to nickel is approximately 5 parts Cu to 1 part Ni for both composites

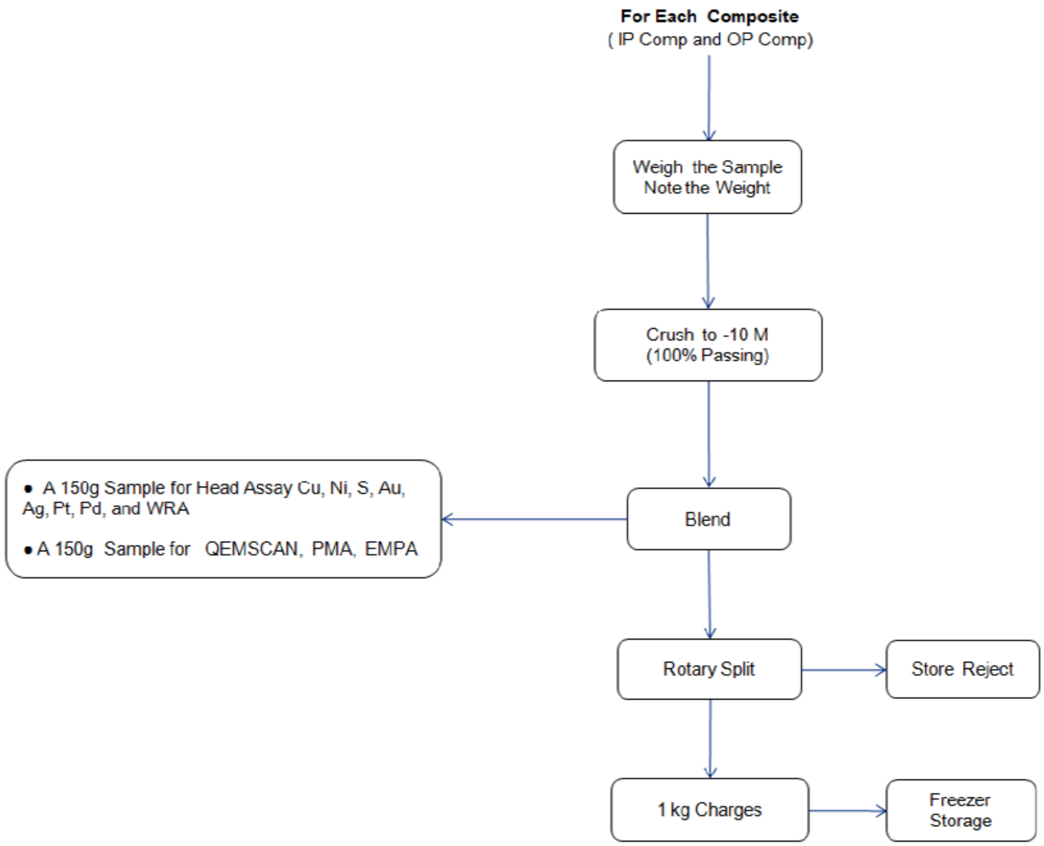


Figure 1: Sample Preparation Diagram for the IP and OP Composites

Table 1: Summary of Head Assay and Whole Rock Analysis

Element	Unit	IP Comp	OP Comp
XRF - Pyrosulphate Fusion			
Cu	%	0.52	0.46
Ni	%	0.11	0.092
LECO			
S	%	1.35	1.14
FA ICP			
Au	g/t	0.030	0.34
Pt	g/t	0.070	0.060
Pd	g/t	0.21	0.20
AAS			
Ni(s)	%	0.068	0.058
Ag	g/t	2.6	2.0
Whole Rock Analysis			
SiO_2	%	43.9	44.3
Al_2O_3	%	11.9	12.1
MgO	%	11.2	11.2
CaO	%	8.18	8.12
Na_2O	%	2.38	2.57
K_2O	%	1.12	1.11
TiO_2	%	0.46	0.49
P_2O_5	%	0.05	0.05
MnO	%	0.21	0.2
Cr_2O_3	%	< 0.01	0.01
V_2O_5	%	0.03	0.03
LOI	%	2.06	1.77
Sum	%	97.9	98.1

2. Mineralogical Characterization of Head Samples

The mineralogy analyses, including the modal analysis, element deportment, grain size distribution, mineral association and liberation, and electron microprobe analysis (EMPA) have been completed on IP and OP composites. The results are summarized and discussed in the following sections. The details are presented in Appendix A

2.1. Sample Preparation and assay Reconciliation

2.1.1. Sample Preparation

Minus 10 mesh sub-samples from IP and OP composite were stage-pulverized to 100% passing 300 µm (48 mesh), and screened into four size fractions: +212 µm, -212+106 µm, -106/+53 µm and -53 µm. The mass distributions of each size fraction are summarized in Table 2. The P_{80} for the IP and OP mineralogy samples can be estimated at ~205 µm and ~191 µm, respectively.

Table 2: Mass Size Distribution of Mineralogy Samples

Size Fraction	Mass Distribution, wt%	
	IP Comp	OP Comp
+212um	18.3	14.7
-212/+106um	31.6	34.1
-106/+53um	25.1	28.5
-53um	25.0	22.6
Total (Combined)	100.0	100.0
Estimated P_{80}	205 µm	191 µm

A single 30 mm polished section was prepared for the +212 µm, -212+106 µm, -106/+53 µm and -53 µm size fractions of each composite. All polished sections were submitted for mineralogical analyses by QEMSCAN.

2.1.2. Operational Modes and Quality Control

The modes of operation used for QEMSCAN™ analysis of the sample consisted of Particle Mineral Analysis (PMA). PMA is a two-dimensional mapping analysis aimed at resolving liberation and locking characteristics of a generic set of particles. A pre-defined number of particles are mapped at a selected point spacing in order to spatially resolve and describe mineral textures and associations. The analysis also provides information on the modal distribution of minerals present in the scan.

Key QEMSCAN™ mineralogical assays have been regressed with the chemical assays for all samples, as presented in Table 3 and Figure 2. Overall correlation, as measured by R-squared criteria is 0.992, with a slope (m) of 0.9616 for the sample. This is considered to be acceptable.

Table 3: Assay Reconciliation

Element	IP Composite					OP Composite				
	Combined	+212um	-212/+106um	-106/+53um	-53um	Combined	+212um	-212/+106um	-106/+53um	-53um
Mg (QEMSCAN)	7.20	6.24	6.57	7.36	8.53	7.59	6.38	7.00	7.66	9.20
Mg (Chemical)	6.63	5.87	6.57	6.82	7.06	6.66	6.57	6.57	6.63	6.88
Al (QEMSCAN)	5.69	6.32	5.99	5.54	4.99	5.93	6.48	6.18	5.86	5.26
Al (Chemical)	6.29	7.20	6.56	5.98	5.61	6.40	7.14	6.62	6.19	5.87
Si (QEMSCAN)	21.1	22.0	21.1	21.3	20.3	21.8	22.2	22.3	21.9	20.6
Si (Chemical)	20.6	21.3	20.6	20.4	20.3	20.8	21.2	21.0	20.8	20.5
S (QEMSCAN)	1.65	1.13	1.75	1.45	2.11	1.32	0.85	1.08	1.25	2.06
S (Chemical)	1.27	0.93	1.20	1.31	1.56	1.14	0.70	0.99	1.18	1.59
Ca (QEMSCAN)	6.11	6.64	6.27	6.33	5.30	6.03	5.77	6.49	6.43	5.03
Ca (Chemical)	5.96	5.90	5.78	6.18	6.02	5.85	5.02	5.81	6.26	5.92
Fe (QEMSCAN)	12.5	11.8	12.8	12.2	12.7	11.2	11.7	11.0	11.0	11.5
Fe (Chemical)	11.4	10.4	11.5	11.8	11.5	11.2	10.4	11.1	11.6	11.6
Ni (QEMSCAN)	0.14	0.064	0.15	0.12	0.20	0.082	0.056	0.058	0.11	0.10
Ni (Chemical)	0.10	0.070	0.10	0.10	0.12	0.088	0.060	0.070	0.090	0.13
Cu (QEMSCAN)	0.59	0.18	0.52	0.54	1.01	0.49	0.20	0.32	0.47	0.95
Cu (Chemical)	0.47	0.21	0.41	0.51	0.68	0.44	0.18	0.35	0.45	0.75

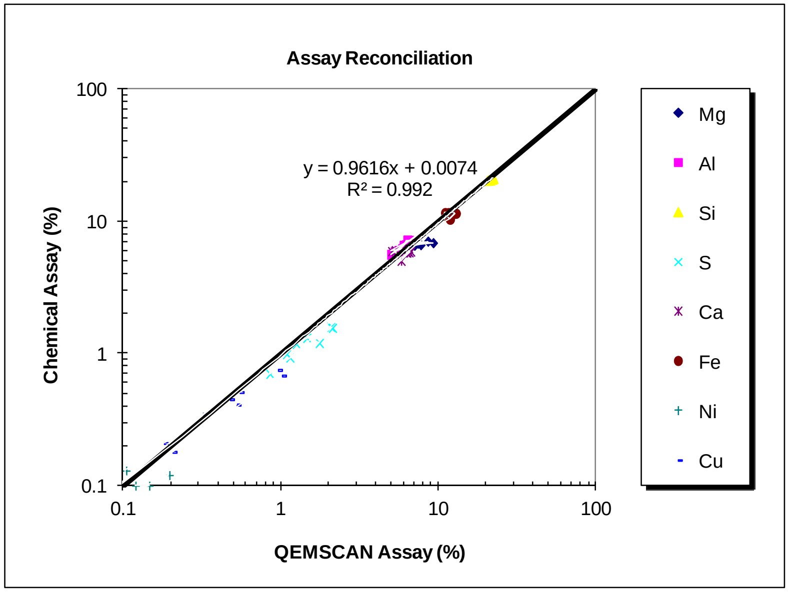


Figure 2: QEMSCAN and Direct Assay Reconciliation

2.2. Modal Analysis

The results of the modal analysis, illustrating mineral distributions by both sample and fraction are given in Table 4 and Table 5, and graphically presented in Figures 3 and 4.

The IP composite is comprised of 27 wt% of Mg-hornblende, 17 wt% of Ca-Fe-Mg amphibole, 16 wt% of micas, 13 wt% of plagioclase, 9 wt% of orthopyroxene, 4 wt% of chlorites, 3 wt% of clinopyroxene, 3% of Fe-oxides, and 1.5 wt% of epidote. The chalcopyrite content is 1.76 wt%, and the pentlandite content is 0.33 wt%. There are other Cu-sulphides and Ni-sulphides in trace amount. The pyrite and pyrrhotite account for 1.05 wt% and 0.84 wt% respectively.

The OP composite is comprised of 33 wt% of Mg-hornblende, 15 wt% of Ca-Fe-Mg amphibole, 17 wt% of micas, 14 wt% of plagioclase, 8.5 wt% of orthopyroxene, 3 wt% of chlorites, 1.5 wt% of clinopyroxene, 1% of Fe-oxides, 1 wt% of serpentine, and 1 wt% of epidote. The chalcopyrite content is 1.44 wt%, and the pentlandite content is 0.15 wt%. There are also other Cu-sulphides and Ni-sulphides in trace amount. The pyrite and pyrrhotite account for 0.58 wt% and 1.06 wt%, respectively.

There is a significant amount of micas observed in both composites. Chlorite and talc are also observed in the composites. This indicates a potential possibility of concentrate grade dilution and Mg contamination due to the natural floatability of the gangue minerals.

2.3. Liberation and Association

Liberation and association characteristics of chalcopyrite, pentlandite, pyrite and pyrrhotite were examined. For the purposes of this analysis, particle liberation is defined based on 2D particle area percent. Particles are classified in the following groups (in descending order) based on mineral-of-interest area percent: free (>=95%), liberated (<95% and >=80%), middling (<80% and >=50%), sub-middling (<50% and >=20%) and locked (<20%). For association characteristics, the binary association groups, for example chalcopyrite:pyrrhotite and chalcopyrite:Ni-sulphides, refer to particle area percent greater than or equal to 95% of the two mineral groups. The complex groups refer to particles with a combination of minerals, including the mineral of interest.

2.3.1. Cu-Sulphides Liberation and Association Characteristics

The Cu-sulphides liberation and the association characteristics of free, liberated, and various middling particles are presented in Figure 5 and Figure 6.

Overall Cu-sulphides liberation is at 78 wt% (free and liberated) for the IP composite and 72 wt% for the OP composite. The liberation increases with increasing particle fineness, with the maximum free and liberated Cu-sulphides achieved at 90 wt% (IP) and 83% (OP) in the -53 µm fraction.

Table 4: Results of Bulk Modal Analysis – IP Composite

Sample		IP Composite								
Fraction		Combined	+212um		-212/+106um		-106/+53um		-53um	
Mass Size Distribution (%)			18.3		31.6		25.1		25.0	
Calculated ESD Particle Size		41	193		87		46		17	
		Sample	Sample	Fraction	Sample	Fraction	Sample	Fraction	Sample	Fraction
Mineral Mass (%)	Chalcopyrite	1.76	0.12	0.63	0.49	1.55	0.40	1.61	0.75	2.98
	Other Cu-Sulphides	0.055	0.005	0.027	0.019	0.061	0.012	0.047	0.019	0.077
	Pentlandite	0.33	0.020	0.11	0.11	0.35	0.071	0.28	0.13	0.53
	Other Ni Minerals	0.0003	0.0001	0.0004	0.0002	0.0005	0.0000	0.0001	0.0001	0.0003
	Pyrrhotite	0.84	0.066	0.36	0.37	1.16	0.22	0.87	0.19	0.75
	Pyrite	1.05	0.26	1.44	0.34	1.08	0.19	0.74	0.26	1.05
	Other Sulphides	0.004	0.001	0.003	0.002	0.005	0.000	0.002	0.002	0.008
	Mg-Hornblende	27.0	5.2	28.2	10.0	31.8	7.5	29.8	4.3	17.1
	Ca-Fe-Mg Amphibole	16.8	2.2	12.0	4.6	14.4	4.5	18.1	5.5	22.0
	Orthopyroxene	8.63	1.80	9.83	2.29	7.24	2.09	8.33	2.45	9.82
	Clinopyroxene	3.39	0.95	5.22	1.13	3.58	0.84	3.34	0.47	1.86
	Chlorites	3.60	0.63	3.42	1.27	4.03	0.86	3.43	0.84	3.37
	Talc	0.41	0.091	0.50	0.13	0.41	0.12	0.46	0.070	0.28
	Serpentine	0.27	0.012	0.065	0.022	0.070	0.028	0.11	0.20	0.82
	Micas	15.7	1.84	10.0	4.33	13.7	3.71	14.8	5.87	23.5
	Plagioclase	12.9	3.40	18.6	4.41	14.0	2.87	11.4	2.19	8.76
	K-Feldspar	0.84	0.35	1.93	0.27	0.86	0.15	0.61	0.066	0.26
	Epidote	1.45	0.58	3.19	0.46	1.46	0.27	1.07	0.14	0.56
	Quartz	0.47	0.037	0.20	0.052	0.16	0.083	0.33	0.30	1.18
	Sphene/Titanite	0.16	0.044	0.24	0.03	0.11	0.035	0.14	0.045	0.18
	Other Silicates	0.73	0.11	0.60	0.21	0.65	0.22	0.87	0.19	0.78
	Fe-Oxides	2.94	0.57	3.13	0.87	2.74	0.72	2.87	0.77	3.10
	Other Oxides	0.18	0.007	0.040	0.034	0.11	0.028	0.11	0.11	0.43
	Carbonates	0.021	0.005	0.027	0.006	0.018	0.007	0.029	0.003	0.013
	Other	0.48	0.027	0.15	0.16	0.50	0.14	0.54	0.16	0.63
	Total	100.00	18.3	100.0	31.6	100.0	25.1	100.0	25.0	100.0
Mean Grain Size by Frequency (µm)	Chalcopyrite	24	32		46		35		15	
	Other Cu-Sulphides	7	10		10		6		5	
	Pentlandite	25	30		36		26		19	
	Other Ni Minerals	8	11		10		6		4	
	Pyrrhotite	29	50		60		31		14	
	Pyrite	36	127		68		41		15	
	Other Sulphides	8	14		13		6		6	
	Mg-Hornblende	20	35		30		19		9	
	Ca-Fe-Mg Amphibole	12	18		18		13		8	
	Orthopyroxene	10	19		14		9		7	
	Clinopyroxene	15	27		18		11		8	
	Chlorites	17	30		23		16		10	
	Talc	9	12		12		8		5	
	Serpentine	5	10		9		6		5	
	Micas	10	22		18		11		7	
	Plagioclase	37	69		56		35		16	
	K-Feldspar	16	21		16		12		9	
	Epidote	30	42		34		24		15	
	Quartz	6	19		11		8		5	
	Sphene/Titanite	25	38		28		24		19	
	Other Silicates	7	10		9		7		5	
	Fe-Oxides	38	106		63		43		19	
	Other Oxides	12	17		30		21		9	
	Carbonates	20	35		20		25		10	
	Other	20	32		40		26		12	

Table 5: Results of Bulk Modal Analysis – OP Composite

Sample		**OP Composite**								
Fraction		**Combined**	**+212um**		**-212/+106um**		**-106/+53um**		**-53um**	
Mass Size Distribution (%)			14.7		34.1		28.5		22.6	
Calculated ESD Particle Size		38	158		85		44		15	
		Sample	**Sample**	**Fraction**	**Sample**	**Fraction**	**Sample**	**Fraction**	**Sample**	**Fraction**
Mineral Mass (%)	Chalcopyrite	1.44	0.09	0.64	0.32	0.93	0.40	1.39	0.63	2.78
	Other Cu-Sulphides	0.079	0.011	0.072	0.017	0.050	0.014	0.048	0.037	0.17
	Pentlandite	0.15	0.010	0.066	0.025	0.072	0.069	0.24	0.05	0.23
	Other Ni Minerals	0.0003	0.00	0.00	0.0001	0.0002	0.0001	0.0002	0.0002	0.0007
	Pyrrhotite	1.06	0.13	0.90	0.38	1.13	0.32	1.11	0.22	0.98
	Pyrite	0.58	0.068	0.46	0.16	0.48	0.11	0.39	0.24	1.05
	Other Sulphides	0.004	0.001	0.005	0.001	0.003	0.002	0.006	0.001	0.004
	Mg-Hornblende	32.6	4.44	30.2	13.2	38.7	10.4	36.5	4.54	20.1
	Ca-Fe-Mg Amphibole	15.2	1.75	11.9	4.73	13.9	4.52	15.9	4.16	18.4
	Orthopyroxene	8.53	1.18	8.03	2.51	7.34	2.48	8.69	2.36	10.4
	Clinopyroxene	1.54	0.25	1.68	0.63	1.84	0.45	1.59	0.22	0.95
	Chlorites	2.75	0.49	3.30	0.89	2.61	0.67	2.36	0.70	3.08
	Talc	0.48	0.06	0.42	0.18	0.51	0.14	0.50	0.10	0.43
	Serpentine	1.02	0.13	0.86	0.19	0.54	0.16	0.57	0.54	2.39
	Micas	16.5	2.41	16.4	4.39	12.9	4.08	14.3	5.63	24.9
	Plagioclase	13.8	2.86	19.5	5.23	15.3	3.61	12.7	2.06	9.08
	K-Feldspar	0.51	0.15	1.00	0.20	0.58	0.12	0.42	0.042	0.19
	Epidote	0.95	0.32	2.18	0.34	1.01	0.18	0.63	0.11	0.47
	Quartz	0.64	0.040	0.27	0.11	0.31	0.13	0.47	0.36	1.59
	Sphene/Titanite	0.22	0.041	0.28	0.08	0.22	0.06	0.22	0.038	0.17
	Other Silicates	0.43	0.057	0.39	0.13	0.38	0.15	0.54	0.088	0.39
	Fe-Oxides	1.04	0.18	1.22	0.27	0.78	0.28	0.99	0.31	1.36
	Other Oxides	0.12	0.009	0.061	0.036	0.10	0.017	0.061	0.056	0.25
	Carbonates	0.048	0.004	0.029	0.006	0.017	0.007	0.025	0.031	0.14
	Other	0.38	0.038	0.26	0.11	0.33	0.11	0.37	0.13	0.57
	Total	100.00	14.7	100.0	34.1	100.0	28.5	100.0	22.6	100.0
Mean Grain Size by Frequency (µm)	Chalcopyrite	20	34		42		33		13	
	Other Cu-Sulphides	7	13		10		7		5	
	Pentlandite	16	20		17		24		11	
	Other Ni Minerals	9	0		9		12		9	
	Pyrrhotite	29	52		51		30		14	
	Pyrite	22	74		50		34		13	
	Other Sulphides	11	19		11		11		8	
	Mg-Hornblende	20	32		31		19		9	
	Ca-Fe-Mg Amphibole	10	19		15		10		7	
	Orthopyroxene	9	18		13		9		6	
	Clinopyroxene	9	13		12		8		6	
	Chlorites	15	26		21		14		9	
	Talc	9	13		14		9		6	
	Serpentine	7	16		14		9		6	
	Micas	10	24		17		10		6	
	Plagioclase	39	82		63		37		15	
	K-Feldspar	15	20		17		13		9	
	Epidote	27	40		32		21		13	
	Quartz	7	20		15		9		5	
	Sphene/Titanite	28	45		38		31		14	
	Other Silicates	7	10		9		7		5	
	Fe-Oxides	20	53		34		26		10	
	Other Oxides	13	26		41		20		8	
	Carbonates	19	20		19		16		19	
	Other	20	50		45		26		11	

The Cu-sulphides are primarily associated with silicates (Cu-sulphide:silicates 15 wt% for IP and 18 wt% for OP), mainly as inclusions in the +212 µm fraction. Approximately 3 wt% of the complex category was observed in the IP Comp, and 5 wt% in the OP Comp.

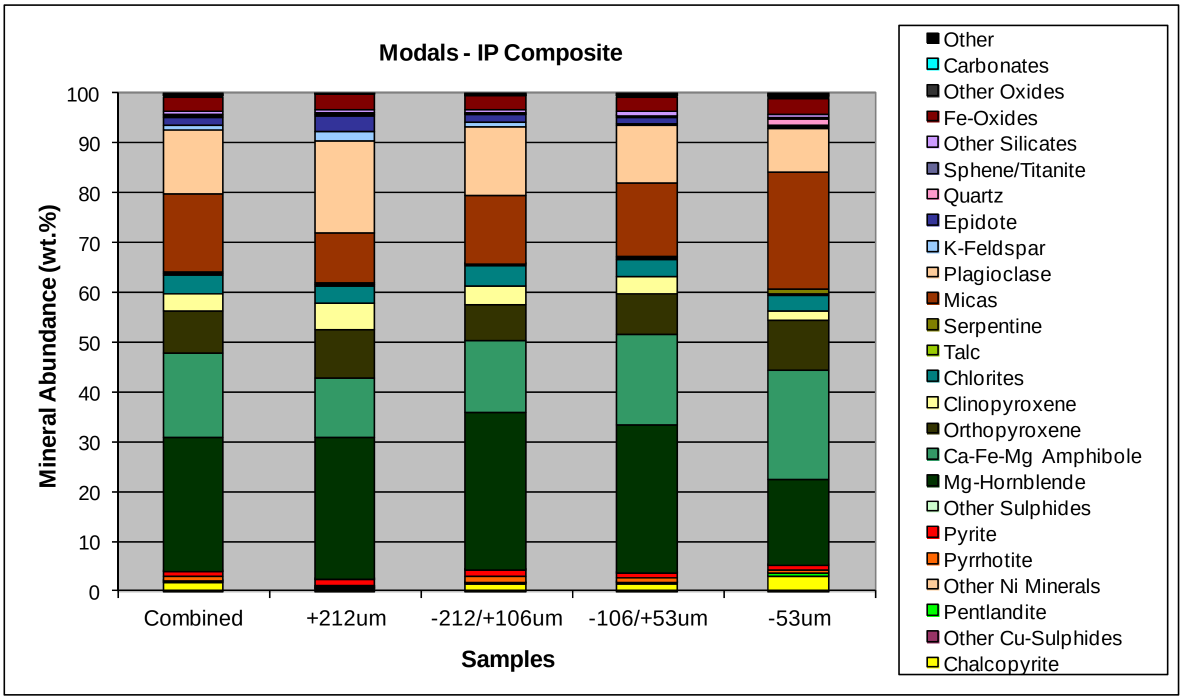


Figure 3: Bulk Modal Analysis – IP Comp

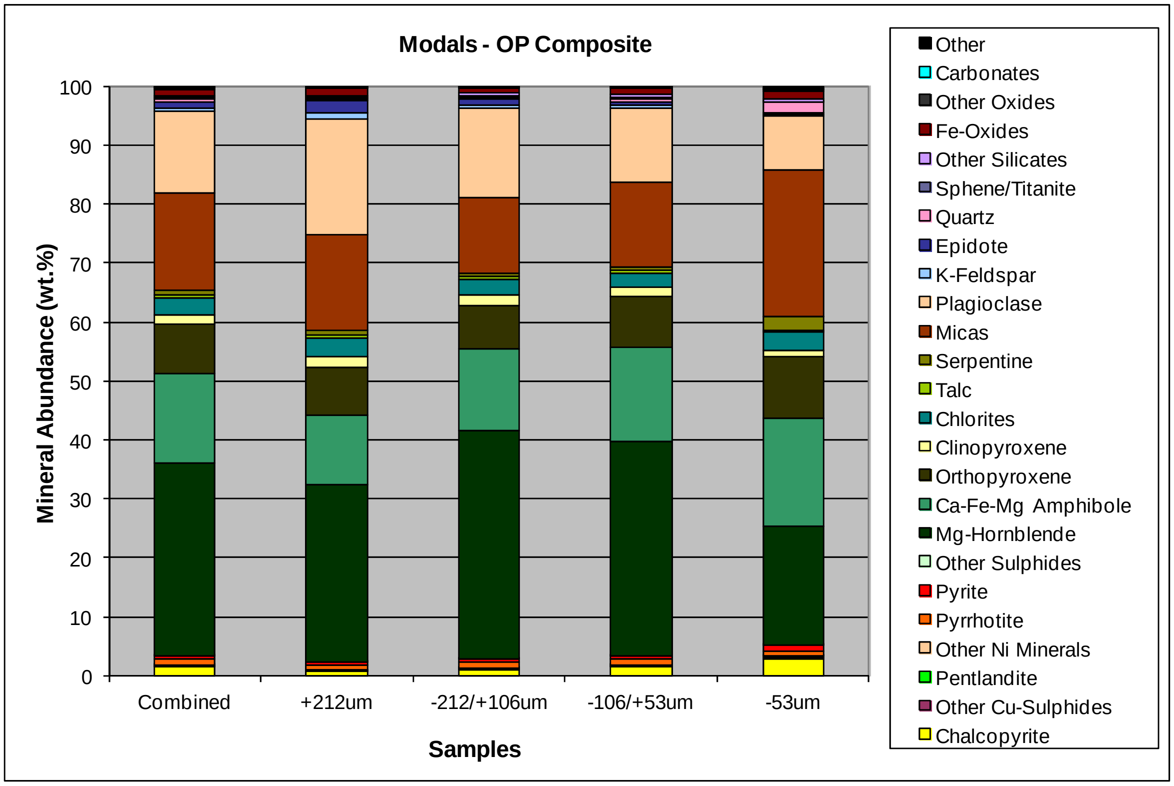
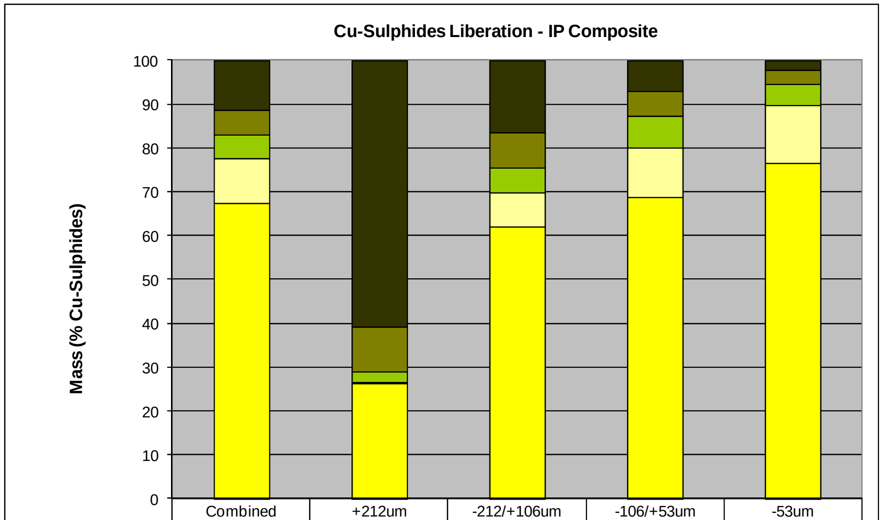
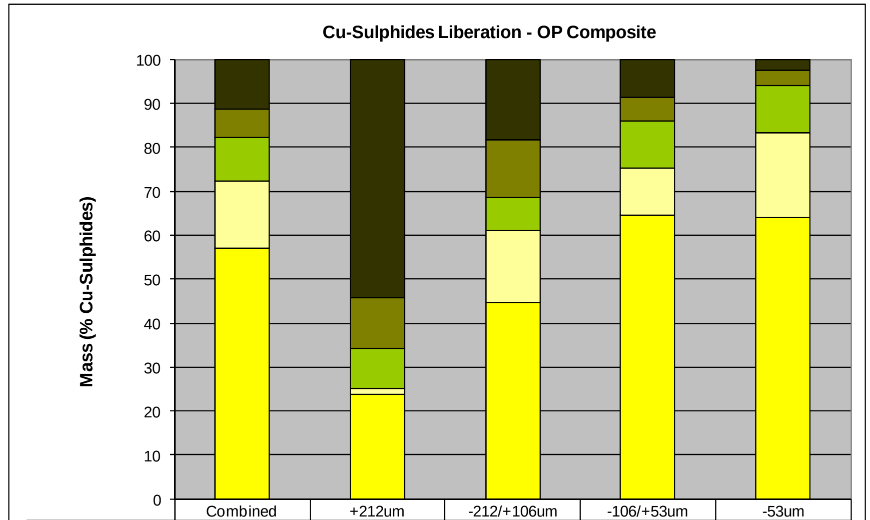


Figure 4: Bulk Modal Analysis – OP Comp

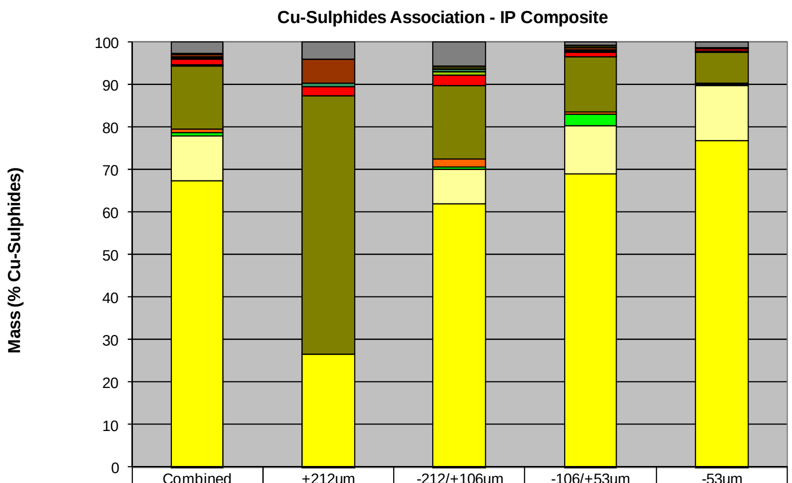


	Combined	+212um	-212/+106um	-106/+53um	-53um
Locked Cu-Sul	11.4	60.9	16.6	7.1	2.4
Cu-Sul Sub-Midds	5.6	10.2	8.0	5.7	3.2
Cu-Sul Midds	5.3	2.5	5.6	7.2	4.6
Lib Cu-Sul	10.4	0.1	7.9	11.3	13.2
Free Cu-Sul	67.3	26.4	61.9	68.8	76.6

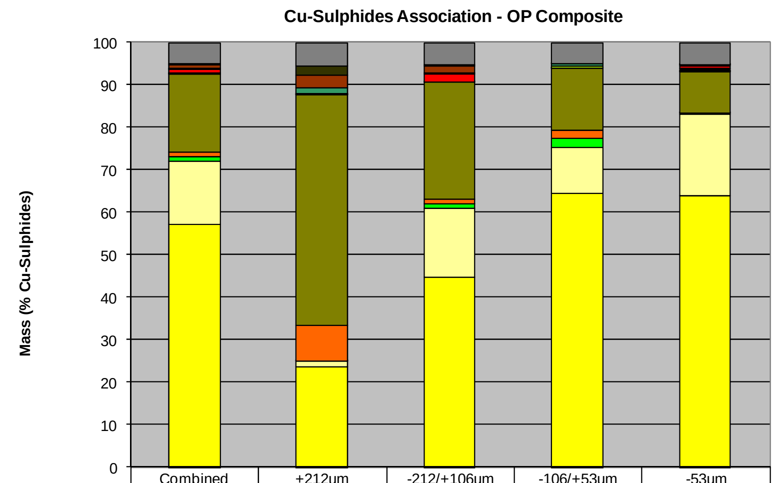


	Combined	+212um	-212/+106um	-106/+53um	-53um
Locked Cu-Sul	11.3	54.3	18.5	8.8	2.4
Cu-Sul Sub-Midds	6.7	11.5	12.9	5.2	3.6
Cu-Sul Midds	9.9	9.2	7.6	10.7	10.7
Lib Cu-Sul	15.0	1.3	16.3	10.9	19.1
Free Cu-Sul	57.1	23.7	44.7	64.4	64.1

Figure 5: Cu-Sulphides Liberation



	Combined	+212um	-212/+106um	-106/+53um	-53um
Cu-Sul:Complex	2.8	4.2	5.9	1.1	1.4
Cu-Sul:Ni-Sul:Po:Sil	0.3	0.0	0.6	0.4	0.0
Cu-Sul:Po:Sil	0.5	5.5	0.04	0.6	0.0
Cu-Sul:Ni-Sul:Sil	0.5	0.8	0.7	0.2	0.4
Cu-Sul:Ni-Sul:Po	0.3	0.0	0.6	0.4	0.0
Cu-Sul: Py	1.2	2.2	2.6	0.9	0.4
Cu-Sul:Other	0.2	0.0	0.0	0.02	0.4
Cu-Sul:Carbonates	0.0	0.0	0.0	0.0	0.0
Cu-Sul:Oxides	0.02	0.02	0.01	0.005	0.03
Cu-Sul:Other Sulphides	0.0	0.0	0.0	0.0	0.0
Cu-Sul:Silicates	14.9	60.8	17.1	13.0	7.2
Cu-Sul:Po	0.8	0.0	2.1	0.6	0.2
Cu-Sul:Ni-Sul	0.9	0.0	0.5	2.7	0.2
Lib Cu-Sul	10.4	0.1	7.9	11.3	13.2
Free Cu-Sul	67.3	26.4	61.9	68.8	76.6



	Combined	+212um	-212/+106um	-106/+53um	-53um
Cu-Sul:Complex	5.1	5.4	5.1	5.0	5.1
Cu-Sul:Ni-Sul:Po:Sil	0.3	2.4	0.4	0.1	0.0
Cu-Sul:Po:Sil	0.6	3.0	1.8	0.0	0.1
Cu-Sul:Ni-Sul:Sil	0.3	1.4	0.1	0.5	0.1
Cu-Sul:Ni-Sul:Po	0.2	0.0	0.0	0.5	0.1
Cu-Sul: Py	0.7	0.3	2.0	0.0	0.5
Cu-Sul:Other	0.3	0.01	0.0	0.04	0.7
Cu-Sul:Carbonates	0.0	0.0	0.0	0.0	0.0
Cu-Sul:Oxides	0.03	0.0	0.04	0.0	0.04
Cu-Sul:Other Sulphides	0.003	0.0	0.0	0.0	0.008
Cu-Sul:Silicates	18.1	54.2	27.6	14.7	9.8
Cu-Sul:Po	1.3	8.4	1.1	1.9	0.0
Cu-Sul:Ni-Sul	0.9	0.01	1.0	2.0	0.2
Lib Cu-Sul	15.0	1.3	16.3	10.9	19.1
Free Cu-Sul	57.1	23.7	44.7	64.4	64.1

Figure 6: Cu-Sulphides Association

2.3.2. Ni-Sulphides Liberation and Association Characteristics

The Ni-sulphides liberation and the association characteristics of free, liberated, and various middling particles are presented in Figure 7 and Figure 8.

Overall Ni-sulphides liberation is low at 53 wt% (free and liberated) for the IP composite and 46 wt% for the OP composite. The liberation increases significantly with increasing particle fineness, from 8 wt% (IP) and 0.4 wt% (OP) of free and liberated Ni-sulphides in +212µm fraction to 83 wt% (IP) and 63% (OP) in the -53 µm fraction.

Ni-sulphides are associated with pyrrhotite at approximately 10 wt% for both composites. Ni-sulphides are also associated with silicates (Ni-sulphide:silicates 6 wt% for IP and 12 wt% for OP). However, primary locked Ni-sulphides appear to be complex at 19 wt% (overall) for IP and 20 wt% for OP, with the maximum of the complex at 37 wt% in the -212+106 µm fraction(IP) and 38 wt% in the +212µm fraction (OP). There are also 3 wt% (IP) and 8 wt% (OP) of Ni-sulphides associated with Cu-sulphides.

2.3.3. Pyrrhotite Liberation and Association Characteristics

The pyrrhotite liberation and the association characteristics of free, liberated, and various middling particles are presented in Figure 9 and Figure 10.

Overall pyrrhotite liberation is at 78 wt% (free and liberated) for the IP composite and 83 wt% for the OP composite. The liberation increases with increasing particle fineness, with the maximum free and liberated pyrrhotite of 80 wt% (IP) and 88% (OP) achieved in the -53 µm fraction.

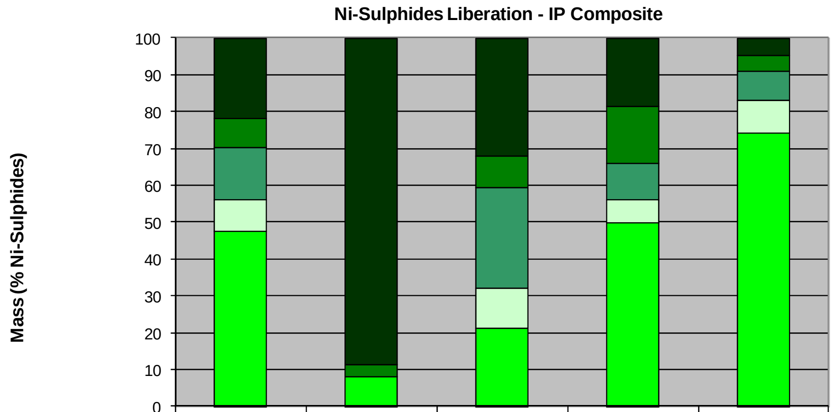
Pyrrhotite appears primarily in the category of complex at 7 wt% (IP) and 8 wt% (OP). Pyrrhotite is also associated with silicates (pyrrhotite:silicates 5.5 wt% for both composites), mainly as inclusions in the +212µm fraction. There are also approximately 3 wt% of triplex (pyrrhotite:Cu-sulphide:Ni-sulphide) in the two composites.

2.3.4. Pyrite Liberation and Association Characteristics

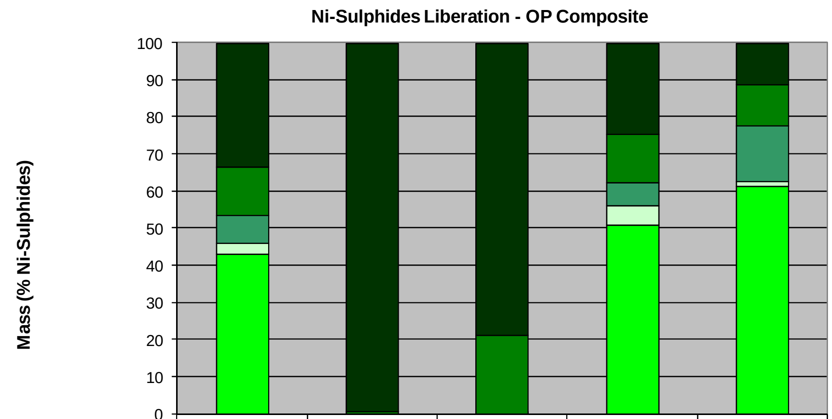
The pyrite liberation and the association characteristics of free, liberated, and various middling particles are presented in Figure 11 and Figure 12.

Overall pyrite liberation is at 66 wt% (free and liberated) for the IP composite and 67 wt% for the OP composite. The liberation increases with increasing particle fineness, with the maximum free and liberated pyrite achieved at 86 wt% (IP) and 83% (OP) in the -53 µm fraction.

Pyrite appears also primarily in the complex category at ~16 wt% for both composites. There are 9 wt% (IP) and 10 wt% (OP) of pyrite associated with silicates, mainly as inclusions in the +212µm fraction.

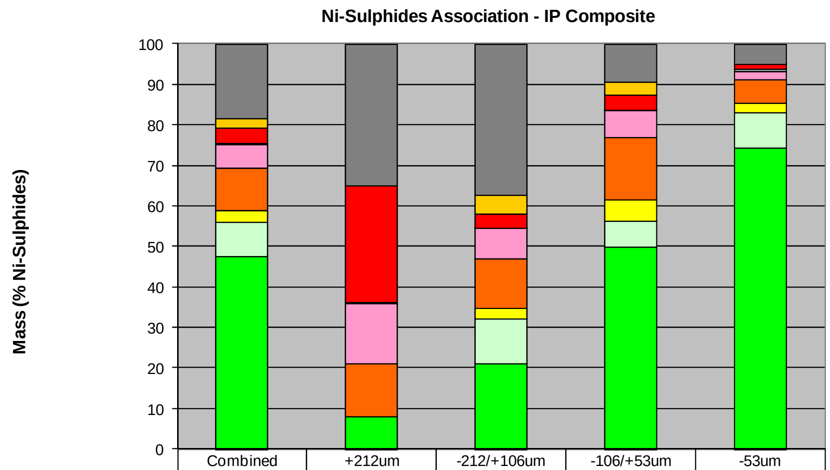


	Combined	+212um	-212/+106um	-106/+53um	-53um
Locked Ni-Sul	21.7	88.6	32.2	18.5	4.9
Ni-Sul Sub-Midds	7.9	3.5	8.5	15.6	4.0
Ni-Sul Midds	14.4	0.0	27.3	9.8	8.1
Lib Ni-Sul	8.5	0.0	11.0	6.3	8.9
Free Ni-Sul	47.5	7.9	21.1	49.8	74.2

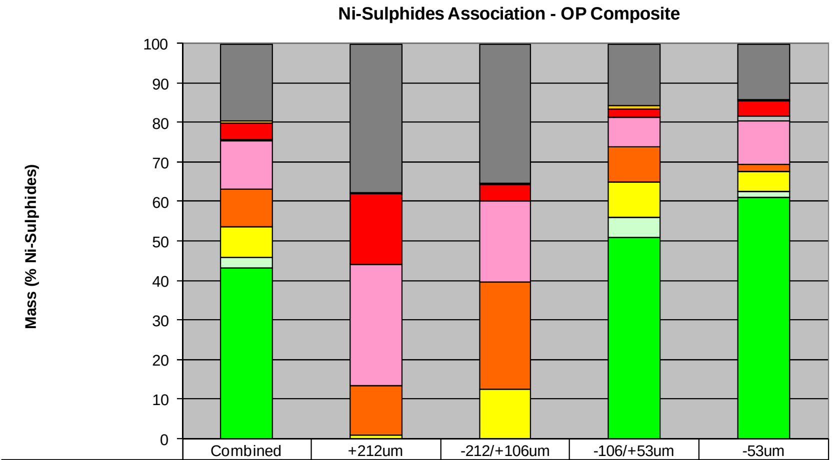


	Combined	+212um	-212/+106um	-106/+53um	-53um
Locked Ni-Sul	33.5	99.5	78.9	24.7	11.1
Ni-Sul Sub-Midds	12.9	0.1	20.7	13.2	11.2
Ni-Sul Midds	7.8	0.0	0.1	6.1	15.1
Lib Ni-Sul	2.7	0.4	0.0	5.1	1.3
Free Ni-Sul	43.2	0.0	0.3	51.0	61.3

Figure 7: Ni-Sulphides Liberation

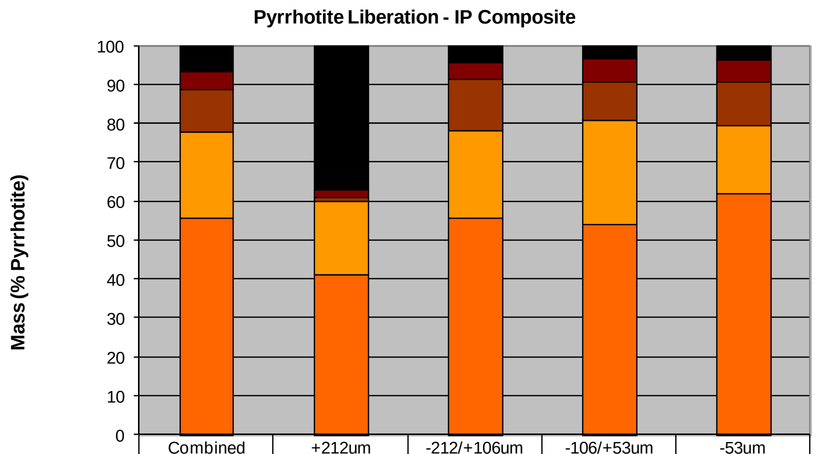


	Combined	+212um	-212/+106um	-106/+53um	-53um
Ni-Sul:Complex	18.5	35.1	37.4	9.3	5.1
Ni-Sul:Cu-Sul:Po	2.2	0.0	4.6	3.3	0.04
Ni-Sul: Py	4.0	28.8	3.4	3.7	1.0
Ni-Sul:Other	0.1	0.0	0.0	0.2	0.2
Ni-Sul:Carbonates	0.0	0.0	0.0	0.0	0.0
Ni-Sul:Oxides	0.2	0.1	0.02	0.03	0.4
Ni-Sul:Other Sulphides	0.0	0.0	0.0	0.0	0.0
Ni-Sul:Silicates	5.7	15.1	7.7	6.6	2.2
Ni-Sul:Po	10.4	13.0	12.3	15.5	5.7
Ni-Sul:Cu-Sul	2.9	0.0	2.6	5.3	2.4
Lib Ni-Sul	8.5	0.0	11.0	6.3	8.9
Free Ni-Sul	47.5	7.9	21.1	49.8	74.2

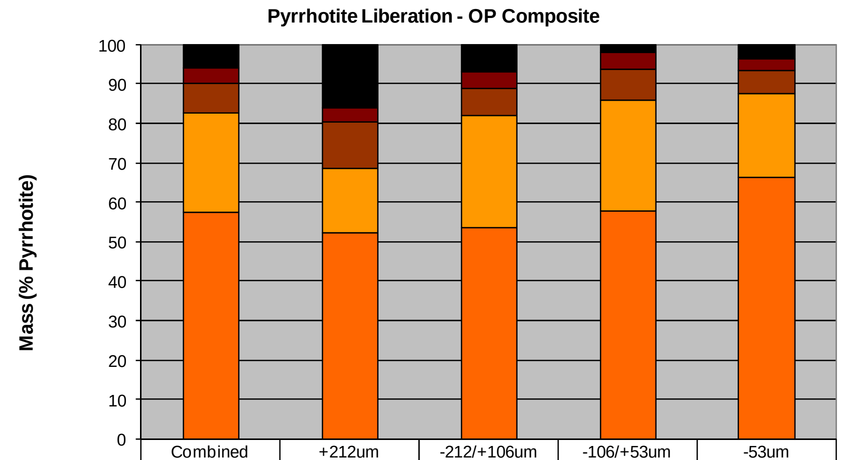


	Combined	+212um	-212/+106um	-106/+53um	-53um
Ni-Sul:Complex	19.7	37.6	35.2	15.8	14.0
Ni-Sul:Cu-Sul:Po	0.5	0.4	0.3	0.6	0.4
Ni-Sul: Py	4.1	17.7	4.4	2.2	3.8
Ni-Sul:Other	0.0	0.1	0.0	0.0	0.0
Ni-Sul:Carbonates	0.0	0.0	0.0	0.0	0.0
Ni-Sul:Oxides	0.4	0.0	0.0	0.04	1.2
Ni-Sul:Other Sulphides	0.0	0.0	0.0	0.0	0.0
Ni-Sul:Silicates	12.3	30.7	20.4	7.5	11.2
Ni-Sul:Po	9.6	12.5	27.0	8.7	1.8
Ni-Sul:Cu-Sul	7.7	0.6	12.4	9.0	5.0
Lib Ni-Sul	2.7	0.4	0.0	5.1	1.3
Free Ni-Sul	43.2	0.0	0.3	51.0	61.3

Figure 8: Ni-Sulphides Association

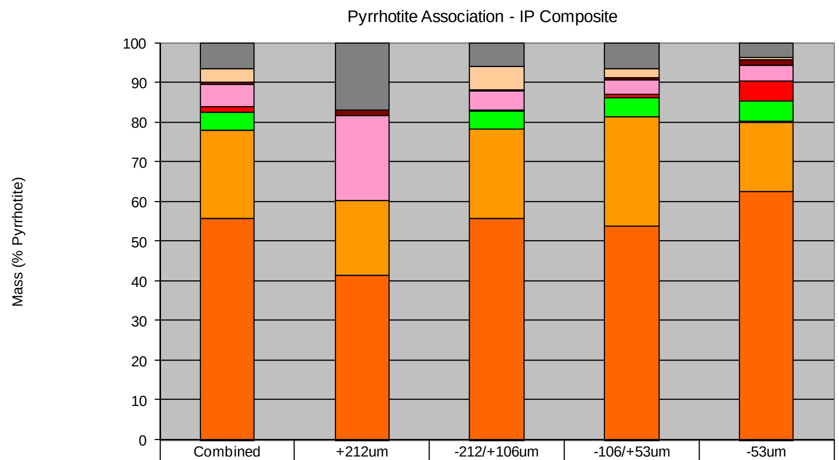


	Combined	+212um	-212/+106um	-106/+53um	-53um
Locked Po	6.7	37.3	4.6	3.5	3.8
Po Sub-Midds	4.9	1.8	4.3	6.1	5.7
Po Midds	10.9	1.1	13.0	9.9	11.3
Lib Po	22.2	18.7	22.6	26.7	17.4
Free Po	55.4	41.1	55.5	53.8	61.9

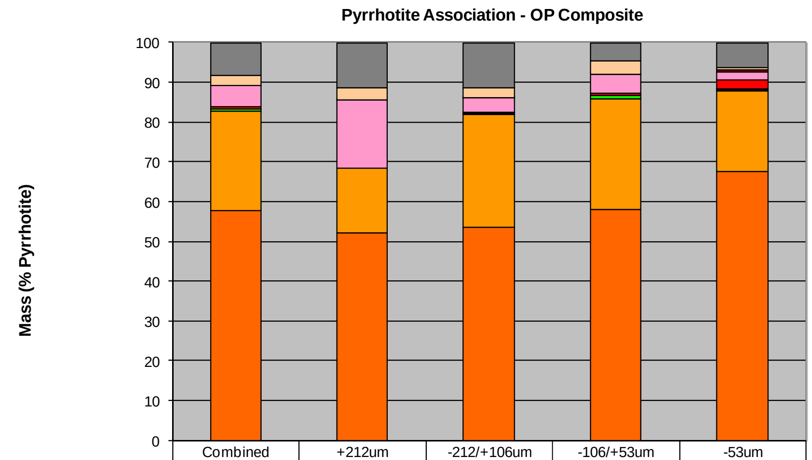


	Combined	+212um	-212/+106um	-106/+53um	-53um
Locked Po	6.0	16.2	6.9	2.0	3.9
Po Sub-Midds	3.9	3.6	4.3	4.3	2.9
Po Midds	7.5	11.9	6.8	7.9	5.6
Lib Po	25.3	16.1	28.5	28.0	21.3
Free Po	57.3	52.2	53.5	57.7	66.2

Figure 9: Pyrrhotite Liberation

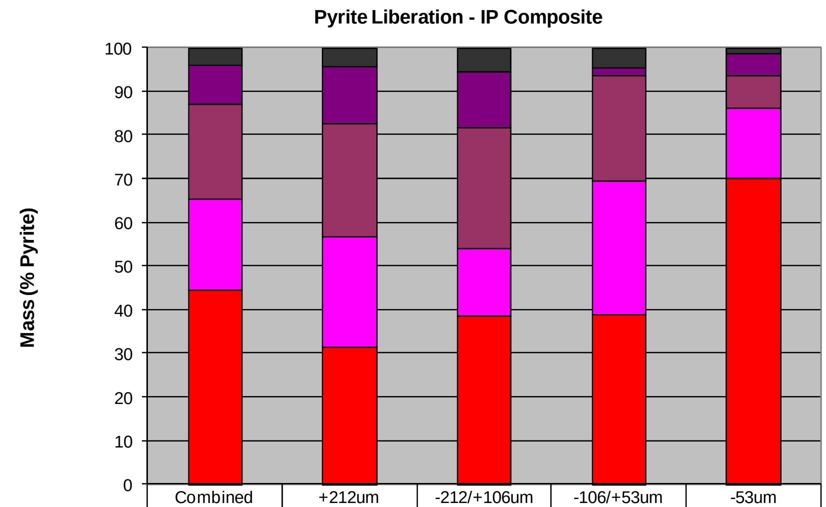


	Combined	+212um	-212/+106um	-106/+53um	-53um
Po:Complex	6.6	17.1	6.1	6.7	3.8
Po:Cu-Sul:Ni-Sul	3.2	0.0	5.9	2.0	0.6
Po:Other	0.0	0.0	0.0	0.0	0.0
Po:Carbonates	0.0	0.0	0.0	0.0	0.0
Po:Oxides	0.7	1.3	0.3	0.6	1.3
Po:Other Sulphides	0.0	0.0	0.0	0.0	0.0
Po:Silicates	5.5	21.4	4.5	3.6	4.1
Po: Py	1.6	0.1	0.5	0.9	5.0
Po:Ni-Sul	4.3	0.0	4.4	4.9	5.1
Po:Cu-Sul	0.03	0.0	0.01	0.0	0.1
Lib Po	22.4	18.8	22.5	27.4	17.5
Free Po	55.6	41.3	55.7	53.8	62.4

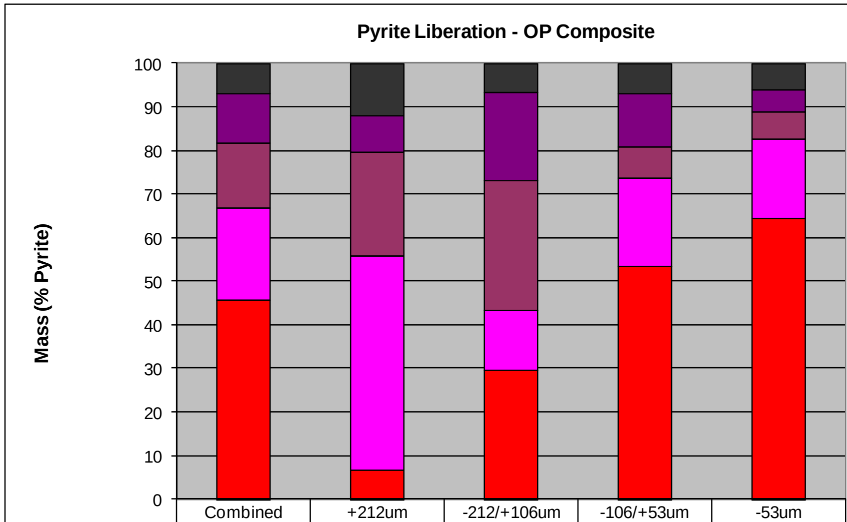


	Combined	+212um	-212/+106um	-106/+53um	-53um
Po:Complex	8.2	11.4	11.3	4.6	6.2
Po:Cu-Sul:Ni-Sul	2.5	3.0	2.7	3.4	0.6
Po:Other	0.0	0.0	0.0	0.0	0.0
Po:Carbonates	0.0	0.0	0.0	0.0	0.0
Po:Oxides	0.1	0.02	0.01	0.01	0.6
Po:Other Sulphides	0.0	0.0	0.0	0.0	0.0
Po:Silicates	5.4	17.1	3.6	4.8	2.2
Po: Py	0.6	0.0	0.0	0.4	2.1
Po:Ni-Sul	0.5	0.0	0.3	0.9	0.4
Po:Cu-Sul	0.04	0.0	0.06	0.04	0.03
Lib Po	25.0	16.2	28.5	27.9	20.2
Free Po	57.7	52.2	53.5	58.0	67.7

Figure 10: Pyrrhotite Association

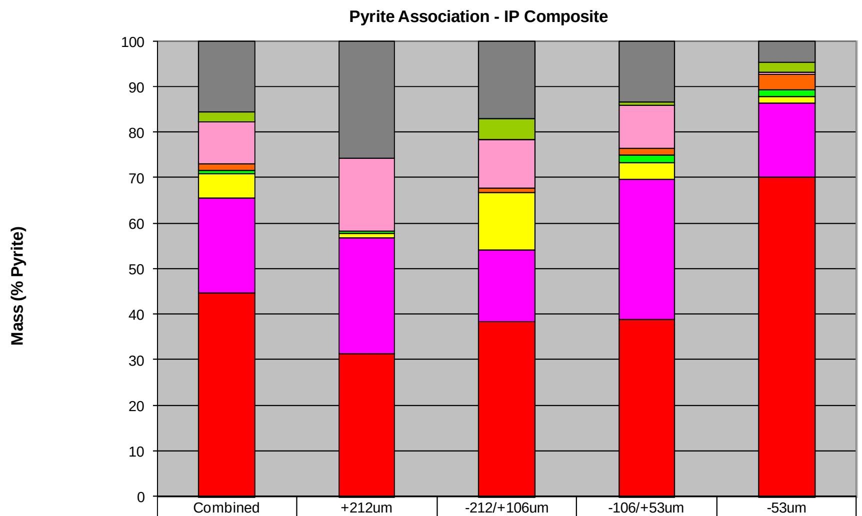


	Combined	+212um	-212/+106um	-106/+53um	-53um
Locked Py	4.0	4.2	5.4	4.6	1.5
Py Sub-Midds	9.0	13.0	13.0	1.8	4.9
Py Midds	21.6	26.0	27.7	24.1	7.4
Lib Py	20.9	25.4	15.6	30.8	16.1
Free Py	44.6	31.3	38.4	38.7	70.1

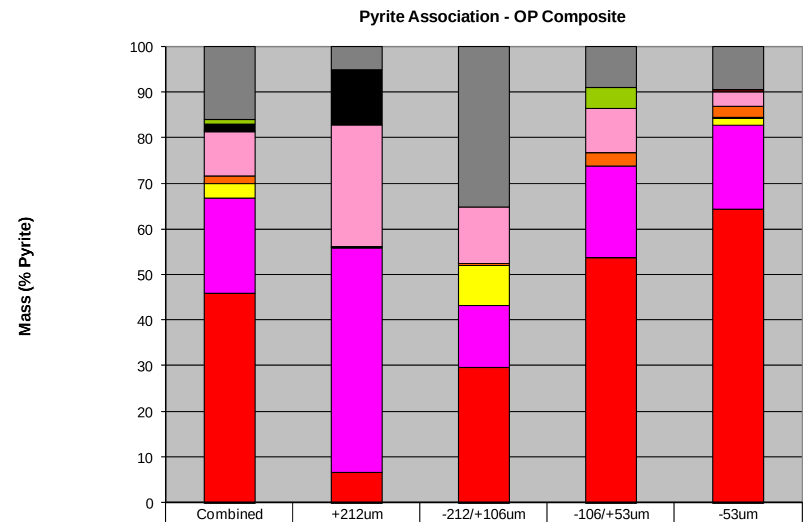


	Combined	+212um	-212/+106um	-106/+53um	-53um
Locked Py	7.1	12.1	6.7	6.9	6.0
Py Sub-Midds	11.2	8.3	20.2	12.3	5.2
Py Midds	15.1	23.9	30.0	7.2	6.2
Lib Py	20.9	49.1	13.6	20.2	18.3
Free Py	45.7	6.6	29.5	53.5	64.3

Figure 11: Pyrite Liberation



	Combined	+212um	-212/+106um	-106/+53um	-53um
Py:Complex	15.6	25.8	17.2	13.4	4.8
Py:Cu-Sul:Ni-Sul	2.1	0.0	4.5	0.7	2.2
Py: Other	0.0	0.0	0.0	0.0	0.0
Py: Carbonates	0.0	0.0	0.0	0.0	0.0
Py: Oxides	0.0	0.0	0.01	0.0	0.0
Py: Other Sulphides	0.0	0.0	0.0	0.02	0.0
Py: Silicates	9.3	16.1	10.8	9.5	0.3
Py: Po	1.4	0.0	0.8	1.5	3.5
Py:Ni-Sul	0.8	0.5	0.0	1.6	1.4
Py:Cu-Sul	5.4	0.9	12.7	3.8	1.5
Lib Py	20.9	25.4	15.6	30.8	16.1
Free Py	44.6	31.3	38.4	38.7	70.1



	Combined	+212um	-212/+106um	-106/+53um	-53um
Py:Complex	16.2	5.3	35.3	9.1	9.5
Py:Cu-Sul:Ni-Sul	0.9	0.0	0.0	4.6	0.0
Py: Other	1.4	12.0	0.03	0.1	0.0
Py: Carbonates	0.0	0.0	0.0	0.0	0.0
Py: Oxides	0.2	0.0	0.0	0.1	0.5
Py: Other Sulphides	0.0	0.0	0.0	0.0	0.0
Py: Silicates	9.8	26.6	12.2	9.6	3.3
Py: Po	1.7	0.3	0.6	2.9	2.3
Py:Ni-Sul	0.2	0.0	0.0	0.1	0.4
Py:Cu-Sul	3.1	0.1	8.8	0.0	1.4
Lib Py	20.9	49.1	13.6	20.2	18.3
Free Py	45.7	6.6	29.5	53.5	64.3

Figure 12: Pyrite Association

2.4. Average Grain Size Distribution

The cumulative grain size distributions of the value minerals, iron sulphides, and silicates in addition to the overall particle size distribution are illustrated in Figure 13 and Figure 14. The following observations can be made:

- Ni-sulphides have the finest grain size in both composites, with the d_{50} ~42 µm for IP composite and ~24 µm for OP composite.
- The cumulative grain size distribution of the Cu-sulphides in the IP composite is similar to Ni-sulphides with the d50 ~45 µm. The d50 of the other minerals (silicates, pyrrhotite, and pyrite) in IP ranged from ~55 µm to ~90 µm.
- The cumulative grain size distribution of the Cu-sulphides in OP composite is coarser than Ni-sulphides with the d50 of ~32 µm. The d50 of the other minerals (silicates, pyrrhotite, and pyrite) in OP ranged from ~45 µm to ~80 µm.
- Finer primary grind and regrind are likely necessary because of the relatively finer particle size of the valuable minerals in order to improve the liberation.

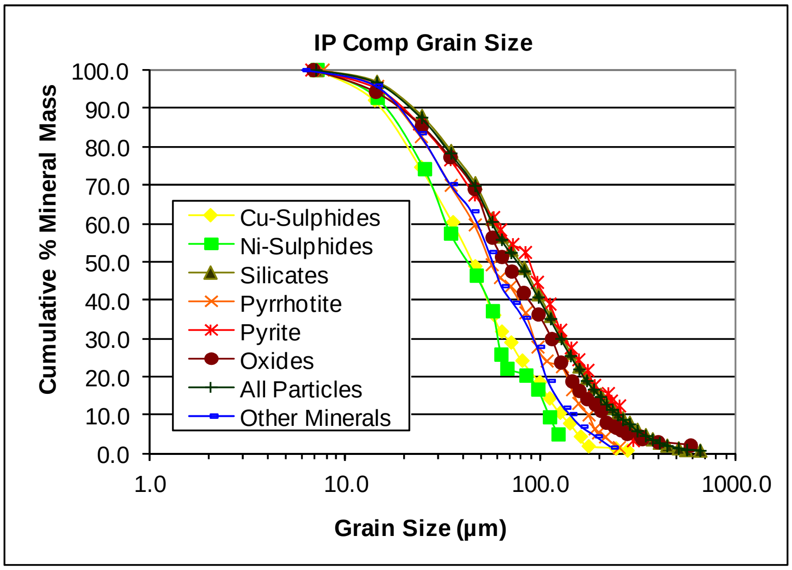


Figure 13: Cumulative Grain Size Distribution – IP Comp

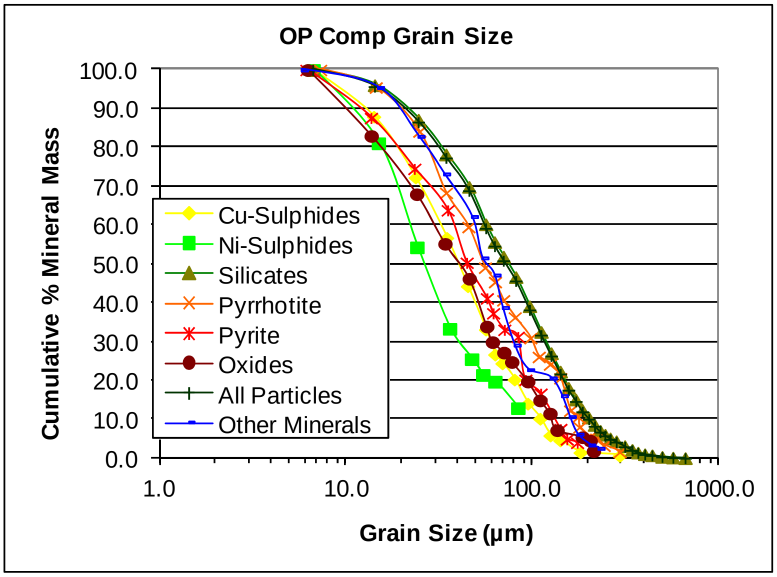


Figure 14: Cumulative Grain Size Distribution – IP Comp

2.5. Element Deportment

Elemental copper and nickel by sample and fraction for both composites were performed using electron microprobe analysis and QEMSCAN. The results are presented and discussed in the following sections.

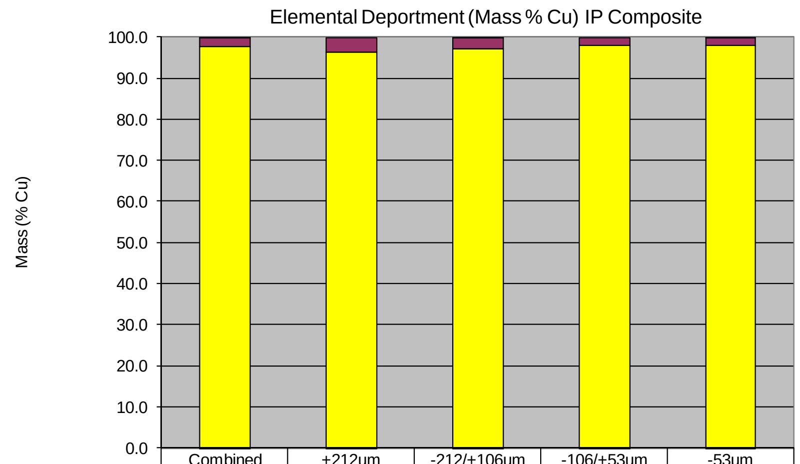
2.5.1. Elemental Cu Deportment

The results of elemental Cu deportment are graphically presented in Figure 15. Chalcopyrite carries ~98% of the Cu in IP composite and ~96% in OP composite. The other Cu-sulphides host ~2% of the Cu in IP and ~4% in OP.

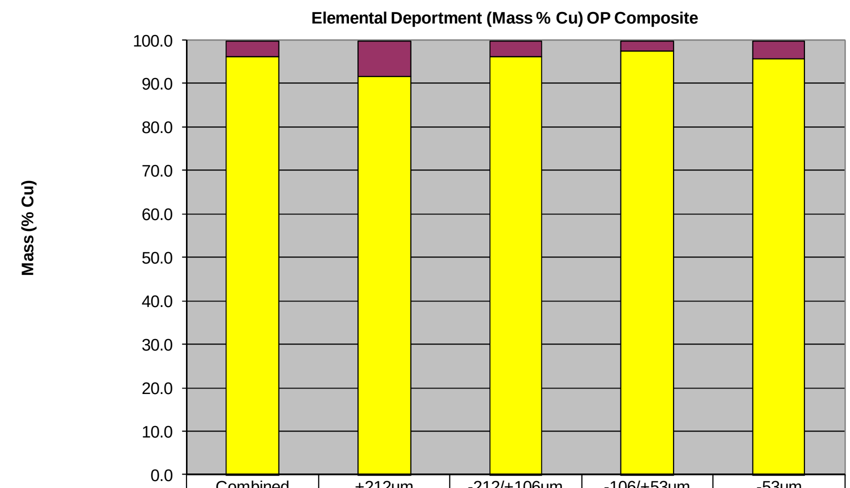
2.5.2. Elemental Ni Deportment

The results of elemental Ni deportment are presented in Figure 16. Pentlandite carries ~76% of the Ni in IP composite and ~59% in OP composite. The silicates carry ~16% of the Ni in IP composites (~10% in Mg-hornblende, ~1% in chlorites and ~5% in micas) and ~31% in OP composite (~20% in Mg-hornblende, ~2% in chlorites and ~10% in micas). The Ni carried by solid solution is considered to be unrecoverable through standard flotation practice. The high percentage of Ni carried by Mg-hornblende and micas may imply a low Ni flotation recovery.

Pyrrhotite and pyrite host ~8% of the Ni in the IP composite and ~11% of the Ni in the OP composite. The Ni carried by iron sulphides may also result in Ni losses due to the slow flotation kinetics of pyrrhotite and pyrite under certain flotation conditions or when pyrite and pyrrhotite are rejected in the upgrading stages.

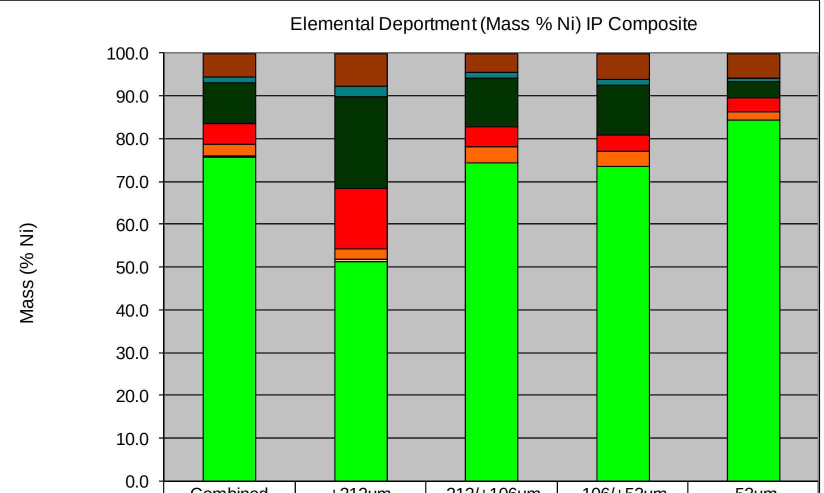


	Combined	+212um	-212/+106um	-106/+53um	-53um
Other Sulphides	0.0	0.0	0.0	0.0	0.1
Other Cu-Sulphides	2.3	3.5	2.8	2.0	1.9
Chalcopyrite	97.7	96.5	97.2	98.0	98.0

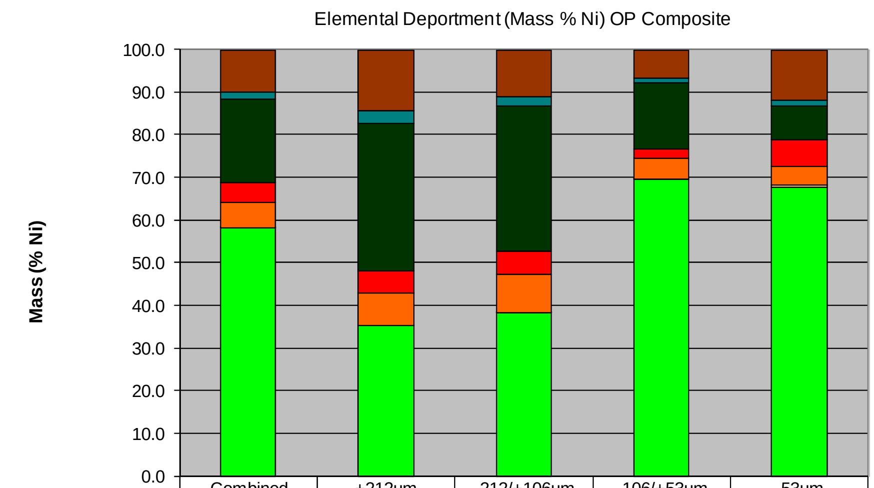


	Combined	+212um	-212/+106um	-106/+53um	-53um
Other Cu-Sulphides	3.8	8.4	3.7	2.4	4.1
Chalcopyrite	96.2	91.6	96.3	97.6	95.9

Figure 15: Elemental Cu Deportment



	Combined	+212um	-212/+106um	-106/+53um	-53um
Micas	5.7	7.7	4.6	6.1	5.9
Chlorites	1.3	2.6	1.4	1.4	0.8
Mg-Hornblende	9.5	21.3	11.3	11.6	3.7
Pyrite	4.9	14.2	4.7	3.9	3.4
Pyrrhotite	2.9	2.6	3.7	3.4	1.8
Other Ni Minerals	0.2	0.5	0.2	0.1	0.1
Pentlandite	75.6	51.1	74.2	73.5	84.2



	Combined	+212um	-212/+106um	-106/+53um	-53um
Micas	9.9	14.4	10.9	6.6	11.7
Chlorites	1.6	2.9	2.2	1.1	1.5
Mg-Hornblende	19.8	34.7	34.3	15.6	7.9
Pyrite	4.5	5.2	5.2	2.3	6.4
Pyrrhotite	6.0	7.5	9.0	4.8	4.4
Other Ni Minerals	0.2	0.0	0.2	0.1	0.4
Pentlandite	58.0	35.3	38.1	69.5	67.6

Figure 16: Element Ni Deportment

2.6. Mineral Release Curves

The mineral release characteristics (for >80% liberation) for mineral of interest are summarized in Table 6 with the mineral release curves as shown in Figure 17. This is used to predict the amount of liberated mineral of interest at varied size distributions. This can be an indicator of optimum grind targets for metallurgical processes to achieve the most liberation for the least amount of grind energy. It should be noted that because this calculation is based on 2D area percent, a slight effect of particle size will be observed in the fine fractions and liberation may be under-estimated.

Table 6: Summary of Mineral Liberation by Size Fractions

Sample	**IP Comp**				**IP Comp**			
Fraction	+212 µm	-212/+106 µm	-106/+53 µm	-53 µm	+212 µm	-212/+106 µm	-106/+53 µm	-53 µm
Average Particle Size (µm)	434	150	75	13	436	150	75	13
minerals	**Mineral Mass % 80% Lib**							
Cu-Sulphides	26.4	69.8	80.1	89.7	25.0	61.0	75.3	83.2
Ni-Sulphides	7.9	32.1	56.1	83.0	0.4	0.3	56.1	62.6
Pyrrhotite	60.1	78.2	81.2	80.0	68.4	82.0	85.8	87.9
Pyrite	56.7	53.9	69.5	86.3	55.8	43.1	73.7	82.6

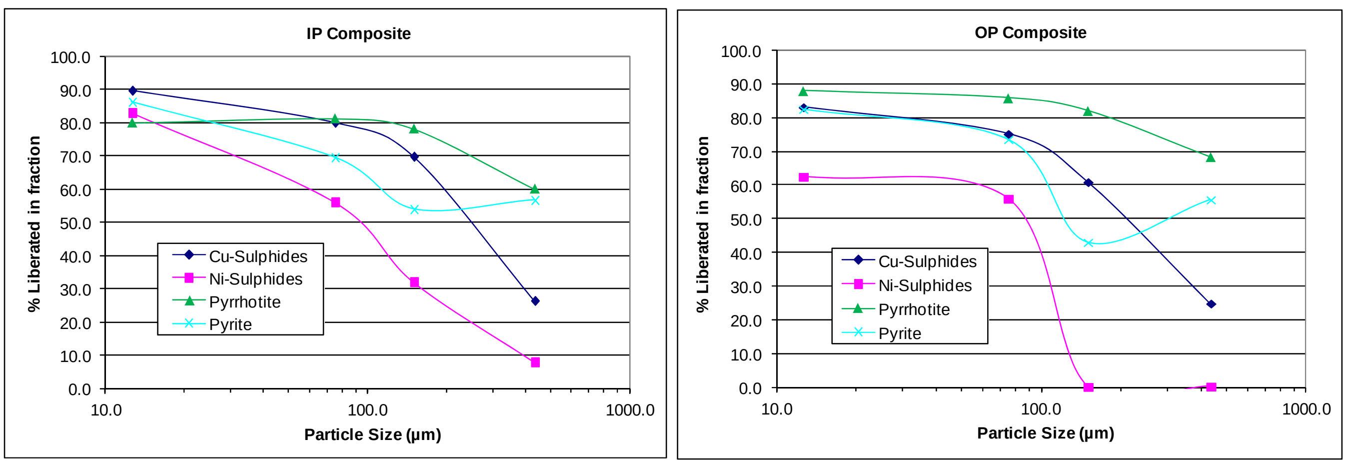


Figure 17: Mineral Release

The mineral release curve for Cu-sulphides shows that 73%~78% of Cu-sulphides are liberated at the average particle size of 100 µm. The liberation increases to 78%~83% at a particle size of 50 µm, and 83%~90% at 13 µm.

The mineral release curve for Ni-sulphides shows that 42%~49% of Ni-sulphides are liberated at the average particle size of 100 µm. The liberation increases to 62%~64% at a particle size of 50 µm. The liberation further increases to 83% at 13 µm in IP composite, while it remains the same (~62%) as at 50 µm in OP composite.

The mineral release curve for pyrrhotite shows that 80%~85% of pyrrhotite is liberated at the average particle size of 100 µm. The liberation seems to have no improvement with decreasing particle size to 13 µm.

The mineral release curve for pyrite shows that 64%~66% of pyrite is liberated at the average particle size of 100 µm. The liberation increases to 75%~78% at a particle size of 50 µm, and 83%~86% at 13 µm.

2.7. Mineralogically Limiting Grade-recovery Curves

A more functional method of presenting liberation is the mineralogically limiting grade-recovery curves. These curves are based on the calculated mass of minerals and the total mass in each liberation category. The highest grade is contained in the >80% liberated mineral particles. Then the next category (60-80% liberation) is added and the combined grade is calculated. This is repeated until all of the minerals are accounted for.

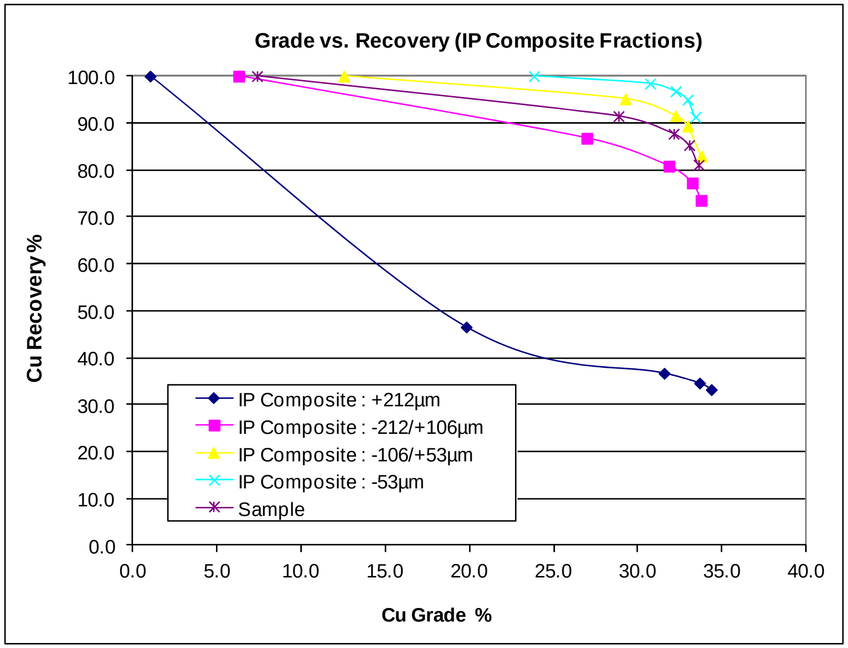
Mineralogically limited grade-recovery analyses provide an indication of the theoretical maximum achievable elemental or mineral grade by recovery using flotation, based on individual particle liberation and grade. These results, of course, do not reflect gangue activation and entrainment or other factors that could occur in the actual metallurgical process.

The mineralogically limited Cu grade-recovery curves for both composites are presented in Figure 18. It should be noted that this analysis assumes similar recovery (e.g., flotation) response between all Cu sulphide minerals, and this will likely affect actual metallurgical performance. Cu recoveries increase from the coarse to the fine fraction as expected from the liberation results for the two composites.

For IP Comp, the mineralogically limited Cu grade versus recovery curve for the overall sample shows that a Cu grade of approximately between 34% and 25% is achievable at 80% and 94% recoveries, respectively. Similar to IP Comp, the curve for the overall sample of OP Comp indicates a Cu grade of 33% to 25% is achievable at 75% and 93% recoveries, respectively.

The mineralogically limited Ni grade-recovery curves for both composites are presented in Figure 19. Ni recoveries increase from the coarse to the fine fraction for IP Comp. However, the -212+106 µm fraction of OP Comp seems to have the lowest Ni recovery.

The mineralogically limited Ni curve of the overall sample shows that a theoretical maximum nickel grade of ~34% seems to be achievable at the recovery of ~56% for IP Comp and ~46% for OP Comp. A finer grind size may increase the recovery of the nickel sulphide minerals, as indicated by the high recovery in the -53 µm fraction at the same Ni grade for both composites.



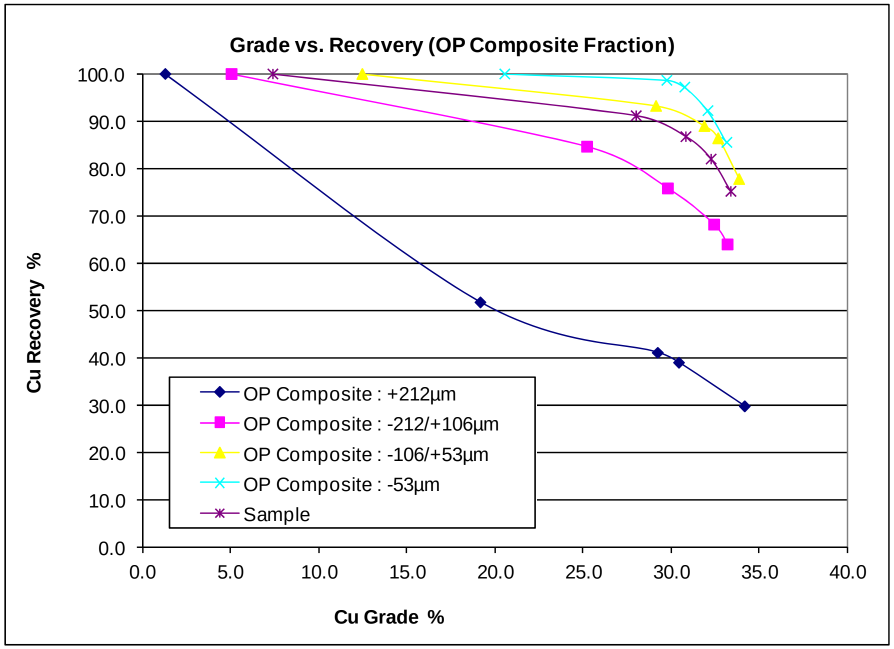
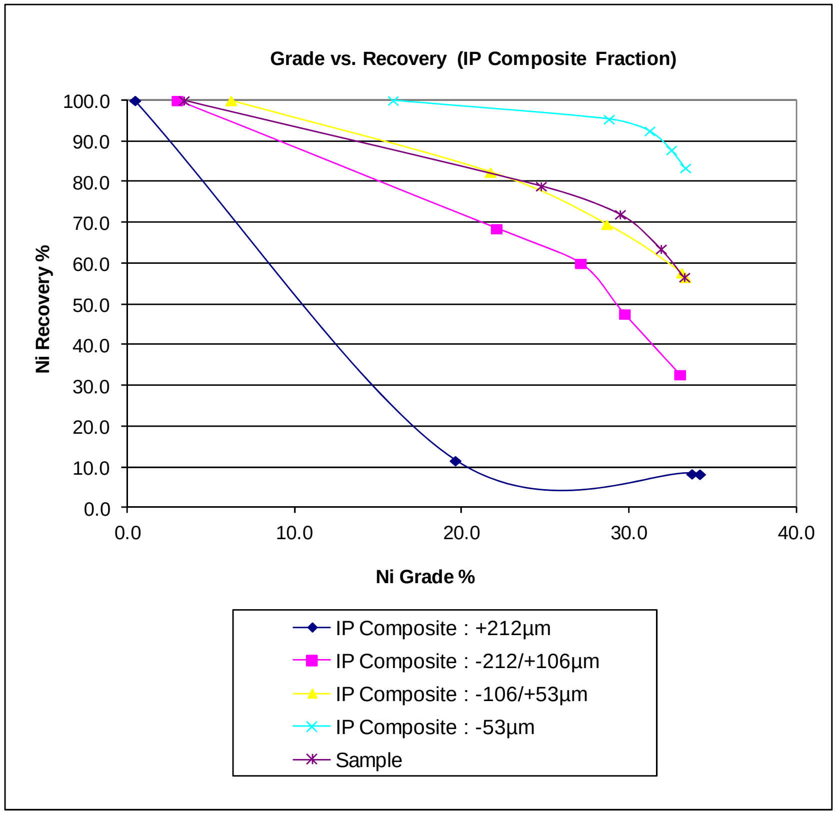


Figure 18: Mineralogically Limited Cu Grade - Recovery Curves



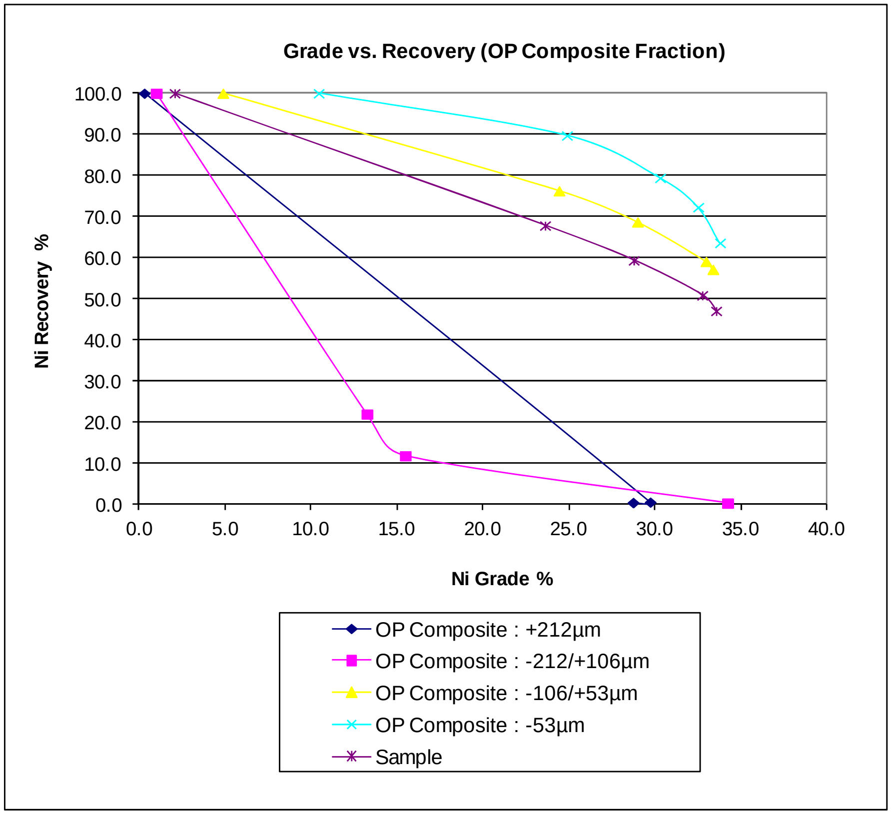


Figure 19: Mineralogically Limited Ni Grade - Recovery Curves

2.8. EMPA (Electron Microprobe Analysis)

EMPA was completed for determining the Ni compositions of the minerals including pyrrhotite, pentlandite, pyrite, tremolite, complex, hornblende, and mica/chlorite. The results are summarised in Table 7.

Pentlandite has the highest Ni content in both composites, at ~28 % (IP) and ~35 % (OP). Pyrrhotite and pyrite carry ~1.5% Ni in IP Comp and ~1.0% Ni in OP Comp. This suggests that recovering pyrrhotite and pyrite intentionally in the flotation is likely able to improve Ni recovery. However, the concentrated Ni grade will be diluted. Mica/chlorite contains ~0.05% Ni in both composites.

Table 7: Summary of EMPA Results

Mineral	EMPA Assay, % Ni (Ave.)	
	IP Comp	OP Comp
Pyrrhotite	0.51	0.65
Pentlandite	28.1	34.5
Pyrite	0.95	0.30
Tremolite	0.024	0.013
Complex	0.017	0.050
Hornblende	0.037	0.038
Mica/Chlorite	0.050	0.047

3. Flotation Testwork

Flotation tests were conducted on both IP and OP composites. A total of 20 tests, as well as 2 locked cycle tests were completed. The test results are summarised and discussed in the following sections. The details are presented in Appendix B.

3.1. Rougher Kinetics

Tests F1 and F2 were the baseline rougher tests completed on the IP and OP composite, respectively. Flex 31 (enhanced isopropyl xanthate) was selected as the collector. Lime was used as the pH regulator to reach pH 10. Primary grind time was set up at 15 minutes for both tests to target a P_{80} of 90µm. The samples were floated for a total of 30 minutes in 5 roughers. Test F3 was repeated as per test F2, but with longer grind time at 18 minutes (P_{80} ~83 µm, due to the low Cu and Ni grades and recoveries obtained in test F2. Test conditions are presented in Table 8 with the results summarized in Table 9. Figure 20 and Figure 21 illustrate the recovery vs. mass pull and recovery vs. grade curves.

Figure 20 and Figure 21 show the kinetics of the rougher tests. Test F1 produced a rougher concentrate at a recovery of ~97% for Cu and ~65% for Ni, grading 6.0% Cu and 0.83% Ni. Compared to test F1 (IP Comp), test F2 (OP Comp) had relatively low recoveries and grades. Only ~90% of Cu and ~64% of Ni were recovered, grading 4.5% Cu and 0.59% Ni. The reason for the poor performance is likely due the coarser particle size (P_{80} 96 µm) resulting in poor mineral liberation. The performance was significantly improved in test F3 (OP Comp) with increased grind time. The rougher concentrate recovered ~99% of the Cu and 70.0% of the Ni, grading 6.6% Cu and 0.94% Ni.

Table 8: Summary of Rougher Test Conditions

Test ID	Comp.	P_{80} (µm)	Stage	Reagents added, g/t			Time, minutes			pH
				Lime	Flex 31	MIBC	Grind	Regrind	Froth	
F-1	IP	87	Rougher	1490	105	32.5	15		30	10
F-2	OP	96	Rougher	1250	105	32.5	15		30	10
F-3	OP	83	Rougher	1140	105	32.5	18		30	10

Table 9: Summary of Rougher Test Results

Test	Comp.	Product	Wt %	Assays, %			% Distribution		
				Cu	Ni	S	Cu	Ni	S
F1	IP	Rougher Conc 1	2.3	19.4	1.43	23.8	86.7	31.0	40.5
		Rougher Conc 1-2	4.0	12.4	1.37	21.0	94.1	50.5	60.5
		Rougher Conc 1-3	5.5	9.14	1.14	17.8	96.1	58.2	71.2
		Rougher Conc 1-4	6.9	7.36	0.98	15.4	96.8	62.3	77.0
		Rougher Conc 1-5	**8.5**	**6.01**	**0.83**	**13.4**	**97.2**	**65.2**	**82.7**
		Rougher Tail	91.5	0.016	0.041	0.26	2.8	34.8	17.3
		Head (calc.)	100.0	0.52	0.11	1.38	100.0	100.0	100.0
F2	OP	Rougher Conc 1	2.2	18.5	1.29	21.7	80.3	30.5	39.2
		Rougher Conc 1-2	3.3	13.2	1.28	19.7	86.6	45.8	53.8
		Rougher Conc 1-3	4.5	9.73	1.09	17.6	88.5	53.8	66.8
		Rougher Conc 1-4	7.0	6.33	0.79	13.2	89.5	60.6	77.6
		Rougher Conc 1-5	**9.9**	**4.52**	**0.59**	**10.2**	**89.8**	**64.4**	**84.1**
		Rougher Tail	90.1	0.056	0.036	0.21	10.2	35.6	15.9
		Head (calc.)	100.0	0.50	0.09	1.19	100.0	100.0	100.0
F3	OP	Rougher Conc 1	2.5	19.4	0.98	21.9	82.9	20.8	35.2
		Rougher Conc 1-2	3.8	14.3	1.38	19.7	93.1	44.8	48.4
		Rougher Conc 1-3	5.6	10.08	1.23	18.8	96.4	58.4	67.6
		Rougher Conc 1-4	7.3	7.85	1.06	16.6	97.8	65.7	77.8
		Rougher Conc 1-5	**8.8**	**6.57**	**0.94**	**15.2**	**98.5**	**70.0**	**85.4**
		Rougher Tail	91.2	0.010	0.039	0.25	1.55	30.0	14.6
		Head (calc.)	100.0	0.59	0.12	1.56	100.0	100.0	100.0

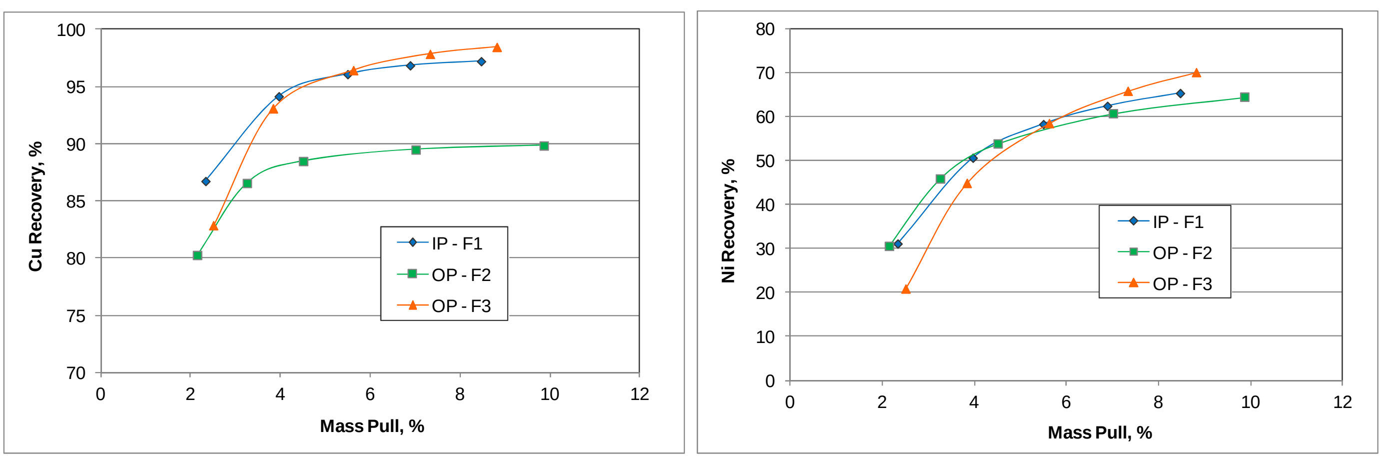


Figure 20: Recovery vs. Mass Pull – Rougher Tests

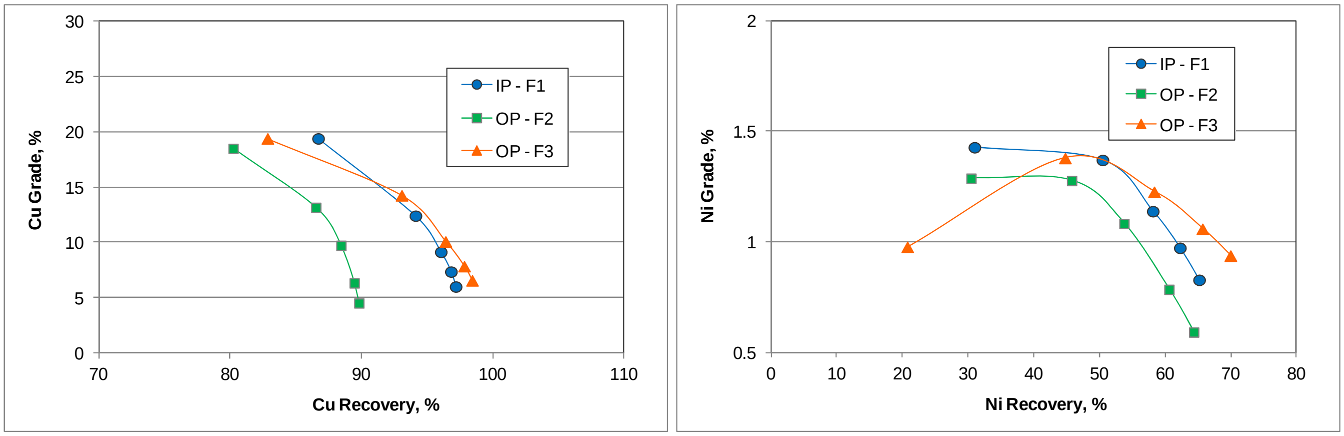


Figure 21: Grade-Recovery Curves – Rougher Tests

3.2. Batch Cleaner Tests

There was a total of 17 tests completed on the two composites (10 tests on IP Comp and 7 tests on OP Comp) to investigate reagent types, dosages, regrind fineness, flowsheet configurations, as well as improve Ni recovery.

3.2.1. Cleaner Tests on IP Composite

The test conditions for batch cleaner tests on the IP Comp are presented in Table 10. The results are presented and discussed in the following sections.

Table 10: Summary of Batch Cleaner Test Conditions (IP Comp)

Test ID	Flowsheet	Stage	Reagents added, g/t						Time, minutes			P_{80}	pH
			Lime	Flex 31	MIBC	Na_2SO_3	3418A	DETA	Grind	Regrind	Froth	µm	
F4	Bulk	Bulk Rougher + Scavenger	750	125					15		30	88	10 -11.5
		Bulk Cleaner	130	2.5	as needed						5		10.5
		Cu Rougher + Cleaner	275								7		10-11.0
		Total	1155	127.5					15		42		
F6	Bulk	Bulk Rougher + Scavenger	1000	35	75				15		30	93	10-10.5
		Bulk Cleaner	130	2.5	20	100				5	5	n/a	9.1
		Cu Rougher + Cleaner	275		30						7		11 -11.6
		Total	1405	37.5	125	100			15	5	42		
F7	Bulk	Bulk Rougher + Scavenger	1200	20	100				15		30	83	10-10.2
		Bulk Cleaner	130	2.5	15						5		9.7
		Cu Rougher + Cleaner	275		25						7		10-11.5
		Total	1605	22.5	140				15		42		
F8	Split	Cu Rougher	1300	25	60				15		12	73	11-11.4
		Cu Cleaner	220	2.5	20						4		11
		Bulk Scavenger	230	10	20						20		10
		Bulk Scav. Cleaner	180	2.5	20	100				5	6	n/a	10
		Total	1930	40	120	100			15	5	42		
F9	Bulk	Bulk Rougher + Scavenger	1400	25	20				15		30	88	10.5
		Bulk Cleaner	120	2.5	4						5		10.5
		Cu Rougher + Cleaner	615		6					5	7	n/a	11.5-12
		Total	2135	27.5	30				15	5	42		
F12	Split	Cu Rougher	850	15	12				15		12	70	10-10.5
		Cu Cleaner	810	2.5	8					5	9	n/a	12
		Ni Scavenger	330	15	12					10	15	n/a	10
		Ni Cleaner	170	2.5	7	350				5	6.5	n/a	10
		Total	2160	35	39	350			15	20	42.5		
F14	Split	Cu Rougher	1060	15	12				15		12	70	10
		Ni Scavenger	590	35	12					10	15	n/a	10
		Total	1650	50	24				15	10	27		
F16	Split	Cu Rougher	520	15	30				15		9	92	9.5-9.8
		Ni Scavenger		70	30		10				15		8.8-9.2
		Ni Scav Cleaner		15	10	50	5	50		5	5	21	8.8-9.0
		Total	520	100	70	50	15	50	15	5	29		
F18	Split	Cu Rougher	470	15	35				15		9	90	9.5
		Cu 1st Cleaner	20		15						3		10
		Ni Scavenger		70	35		10				15		8.8-9.2
		Total	490	85	85		10		15		27		
F19	Split	Cu Rougher	490	15	45				15		9	91	9.5
		Cu Cleaner	1670	2.5	35					5	9	65	12
		Ni Scavenger		70	55		10				15		8.7-9.2
		Ni Scav Cleaner	260	20	30	50				10	7	17	10.5
		Total	2420	107.5	165	50	10				40		

3.2.1.1. Effect of Regrind

Test F4 was an initial cleaner test on the IP Comp using a bulk flotation flowsheet. There were 3 bulk roughers and a bulk cleaner followed by a Cu rougher and two Cu cleaners. Two rougher scavengers were included in the circuit to assess additional Ni recovery. A Cu cleaner concentrate was produced at ~74% Cu recovery grading 27.7% Cu. There was also ~13% of the Ni at a grade of 1.12% Ni reporting to the Cu concentrate.

Test F6 repeated test F4, but with 5 minutes regrind on the bulk rougher concentrate. A comparison of test F6 and F4 indicates that the Cu metallurgical performance was improved significantly with the regrind. The Cu recovery increased from ~74% (F4) to ~82% (F6) with a slight drop in Cu grade from 27.7% to 25.1%. The Ni recovery to the Cu concentrate increased ~3% (Table 11). This indicates that regrinding will result in higher recoveries and grades for both Cu and Ni. Mineralogy on the feed materials also indicated that regrind would be a requirement to achieve a sufficient liberation of the minerals.

Table 11: Summary of Test Results – Effect of Regrind (IP Comp)

Test ID	Product	Wt %	Assays, %, g/t			% Distribution		
			Cu	Ni	S	Cu	Ni	S
F4	**Cu 2nd Clnr Conc**	**1.3**	**27.7**	**1.12**	**33.6**	**73.7**	**12.9**	**31.7**
	Cu 1st Clnr Conc	2.0	20.5	1.75	32.1	87.8	32.5	48.8
	Cu Ro Conc	2.3	18.4	1.73	30.5	91.2	37.2	53.5
	Bulk Cleaner Conc	2.6	16.7	1.65	28.4	92.2	39.5	55.3
	Bulk Rougher Conc	5.3	8.58	1.11	16.3	96.2	54.0	64.6
	Bulk Ro Scav Conc No 1+2	3.4	0.24	0.30	6.4	1.7	9.1	16.3
	Rougher Scav Tail	91.3	0.011	0.044	0.28	2.1	36.8	19.1
	Head (calc.)	100.0	0.47	0.11	1.34	100.0	100.0	100.0
F6	**Cu 2nd Clnr Conc**	**1.6**	**25.1**	**1.07**	**30.5**	**82.3**	**16.3**	**36.0**
	Cu 1st Clnr Conc	1.9	22.5	1.20	29.1	89.1	22.2	41.5
	Cu Ro Conc	2.2	20.1	1.24	27.6	91.0	26.1	45.0
	Bulk Cleaner Conc	2.7	17.0	1.30	25.4	93.8	33.6	50.6
	Bulk Rougher Conc	5.4	8.69	1.11	17.4	96.4	57.4	69.5
	Bulk Ro Scav Conc No 1+2	3.0	0.21	0.22	4.2	1.3	6.5	9.4
	Rougher Scav Tail	91.6	0.012	0.041	0.31	2.3	36.1	21.1
	Head (calc.)	100.0	0.48	0.10	1.35	100.0	100.0	100.0

3.2.1.2. Effect of Collector Dosage

Tests F7 and F9 were conducted to investigate the effect of collector dosage. Test F7 repeated test F4, but the collector was reduced almost in half in the bulk roughers. Test F9 repeated test F6 conditions, but with 5 minutes regrind on the bulk 1st cleaner concentrate, instead of on the rougher concentrate. The collector was also reduced to half in the rougher and scavenger stage, and the Cu rougher pH was adjusted to 12 to try to reject nickel and iron sulphides. The flowsheet applied in test F9 is illustrated in Figure 22. The test results are presented in Table 12.

Figure 23 illustrates the grade versus recovery relationships for the tests. A comparison of test F7 and F4 indicates that the Cu recovery increased from ~85% (F4) to ~88% (F7) at an equivalent concentrate grade of ~22% Cu. The Ni recovery increased significantly from ~37% (F4) to ~50% (F7) at an equivalent concentrate grade of ~1.7% Ni. The iron sulphides were likely to float actively with higher collector dosage, resulting in Cu and Ni losses. Test F9 achieved similar results as test F6. The Cu recovery and grade were at ~82% and ~25% Cu, while the Ni recovery was ~14% grading ~0.9% Ni.

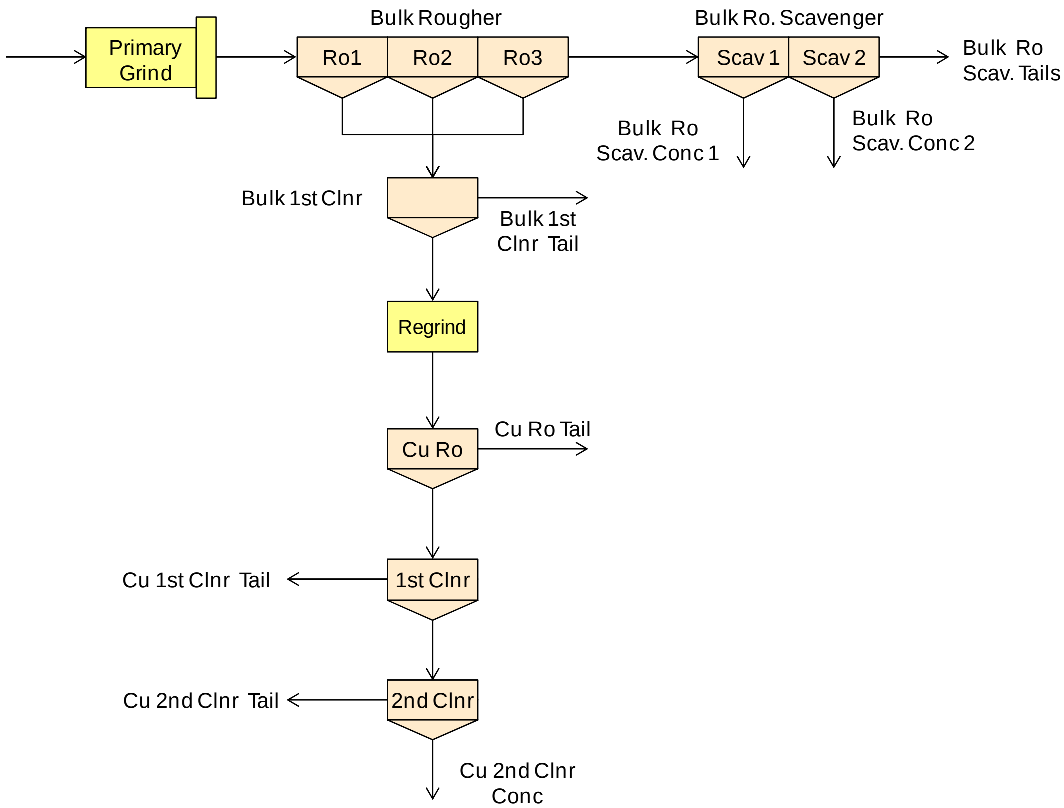


Figure 22: Bulk Flotation Flowsheet

Table 12: Summary of Test Results – Effect of Collector Dosage (IP Comp)

Test	Product	Wt %	Assays, %, g/t			% Distribution		
			Cu	Ni	S	Cu	Ni	S
F7	**Cu 2nd Clnr Conc**	**2.0**	**22.2**	**1.90**	**31.6**	**88.3**	**35.9**	**46.2**
	Cu 1st Clnr Conc	2.6	17.8	1.89	29.8	92.8	46.8	57.2
	Cu Ro Conc	2.8	16.5	1.81	28.3	94.1	49.1	59.4
	Bulk Cleaner Conc	3.3	14.3	1.63	25.0	95.1	51.3	61.0
	Rougher Conc	5.0	9.59	1.19	17.6	96.8	57.2	65.1
	Scav Conc No 1+2	2.0	0.24	0.29	6.92	1.0	5.4	10.1
	Cu 1st + 2nd Clnr Tls +Cu Ro Tls	1.3	2.55	1.22	15.2	6.8	15.4	14.8
	Rougher Scav Tail	93.0	0.012	0.042	0.36	2.3	37.4	24.8
	Head (calc.)	100.0	0.50	0.10	1.35	100.0	100.0	100.0
F9	**Cu 2nd Clnr Conc**	**1.5**	**25.4**	**0.93**	**28.9**	**81.7**	**14.1**	**34.2**
	Cu 1st Clnr Conc	1.9	22.9	1.08	27.2	90.8	20.3	39.7
	Cu Ro Conc	2.3	19.5	1.27	24.9	94.2	28.9	44.4
	Bulk Cleaner Conc	3.8	11.9	1.41	20.7	95.5	53.3	61.2
	Bulk Rougher Conc	6.4	7.35	0.95	13.4	97.1	59.4	65.0
	Bulk Ro Scav Conc No 1+2	2.4	0.15	0.24	6.89	0.77	5.65	12.6
	Rougher Scav Tail	91.3	0.011	0.039	0.32	2.1	34.9	22.4
	Head (calc.)	100.0	0.48	0.10	1.30	100.0	100.0	100.0

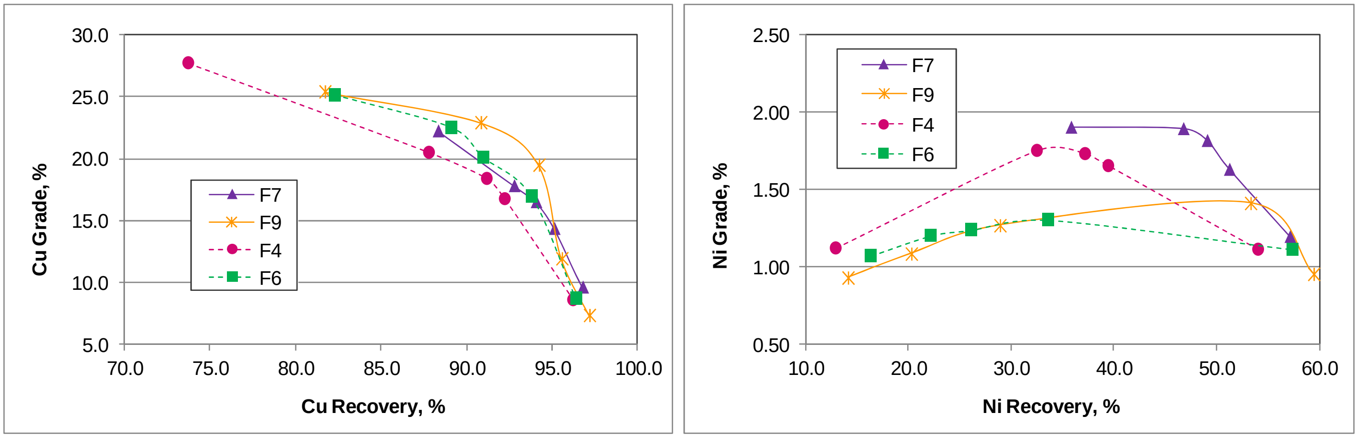


Figure 23: Grade vs. Recovery Relationships – Effect of Collector Dosage (IP Comp)

3.2.1.3. Aggressive Nickel Scavenging

Tests F14, F16, and F18 were performed in order to improve Ni recovery. A split flowsheet was applied in the three tests. Test F14 was carried out with three Cu roughers followed by a 10 minute regrind on the Cu rougher tails. The ground materials were subjected to Ni scavenging. In test F16, a 5 minute regrind was carried on the Ni scavenger concentrate followed by two Ni scavenger cleaners. In test F18, the Cu rougher concentrate was upgraded in a Cu cleaner. The Cu cleaner tails and the Cu rougher tails were combined and subjected to Ni scavenging without regrind.

Aggressive Ni scavenging strategies were applied in the three tests. Test F14 was conducted with a high dosage of Flex 31 (35g/t) to the Ni scavengers. The collector was further increased to 70 g/t in tests F16 and F18. Depressants Na_2SO_3 and DETA were added to the regrind mill in test F16 to attempt to reject pyrrhotite. The Ni scavengers and cleaners in tests F16 and F18 were operated at natural pH, and 3418A was added as a secondary collector.

The test results are summarized in Table 13 with Figure 24 illustrating the metallurgical performance of the Ni scavenging circuit. Observations are as follows:

- There was 53% ~ 64% of Ni reporting to the Cu circuit.
- No significant improvement on the Ni recovery was achieved in test F14 with the regrind on the Ni scavenger feed (Cu rougher tails).
- Na_2SO_3 and DETA appeared to have no effect on rejection of pyrrhotite in the Ni cleaning stage (F16). With two Ni cleaners, the Ni stage recovery dropped from 25% to 4% with the Ni concentrate grade upgraded from 0.13% Ni to 0.42% Ni.
- The best result was achieved in test F18, with 36% Ni stage recovery grading 0.18% Ni. The overall Ni recovery (Cu cleaner concentrate + Ni scavenger concentrate) was ~70% grading 0.54% Ni.

Table 13: Summary of Results – Aggressive Ni Scavenging (IP Comp)

Test	Product	Wt %	Assays, %, g/t			% Distribution			Stage Recovery, %		
			Cu	Ni	S	Cu	Ni	S	Cu	Ni	S
F14	Cu Rougher Conc 1	2.7	17.3	1.50	22.6	89.3	38.7	44.2			
	Cu Rougher Conc 1-2	4.2	11.6	1.29	17.4	95.2	53.0	54.2			
	Cu Rougher Conc 1- 3	5.5	8.98	1.06	14.5	96.3	57.1	58.9			
	Ni Scav Conc 1	1.0	0.65	0.46	12.2	1.2	4.4	8.8	33.5	10.2	21.5
	Ni Scav Conc 1-2	1.6	0.49	0.41	11.0	1.6	6.5	13.3	42.4	15.3	32.3
	Ni Scav Conc 1-3	**2.2**	**0.41**	**0.38**	**10.3**	**1.7**	**8.0**	**16.8**	**46.9**	**18.8**	**40.8**
	Ni Scav Tails	92.2	0.011	0.039	0.36	2.0	34.8	24.3	53.1	81.2	59.2
	Cu Rougher Tail (Ni Scav Feed)	94.5	0.020	0.047	0.6	3.7	42.9	41.1	100.0	100.0	100.0
	Head (calc.)	100.0	0.52	0.10	1.36	100.0	100.0	100.0			
F16	Cu Rougher Conc 1	3.0	16.1	1.53	22.6	92.7	45.0	49.8			
	Cu Rougher Conc 1-2	4.7	10.6	1.28	18.9	95.7	59.0	65.4			
	Cu Rougher Conc 1- 3	6.3	7.98	1.03	15.8	96.6	63.8	73.1			
	Ni Scav 2nd Clnr Conc	0.3	0.63	0.42	8.30	0.4	1.4	2.1	12.5	4.0	7.9
	Ni Scav 1st Clnr Conc	1.6	0.21	0.18	3.53	0.6	2.9	4.2	18.9	8.1	15.5
	Ni Scav Conc	**7.5**	**0.085**	**0.13**	**3.31**	**1.2**	**9.2**	**18.1**	**36.2**	**25.4**	**67.2**
	Ni Scav Tails	86.2	0.013	0.032	0.14	2.1	27.0	8.8	63.8	74.6	32.8
	Cu Rougher Tail (Ni Scav Feed)	93.7	0.019	0.040	0.39	3.4	36.2	26.9	100.0	100.0	100.0
	Head (calc.)	100.0	0.52	0.10	1.37	100.0	100.0	100.0			
F18	Cu 1st Clnr Conc	3.9	12.7	1.44	22.7	95.4	53.7	66.1			
	Ni Scavenger Conc 1	4.0	0.27	0.29	4.55	2.1	11.1	13.7	45.6	24.0	40.3
	Ni Scavenger Conc 1-2	6.8	0.19	0.22	3.88	2.5	14.3	19.6	53.7	30.8	57.8
	Ni Scavenger Conc 1-3	**9.6**	**0.15**	**0.18**	**3.40**	**2.8**	**16.7**	**24.2**	**60.2**	**36.0**	**71.5**
	Ni Scavenger Tail	86.5	0.011	0.036	0.15	1.8	29.7	9.7	39.8	64.0	28.5
	Cu Ro Tails + Cu 1st Clnr Tails (Ni Scav Feed)	96.1	0.024	0.049	0.46	4.6	46.3	33.9	100.0	100.0	100.0
	Head (calc.)	100.0	0.52	0.11	1.34	100.0	100.0	100.0			

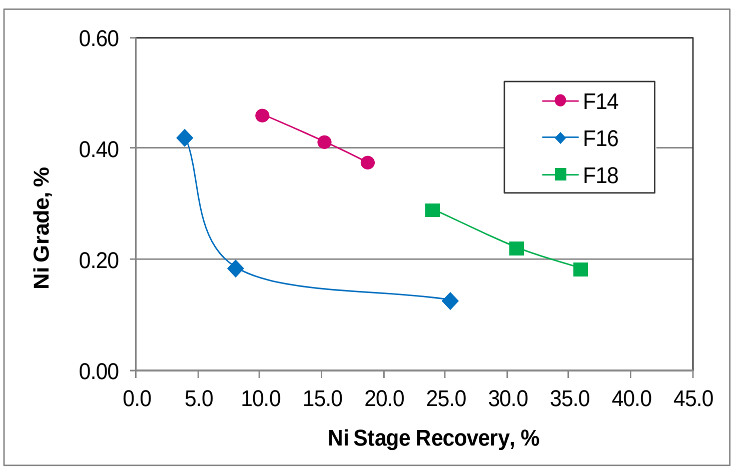


Figure 24: Grade vs. Recovery – Ni Scavenging Circuit (IP Comp)

3.2.1.4. Investigation of Flowsheet Configuration

Tests F8, F12, and F19 were conducted to investigate flowsheet configurations. Test F8 was performed using the split flotation flowsheet as shown in Figure 25. The Cu circuit had three Cu roughers followed by two Cu cleaners. The Cu rougher tails were subjected to two bulk scavengers, and then upgraded in three bulk cleaners. Test F12 was completed using the flowsheet as shown in Figure 26. The Cu rougher and 1st cleaner tails were combined and reground for 10 minutes, and then subjected to Ni scavenging. The Ni scavenger concentrate was reground for another 5 minutes and further upgraded in three Ni scavenger cleaners. The flowsheet applied in test F19 (Figure 27) was similar to test F12, but without a regrind on the Ni scavenger feed (Cu rougher tails +Cu 1st cleaner tails). Conditions for the Cu roughers and Ni scavengers of test F18 were applied in test F19. The pH was adjusted to ~9 in the Ni scavengers, while the Ni scavenger cleaners were operated at pH ~10.5.

The test results are summarized in Table 14 with Figure 28 illustrating the metallurgical performance for both Cu and Ni (or bulk) scavenging circuits. The following observations can be derived:

- The initial evaluation of split flowsheet (F8) indicated that a Cu cleaner concentrate grading 19.7% Cu and 1.5% Ni was produced with two stages of cleaning. The Cu recovery was ~86% with ~29% of Ni also reporting to the concentrate. In the bulk scavenging circuit, the cleaner concentrate recovered 1.0% of the Cu and 1.1% of the Ni, grading 4.69% Cu and 1.16% Ni. The overall Ni performance was poor.
- Comparing to test F8, the performance of the Cu circuit in tests F12 and F19 was improved. Similar results were achieved in the Cu circuit for both tests, with ~86% of the Cu recovered to the cleaner concentrate at a grade of 25-26% Cu. There was also 14-18% of the Ni reporting to the Cu cleaner concentrate, grading approximately 1.0% Ni.
- In test F19, the Cu 3rd cleaner achieved a similar result with the Cu 4th cleaner of F12, while the Cu 4th cleaner had a significant decrease in Cu recovery from ~86% to ~69% improving the grade from 26.3% Cu to 31.4% Cu. This suggested that the Cu 4th cleaner is unnecessary, and could be excluded from the circuit.
- A comparison of F8 (no regrind on the scavenger feed) and F12 (regrind on the scavenger feed) indicates that the Ni recovery was increased from ~10% (F8) to ~13% (F12) with the grade decreased from 0.43% Ni (F8) to 0.38% Ni (F12). There was no significant improvement achieved with regrind on the Ni scavenger feed. Therefore, a regrind on Ni scavenger feed (Cu rougher tails) is not recommended.
- A comparison of the Ni circuit performance of F19 (aggressive Ni scavenging) and F12 indicates that the Ni stage recovery (Ni 3rd cleaner concentrate) was significantly improved from ~7.0% (F12) to ~28% (F19).
- Test F19 produced a Cu 3rd cleaner concentrate grading 26.3% Cu and 0.88% Ni at recoveries of ~86% for Cu and ~14% for Ni, as well as a Ni cleaner concentrate grading 1.71% Ni and 3.24% Cu at recoveries of ~12% for Ni and 5.0% for Cu. The overall Ni recovery was low at ~26% (Cu 3rd cleaner Conc + Ni 3rd cleaner Conc) grading 1.15% Ni

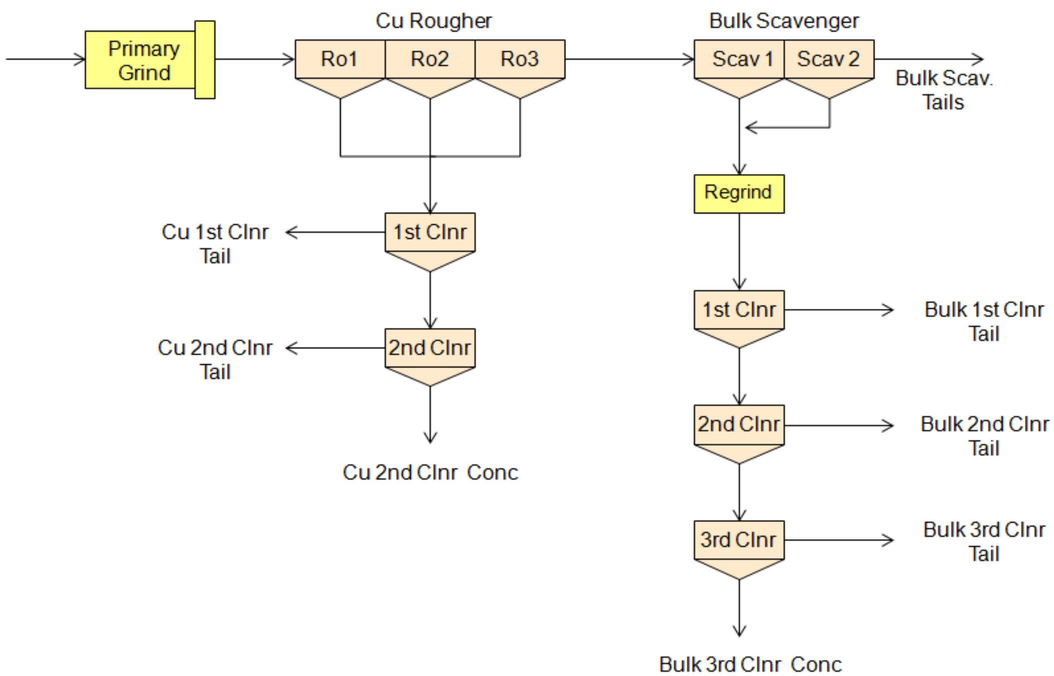


Figure 25: Split Flotation Flowsheet for Test F8

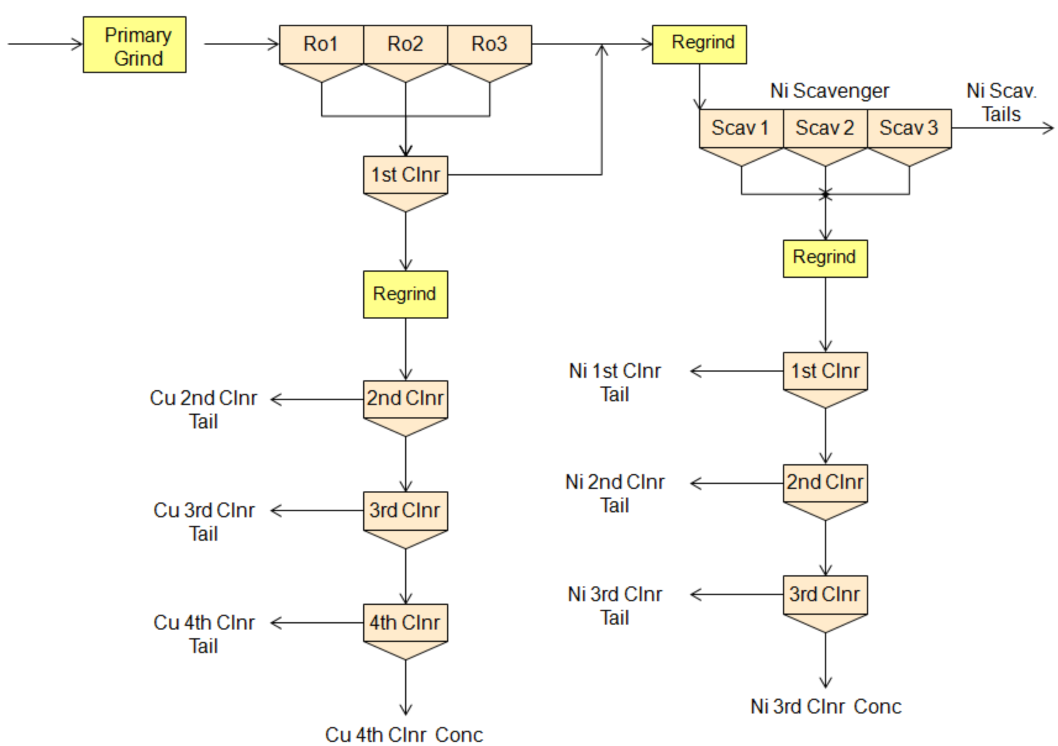


Figure 26: Split Flotation Flowsheet for Test F12

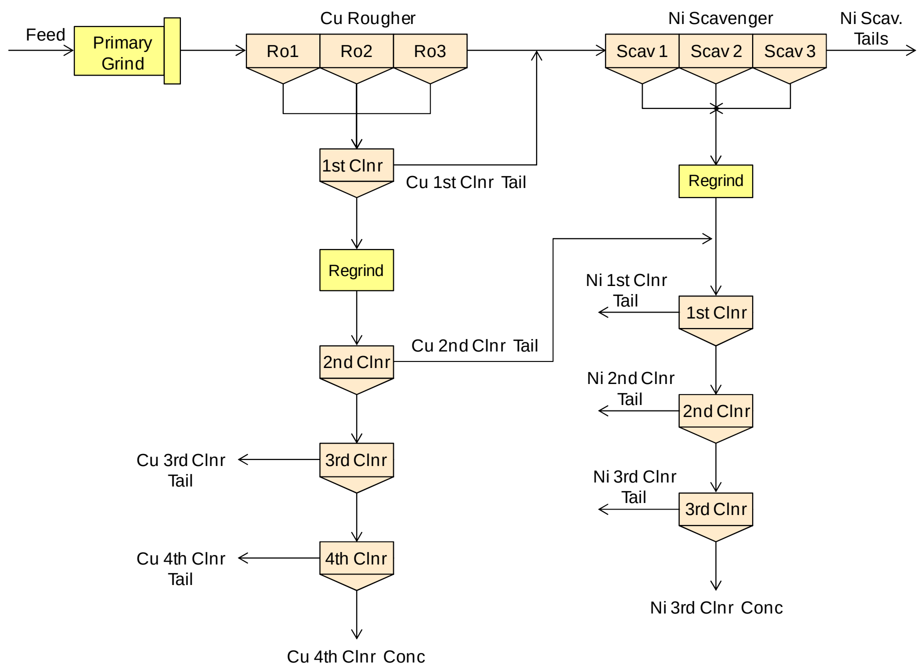


Figure 27: Split Flotation Flowsheet for Test F19

Table 14: Summary of Test Results – Investigation of Flowsheet Configuration (IP Comp)

Test ID	Product	Wt %	Assays, %, g/t			% Distribution			Stage Recovery, %		
			Cu	Ni	S	Cu	Ni	S	Cu	Ni	S
F8	**Cu 2nd Clnr Conc**	**2.2**	**19.7**	**1.47**	**26.7**	**86.4**	**29.4**	**43.1**			
	Cu 1st Clnr Conc	2.8	15.9	1.50	22.9	88.8	38.3	47.1			
	Cu Ro Conc 1-3	5.0	9.60	1.13	15.0	96.3	51.7	55.4			
	Bulk 3rd Clnr Conc	**0.1**	**4.69**	**1.16**	**36.9**	**1.0**	**1.1**	**2.8**	**59.6**	**11.0**	**11.9**
	Bulk 2nd Clnr Conc	0.2	2.15	0.90	34.9	1.0	2.0	6.3	65.7	20.5	27.0
	Bulk 1st Clnr Conc	0.6	1.08	0.68	23.7	1.2	3.6	9.9	76.7	36.3	42.8
	Bulk Scav Conc 1-2	2.4	0.32	0.43	12.8	1.6	9.8	23.2	100.0	100.0	100.0
	Cu Rougher Tail	95.0	0.019	0.055	0.63	3.7	48.3	44.6			
	Head (calc.)	100.0	0.49	0.11	1.34	100.0	100.0	100.0			
F12	**Cu 4th Clnr Conc**	**1.6**	**25.3**	**1.17**	**29.8**	**85.7**	**18.3**	**36.9**			
	Cu 3rd Clnr Conc	1.8	23.1	1.29	28.9	88.0	22.8	40.3			
	Cu 2nd Clnr Conc	2.2	19.6	1.45	27.6	91.2	31.2	46.8			
	Cu 1st Clnr Conc	3.3	13.6	1.50	23.4	94.5	48.2	59.7			
	Ni 3rd Clnr Conc	**0.2**	**3.06**	**1.64**	**21.5**	**1.4**	**3.6**	**3.7**	**25.9**	**6.9**	**9.1**
	Ni 2nd Clnr Conc	0.5	1.96	1.22	16.9	2.3	6.5	7.1	40.6	12.5	17.7
	Ni 1st Clnr Conc	1.2	1.20	0.85	11.8	3.0	9.9	10.8	54.4	19.1	26.8
	Ni Scavenger Conc	3.5	0.48	0.38	5.2	3.6	13.1	14.1	64.2	25.3	35.1
	Cu Ro Tls + 1st Clnr Tls (Ni Scav Feed)	96.7	0.027	0.054	0.53	5.5	51.8	40.3	100.0	100.0	100.0
	Ni Scav Tails	93.2	0.010	0.042	0.36	2.0	38.7	26.2			
	Head (calc.)	100.0	0.47	0.10	1.28	100.0	100.0	100.0			
F19	Cu 4th Clnr Conc	1.1	31.4	0.35	32.1	69.3	3.6	27.8			
	Cu 3rd Clnr Conc	**1.7**	**26.3**	**0.88**	**29.3**	**86.4**	**13.7**	**37.8**			
	Cu 2nd Clnr Conc	2.3	20.5	1.31	25.2	90.5	27.3	43.5			
	Ni Scav 3rd Clnr Conc	**0.8**	**3.24**	**1.71**	**32.5**	**5.0**	**12.4**	**19.5**	**70.8**	**28.4**	**42.4**
	Ni Scav 2nd Clnr Conc	1.3	2.18	1.36	23.1	5.7	16.8	23.7	81.3	38.7	51.5
	Ni Scav 1st Clnr Conc	2.8	1.11	0.86	12.9	6.1	22.4	27.9	87.5	51.5	60.6
	Ni Scav Conc + Cu 2nd Clnr Tls	11.4	0.32	0.42	5.3	7.0	43.5	46.0	100.0	100.0	100.0
	Ni Scavenger Tail	86.4	0.015	0.037	0.16	2.5	29.3	10.5			
	Head (calc.)	100.0	0.52	0.11	1.32	100.0	100.0	100.0			

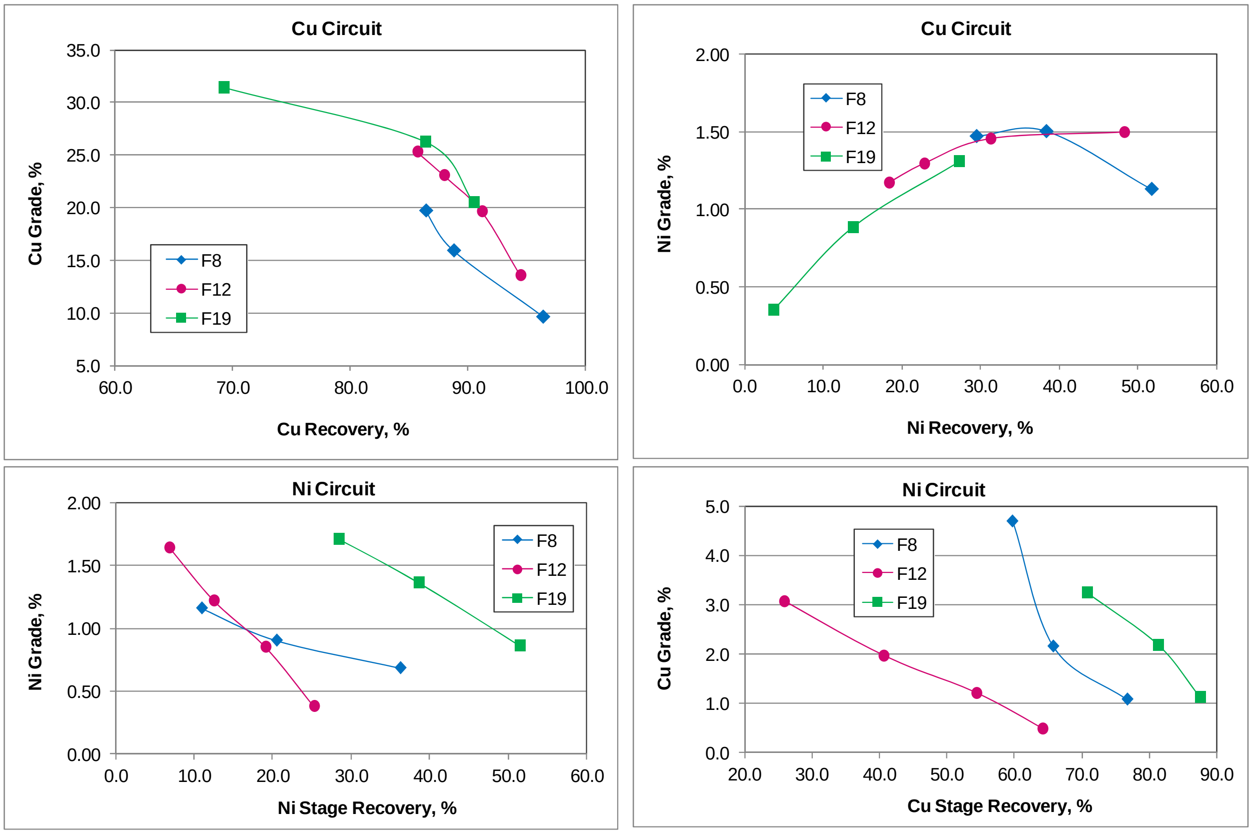


Figure 28: Grade vs. Recovery – Investigation of Flowsheet Configuration (IP Comp)

3.2.2. Cleaner Tests on OP Composite

Cleaner tests conducted on the OP composite were generally parallel to the cleaner tests completed on the IP composite. The conditions for the tests are presented in Table 15.

Test F5 was an initial cleaner test on the OP Comp using similar cleaning conditions as test F4 on the IP Comp. Test F10 repeated test F5, but with a 5 minutes regrind on the bulk rougher concentrate. The collector dosage to the bulk roughers was reduced from 25 g/t (F5) to 15 g/t (F10).

Tests F11, F13 and F20 were completed to evaluate flowsheet configurations. The conditions and flowsheet (Figure 25, Figure 26, and Figure 27) for tests F8, F12 and F19 on the IP Comp were applied in the three tests, respectively.

Tests F15 and F17 focused on aggressive Ni scavenging in order to improve Ni recovery. In test F15, high collector dosage (35g/t) to the Ni scavenger was applied, while the collector was doubled to 70g/t in test F17. The pH for the Ni scavenger of F17 was operated at natural and 3418A was added as a secondary collector. The test results are summarized in Table 16. Observations are as follows:

- A comparison of tests F10 and F5 indicates that reducing collector dosage in half to the bulk roughers (F10) seemed to have no impact on the performance. The two tests achieved similar results, at rougher recoveries 93.5-96.5% for Cu and ~55% for Ni, grading ~8.0% Cu and ~0.9% Ni. With regrind (F10), the performance of the Cu cleaner was significantly improved. Test F10 had the Cu 2nd cleaner concentrate grade ~8% Cu higher than test F5, while the Cu recovery was also improved 3.5% (Table 16 and Figure 29).

- A comparison of tests F15 and F17 indicates that test F17 had better results with aggressive Ni scavenging, with the Ni recovery in the scavenger improved from ~6% to ~20% (Table 16).

- A comparison of tests F11 and F13 indicates there was no improvement on Ni grade and recovery achieved by test F13 with fine regrind of the Ni scavenger feed (Figure 26). The Ni scavenger concentrate (F13) recovered 16.6% of Ni grading 0.36% Ni, while it was 19.3% for test F11 grading 0.63% Ni (Table 16, Figure 30).

- A comparison of the Ni circuit performance of F20 (aggressive Ni scavenging) and F13 indicates that the Ni stage recovery (Ni 3rd cleaner concentrate) was significantly improved from ~5.0% (F13) to ~21% (F20).

- In test F20, the Cu 3rd cleaner achieved a similar result with the Cu 4th cleaner of F13, while the Cu 4th cleaner had a significant decrease on Cu recovery from 83% to 63% with the grade improved from ~28% Cu to ~32% Cu. This suggested that a Cu 4th cleaner is unnecessary, and could be excluded from the circuit.

- Test F20 produced a Cu 3rd cleaner concentrate grading 28.4% Cu and 0.65% Ni at recoveries of ~83% for Cu and ~10% for Ni. A Ni cleaner concentrate grading 1.84% Ni and 5.6% Cu was also produced at recoveries of ~10% for Ni and 6.1% for Cu. The overall Ni recovery was poor at ~20% (Cu 3rd cleaner Conc + Ni 3rd cleaner Conc) grading 0.98% Ni.

Table 15: Summary of Batch Cleaner Test Conditions (OP Comp)

Test ID	Flowsheet	Stage	Reagents added, g/t					Time, minutes			P_{80}	pH
			Lime	Flex 31	MIBC	Na_2SO_3	3418A	Grind	Regrind	Froth	µm	
F5	Bulk	Bulk Rougher	810	25	60			18		10	78	10
		Bulk Cleaner	130	2.5	10					5		10.7
		Bulk Ro Scavenger	110	10	20					20		10
		Cu Rougher	150		10					3		11.6
		Cu Cleaner	125		20					4		11.5
		Total	1325	37.5	120			18		42		
F10	Bulk	Bulk Rougher	910	15	60			18		10	80	10
		Bulk cleaner	0	2.5	10	100			5	5	n/a	10
		Bulk Ro Scavenger	230	10	20					20		10
		Cu Rougher	200		10					3		10.2
		Cu Cleaner	345		20					4		12.2-12.3
		Total	1685	27.5	120			18	5	42		
F11	Split	Cu Rougher	1810	15	60			18		12	89	11.5
		Cu Cleaner	680	2.5	20					4		12
		Bulk Ro Scavenger	60	10	20					20		9.5
		Bulk cleaner	500	2.5	20	250			5	6	n/a	10.5
		Total	3050	30	120	250		18	5	42		
F13	Spilt	Cu Rougher	750	15	12			18		12	n/a	10-10.5
		Cu Cleaner	1010	2.5					5	9	n/a	12.0
		Ni Scavenger	140	15	12				10	15	64	10
		Ni Cleaner	100	2.5		350			5	6.5	35	10-10.2
		Total	2000	35	24	350		18	20	42.5		22
F15	Spilt	Cu Rougher	950	15	12			18		12	90	
		Ni Scavenger	560	35	12				10	15		
		Total	1510	50	24			18	10	27		
F17	Spilt	Cu Rougher	470	15	35			18		9	84	9.5
		Cu 1st Cleaner	40		15					3		10.0
		Ni Scavenger		70	40		10			15		8.8-9.2
		Total	510	85	90		10	18		27		
F20	Spilt	Cu Rougher	480	15	45			18		9	82	9.5
		Cu Cleaner	1830	2.5	35				8	9	63	12.0
		Ni Scavenger		70	45		10			15		8.8-9.3
		Ni Scav.Cleaner	260	20	35	50			12	7	14	10.5
		Total	2570	107.5	160	50	10	18	20	40		

Table 16: Summary of Cleaner Test Results (OP Comp)

Test	Product	Wt %	Assays, %, g/t			% Distribution			Stage Recovery, %		
			Cu	Ni	S	Cu	Ni	S	Cu	Ni	S
F5	**Cu 2nd Clnr Conc**	**1.6**	**19.7**	**1.65**	**32.1**	**79.0**	**32.4**	**47.0**			
	Cu 1st Clnr Conc	2.0	17.4	1.60	30.7	86.2	38.9	55.6			
	Cu Ro Conc	2.3	16.0	1.57	29.2	91.9	44.4	61.3			
	Bulk Cleaner Conc	2.7	14.4	1.49	26.9	94.5	48.0	64.6			
	Bulk Rougher Conc	**4.9**	**7.98**	**0.93**	**16.2**	**96.5**	**55.1**	**71.6**			
	Scav Conc No 1+2	2.3	0.25	0.25	5.73	1.4	7.0	11.8			
	Bulk Rougher Tail	92.8	0.009	0.034	0.20	2.0	37.9	16.6			
	Head (calc.)	100.0	0.41	0.083	1.12	100.0	100.0	100.0			
F10	**Cu 2nd Clnr Conc**	**1.3**	**28.2**	**0.72**	**30.2**	**82.5**	**10.2**	**34.9**			
	Cu 1st Clnr Conc	1.5	24.8	0.99	28.2	87.0	16.9	39.0			
	Cu Ro Conc	1.8	21.6	1.22	26.3	90.1	24.7	43.3			
	Bulk Cleaner Conc	2.9	13.7	1.51	23.1	92.4	49.4	61.5			
	Bulk Rougher Conc	**5.2**	**7.75**	**0.94**	**13.8**	**93.5**	**55.1**	**66.0**			
	Scav Conc No 1+2	3.2	0.13	0.22	5.32	0.9	7.8	15.6			
	Bulk Rougher Tail	91.6	0.026	0.036	0.22	5.5	37.1	18.4			
	Head (calc.)	100.0	0.43	0.089	1.09	100.0	100.0	100.0			
F11	**Cu 2nd Clnr Conc**	**2.0**	**21.2**	**1.38**	**26.5**	**86.3**	**29.1**	**39.7**			
	Cu 1st Clnr Conc	2.5	17.2	1.29	22.3	88.2	34.3	42.2			
	Cu Ro Conc 1-3	5.3	8.49	0.79	12.0	93.7	45.3	48.8			
	Bulk 3rd Clnr Conc	**0.1**	**14.6**	**2.05**	**29.7**	**2.7**	**1.9**	**2.0**	60.7	10.0	6.3
	Bulk 2nd Clnr Conc	0.2	6.63	1.47	32.9	3.3	3.8	6.1	75.7	19.8	19.1
	Bulk 1st Clnr Conc	0.5	3.27	1.20	30.0	3.7	7.0	12.5	84.9	36.5	39.6
	Bulk Scav Conc 1-2	2.8	0.75	0.63	14.7	4.4	19.3	31.7	100.0	100.0	100.0
	Cu Rougher Tail	94.7	0.032	0.054	0.71	6.3	54.7	51.2			
	Head (calc.)	100.0	0.48	0.093	1.31	100.0	100.0	100.0			
F13	**Cu 4th Clnr Conc**	**0.8**	**28.9**	**0.74**	**30.4**	**52.4**	**6.6**	**21.1**			
	Cu 3rd Clnr Conc	1.1	25.2	1.11	28.6	68.6	15.0	29.9			
	Cu 2nd Clnr Conc	1.5	20.7	1.39	26.8	75.1	25.0	37.2			
	Cu 1st Clnr Conc	2.5	15.5	1.50	23.9	91.1	43.8	53.8			
	Ni 3rd Clnr Conc	**0.3**	**2.33**	**0.95**	**16.8**	**1.5**	**3.0**	**4.2**	16.8	5.4	9.0
	Ni 2nd Clnr Conc	0.4	4.25	1.12	21.3	4.5	5.8	8.6	50.0	10.4	18.6
	Ni 1st Clnr Conc	0.9	2.62	0.87	15.2	5.9	9.6	13.1	65.9	17.1	28.4
	Ni Scavenger Conc	3.9	0.77	0.36	5.54	7.2	16.6	19.8	**80.1**	**29.6**	**42.8**
	Cu Ro Tail +Cu 1st Clnr Tail	97.5	0.039	0.049	0.52	8.9	56.2	46.2	100.0	100.0	100.0
	Head (calc.)	100.0	0.42	0.085	1.10	100.0	100.0	100.0			
F15	Cu Rougher Conc 1	2.8	14.5	1.12	18.3	91.8	33.6	45.2			
	Cu Rougher Conc 1-2	4.2	10.0	1.01	14.5	95.3	45.6	53.9			
	Cu Rougher Conc 1- 3	**5.8**	**7.37**	**0.82**	**11.7**	**96.3**	**50.6**	**59.6**			
	Ni Scav Conc 1	1.2	0.32	0.27	6.40	0.8	3.4	6.5			
	Ni Scav Conc 1-2	1.8	0.25	0.25	6.44	1.0	4.9	10.3			
	Ni Scav Conc 1-3	**2.3**	**0.22**	**0.24**	**6.29**	**1.2**	**5.9**	**12.7**			
	Cu Rougher Tail (Ni Scav Feed)	94.2	0.017	0.049	0.48	3.7	49.4	40.4			
	Head (calc.)	100.0	0.44	0.093	1.13	100.0	100.0	100.0			
F17	**Cu 1st Clnr Conc**	**2.9**	**14.5**	**1.45**	**24.5**	**94.2**	**48.6**	**64.4**			
	Ni Scavenger Conc 1	4.6	0.22	0.27	4.85	2.3	14.4	20.2			
	Ni Scavenger Conc 1-2	7.6	0.16	0.20	3.80	2.7	17.9	26.3			
	Ni Scavenger Conc 1-3	**10.4**	**0.13**	**0.17**	**3.12**	**2.9**	**20.2**	**29.3**			
	Ni Scavenger Tail	86.7	0.015	0.031	0.080	2.9	31.2	6.3			
	Head (calc.)	100.0	0.45	0.086	1.10	100.0	100.0	100.0			
F20	Cu 4th Clnr Conc	0.9	32.4	0.31	31.6	63.2	3.1	24.7			
	Cu 3rd Clnr Conc	**1.3**	**28.4**	**0.65**	**29.3**	**83.1**	**9.7**	**34.3**			
	Cu 2nd Clnr Conc	1.8	23.1	1.07	27.0	88.1	20.8	41.2			
	Ni Scav 3rd Clnr Conc	**0.5**	**5.60**	**1.84**	**38.3**	**6.1**	**10.1**	**16.6**	**67.6**	**20.7**	**33.0**
	Ni Scav 2nd Clnr Conc	0.9	3.65	1.53	28.9	6.9	14.7	21.8	76.7	30.0	43.3
	Ni Scav 1st Clnr Conc	2.2	1.56	0.88	14.4	7.6	21.8	28.0	84.3	44.4	55.7
	Ni Scav Conc + Cu 2nd Clnr Tls	10.4	0.40	0.42	5.54	9.0	49.1	50.4	100.0	100.0	100.0
	Ni Scavenger Tail	87.8	0.015	0.031	0.11	2.9	30.1	8.4			
	Head (calc.)	100.0	0.46	0.090	1.15	100.0	100.0	100.0			

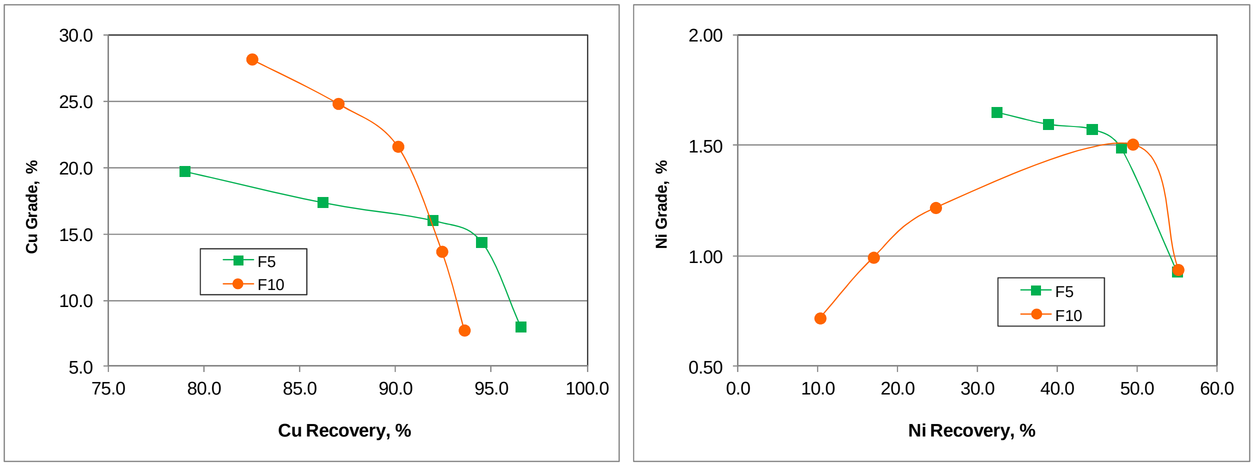


Figure 29: Grade vs. Recovery – Effect of Regrind (OP Comp)

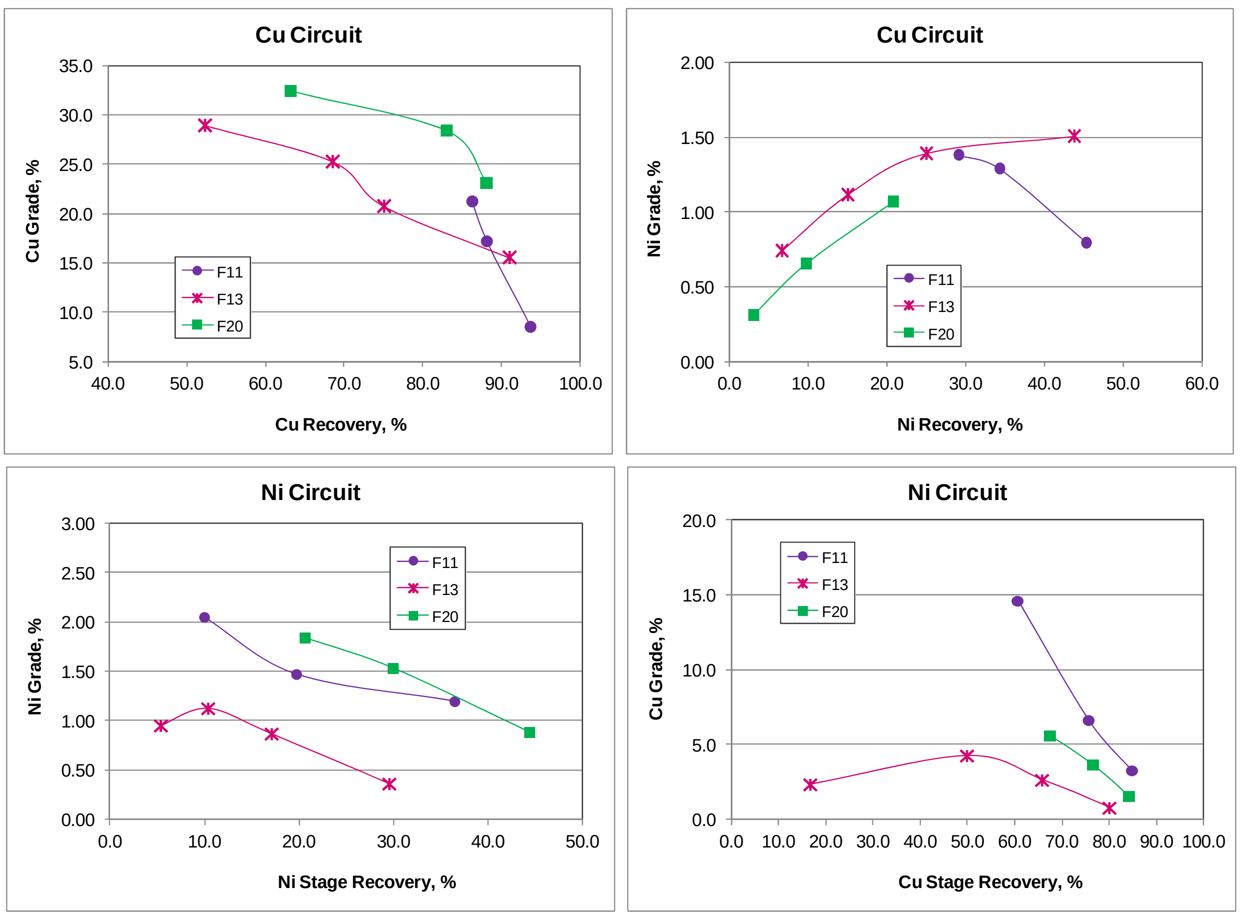


Figure 30: Grade vs. Recovery – Investigation of Flowsheet Configuration (OP Comp)

3.3. Locked Cycle Test

Locked cycle tests, LCT1 and LCT2, were completed on IP Comp and OP Comp respectively. The flowsheet for the locked cycle tests is shown in Figure 31 since this configuration showed the most promise in the batch tests. It was similar to the flowsheet applied in tests F19 and F20 (Figure 27), however the Cu 4th cleaner was eliminated. Conditions used for LCT1 and LCT2 were also similar to tests F19 and F20. The locked cycle test results are compared with tests F19 and F20 in Table 17 and Figure 32. The LCT was balanced over the final 3 cycles, D-F. Observations included:

- LCT1 generated a Cu concentrate grading 28.5% Cu and 0.52% Ni at recoveries of ~92% for Cu and ~8% for Ni. The Cu concentrate also contained 9.96g/t PGM (Pt+Pd+Au).
- LCT1 generated a Ni concentrate grading 2.12% Ni and 1.97% Cu at recoveries of ~25% for Ni and ~5% for Cu. The Ni concentrate also contained ~3.75g/t PGM.
- LCT2 produced a Cu concentrate grading 30.1% Cu and 0.38% Ni at recoveries of ~91% for Cu and ~6% for Ni. The Cu concentrate also contained 9.96g/t PGM.
- LCT2 produced a Ni concentrate grading 2.05% Ni and 3.15% Cu at recoveries of ~20% for Ni and ~6% for Cu. The Ni concentrate also contained 6.20g/t PGM.
- Comparing to batch cleaner tests F19 and F20, LCT1 had recoveries ~5% (Cu) and ~12% (Ni) higher than F19, while LCT2 had recoveries ~7% (Cu) and ~10% (Ni) higher than F20.

The stability data for LCT1 and LCT2 are presented in Table 18. The stability was acceptable for all elements.

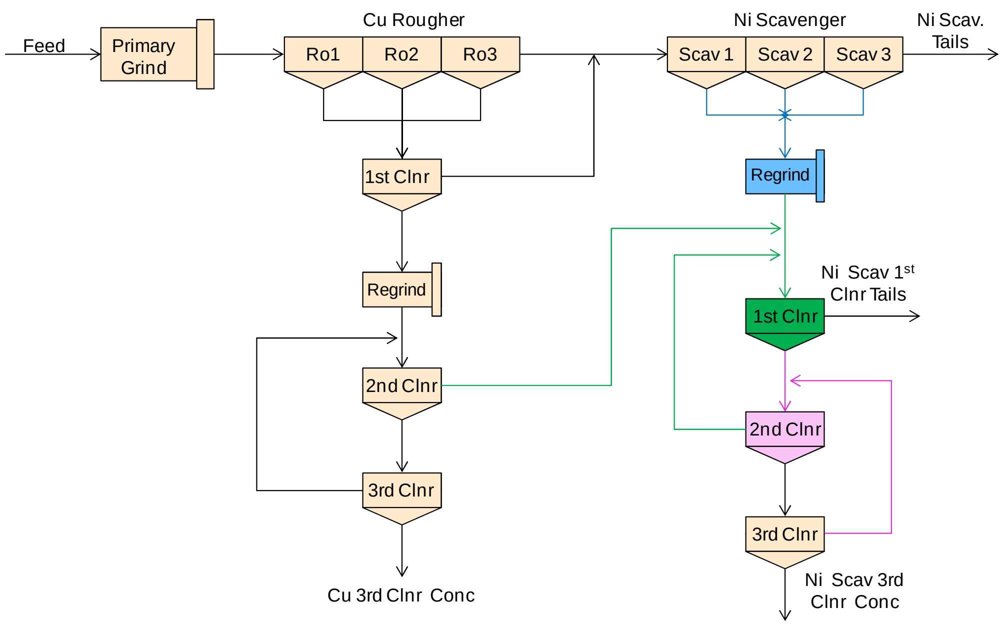


Figure 31: Flowsheet for Locked Cycle Tests LCT1 and LCT2

Table 17: Summary of Locked Cycle Test Results

Test ID	Composite	P80	Product	Wt %	Assays, %, g/t						% Distribution		
					Cu	Ni	S	Pt	Pd	Au	Cu	Ni	S
F19	IP Comp	Primary Grind : 91 µm	Cu 3rd Clnr Conc	1.7	26.3	0.88	29.3				86.4	13.7	37.8
		Cu regrind : n/a	Ni Scav 3rd Clnr Conc	0.8	3.24	1.71	32.5				5.0	12.4	19.5
		N regrind : 17 µm	Ni Scav 1st Clnr Tails	8.5	0.053	0.27	2.79				0.9	21.1	18.1
			Ni Scavenger Tail	86.4	0.015	0.037	0.16				2.5	29.3	10.5
			Head (calc.)	100.0	0.52	0.11	1.32				100.0	100.0	100.0
LCT1	IP Comp	Primary Grind : 92 µm	Cu 3rd Clnr Conc	1.7	28.5	0.52	29.1	1.82	6.52	1.62	91.5	8.4	37.1
		Cu regrind : n/a	Ni Scav 3rd Clnr Conc	1.2	1.97	2.12	28.9	0.93	2.23	0.59	4.5	24.7	26.3
		N regrind : 18 µm	Ni Scav 1st Clnr Tail	12.1	0.079	0.29	2.37				1.8	34.0	21.7
			Ni Scavenger Tails	85.0	0.013	0.040	0.23				2.1	32.9	14.9
			Head (calc.)	100.0	0.53	0.10	1.32				100.0	100.0	100.0
F20	OP Comp	Primary Grind : 82 µm	Cu 3rd Clnr Conc	1.3	28.4	0.65	29.3				83.1	9.7	34.3
		Cu regrind : n/a	Ni Scav 3rd Clnr Conc	0.5	5.60	1.84	38.3				6.1	10.1	16.6
		N regrind : 14 µm	Ni Scav 1st Clnr Tails	8.2	0.079	0.30	3.12				1.4	27.3	22.3
			Ni Scavenger Tail	87.8	0.015	0.031	0.11				2.9	30.1	8.4
			Head (calc.)	100.0	0.46	0.090	1.15				100.0	100.0	100.0
LCT2	OP Comp	Primary Grind : 85 µm	Cu 3rd Clnr Conc	1.3	30.1	0.38	30.4	1.26	7.59	1.11	90.6	6.1	38.8
		Cu regrind : n/a	Ni Scav 3rd Clnr Conc	0.8	3.15	2.05	32.1	1.67	3.76	0.77	5.8	20.2	25.2
		N regrind : 16 µm	Ni Scav 1st Clnr Tail	14.6	0.053	0.25	2.04				1.8	43.3	28.4
			Ni Scavenger Tails	83.2	0.010	0.030	0.10				1.9	30.4	7.7
			Head (calc.)	100.0	0.45	0.083	1.05				100.0	100.0	100.0

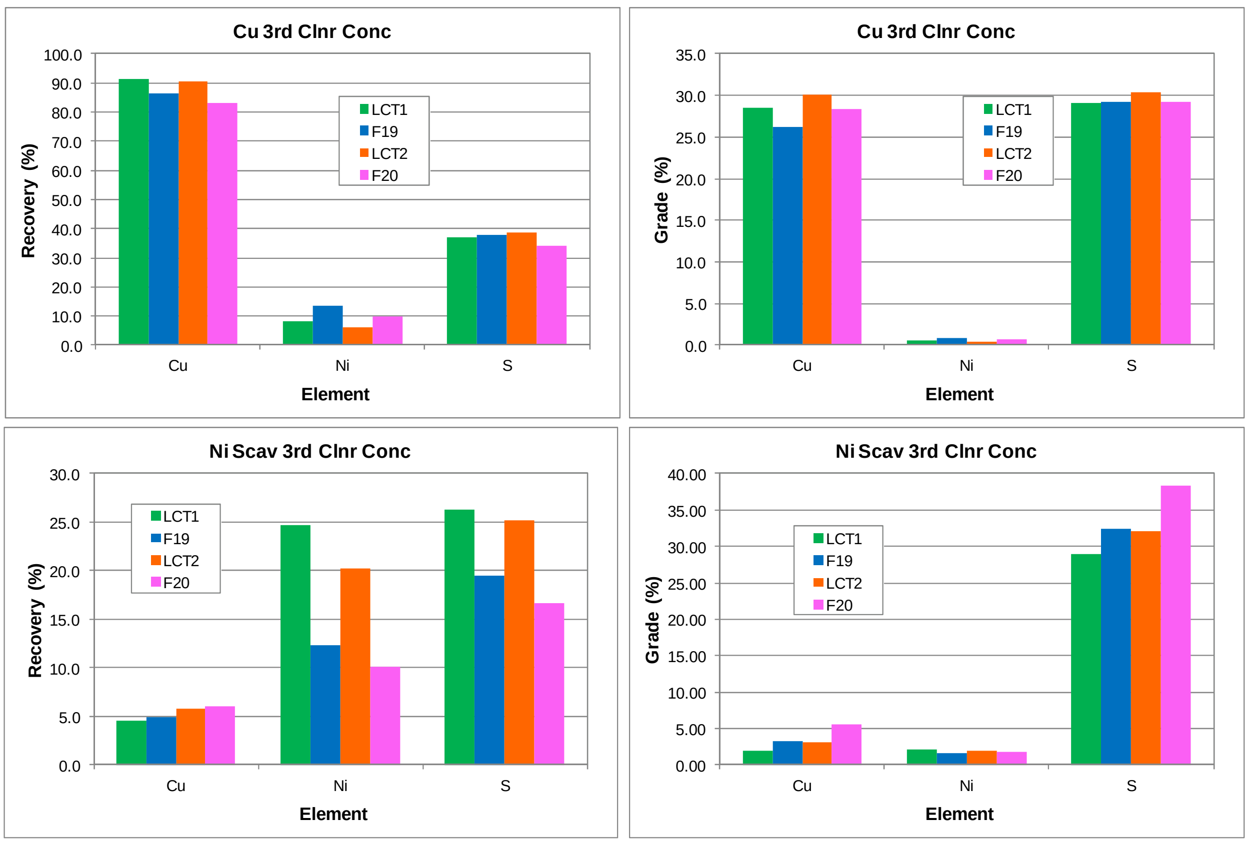


Figure 32: Grade and Recovery – Locked Cycle Test vs. Batch Test

Table 18: Summary of LCT Circuit Stability

Test ID	Cycle	Wt%	Cu	Ni	S
LCT1	A	96.4	94.2	78.9	85.4
	B	99.3	101.4	90.4	96.4
	C	98.9	97.1	95.1	97.3
	D	99.9	102.5	98.8	99.3
	E	98.6	100.6	97.8	99.6
	F	100.0	99.1	93.5	98.0
	ave C-F	99.3	99.8	96.3	98.6
	ave D-F	99.5	100.7	96.7	99.0
	ave E-F	99.3	99.8	95.7	98.8
Test ID	Cycle	Wt%	Cu	Ni	S
LCT2	A	94.6	92.2	73.2	82.7
	B	99.0	102.6	97.3	98.8
	C	100.9	102.2	102.2	101.4
	D	99.4	98.9	91.5	99.2
	E	101.1	97.9	101.0	96.7
	F	100.0	100.1	96.6	98.5
	ave C-F	100.4	99.8	97.8	99.0
	ave D-F	100.2	99.0	96.4	98.2
	ave E-F	100.6	99.0	98.8	97.6

The Cu cleaner concentrates and Ni scavenger cleaner concentrates were further subjected to a detailed assay suite, which included Si assays and an ICP scan. In addition, QEMSCAN using the Bulk Mineral Analysis (BMA) to identify the mineral deportment was conducted. The mineral distribution determined by QEMSCAN is presented in Table 19 and Figure 33. The detailed assays for the major elements in the Cu and Ni concentrates were calculated using the assay, ICP scan and QEMSCAN results is presented in Table 20. The main observations are heighted as follows:

- The Cu concentrate consists mainly of chalcopyrite at ~81 wt% for IP Comp (LCT1) and ~87 wt% for OP Comp (LCT2). There is also ~4.5 wt% (IP) and ~4.0 wt% (OP) of cubanite in the Cu concentrates.
- The Ni concentrate consists mainly of iron sulphides at ~50 wt% (pyrite+ pyrrhotite) for IP Comp and ~53 wt% for OP Comp. There were ~7 wt% (IP) and ~9 wt% (OP) of chalcopyrite reporting to the Ni concentrates. The pentlandite recovered to the concentrates accounts for ~10 wt% (IP) and ~8 wt% (OP).
- Silicates reporting to the Ni concentrates were significantly higher than to the Cu concentrates.

Table 19: Bulk Mineral Analysis on LCT Cu and Ni Concentrates

Sample		LCT1 Cu 3rd Cleaner Conc F	LCT1 Ni Scav 3rd Clnr Conc F	LCT2 Cu 3rd Cleaner Conc F	LCT2 Ni Scav 3rd Clnr Conc F
Fraction		-300/+3um	-300/+3um	-300/+3um	-300/+3um
Mass Size Distribution (%)		100.0	100.0	100.0	100.0
Calculated ESD Particle Size		12	15	11	13
		Sample	Sample	Sample	Sample
Mineral Mass (%)	Chalcopyrite	80.8	6.81	87.2	9.15
	Cubanite	4.46	1.71	4.05	3.11
	Other Cu-Sulphides	0.57	0.26	0.80	0.68
	Pentlandite	1.38	10.2	1.07	7.88
	Other Ni Minerals	0.00	0.01	0.00	0.01
	Pyrrhotite	0.67	11.2	0.53	19.5
	Pyrite	1.31	38.8	0.73	33.3
	Other Sulphides	0.21	0.25	0.14	0.30
	Mg-Hornblende	1.36	3.86	0.49	3.76
	Ca-Fe-Mg Amphibole	1.19	4.99	0.27	2.60
	Orthopyroxene	1.95	5.80	1.02	5.03
	Clinopyroxene	0.17	0.78	0.01	0.16
	Chlorites	0.71	2.57	0.16	1.36
	Talc	1.53	1.65	1.87	1.98
	Serpentine	0.46	1.26	0.47	2.00
	Micas	1.89	5.35	0.64	4.18
	Plagioclase	0.70	1.76	0.13	1.69
	K-Feldspar	0.02	0.08	0.01	0.05
	Epidote	0.16	0.33	0.00	0.12
	Quartz	0.17	0.58	0.11	1.00
	Sphene/Titanite	0.02	0.08	0.00	0.02
	Other Silicates	0.02	0.04	0.06	0.01
	Fe-Oxides	0.17	1.48	0.13	1.76
	Other Oxides	0.02	0.07	0.01	0.08
	Carbonates	0.05	0.09	0.05	0.15
	Other	0.00	0.02	0.00	0.03
	Total	100.0	100.0	100.0	100.0

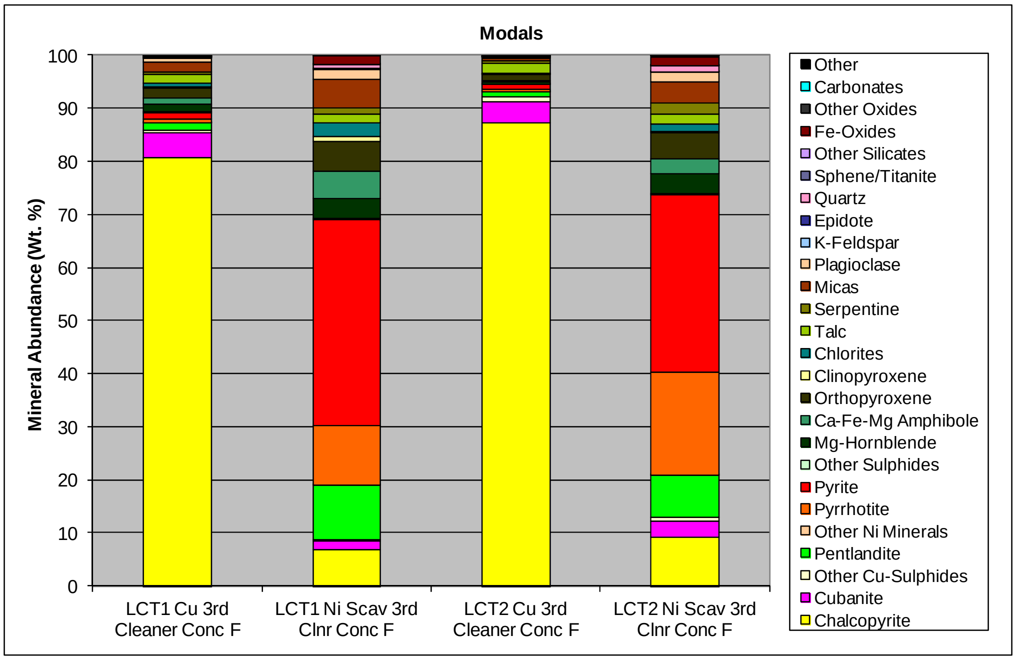


Figure 33: Bulk Mineral Analysis on LCT Cu and Ni Concentrates

Table 20: Detailed Assays of LCT Cu and Ni Concentrate Composite

Element	Unit	LCT1 Cu 3rd Cleaner Conc D	LCT1 Ni Scav 3rd Clnr Conc E	LCT2 Cu 3rd Cleaner Conc E	LCT2 Ni Scav 3rd Clnr Conc D
XRF - Pyrosulphate Fusion					
Cu	%	29.4	1.86	29.6	3.36
Ni	%	0.57	2.08	0.40	1.99
LECO					
S	%	30.0	28.6	30.0	32.3
AA Assay					
Si	%	2.55	8.28	2.28	6.18
ICP-OES					
Ag	g/t	96	24	92	30
Al	g/t	5020	16500	3240	11100
As	g/t	< 30	< 30	< 30	< 30
Ba	g/t	143	589	122	302
Be	g/t	< 0.03	0.12	< 0.03	0.06
Bi	g/t	< 200	< 200	< 200	< 200
Ca	g/t	4900	14500	4490	11000
Cd	g/t	12	5	10	8
Co	g/t	522	2370	397	2250
Cr	g/t	5	41	5	54
Fe	g/t	273000	292000	285000	341000
K	g/t	912	3560	397	1520
Li	g/t	< 10	< 10	< 10	< 10
Mg	g/t	12500	37900	12300	30400
Mn	g/t	173	801	114	474
Mo	g/t	< 10	13	< 10	21
Na	g/t	1110	4040	838	3270
P	g/t	< 200	< 200	< 200	< 200
Pb	g/t	< 70	74	< 70	175
Sb	g/t	< 20	< 20	< 20	< 20
Se	g/t	< 80	< 80	< 80	< 80
Sn	g/t	< 30	< 30	< 30	< 30
Sr	g/t	24.9	83.2	21.3	71.5
Ti	g/t	305	944	188	552
Tl	g/t	< 30	< 30	< 30	< 30
U	g/t	< 60	< 60	< 60	< 60
V	g/t	10	33	7.6	23
Y	g/t	0.6	2.3	0.5	1.7
Zn	g/t	1180	824	1100	1010
Mineralogy					
O	%	5.43	15.1	3.13	13.7
FAICP					
Pt	g/t	1.82	0.93	1.26	1.67
Pd	g/t	6.52	2.23	7.59	3.76
Au	g/t	1.62	0.59	1.11	0.77
Total		**98.0**	**93.4**	**96.3**	**97.9**

3.4. Investigation of Ni Flotation Performance

Difficulties to recover nickel minerals were observed during the testwork completed on both composites. Strategies including finer regrinding, higher collector dosage, natural pH, as well as secondary collector were examined in order to improve Ni recovery. However, the results were not as good as hoped for. Reasons for the poor Ni flotation performance could be insufficient liberation of Ni-sulphides, as suggested by mineralogy on the feed. The Ni carried by pyrite and pyrrhotite, and non-sulphides could also affect the Ni recovery during the flotation process.

The liberation and association characteristics of sulphide minerals in the two composites are summarized in Table 21. The liberation of Ni-sulphides were ~56% (>=80% mineral-of-interest area percent) with the mineralogy sample of IP Comp and ~46% with OP Comp. Note that the particle size (P_{80}) for the mineralogy sample was estimated at 205 µm for IP Comp and 191 µm for OP Comp (Section 2.1.1.) The flotation tests on the two composites were conducted at P_{80} ranged from 63 µm to 96 µm for primary grind, and from 14 µm to 35 µm for regrind. Therefore, the Ni-sulphides liberation of flotation samples would be higher than the mineralogy samples.

Table 21: Summary of Liberation and Association Characteristics of Sulphide Minerals

Minerals	Unit	IP Comp	OP Comp
Cu Sulphides			
Free + Liberated	%	77.7	72.1
Associated with Silicates	%	14.9	18.1
Associated with Pyrite	%	1.2	0.7
Associated with Pyrrhotite	%	0.8	1.3
In Complex	%	2.8	5.1
Ni Sulphides			
Free + Liberated	%	56.0	45.9
Associated with Silicates	%	5.7	12.3
Associated with Pyrite	%	4.0	4.1
Associated with Pyrrhotite	%	10.4	9.6
Associated with Cu-sulphides and Pyrrhotite	%	2.2	0.5
In Complex	%	18.5	19.7
Pyrite			
Free + Liberated	%	65.5	66.6
Associated with Silicates	%	9.3	9.8
Associated with Ni-sulphides	%	0.8	0.2
Associated Cu-sulphides	%	5.4	3.1
Associated with Cu and Ni sulphides	%	2.1	0.9
In Complex	%	15.6	16.2
Pyrrhotite			
Free + Liberated	%	77.6	82.6
Associated with Silicates	%	5.5	5.4
Associated with Ni-sulphides	%	4.4	0.5
Associated Cu-sulphides	%	0.03	0.04
Associated with Cu and Ni sulphides	%	3.2	2.5
In Complex	%	6.6	8.2

Element Ni deportment analysis (Section 0) indicated that the major Ni carriers are as follows:

- Pentlandite carries 75.6% (IP Comp) and 58.6%(OP Comp) of the Ni.
- Pyrrhotite carries 2.9% (IP Comp) and 6.0% (OP Comp) of the Ni.
- Pyrite carries 4.9% (IP Comp) and 4.5% (OP Comp) of the Ni.
- There were ~16% (IP Comp) and ~31% (OP Comp) of the Ni carried by silicates.

The head samples of composites, as well as the Ni scavenger and Ni scavenger 1st cleaner tails from tests LCT1 and LCT2, were assayed for Ni(S) in order to provide an indication of the distribution of the Ni in sulphides. The results are summarised in Table 22. The following observations were derived:

- There was 38% (IP) and 37% (OP) of the Ni in the head samples carried by non-sulphides. This amount of nickel would be considered as unrecoverable through standard flotation process for sulphide minerals.

- LCT1 recovered 51.5% of the Ni(S) to the concentrates (Cu cleaner concentrate + Ni scavenger cleaner concentrate), while 41% of the Ni (s) was lost in the Ni scavenger 1st cleaner tails. The Ni lost in the Ni scavenger 1st cleaner tails was mostly carried by sulphides (~82%), and only ~18% in non-sulphides. This is likely due to the rejection of pyrrhotite and pyrite during the Ni cleaning stage. The distribution of Ni(S) in the Ni scavenger tails was only 7.5%.

- LCT2 recovered 43.9% of Ni(S) to the concentrates. There was also a significant amount of the Ni(S) (50.4%) lost in the Ni scavenger 1st cleaner tails. Similar to LCT1, the Ni lost in the Ni scavenger 1st cleaner tails was also mostly carried by sulphides (~80%). The distribution of Ni(S) in the Ni scavenger tails was only 5.7%.

- Further testing on the Ni scavenger 1st cleaner tails to recover and upgrade Ni(S) may be beneficial to improve the overall Ni recovery.

Table 22: Results of Ni(s) Assay on Head Samples and the LCT Tails

Test ID	Sample ID	Product	Weight (%)	Ni (%)	Ni(S) (%)	% of Ni in Sulphides	% of Ni in Non-sulphides	Ni (s) Distribution (%)
LCT1	IP Comp	Ni Scav 1st Clnr Tails	12.1	0.28	0.23	82.1	17.9	41.0
		Ni Scav Tails	85.0	0.040	0.006	15.0	85.0	7.5
		Cu Clnr + Ni Scav Clnr Conc	2.9	1.45	1.21	83.3	16.7	51.5
		Head(calc)	100	0.11	0.068	61.8	38.2	100.0
LCT2	OP Comp	Ni Scav 1st Clnr Tails	14.6	0.25	0.20	80.0	20.0	50.4
		Ni Scav Tails	83.2	0.030	0.004	13.3	86.7	5.7
		Cu Clnr + Ni Scav Clnr Conc	2.2	1.39	1.16	83.4	16.6	43.9
		Head(cale)	100.0	0.092	0.058	63.0	37.0	100.0

Conclusions and Recommendations

Two samples, IP and OP composites, from Thierry-K1-1 Cu/Ni deposit were received for flotation testwork. The following conclusions can be made from the testwork.

The IP Comp contained 0.52% Cu, 0.11% Ni, 0.068% Ni(S), 0.31 g/t PGM (Pt+Pd+Au), 2.6 g/t Ag, and 1.35% S. The OP Comp contained 0.46% Cu and 0.092% Ni, 0.058% Ni(S), 0.60 g/t PGM, 2.0 g/t Ag, and 1.14% S. The ratio of copper to nickel is approximately 5 parts Cu to 1 part Ni for both composites.

The modal analysis identified that the dominant mineral in the IP and OP composites was Mg-Hornblende, accounting for 27.0 wt% and 33.0 wt%, respectively. The contents of the other minerals are as follows:

Minerals	**Wt %**	
	IP Comp	OP Comp
Ca-Fe-Amphibole	17.0	15.0
Micas	16.0	17.0
Plagioclase	13.0	14.0
Orthopyoxene	8.63	8.53
Chlorites	3.60	2.75
Clinopyroxene	3.39	1.54
Fe Oxides	2.94	1.04
Chalcopyrite	1.76	1.44
Pentlandite	0.33	0.15
Pyrite	1.05	0.58
Pyrrhotite	0.84	1.06

The sulphide liberation and association analysis of the mineralogy samples, which had a P_{80} of ~205 µm for IP and ~191 µm for OP, revealed the following:

- The Cu-sulphides (occurring primarily as chalcopyrite) were ~78% liberated (>=80% mineral-of interest area percent) in IP and ~72% in OP.
- Ni-sulphides (occurring primarily as pentlandite) were ~53% liberated in IP and 46% in OP.

The grain size distribution analysis indicated that Ni-sulphides had the finest grain size in both composites, at a d50 of ~42 µm for IP and ~24 µm for OP. The Cu-sulphides in IP composite had a similar d50 to the Ni-sulphides at ~45 µm, while the d50 of the Cu-sulphides in OP composite was coarser than the Ni-sulphides at ~32 µm.

The electron microprobe analysis revealed that most of the Cu was carried by chalcopyrite, at ~98% in IP and ~96% in OP. The major Ni-carrier was pentlandite, accounting for 75.5% in IP and 58.0% in OP. Silicates carried 16.5% (IP) and 31.1% (OP) of the Ni, while pyrrhotite and pyrite carried ~8.0% and 10.5% of the Ni in IP and OP, respectively. The Ni carried by silicates and iron sulphides is expected to lead to poor Ni recovery. The electron microprobe analysis also determined a high Ni content in pyrrhotite and pyrite at ~1.5% (IP) and ~1.0% (OP), suggesting that recovering pyrrhotite and pyrite intentionally in flotation is likely able to improve Ni recovery.

The flotation testwork was completed on both composites. Three rougher kinetics tests were conducted to evaluate primary grind particle size. A P_{80} of ~90 µm was selected.

There were 17 cleaner tests completed to investigate reagents, dosages, regrind fineness, and flowsheet configurations.

- Flex 31 (enhanced isopropyl xanthate) was found to be an effective collector, and the dosage was optimized at 17.5 g/t for Cu and 120 g/t for Ni for both composites.
- Regrind was found to be a requirement to achieve high recoveries and grades for both Cu and Ni. A regrind particle size (P_{80}) of ~65 µm for the Cu cleaner and ~15 µm for the Ni cleaner was selected.
- Na_2SO_3 was used as the iron sulphide gangue depressant in the Cu cleaning stage.
- Ni-sulphides were found to be more difficult to recover than Cu-sulphides. A split flowsheet was selected to float the Cu-sulphides separately from the Ni-sulphides.

Cleaner test F19 on IP composite, using optimised conditions, produced a Cu 3rd cleaner concentrate grading 26.3% Cu at the recovery of ~86% and a Ni 3rd cleaner concentrate grading 1.71% Ni at a recovery of ~12%. The Ni reporting to the Cu cleaner concentrate was ~14%.

Cleaner test F20 on OP composite, using optimised conditions, produced a Cu 3rd cleaner concentrate grading 28.4% Cu at the recovery of ~83% and a Ni 3rd cleaner concentrate grading 1.84% Ni at the recovery of ~10%. The Ni reporting to the Cu cleaner concentrate was ~10%.

Locked cycle tests LCT1 on IP and LCT2 on OP were completed applying the flowsheet and conditions of F19 and F20, respectively. The metallurgical projection (cycles D-F) is presented in the following table.

Test ID	**Product**	**Grade, %, g/t**			**Recovery, %**	
		Cu	Ni	PGM*	Cu	Ni
LCT1	Cu Concentrate	28.5	0.52	9.96	92.0	8.0
	Ni Concentrate	1.97	2.12	3.75	5.0	25.0
LCT2	Cu Concentrate	30.1	0.38	9.96	91.0	6.0
	Ni Concentrate	3.15	2.05	6.20	6.0	20.0

* Pt+Pd+Au

LCT1 had recoveries ~5% (Cu) and ~12% (Ni) higher than F19, while LCT2 had recoveries ~7% (Cu) and ~10% (Ni) higher than F20. There was also 9.96g/t of PGM (Pt+Pd+Au) contained in the Cu concentrate from both locked cycle tests. The Ni concentrate contained 3.75g/t PGM for LCT1 and 6.20g/t PGM for LCT2.

QEMSCAN bulk mineral analysis on the Cu and Ni concentrates from the locked cycle tests revealed that the Cu concentrate consists mainly of chalcopyrite at ~81 wt% for LCT1 and ~87 wt% for LCT2. The Ni concentrate consists of iron sulphides at ~50 wt% (pyrite+ pyrrhotite) for IP and ~53 wt% for OP. There were ~ 7 wt% (IP) and ~9 wt% (OP) of chalcopyrite reported to the Ni concentrates. The pentlandite recovered to the concentrates accounts for ~10 wt% (IP) and ~8 wt% (OP).

Conditions applied in the locked cycle tests were as follows:

Test ID	**Circuit**	**P_{80}**	**Reagent, g/t**				**Froth Time**	**pH**
		(µm)	Lime	Flex 31	Na_2SO_3	MIBC	(min)	
LTC1	Cu Rougher	92	480	15		50	9	9.5
	Cu Cleaner	65	930	2.5	100	35	7	12
	Ni Scavenger			70		55	15	8.8-9.4
	Ni Cleaner	12	240	50		30	9	10.5
	Sum		1650	137.5	100	170	40	
LTC2	Cu Rougher	85	470	15		50	9	9.5
	Cu Cleaner	63	940	2.5	100	25	7	12
	Ni Scavenger			70		45	15	9-9.5
	Ni Cleaner	16	230	50		35	9	10.5
	Sum		1640	137.5	100	155	40	

The Ni(S) assay analysis on the IP and OP head samples, Ni scavenger tails and Ni 1st cleaner tails from the locked cycle tests revealed the following:

- There were ~38% (IP) and ~37% (OP) of the Ni in the head samples carried by non-sulphides. This amount of Ni would be considered as unrecoverable.
- A total of 51.5% (LCT1) and 43.9% (LCT2) of the Ni(S) were recovered to the Cu and Ni cleaner concentrates.
- A significant amount of the Ni(S) at ~41% (LCT1) and ~50% (LCT2) reported to the Ni 1st cleaner tails. This was likely due to the rejection of pyrrhotite and pyrite in the stage.
- Only 7.5% (LCT1) and 5.7% (LCT2) of the Ni(S) was lost to the Ni scavenger tails.

The following recommendations are made for further testwork:

- Further investigation should be carried out to explore options to improve nickel recovery. Variables such as alternative collectors and activators to improve Ni-sulphide recovery could be examined.
- Effect of depressant type and dosage. Only Na_2SO_3 was selected in the testwork. There are other secondary depressants that should be considered.
- Effect of regrind size. The regrind size for the Cu and Ni cleaners in this test program was selected but not optimised
- Environmental testing on tailings solids and effluent from a locked cycle test should be completed.

Appendix B

Billiken Management

Project:		K1-1 Project
Hole Number:		K-12-46
Units of Measurement:		feet
Location	**NTS Sheet:**	
	Township:	Ponsford Lake Area
	Claim No:	CLM213
	Grid:	Local
	Easting:	8700
	Northing:	500
	Elevation:	-
GPS Co-ordinates:	**Zone:**	U15
(if applicable)	**Datum:**	NAD 83
	Easting:	*688067*
	Northing:	*5709802*
Collar Dip:		-60
Collar Azimuth:		180
Hole Length:		690
Core Size:		TWB
Recovery:		99%
Logged By:		Mark Wellstead
Date:	**Start:**	17th June 2012
	Finish:	18th June 2012
Drilled by:		Cartwright
Date:	**Start:**	16th June 2012
	Finish:	17th June 2012

INCLINATION TESTS		
DEPTH	DIP	AZIMUTH
60	-58.8	188.5
200	-58.1	179
350	-57.7	178.1
500	-57.1	178.4
690	-56	177.2

Comments

Billiken Management

PROJECT: K1-1 | HOLE NO: | PAGE: 2

FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag ppm	Au ppm	Pd ppm
			ANALYTICAL RESULTS								
0.00	31.50	**OB**	5246548	31.50	36.50	5.00					
			5246549	36.50	41.50	5.00					
31.50	60.00	**Crystalline Iron Formation and Chlorite-Magnetite-Mica Schist**	5246551	41.50	44.50	3.00	788	1350	<0.5	0.003	0.046
		31.5-44.5 is coarse, mid-grey, crystalline, magnetic. Grades into dark green schist, slightly less magnetism, 30-60deg foliation. **Rare medium cpy clots within schist.**	5246552	44.50	49.50	5.00	1100	1030	<0.5	0.004	0.054
			5246553	49.50	54.50	5.00	1120	1070	<0.5	0.003	0.055
			5246554	54.50	60.00	5.50	2550	1050	0.8	0.007	0.104
			5246555	60.00	66.50	6.50	80.5	340	<0.5	<0.001	0.015
60.00	66.50	**Quartz Gabbro**	5246556	66.50	71.50	5.00	2870	1220	1	0.027	0.098
		60-66.5 is quartz dolerite/gabbro - sharp upper contact, more vague lower chilled contact (6in contact zone is ~10% fine cpy)	5246557	71.50	76.50	5.00	2870	976	0.9	0.012	0.106
			5246558	76.50	80.00	3.50	1050	433	1.1	0.006	0.043
66.50	76.50	**Crystalline Iron Formation and Chlorite-Magnetite-Mica Schist**	5246559	80.00	83.30	3.30	924	304	0.7	0.004	0.022
		Below this is generally magnetic schist, variable diss cpy up to 5%. 72-73 is quartz dolerite again	5247061	83.30	88.30	5.00	2280	901	1.1	0.004	0.088
			5247062	88.30	95	6.70	3550	1390	1.3	0.006	0.137
			5247063	95	100	5.00	5730	1340	1.1	0.036	0.133
76.50	83.30	**"Pseudobreccia"**	5247064	100	106.00	6.00	2770	1320	2	0.005	0.088
		Very coarse mix of angular (but not crystalline) quartz plagioclase and hornblende. Partly unaligned partly 60deg-foliated. Two quartz veins (6in at 80ft 12in at 81.5ft). **1-2% diss cpy**	5247065	106.00	111.00	5.00	3520	1270	1.2	0.013	0.105
			5247066	111.00	116.00	5.00	3420	1210	1.4	0.012	0.098
			5247067	116.00	121.00	5.00	1400	866	0.6	0.005	0.046
			5247068	121.00	126.00	5.00	1440	1120	0.6	0.016	0.047
83.30	95.00	**Mafic Tuffs and Volcanics and Iron Formations?**	5247069	126.00	131.00	5.00	746	604	<0.5	0.003	0.025
			5247071	131.00	136	5.00	2200	1110	0.9	0.004	0.067
		Long sequence of poorly distinguished units - dark green-grey fine-med soft mafic volcanics. Intermittently magnetic (iron saturated = ultramafic? Or iron formations?). 30deg banding. **Med concordant cpy stringers 1-2%**	5247072	136	141	5.00	1540	1080	0.6	0.002	0.064
			5247073	141	148	7.00	727	871	<0.5	<0.001	0.032
			5247074	148	155	7.00	2710	1770	1	0.024	0.151
			5247075	155	160	5.00	937	970	<0.5	<0.001	0.028
95.00	106.00	**Chlorite-Magnetite-Mica Schist / Iron Formation**	5247076	160	165	5.00	653	848	<0.5	<0.001	0.024
		Stretch of mica-magnetite-chlorite schistose iron formation **~1% cpy**	5247077	165	170	5.00	710	857	<0.5	0.003	0.025
			5247078	170	175	5.00	688	812	<0.5	0.001	0.02
106.00	148.00	**Mafic Tuffs and Volcanics and Iron Formations?**	5247079	175	180	5.00	858	860	<0.5	0.017	0.025
		As before. **Med concordant cpy stringers 1-2%**	5247080	180	185	5.00	735	772	<0.5	0.001	0.026
			5247082	185	190	5.00	860	891	<0.5	<0.001	0.027
148.00	155.00	**Chlorite-Magnetite-Mica Schist / Iron Formation**	5247083	190	195	5.00	703	678	<0.5	0.001	0.022
		As earlier in hole. Incompetent core. **~1% med coarse diss cpy**	5247084	195	200	5.00	663	782	<0.5	0.004	0.028
			5247085	200	205	5.00	543	887	<0.5	0.019	0.027
155.00	247.00	**Mafic Tuffs and Volcanics and Iron Formations?**	5247086	205	210.00	5.00	544	879	<0.5	0.003	0.032
			5247087	210.00	215.00	5.00	1120	1010	0.8	0.004	0.05
		As before. 191.5-192.5 is a quartz dolerite - resembles a finer "pseudobreccia" - medium hornblendes set in a quartz-plagioclase groundmass (hornblende-supported). Very poor recovery 229-245ft. **Mineralization generally <1% cpy**	5247088	215.00	220	5.00	947	938	<0.5	0.004	0.035
			5247089	220	225	5.00	980	771	0.8	0.008	0.03

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FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag ppm	Au ppm	Pd ppm
247.00	279.00	**Iron Formation**	5247091	225	230	5.00	718	1010	<0.5	0.018	0.042
			5247092	230	235	5.00	488	917	<0.5	0.001	0.046
		Mid-grey unit comprising magnetite and a weak, pale grey, very fine material (likely a mix of minerals). Banded at 45deg. Rare clots of cpy except 268-270 which is a non-mag fine mafic flow or dyke with **~3% medium diss cpy.** Lowermost few feet are finer, more laminated, possibly interbedded with a mafic tuff	5247093	235	240	5.00	604	1010	0.6	0.002	0.053
			5247094	240	247	7.00	3330	1350	1.4	0.009	0.094
			5247095	247	252	5.00	6750	1320	3	0.029	0.186
			5247096	252	257	5.00	4980	1130	1.8	0.026	0.132
			5247097	257	262	5.00	3580	1120	1.1	0.017	0.117
279.00	285.00	**Quartz Gabbro or "Pseudobreccia"**	5247098	262	268	6.00	3400	1010	1.2	0.03	0.107
			5247099	268	270	2.00	2940	1010	1.5		
		Crystalline qz-hb-plag intrusive with chilled margins and **1-2% med diss cpy** (more along chilled margins - cpy does not get finer like the other minerals)	5247101	270	275	5.00	2190	980	0.6	0.004	0.083
			5247102	275	279	4.00	2790	1160	1.3	0.022	0.112
			5247103	279	285	6.00	3590	1100	3.3	0.019	0.133
285.00	295.00	**Iron Formation**	5247104	285	290	5.00	2770	1100	0.9	0.007	0.1
		As before. **Up to 1% cpy**	5247105	290	295	5.00	2340	1050	0.9	0.009	0.098
			5247106	295	300	5.00	2430	963	1.2	0.01	0.088
295.00	397.00	**Mixed Mafic Tuffs and Volcanics (and Iron Formation?)**	5247107	300	305	5.00	2530	979	1.1	0.01	0.107
			5247108	305	310	5.00	2990	817	1.8	0.019	0.088
			5247109	310	316.5	6.50	3310	851	1.6	0.042	0.108
		Long stretch of poorly distinguished mafic units with 45-60deg banding. Intermittent magnetism with no obvious corresponding change in appearence. Consistently mineralized, **fine-med cpy, diss and stringer, 2-5%.** Cloudy quartz vein 316.5-318. 342-344 fine massive and mid-grey, possibly a diorite flow/dyke, with quartz phenocrysts. 356.2-358.5 resembles iron formation as in earlier units - different, mid-grey appearence to the stretches of magnetic volcanics. Distinctive ~3cm thick band of pure magnetite at 372.5ft (what is this?). Gradually becomes more crystalline towards end of unit ~380-397ft).	5247111	316.5	318	1.50	782	316	0.6	0.004	0.033
			5247112	318	323	5.00	3320	1210	2	0.016	0.133
			5247113	323	328	5.00	1970	1250	0.6	0.003	0.111
			5247114	328	333	5.00	2470	1210	1	0.016	0.102
			5247115	333	338	5.00	1580	1070	<0.5	0.006	0.068
			5247116	338	342	4.00	1700	1060	0.5	0.008	0.063
			5247117	342	344	2.00	151	155	1	<0.001	0.008
			5247118	344	349	5.00	1820	1160	0.5	0.006	0.072
			5247119	349	356.2	7.20	1540	1090	<0.5	0.005	0.07
			5247120	356.2	358.5	2.30	2520	1090	0.8	0.041	0.08
			5247122	358.5	363.5	5.00	3240	1290	1	0.011	0.1
			5247123	363.5	368.5	5.00	2480	1250	0.7	0.008	0.095
			5247124	368.5	373.5	5.00	1730	978	1.2	0.014	0.081
			5247125	373.5	378.5	5.00	2770	779	2.6	0.025	0.105
			5247126	378.5	383.5	5.00	1590	682	1.6	0.009	0.084
			5247127	383.5	388.5	5.00	1410	639	1.6	0.009	0.085
			5247128	388.5	393.5	5.00	1900	791	2.5	0.012	0.118
			5247129	393.5	397	3.50	2980	1660	2.8	0.025	0.179

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FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag ppm	Au ppm	Pd ppm
397.00	412.50	**Intermediate Tuff**	5247131	397	402	5.00	329	260	0.8	0.005	0.013
		Mid-grey fine unit, well bedded at 60deg. 406-412.5 is mixed and interbedded with mafic tuffs, mineralized **(~1% cpy + some po)**	5247132	402	406	4.00	582	257	<0.5	0.007	0.012
			5247133	406	412.5	6.50	1990	954	1.8	0.029	0.107
			5247134	412.5	417.5	5.00	1800	611	1.3	0.009	0.059
412.50	433.00	**Banded Mafic Volcanics**	5247135	417.5	422.5	5.00	2550	886	2	0.01	0.089
		Coarse crystalline dark green mafic unit, banded at ~60deg and with varying amounts of qz+plag in groundmass - possibly flooded in pseudobreccia-like sections up to a foot long. **These sections are ~5% cpy but bulk of unit is 1-2% med diss cpy.**	5247136	422.5	427.5	5.00	1520	708	2	0.007	0.076
			5247137	427.5	433	5.50	1320	600	2.2	0.005	0.061
			5247138	433	438	5.00	2890	152	2.4	0.012	0.006
			5247139	438	443	5.00	1330	597	2.3	0.002	0.063
			5247141	443	448	5.00	575	367	1.4	<0.001	0.038
433.00	438.00	**Diorite Dyke or Flow**	5247142	448	452.8	4.80	262	305	1.1	<0.001	0.028
		Medium massive intermediate unit, sharp concordant boundaries, occasional mafic xenoliths and mineralized fracture planes.	5247143	452.8	458	5.20	656	235	1.5	0.001	0.019
			5247144	458	463	5.00	950	358	1.2	0.022	0.037
			5247145	463	468.3	5.30	1160	510	1.6	0.003	0.046
438.00	452.80	**Banded Quartz Mafic Volcanics/tuffs**	5247146	468.3	472.5	4.20	1340	439	1.9	0.006	0.043
		As before but with a greater (and increasing) proportion of quartz and plagioclase and/or siliceous lapilli. Appears to grade into following unit. Mineralized very patchily; **diss cpy 0-1%**	5247147	472.5	477	4.50	698	292	1.2	0.002	0.03
			5247148	477	482	5.00	943	385	1.6	0.004	0.044
			5247149	482	487	5.00	1290	449	2.8	0.004	0.075
			5247151	487	490	3.00	2210	1340	2.5	0.03	0.165
452.80	482.00	**Quartz Gabbro or "Pseudobreccia"**	5247152	490	494	4.00	1850	487	2.2	0.006	0.081
		Becomes coarser with weaker banding. **Well-disseminated fine-med cpy ~2%**. Several small quartz veins at all angles (468.3-472.5). 475-476 is strongly sheared but core is competent. Very coarse cpy+po clots at very bottom of unit	5247153	494	497.4	3.40	1370	455	1.9	0.004	0.057
			5247154	497.4	498.5	1.10	91.3	182	0.6	<0.001	0.005
			5247155	498.5	503.5	5.00	665	374	2.1	0.021	0.041
			5247156	503.5	508.5	5.00	1160	418	1.7	0.005	0.051
482.00	535.00	**Gabbro**	5247157	508.5	513.5	5.00	2680	798	3	0.035	0.086
		Coarse crystalline unit. Quartz and much of the plagioclase dissapear. Near-entirely hornblende (=ultramafic?) 482-485ft. 490-494 is foliated with two fabrics at ~30 and ~70deg - this stretch is possibly banded flow? **Intensely mineralized on fracture planes only (cpy+py+po). Otherwise <1% cpy** 497.4-498.5 is a distinctive diorite dyke. Intermittent 45-60deg foliation below here, sometimes absent.	5247158	513.5	518.5	5.00	1550	1110	1.7	0.007	0.086
			5247159	518.5	523.5	5.00	692	492	1	0.003	0.034
			5247160	523.5	528.5	5.00	1560	547	2.4	0.006	0.045
			5247162	528.5	535	6.50	2450	568	2.7	0.028	0.048

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FROM	TO	DESCRIPTION
535.00	591.30	**Quartz Gabbro** Or "pseudobreccia". Plagioclase content gradually increases and quartz gradually reappears (same unit as above but with fractionation?). **Better mineralized 2-3% fine-coarse diss cpy.** 547-548 is fine-veryfine, dark green, containing short brecciated sections flooded entirely with pure pyrrhotite. Last few feet are finer - chilled margin?
591.30	595.40	**Iron Formation** Mid-grey magnetite-biotite-chlorite iron formation. Pyrite flakes on some bedding surfaces. 70deg bedding. **No chalcopyrite visible**
595.40	627.50	**Mixed Mafic Tuffs, Volcanics and Iron Formations** Ambiguous lithologies with vague transitions, none is overly dominant. Partly schistose and partly brittle and fractured. **600-615ft has clots and stringers of well-mixed cpy py and po. Probably 3% cpy**. 601-602 is a quartz vein with numerous hornblendite xenoliths. **615-617 is 5% fine-coarse stringer cpy.** Mineralization rapidly trails off beyond here. End of unit is primarily hornblende-biotite schistose volcanics.
627.50	690.00	**Mafic Tuffs and/or Sediment** Well-bedded 70-deg fine tuffs, partly epidotised. No sulphides except occasional pyrites within thin quartz veins. 690ft EOH

ANALYTICAL RESULTS

SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag ppm	Au ppm	Pd ppm
5247163	535	540	5.00	575	426	1.4	0.004	0.019
5247164	540	545	5.00	5090	751	3.7	0.038	0.056
5247165	545	550	5.00	3450	2300	2.4	0.021	0.131
5247166	550	555	5.00	1120	716	1.6	0.007	0.046
5247167	555	560	5.00	605	578	0.9	0.002	0.033
5247168	560	565	5.00	903	657	0.6	0.032	0.042
5247169	565	570	5.00	1820	738	1.6	0.013	0.079
5247171	570	575	5.00	542	540	<0.5	0.004	0.027
5247172	575	580	5.00	432	534	0.7	0.001	0.022
5247173	580	585	5.00	879	591	1	0.003	0.027
5247174	585	591.3	6.30	1220	826	0.8	0.036	0.049
5247175	591.3	595.4	4.10	967	875	0.7	0.006	0.043
5247176	595.4	601	5.60	2150	1560	1	0.015	0.103
5247177	601	602.5	1.50	482	578	0.5	0.003	0.036
5247178	602.5	607.5	5.00	2310	965	1.1	0.025	0.07
5247179	607.5	612.5	5.00	2370	1320	1	0.007	0.094
5247181	612.5	617.5	5.00	4960	1050	3.2	0.019	0.124
5247182	617.5	622.5	5.00	3350	838	2	0.027	0.081
5247183	622.5	627.5	5.00	569	563	1.1	0.003	0.05
5247184	627.5	632.5	5.00	304	249	0.7	0.04	0.013
5247185	632.5	637.5	5.00	70.4	135	1.8	0.001	0.014

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FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu %	Ni ppm	Ag g/t	Au ppb	Pd ppb
			5246550	ME-9							
			5247060	Blank							
			5247070	Oreas 13b							
			5247081	Pulp of 5247080							
			5247090	ME-9							
			5247100	Blank							
			5247110	Oreas 13b							
			5247121	Pulp of 5247120							
			5247130	ME-9							
			5247140	Blank							
			5247150	Oreas 13b							
			5247161	Pulp of 5247160							
			5247170	ME-9							
			5247180	Blank							

RQD

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FROM	TO	Actual Drilled	Σ pieces <10cm	RQD %
31.50	40.00	8.50	2.25	62.50
40.00	50.00	10	1.75	82.50
50.00	60.00	10	2.33	76.70
60.00	70.00	9.8	1.42	83.80
70.00	80.00	10	0.50	95.00
80.00	90.00	10	0.92	90.80
90.00	100.00	10	2.25	77.50
100.00	110.00	10	4.42	55.80
110.00	120.00	10	0.50	95.00
120.00	130.00	10	1.33	86.70
130.00	140.00	10	0.25	97.50
140.00	150.00	10	1.84	81.60
150.00	160.00	9.9	2.17	77.30
160.00	170.00	10	0.33	96.70
170.00	180.00	10	0.25	97.50
180.00	190.00	10	0.84	91.60
190.00	200.00	10	0.84	91.60
200.00	210.00	9.8	1.58	82.20
210.00	220.00	9.8	3.42	63.80
220.00	230.00	9.7	1.75	79.50
230.00	240.00	7.5	5.67	18.30
240.00	250.00	9	4.33	46.70
250.00	260.00	10	0.08	99.20
260.00	270.00	10	2.33	76.70
270.00	280.00	10	1.75	82.50
280.00	290.00	9.9	0.33	95.70
290.00	300.00	10	1.67	83.30
300.00	310.00	9.8	0.84	89.60
310.00	320.00	10	2.25	77.50
320.00	330.00	10	1.75	82.50
330.00	340.00	10	1.07	89.30
340.00	350.00	10	3.33	66.70
350.00	360.00	10	3.00	70.00
360.00	370.00	10	2.67	73.30
370.00	380.00	10	1.17	88.30
380.00	390.00	10	1.25	87.50
390.00	400.00	10	2.08	79.20
400.00	410.00	10	1.50	85.00
410.00	420.00	9.8	0.58	92.20
420.00	430.00	9.2	0.08	91.20
430.00	440.00	10	0.25	97.50
440.00	450.00	9.9	0.58	93.20
450.00	460.00	9.9	0.92	89.80
460.00	470.00	9.4	1.33	80.70
470.00	480.00	10	0.17	98.30
480.00	490.00	10	0.33	96.70
490.00	500.00	10	0	100.00
500.00	510.00	10	1.1	89.00
510.00	520.00	10	0.4	96.00
520.00	530.00	9.9	0.5	94.00
530.00	540.00	10	0.7	93.00
540.00	550.00	10	0.7	93.00
550.00	560.00	10	0.25	97.50
560.00	570.00	10	0	100.00
570.00	580.00	9.9	0.3	96.00
580.00	590.00	10	0.9	91.00
590.00	600.00	9.9	2	79.00
600.00	610.00	10	2.7	73.00
610.00	620.00	10	2.3	77.00
620.00	630.00	10	0.5	95.00
630.00	640.00	10	0.5	95.00
640.00	650.00	9.9	0.75	91.50
650.00	660.00	10	0.75	92.50
660.00	670.00	10	0.2	98.00
670.00	680.00	10	1.33	86.70
680.00	690.00	9.8	0.5	93.00

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Specific Gravity

Depth	Dry wt kg	Wet wt kg	SG (d/d-w)	Lithology				
40	0.86	0.50	2.40	iron fm				
55	0.73	0.43	2.44	mt-mc-chl schist				
65	0.46	0.24	2.07	qz gab				
80	0.43	0.22	2.00	psbreccia				
100	0.64	0.42	2.91	sch				
120	0.46	0.24	2.07	mt maf vol				
140	0.59	0.33	2.24	sch				
160	0.58	0.32	2.25	maf vol				
180	0.77	0.46	2.44	maf vol				
200	0.74	0.43	2.38	maf vol				
220	0.65	0.38	2.37	maf vol				
245	0.42	0.21	2.02	sch iron fm				
260	0.82	0.49	2.50	iron fm				
280	0.83	0.50	2.52	qz gab				
300	0.47	0.25	2.13	mat maf vol				
320	0.46	0.24	2.10	maf tuff				
340	0.60	0.33	2.22	maf tuff				
360	0.58	0.32	2.25	iron fm				
380	0.46	0.25	2.22	maf vol				
400	0.58	0.30	2.09	int tuff				
420	0.41	0.21	2.09	qz gab				
435	0.62	0.32	2.09	dio				
450	0.47	0.25	2.12	qz maf volcanoclastic				
470	0.6	0.335	2.26	qz gab				
500	0.915	0.554	2.53	qz maf vol				
520	0.74	0.435	2.43	qz gab				
540	0.465	0.245	2.11	qz gab				
560	0.472	0.249	2.12	qz gab				
580	0.57	0.314	2.23	qz gab				
595	0.41	0.21	2.01	iron fm				
610	0.49	0.26	2.15	magnetite schist				
625	0.46	0.23	2.05	maf schist				
640	0.69	0.39	2.33	maf tuff + sed				
680	0.48	0.26	2.15	maf tuff or epi sed				

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				ANALYTICAL RESULTS					
SAMPLE	FROM	TO	LENGTH	Sample Book	Cu ppm	Ni ppm	Ag ppm	Au ppm	Pd ppm
5246548	31.50	36.50	5.00	5					
5246549	36.50	41.50	5.00	5					
5246550	ME-9			5					
5246551	41.50	44.50	3.00	5					
5246552	44.50	49.50	5.00	5					
5246553	49.50	54.50	5.00	5					
5246554	54.50	60.00	5.50	5					
5246555	60.00	66.50	6.50	5					
5246556	66.50	71.50	5.00	5					
5246557	71.50	76.50	5.00	5					
5246558	76.50	80.00	3.50	5					
5246559	80.00	83.30	3.30	5					
5247060	Blank			6					
5247061	83.30	88.30	5.00	6					
5247062	88.30	95	6.70	6					
5247063	95	100	5.00	6					
5247064	100	106.00	6.00	6					
5247065	106.00	111.00	5.00	6					
5247066	111.00	116.00	5.00	6					
5247067	116.00	121.00	5.00	6					
5247068	121.00	126.00	5.00	6					
5247069	126.00	131.00	5.00	6					
5247070	Oreas 13b			6					
5247071	131.00	136	5.00	6					
5247072	136	141	5.00	6					
5247073	141	148	7.00	6					
5247074	148	155	7.00	6					
5247075	155	160	5.00	6					
5247076	160	165	5.00	6					
5247077	165	170	5.00	6					
5247078	170	175	5.00	6					
5247079	175	180	5.00	6					
5247080	180	185	5.00	6					
5247081	Pulp of 5247080			6					
5247082	185	190	5.00	6					
5247083	190	195	5.00	6					
5247084	195	200	5.00	6					
5247085	200	205	5.00	6					
5247086	205	210.00	5.00	6					
5247087	210.00	215.00	5.00	6					
5247088	215.00	220	5.00	6					
5247089	220	225	5.00	6					
5247090	ME-9			6					
5247091	225	230	5.00	6					
5247092	230	235	5.00	6					
5247093	235	240	5.00	6					
5247094	240	247	7.00	6					
5247095	247	252	5.00	6					
5247096	252	257	5.00	6					
5247097	257	262	5.00	6					
5247098	262	268	6.00	6					
5247099	268	270	2.00	6					
5247100	Blank			6					
5247101	270	275	5.00	6					
5247102	275	279	4.00	6					
5247103	279	285	6.00	6					
5247104	285	290	5.00	6					
5247105	290	295	5.00	6					
5247106	295	300	5.00	6					
5247107	300	305	5.00	6					
5247108	305	310	5.00	6					
5247109	310	316.5	6.50	6					
5247110	Oreas 13b			7					
5247111	316.5	318	1.50	7					
5247112	318	323	5.00	7					
5247113	323	328	5.00	7					
5247114	328	333	5.00	7					
5247115	333	338	5.00	7					
5247116	338	342	4.00	7					
5247117	342	344	2.00	7					
5247118	344	349	5.00	7					
5247119	349	356.2	7.20	7					
5247120	356.2	358.5	2.30	7					
5247121	Pulp of 5247120			7					
5247122	358.5	363.5	5.00	7					
5247123	363.5	368.5	5.00	7					
5247124	368.5	373.5	5.00	7					
5247125	373.5	378.5	5.00	7					
5247126	378.5	383.5	5.00	7					
5247127	383.5	388.5	5.00	7					
5247128	388.5	393.5	5.00	7					
5247129	393.5	397	3.50	7					
5247130	ME-9			7					
5247131	397	402	5.00	7					

5247132	402	406	4.00	7
5247133	406	412.5	6.50	7
5247134	412.5	417.5	5.00	7
5247135	417.5	422.5	5.00	7
5247136	422.5	427.5	5.00	7
5247137	427.5	433	5.50	7
5247138	433	438	5.00	7
5247139	438	443	5.00	7
5247140	Blank			7
5247141	443	448	5.00	7
5247142	448	452.8	4.80	7
5247143	452.8	458	5.20	7
5247144	458	463	5.00	7
5247145	463	468.3	5.30	7
5247146	468.3	472.5	4.20	7
5247147	472.5	477	4.50	7
5247148	477	482	5.00	7
5247149	482	487	5.00	7
5247150	Oreas 13b			7
5247151	487	490	3.00	7
5247152	490	494	4.00	7
5247153	494	497.4	3.40	7
5247154	497.4	498.5	1.10	7
5247155	498.5	503.5	5.00	7
5247156	503.5	508.5	5.00	7
5247157	508.5	513.5	5.00	7
5247158	513.5	518.5	5.00	7
5247159	518.5	523.5	5.00	7
5247160	523.5	528.5	5.00	8
5247161	Pulp of 5247160			8
5247162	528.5	535	6.50	8
5247163	535	540	5.00	8
5247164	540	545	5.00	8
5247165	545	550	5.00	8
5247166	550	555	5.00	8
5247167	555	560	5.00	8
5247168	560	565	5.00	8
5247169	565	570	5.00	8
5247170	ME-9			8
5247171	570	575	5.00	8
5247172	575	580	5.00	8
5247173	580	585	5.00	8
5247174	585	591.3	6.30	8
5247175	591.3	595.4	4.10	8
5247176	595.4	601	5.60	8
5247177	601	602.5	1.50	8
5247178	602.5	607.5	5.00	8
5247179	607.5	612.5	5.00	8
5247180	Blank			8
5247181	612.5	617.5	5.00	8
5247182	617.5	622.5	5.00	8
5247183	622.5	627.5	5.00	8
5247184	627.5	632.5	5.00	8
5247185	632.5	637.5	5.00	8
5247186				
5247187				
5247188				
5247189				
5247190				
5247191				
5247192				
5247193				
5247194				
5247195				
5247196				
5247197				
5247198				
5247199				
5247200				
5247201				
5247202				

Hole ID	Box #	From (m)	To (m)
	1	31.50	45.90
	2	45.90	59.70
	3	59.70	74.30
	4	74.30	88.80
	5	88.80	102.10
	6	102.10	116.00
	7	116.00	130.00
	8	130.00	144.50
	9	144.50	158.40
	10	158.40	172.20
	11	172.20	186.70
	12	186.70	200.70
	13	200.70	214.60
	14	214.60	229.00
	15	229.00	241.50
	16	241.50	256.90
	17	256.90	270.70
	18	270.70	284.70
	19	284.70	299.80
	20	299.80	313.70
	21	313.70	327.90
	22	327.90	341.80
	23	341.80	355.40
	24	355.40	369.40
	25	369.40	380.70
	26	380.70	397.40
	27	397.40	411.60
	28	411.60	426.30
	29	426.30	440.30
	30	440.30	454.80
	31	454.80	469.50
	32	469.50	483.90
	33	483.90	497.90
	34	497.90	512.00
	35	512.00	526.40
	36	526.40	540.70
	37	540.70	555.50
	38	555.50	569.80
	39	569.80	584.00
	40	584.00	598.30
	41	598.30	612.20
	42	612.20	626.00
	43	626.00	640.40
	44	640.40	655.40

45	655.40	669.90
46	669.90	684.00
47	684.00	690.00

Billiken Management

Project:		K1-1
Hole Number:		K-11-26 (P-46)
Units of Measurement:		feet
Location	**NTS Sheet:**	
	Township:	
	Claim No:	
	Grid:	K1-1 Local
	Easting:	9400E
	Northing:	1000N
	Elevation:	
GPS Co-ordinates:	**Zone:**	u15
(if applicable)	**Datum:**	NAD 83
	Easting:	688282
	Northing:	5709954
Collar Dip:		-50
Collar Azimuth:		180
Hole Length:		11200ft
Core Size:		TWB
Recovery:		
Logged By:		Howard Lahti
Date:	**Start:**	Nov 13 ,2011
	Finish:	November 17, 2011
Drilled by:		Cartwright
Date:	**Start:**	November 12, 2011
	Finish:	November 17, 2011

INCLINATION TESTS		
DEPTH	DIP	AZIMUTH
COLLAR	-50	180
90	-49	152.5
260	-47	183.1
420	-45.7	180.3
580	-45	175
740	-44.1	197
900	-44.6	184.8
1060	-44.2	190.1
1220	-45.5	180.7
1380	-46	197.9

Comments

This hole is located to test the mineralization at depth. This hole not only verified the copper mineralization at an intermediate depth but revealed at least to new copper zones past 1100ft deep. It is still open to the west and east.

Billiken Management			PROJECT: K1-1 Project				HOLE NO: K-11-26			PAGE: 2	
FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag ppm	Au ppm	Pd ppm
0.00	30.00	**Overburden (36 ft casing)**									
30.00	238.00	**Volcanoclastic Sediments**									
		Well banded to massive, fine grained, hard and composed mainly of hornblende and silica. The core is locally finely laminated with many fine white re-crystallized quartz bands parallel to the foiliation and bedding (70º to CA). There is ubiquitous epidote alteration and silicification that seems to like certain beds. There is no evidence of structural deformation or sulphide mineralization except for some fine grained pyrite found in some small quartz veins.									
238.00	360.00	**Volcanoclastic Sediment/Mafic Volcanics**									
		Massive, black to dark green, composed mainly of massive fine g rained hornblende, minor silica. Within the mdarker mafic bands are thin seams of white quartz parallel to the bedding at 85o to the CA. at 312 is a 1.5ft section with kspar alteration. There is rare disseminated pyrite at 346 and 361 ft.									
360.00	475.00	**Volcanoclastic Sediment**									
		Similar to above but with grey cherty units interbedded with the other sediments. There are some chert beds with fine grained disseminated pyrite. There is no chalcopyrite in this section.									
475.00	504.60	**Volcanoclastic Sediment/Psuedobreccia**									
		Intercalated beds of volcanoclastic sediments with poorly developed psuedobreccia. The rock is composed of massive fine grained black hornnblende. Some of the beds may be mafic volcanics/tuff. There are no significant sulphides.									
504.60	518.70	**Psuedobreccia**									
		cemented together with white silica. The last 6" to 1 foot with minor									
		barren	E5313332	510	515	5	1040	163.00	<0.5	0.007	0.016
		tr cpy	E5313333	515	518.75	3.75	2520	299.00	1.1	0.009	0.02

Billiken Management			PROJECT: K1-1				HOLE NO: K-11-26			PAGE: 3	
FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu %	Ni ppm	Ag ppm	Au ppm	Pd ppm
518.70	620.00	**Volcanoclastic Sediment/Psuedobreccia**									
		Section is composed of intercalated bands of sediments with thin beds of chert. The volcanoclastic sediments vary from very fine, hornblende bands and grey felsic silica rich beds. They main minerals are hornblende and partially re-crystallized cherty beds. The main chalcopyrite mineral section are as follows: 510.7-535, 555-575 and 575 - 620 continues into the next section to 740ft.)									
		1-4% cpy	E5313334	518.75	525	6.25	4450	1570	3.2	0.031	0.215
		1-2% cpy	E5313335	525	530	5	6290	908	3.2	0.042	0.157
		1-2% cpy	E5313336	530	535	5	5880	967	3.3	0.048	0.189
		tr cpy, erratic	E5313337	535	540	5	5430	1340	3.1	0.023	0.272
		tr cpy	E5313338	540	545	5	6060	1020	3.1	0.03	0.177
		1% cpy	E5313339	545	550	5	7700	984	3.4	0.046	0.178
		tr cpy	E5313341	550	555	5	6520	768	3.5	0.029	0.148
		1-2 % cpy, po	E5313342	555	560	5	9620	1280	5.8	0.056	0.25
		1-2 % cpy, po	E5313343	560	565	5	8130	1460	5.4	0.039	0.248
		<1% cpy	E5313344	565	570	5	7310	1110	4.3	0.033	0.189
		<1% cpy	E5313345	570	575	5	5040	815	2.1	0.014	0.257
		nil cpy	E5313346	575	580	5	2120	352	0.9	0.035	0.027
		<1% cpy	E5313347	580	585	5	2840	669	2	0.025	0.115
		tr cpy	E5313348	585	590	5	2140	417	0.5	0.014	0.06
		tr sul	E5313349	590	595	5	1160	397	0.7	0.004	0.046
		<1% cpy	E5313351	595	600	5	1730	416	0.9	<0.001	0.049
		tr cpy	E5313352	600	605	5	3050	440	1.4	0.012	0.067
		tr cpy	E5313353	605	610	5	1430	362	0.8	0.004	0.015
		nil cpy	E5313354	610	615	5	3830	802	2.1	0.005	0.146
		tr sul	E5313355	615	620	5	2150	508	1.4	0.008	0.078
620.00	651.00	**Volcanoclastic Sediment/Psuedobreccia**									
		Similar to above but the thin psuedobreccia units are thin and poorly developed. These units are interbedded with finely foliated salt and pepper textures sediments. The chalcopyrite mineralization is weak and erratic.									

Billiken Management

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FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu %	Ni ppm	Ag ppm	Au ppm	Pd ppb
			ANALYTICAL RESULTS								
620.00	651.00	**Volcanoclastic Sediment/Psuedobreccia (continued)**									
		tr cpy	E5313356	620	625	5	1740	398	0.9	0.007	0.05
		tr cpy,po, py	E5313357	625	630	5	1230	298	1	0.006	0.015
		<1% cpy, py, po	E5313358	630	635	5	3020	736	1.5	0.028	0.132
		tr cpy	E5313359	635	640	5	2120	341	0.9	0.008	0.039
		tr cpy,po, py	E5313360	640	645	5	3640	805	1.9	0.023	0.102
		nil sul	E5313362	645	650	5	2800	735	1.5	0.014	0.121
651.00	695.00	**Volcanoclastic Sediment/Psuedobreccia**									
		Same as above with a mixture of very fine grained units mixed in with finely laminated units. The section has widespread erratic low concentrations of chalcopyrite.									
			E5313363	650	655	5	3340	672	1.3	0.014	0.111
			E5313364	655	660	5	3880	832	1.9	0.021	0.142
			E5313365	660	665	5	2440	392	1.4	0.004	0.077
			E5313366	665	670	5	2730	507	1	0.009	0.077
			E5313367	670	675	5	1560	415	0.9	0.002	0.036
			E5313368	675	680	5	1170	359	<0.5	0.016	0.015
			E5313369	680	685	5	291	208	<0.5	0.002	<0.001
			5313371	685	690	5	2330	377	<0.5	0.01	0.058
			5313372	690	695	5	**8760**	911	3.3	0.025	0.189
695.00	747.00	**Volcanoclastic Sediment/Mafic Volcanics**									
		This section is mainly composed of mafic and felsic units some with coarse grained magnetite. Some of the black-dark green coasre grained units totally altered to biotite and chlorite may be mafic intrusive dykes that intruded along the major east-west fault zone. The rocks are sheared, brecciated and folded. The section only contains low concentrations of chalcopyrite and other sulphides.									
		<1% cpy, po, py	5313373	695	700	5	**4690**	963	1.4	0.034	0.168
		<1% cpy, po, py	5313374	700	705	5	**6750**	1290	2.9	0.027	0.254
		tr cpy, po, py	5313375	705	710	5	**5410**	1140	2.4	0.013	0.221
		tr cpy, po, py major fault	5313376	710	715	5	**8620**	1040	3.7	0.043	0.199

Billiken Management

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FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu %	Ni ppm	Ag ppm	Au ppm	Pd ppm
695.00	747.00	**Volcanoclastic Sediment/Mafic Volcanics (continued)**									
		tr cpy, po, py major fault	5313377	715	720	5	**4470**	1130	2.8	0.022	0.168
		tr cpy, po, py major fault	5313378	720	725	5	**5530**	929	1.8	0.044	0.15
		tr sul, siliceous rock	5313379	725	730	5	**3670**	485	<0.5	0.017	0.063
		tr py, tr cpy	5313381	730	735	5	**3200**	953	1.1	0.01	0.134
		tr py, tr cpy	5313382	735	740	5	**3220**	889	1.2	0.009	0.178
		tr cpy	5313383	740	745	5	**3250**	868	1.2	0.011	0.125
		<1% cpy, py	5313384	745	750	5	**6940**	1230	2.9	0.024	0.255
747.00	766.00	**Psuedobreccia**									
		Well developed with hornblende laths cemented in white fine grained mass of silica. The section has 1% chalcopyrite-pyrite in an erratic pattern.									
		1% cpy	5313385	750	755	5	**8910**	1020	3.3	0.029	0.196
		tr cpy, py	5313386	755	760	5	**4680**	806	2	0.019	0.159
		tr sul, tr cpy	5313387	760	765	5	**6920**	677	2.5	0.026	0.11
766.00	832.00	**Deformation Zone**									
		In this section it is difficult to determine the exact lithology as all of the mafic volcanic, intrusive rocks and pelitic units are all totally altered to biotite-chlorite and minor actinolite. Certain units exhibit more structural and other types of deformation than others. The section is mineralized with chalcoprite, pyrrhotite and pyrite. Short section can have over 5% chalcopyrite.									
		1% cpy	5313388	765	770	5	**5550**	1130	2.5	0.018	0.185
		<1% cpy	5313389	770	775	5	**4480**	1150	2.6	0.011	0.14
		tr sul	5313391	775	780	5	1690	996	1	0.006	0.092
		tr sul, tr cpy	5313392	780	785	5	**3690**	895	1.6	0.014	0.127
		<1% cpy, po	5313393	785	790	5	2220	696	1.2	0.005	0.072
		<1% cpy, po	5313394	790	795	5	**3990**	1060	2.5	0.012	0.155
		<1% cpy	5313395	795	800	5	2830	991	2.8	0.012	0.112
		mainly mag	5313396	800	805	5	1480	1090	1.2	0.007	0.078
		mainly mag	5313397	805	810	5	940	1260	1.4	0.003	0.05
		mainly mag	5313398	810	815	5	565	1390	1.4	<0.001	0.041

Billiken Management			PROJECT: K1-1				HOLE NO: K-11-26			PAGE:	
			ANALYTICAL RESULTS								
FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag ppm	Au ppm	Pd ppm
766.00	832.00	**Deformation Zone (continued)**									
		mainly mag	5313399	815	820	5	1070	1220	1.4	0.005	0.049
		mainly mag	5313400	820	825	5	1960	1060	1	0.015	0.064
		tr sul with mass biotite	5313402	825	830	5	**4010**	789	1.3	0.022	0.102
832.00	867.00	**Psuedobreccia/Mafic Volcanics**									
		Intercalated psuedobreccia and totally altered mafic units with massive biotite and chlorite.									
			5313403	830	835	5	**5680**	1120	2	0.018	0.178
			5313404	835	840	5	**5300**	1050	2	0.017	0.138
			5313405	840	845	5	2690	885	1.4	<0.001	0.184
			5313406	845	850	5	**6670**	1420	2.2	0.027	0.165
			5313407	850	855	5	**4090**	1170	1.3	0.007	0.156
			5313408	855	860	5	**5980**	901	1.5	0.016	0.144
			5313409	860	865	5	**3060**	801	1.1	0.01	0.088
867.00	955.00	**Volcanoclastic Sediments/Mafic Volcanics**									
		Section with typical volcanoclastic sediments interbedded with dark green to black mafic volcan rock composed of biotite-chlorite. The volcanoclastics are generally very fine grained massive to well banded and may have the original hornblende unchanged. The section has an erratic low concentration of chalcopyrite and other sulphides.									
		tr sul, mag	E5313411	865	870	5	4160	1110	2.2	0.012	0.129
		<1% cpy	E5313412	870	875	5	4310	1280	2.4	0.018	0.138
		tr po, cpy, py	E5313413	875	880	5	2830	278	1.1	0.01	0.027
		barren	E5313414	880	885	5	1460	383	0.5	0.003	0.04
		tr cpy	E5313415	885	890	5	3760	1170	1.8	0.018	0.115
		tr sul, tr cpy	E5313416	890	895	5	3700	1090	2.3	0.021	0.138
		tr cpy	E5313417	895	900	5	4480	804	2.2	0.017	0.093
		barren	E5313418	900	905	5	2750	420	1	0.007	0.04
		tr cpy	E5313419	905	910	5	4490	685	1.9	0.029	0.083
		<1% cpy	E5313421	910	915	5	3750	641	2.1	0.024	0.065
		1% cpy	E5313422	915	920	5	4410	938	1.9	0.024	0.111

Billiken Management			PROJECT: K1-1				HOLE NO: K-11-26			PAGE:	
			ANALYTICAL RESULTS								
FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag ppm	Au ppm	Pd ppm
867.00	955.00	**Volcanoclastic Sediments/Mafic Volcanics (continued)**									
		1% cpy	E5313423	920	925	5	4850	1070	2.4	0.019	0.136
		<1% cpy	E5313424	925	930	5	3050	1060	1.9	<0.001	0.077
		<1% cpy	E5313425	930	935	5	3740	914	2.2	<0.001	0.078
		1-2% cpy	E5313426	935	940	5	6990	1390	3.8	0.024	0.169
		tr cpy	E5313427	940	945	5	4870	1450	2.8	0.024	0.243
		tr sul, , mag	E5313428	945	950	5	4360	1460	2.7	0.033	0.197
		rare sul, , mag	E5313429	950	955	5	4060	1290	2.6	0.02	0.152
955.00	1015.00	**Volcanoclastic Sediment/Psuedobreccia**									
		Similar to the above but several thin bands of poorly developed psuedobreccia. The volcanoclastic sediments have less deformation but still composed of very fine grained units. The bedding/foliation isalmost perpendicular to the CA. Near the beginning of the section there are faults and shear zones in some of the more mafic units.									
		tr sul, fault	E5313431	955	960	5	1280	628	0.8	0.006	0.054
		tr sul, fault	E5313432	960	965	5	1090	689	0.9	0.006	0.046
		py in shear chl, biotite	E5313433	965	970	5	1670	875	1.1	0.008	0.052
		barren, platy py	E5313434	970	975	5	1650	806	1.1	0.007	0.082
		<1% cpy, micro-fract	E5313435	975	980	5	3340	642	1.5	0.012	0.09
		<1% cpy, micro-fract	E5313436	980	985	5	576	242	<0.5	0.001	0.024
		tr cpy	E5313437	985	990	5	2670	734	2.9	0.006	0.111
		nil sul	E5313438	990	995	5	492	236	<0.5	0.013	0.043
		tr cpy	E5313439	995	1000	5	537	221	0.8	0.001	0.017
		tr cpy, 2.5' core lost, core ground up	E5313440	1000	1005	5	1250	500	<0.5	0.004	0.05
		tr cpy, 2' core lose severe fault zone core highly brocken and ground up.	E5313442	1005	1010	5	1640	766	0.9	0.007	0.095
		tr cpy, po, py	E5313443	1010	1015	5	4420	687	2.2	0.015	0.086
1015.00	1030.00	**Mafic Volcanics**									
		Short section of black to dark green totally altered rock withmassive biotite and chlorite. Section affected by major fault zone.									

			PROJECT: K1-1				HOLE NO: K-11-26			PAGE: 8
Billiken Management											
FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag ppm	Au ppm	Pd ppm
1015.00	1030.00	**Mafic Volcanics (continued)**									
		<1%	E5313444	1015	1020	5	5180	1010	2.4	0.032	0.178
		2-3% cpy	E5313445	1020	1025	5	5320	934	3.5	0.017	0.128
		2-3% cpy	E5313446	1025	1030	5	5360	1280	3.1	0.015	0.159
1030.00	1045.00	**Fault Zone**									
		Black, dark green mafic rock composed of biotite and chlorite that has undergone structural deformation. This soft rock is ameanable to deformation while silica rich rock is untouched and unaltered. Locally it can be enriched in chalcopyrite with a concentration that can exceed 3% over a short distance.									
		2-3% cpy	E5313447	1030	1035	5	7850	1160	3.6	0.025	0.176
		<1% cpy, po, py	E5313448	1035	1040	5	6080	1150	3.2	0.028	0.198
		2-4% cpy	5313450	1040	1045	5	6290	1120	2.8	0.161	1.23
1045.00	1060.00	**Mafic Volcanics**									
		This rock is similar to that above but less deformed. The mafic rocks are still altered to biotite,chlorite with minor hornblende. There are some magnetic bands in the section									
		1-2% cpy	5313451	1045	1050	5	2790	1030	<0.5	0.012	0.098
		tr sul, mag	5313452	1050	1055	5	**3140**	1190	1.9	0.002	0.104
		tr cpy, platy py	5313453	1055	1060	5	2590	1180	1.5	0.011	0.103
1060.00	1170.00	**Volcanoclastic Sediment/Mafic Volcanics**									
		The core is composed of sediments massive to banded with the most altered mafic units probably mafic vlcanics (tuff). The sediment units are generally fairly hard with fine grained hornblende and minor biotite. The section has a low concentration of chalcopyrite and other sulphides until 1135 where there is a large increase in copper mineralization.									
		barren	E5313454	1060	1065	5	2030	726	2.4	<0.001	0.084
		tr sul, IF mag	E5313455	1065	1070	5	3210	1440	2.2	0.021	0.131

Billiken Management			PROJECT: K1-1				HOLE NO: K-11-26			PAGE: 9	
FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu %	Ni ppm	Ag g/t	Au ppb	Pd ppb
1060.00	1170.00	**Volcanoclastic Sediment/Mafic Volcanics (continued)**									
		tr cpy, IF	5313456	1070	1075	5	**3260**	1640	2.6	0.018	0.113
		tr cpy, po	5313457	1075	1080	5	**3450**	1560	2.7	0.024	0.134
		tr cpy, po	5313458	1080	1085	5	2660	1670	2.4	0.017	0.118
		tr cpy, po	5313459	1085	1090	5	**4180**	1780	3.8	0.023	0.15
		tr cpy, po, v f gr	5313461	1090	1095	5	**3090**	1410	2.7	0.021	0.131
		tr cpy, po, v f gr	5313462	1095	1100	5	**4450**	1150	3.4	0.029	0.146
		tr cpy, po, v f gr	5313463	1100	1105	5	**3450**	1010	2.4	0.021	0.115
		tr cpy, po, v f gr	5313464	1105	1110	5	2710	958	1.5	0.01	0.096
		<1% cpy	5313465	1110	1115	5	2080	1030	0.7	0.02	0.09
		tr cpy, If ,mag	5313466	1115	1120	5	**3660**	992	2.4	0.015	0.12
		tr cpy, py, If mag	5313467	1120	1125	5	**3990**	965	2.7	0.025	0.116
		tr cpy	5313468	1125	1130	5	**4430**	1040	2	0.033	0.142
		tr cpy, py	5313469	1130	1135	5	**3040**	876	2.3	0.023	0.107
		1-2% cpy	5313471	1135	1140	5	**3810**	838	2.5	0.019	0.13
		3-6% cpy, po	5313472	1140	1145	5	**9430**	1160	4.7	0.031	0.184
		1-3% cpy	5313473	1145	1150	5	**4830**	831	1.9	0.028	0.107
		1-3% cpy	5313474	1150	1155	5	**3900**	1020	1.2	0.014	0.192
		2-3% cpy	5313475	1155	1160	5	**3900**	1060	1.6	0.013	0.18
		1% cpy	5313476	1160	1165	5	**4320**	793	1.3	0.033	0.118
		tr cpy, <1% py	5313477	1165	1170	5	**3540**	837	1.6	0.015	0.114
1170.00	1370.00	**Volcanoclastic Sediment**									
		The rock becomes volcanoclastic sediment with reare or non-existant volcanic tuff or flows. The lithology consists of intercalated mafic and felsic units, very fine grained, moderately hard and with a prenomenace of fine grained hornblende. There are local areas with an increase in chalcopyrite usually over short distances.									
		1% cpy, py	5313478	1170	1175	5	**3690**	808	1.8	0.019	0.107
		1-2% cpy, py	5313479	1175	1180	5	**5520**	1130	2	0.022	0.171
		1% cpy, py	5313480	1180	1185	5	1790	846	0.5	0.006	0.114
		1% cpy, py	5313482	1185	1190	5	**3580**	948	1.5	0.024	0.112
		1-2% cpy	5313483	1190	1195	5	**4860**	1140	2.9	0.017	0.123
		1-2% cpy	5313484	1195	1200	5	**5410**	1270	2.5	0.022	0.177
		1-2% cpy, mag	5313485	1200	1205	5	**5590**	1150	2.8	0.027	0.149

Billiken Management			PROJECT: K1-1				HOLE NO: K-11-26			PAGE: 10	
			ANALYTICAL RESULTS								
FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag ppm	Au ppm	Pd ppm
1170.00	1370.00	**Volcanoclastic Sediment (continued)**									
		1-2% cpy, mag	5313486	1205	1210	5	**5340**	1250	3	0.022	0.153
		1% cpy	5313487	1210	1215	5	2930	840	2	0.038	0.088
		2-3% cpy po, py	5313488	1215	1220	5	**3850**	1000	1.5	0.015	0.152
		1-2% cpy, mag	5313489	1220	1225	5	2320	894	0.7	0.011	0.097
		1% cpy, py	E5313491	1225	1230	5	2800	886	1.8	0.012	0.084
		<1% cpy	E5313492	1230	1235	5	3800	932	2.3	0.018	0.106
		1% cpy, py	E5313493	1235	1240	5	3480	952	2.1	0.011	0.1
		tr cpy	E5313494	1240	1245	5	3370	641	2.6	0.014	0.073
		tr cpy, 1% py	E5313495	1245	1250	5	2430	862	2.3	0.007	0.098
		tr cpy	E5313496	1250	1255	5	3350	1030	2.8	0.015	0.115
		tr cpy, fault	E5313497	1255	1260	5	1690	734	1.9	0.014	0.074
		1% cpy, py	E5313498	1260	1265	5	3460	1020	2.3	0.016	0.124
		1% cpy, py	E5313499	1265	1270	5	4310	1020	2.2	0.032	0.136
		<1%, ep, qtz vein	E5313501	1270	1275	5	2000	574	0.9	0.012	0.067
		tr cpy	E5313502	1275	1280	5	2390	775	1.7	0.01	0.084
		<1% cpy, py, mag	E5313503	1280	1285	5	3600	988	2.9	0.018	0.141
		1% cpy	E5313504	1285	1290	5	1810	661	1.6	0.013	0.064
		1-2% cpy	E5313505	1290	1295	5	3500	821	2.5	0.021	0.121
		1-2% cpy	E5313506	1295	1300	5	2710	635	1.9	0.037	0.084
		1-2% cpy, py	E5313507	1300	1305	5	2820	801	1.7	0.014	0.128
		1-2% cpy, py	E5313508	1305	1310	5	1750	470	1.9	0.005	0.063
		1-2% cpy, py	E5313509	1310	1315	5	2430	746	2.1	0.006	0.092
		1-2% cpy, py	E5313511	1315	1320	5	3670	1070	3.2	0.008	0.126
		1% cpy	E5313512	1320	1325	5	3090	906	1.8	0.025	0.127
		tr cpy	E5313513	1325	1330	5	2470	676	1.3	0.008	0.086
		tr cpy	E5313514	1330	1335	5	2300	825	2.3	0.013	0.105
		1% cpy	E5313515	1335	1340	5	1780	612	1.1	0.006	0.067
		1% cpy	E5313516	1340	1345	5	866	395	1.1	0.001	0.034
		tr sul	E5313517	1345	1350	5	126	126	0.8	<0.001	0.004
		barren	E5313518	1350	1355	5	91	121	0.9	0.011	0.003
	EOH										

Billiken Management

PROJECT: Thierry K1-1	HOLE NO:	PAGE:

FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu %	Ni ppm	Ag g/t	Au ppb	Pd ppb
		BLANK	5313380				57.8	10.3	0.8	<0.001	<0.001
		Standard - OREAS 13G	5313390				2440	2370	1.7	0.198	0.13
		Pulp Replicate of 5313400	5313401				1780	1010	0.8	0.015	0.063
		Standard - ME-9	5313410				6700	8730	4.1	0.127	1.3
		BLANK	5313420				99.2	90.8	<0.5	<0.001	0.002
		Standard - OREAS 13G	5313430				nss	nss	nss	0.214	0.136
		Pulp Replicate of 5313440	5313441				1210	491	1.2	<0.001	0.047
		Standard - ME-9	5313449				7050	9180	4.7	0.016	0.185
		BLANK	5313460				97.5	50.2	<0.5	0.013	0.001
		Standard - OREAS 13G	5313470				2460	2430	1.9	0.204	0.119
		Pulp Replicate of 5313480	5313481				2030	891	<0.5	0.008	0.113
		Standard - ME-9	5313490				6760	9060	4.6	0.133	1.28

Hole ID	Box #	From (m)	To (m)
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Billiken Management

Project:		K1-1
Hole Number:		K-11-23
Units of Measurement:		feet
Location	**NTS Sheet:**	
	Township:	
	Claim No:	
	Grid:	K1-1 Local
	Easting:	10900E
	Northing:	750N
	Elevation:	
GPS Co-ordinates:	**Zone:**	
(if applicable)	**Datum:**	NAD83
	Easting:	688738
	Northing:	5709895
Collar Dip:		-50
Collar Azimuth:		180
Hole Length:		950
Core Size:		TWB
Recovery:		
Logged By:		Howard Lahti
Date:	**Start:**	November 9, 2011
	Finish:	November 12, 2011
Drilled by:		Cartwright
Date:	**Start:**	November 8, 2011
	Finish:	November 11, 2011

INCLINATION TESTS

DEPTH	DIP	AZIMUTH
COLLAR	-50	180
70	-49.3	
150	-48.8	210.8
310	-46.9	160.2
470	-46.7	336.2
630	46.3	202.5
790	-46.3	188.2
950	-46.2	203.1

Comments

This hole was located to undercut K-11-19 at a depth of about 200 feet. The section as a whole is not as good as the hole that cut the mineralized section higher up. The copper mineralization is extensive but low grade. Also the intersection of the major east-west fault is not as intense as holes drilled further to the west. The copper zone is weak from 430-470 (trace chalcopyrite, pyrrhotite and pyrite). the Main Zone from 470-530 (1-4% cpy) and a thick very low grade section from 530 to 775.

Billiken Management			PROJECT: K1-1				HOLE NO: K-11-23			PAGE: 2	
			ANALYTICAL RESULTS								
FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
0.00	49.00	**Casing** (overburden 40)									
49.00	66.40	**Volcanoclastic Sediment**									
		Massive, light to dark grey, well banded at 85º and composed mainly of hornblende and silica. There are minor narrow bands with epidote alteration. The core shows little evidence of structural deformation.									
66.40	69.70	**Quartz Feldspar Porphyry**									
		This hard, greyish dyke has fuzzy crystals due to re-heating.									
69.70	155.00	**Volcanoclastic Sediment**									
		This section is well banded with light more felsic units intercalated with the dark more mafic bands. The principle minerals are hornblende and silica. There are greyish white chert beds between 151.25 to 153. No sulphides were seen except minor amounts in thin quartz veins.									
155.00	340.70	**Volcanoclastic Sediment**									
		As above this section is well banded with a few thicker massive units. The core is composed of hornblende, silica and erratic epidote which alters only certain bands. The bedding and foliation is almost perpendicular to the CA. There are several thin quartz feldspar dykes. Rare pyrite was seen in some small quartz veins.									
340.70	404.70	**Volcanoclastic Sediment**									
		Similar to above with most of the section with highly altered mafic units fine grained and with bedding/foliation almost perpendicular to the CA. No sulphides seen.									
404.70	418.00	**Mafic Volcanics**									
		This section is composed of hornblende and biotite, massive, with small black flecks. It is posible that this section is a mafic flow or type of tuff.									

Billiken Management			PROJECT: K1-1				HOLE NO: K-11-23			PAGE: 3	
			ANALYTICAL RESULTS								
FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
413.00	430.00	**Volcanoclastic Sediment/Tuff**									
		The core is mainly composed of hornblende with some biotite. The dark grenish grey rock rarely has tiny spects of sulphide.									
		a shear with chlorite									
		contact with weakly mineralized copper zone									
430.00	470.00	**Weak Copper Zone**									
		As the hole getss closer to the major fault/shear zone the Volcanoclastic Sediment and intercalated tuff? Mafic volcanics become mineralized with chalcopyrite, pyrrhotite and pyrite. The first 40 ft of the mineralization is low grade with almost equal anounts of each. The foliation remains almost perpendicular to the CA. Psuedobreccia starts at 439.	E5313057	420	425	5	952	436	<0.5	0.004	0.059
			E5313058	425	430	5	683	242	<0.5	0.004	0.016
		Tr cpy, po, py	E5313260	430	435	5	182	235	<0.5	<0.001	0.009
		Tr cpy, po, py	E5313261	435	440	5	586	328	<0.5	<0.001	0.032
		tr cpy	E5313262	440	445	5	1610	436	<0.5	0.004	0.041
		1% cpy	E5313263	445	450	5	1290	370	0.6	0.003	0.047
		no sul	E5313264	450	455	5	284	224	<0.5	<0.001	0.017
		Tr cpy, po, py	E5313265	455	460	5	**3680**	450	1.2	0.009	0.156
		Tr cpy, po, py	E5313266	460	465	5	1150	215	<0.5	0.004	0.05
		Tr cpy, po, py	E5313267	465	470	5	1740	204	0.7	0.003	0.039
470.00	530.00	**Main Copper Zone**									
		Mainly volcanoclastic sediment with possible intercalated mafic tuff and /or mafic volcanics. The psuedobreccia tha started at 439 extends to 505.5 and contains some the highes grade copper mineralization. The section from 505.5 to 530 is volcanoclastic sediment. It is believed that the psuedobreccia is a also part of the volcanoclastic sediment sequence but the strange growths of large hornblende angular to subanglular crystals gives the unit its strange texture.									
		<1% cpy	E5313268	470	475	5	1700	312	0.8	0.015	0.051
		1-2% cpy	E5313270	475	480	5	**5660**	630	2.3	0.063	0.306
		1-2% cpy	E5313271	480	485	5	**7470**	570	3	0.118	0.124

Billiken Management			PROJECT:				HOLE NO:			PAGE: 4	
FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
470.00	530.00	**Main Copper Zone (Continued)**									
		2-3% cpy	E5313272	485	490	5	**11000**	1100	6.3	0.111	0.255
		1-2% cpy	E5313273	490	495	5	**5320**	497	1.8	0.045	0.107
		tr cpy	E5313274	495	500	5	1520	402	<0.5	0.01	0.102
		<1% cpy	E5313275	500	505	5	**3420**	606	0.9	0.028	0.15
		tr cpy	E5313276	505	510	5	1320	422	<0.5	0.019	0.063
		<1% cpy, po	E5313277	510	515	5	1140	319	<0.5	0.029	0.046
		1-2% cpy	E5313278	515	520	5	**7710**	678	3.2	0.042	0.221
		1-2% cpy	E5313279	520	525	5	**8560**	968	3.5	0.037	0.324
		<1% cpy, po	E5313281	525	530	5	942	236	<0.5	0.004	0.07
530.00	780.00	**Weak Copper Zone**									
		This part of the core has a low grade chalcopyrite concentration with erratic higher grade sections. There is also a variable concenration of pyrrhotite and pyrite. The host rock is mainly volcanoclastic sediments but also has sections exhibiting the deformation and alteration of a major fault/shear system. This broad mineralized zone also has several quartz feldspar porphyry dykes with an example at 665-674. There are also some massive white quartz veins with orange kspar alteration that are greater than 1 foot thick. The quartz veins are not directly related to fault structures but appear more like injection quartz with irregular corrosive contacts with the host rock. There are two main areas that exhibit major fault/shear characteristics: 674-695 and 722-739.4 ft. The rock in these structures can be composed of large crystals of biotite and chlorite (actinolite) with some breccia and a well developed variable foliation. Some of the darl mafic rock may have been thin mafic intrusive dykes that originated deep in the crust. Minor units of psuedobreccia.									
		tr cpy	E5313282	530	535	5	**6930**	931	3.2	0.036	0.311
		tr cpy, po, py	E5313283	535	540	5	2260	402	<0.5	0.007	0.098
		tr cpy, po, py	E5313284	540	545	5	2290	335	<0.5	0.008	0.085
		< 1% cpy, po	E5313285	545	550	5	1410	242	<0.5	0.006	0.051
		1-2% cpy	E5313286	550	555	5	**3800**	585	1.3	0.01	0.176
		tr cpy	E5313287	555	560	5	1110	257	<0.5	0.001	0.037
		no sul	E5313288	560	565	5	1450	285	<0.5	0.015	0.061
		tr cpy, po, py	E5313290	565	570	5	1850	376	0.6	0.006	0.063
		tr sul	E5313291	570	575	5	2260	485	1.4	0.01	0.104

Billiken Management			PROJECT: k1-1				HOLE NO: K-11-23			PAGE: 5	
FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
530.00	780.00	**Weak Copper Zone (Continued)**									
		tr cpy	E5313292	575	580	5	806	248	<0.5	0.002	0.022
		1-2% cpy	E5313293	580	585	5	**3920**	580	1.9	0.013	0.117
		<1% cpy, po	E5313294	585	590	5	**3260**	507	1.5	0.012	0.099
		no sul	E5313295	590	595	5	1100	259	<0.5	0.002	0.031
		tr cpy	E5313296	595	600	5	1600	378	0.9	0.006	0.074
		tr cpy	E5313297	600	605	5	785	225	<0.5	0.004	0.021
		tr cpy	E5313298	605	610	5	1150	309	0.7	0.019	0.052
		tr cpy	E5313300	610	615	5	995	262	<0.5	0.005	0.035
		tr sul	E5313301	615	620	5	971	237	<0.5	0.005	0.029
		no sul	E5313302	620	625	5	469	208	<0.5	0.002	0.023
		tr cpy	E5313303	625	630	5	965	219	<0.5	0.002	0.039
		tr cpy	E5313304	630	635	5	1580	321	0.7	0.006	0.059
		tr cpy	E5313305	635	640	5	1310	253	<0.5	0.003	0.043
		tr cpy, po, py mafic host	E5313306	640	645	5	910	227	<0.5	0.003	0.031
		tr cpy, po, py	**E5313314**	645	650	5	2750	430	1	0.012	0.093
		tr cpy, po, py	E5313307	650	655	5	2890	577	1.9	0.029	0.143
		1% cpy	E5313308	655	660	5	1640	334	1.4	0.022	0.069
		tr cpy	E5313310	660	665	5	1210	406	0.9	0.005	0.076
		nil sul	E5313311	665	670	5	124	33.7	<0.5	<0.001	0.006
		tr cpy, po, py	E5313312	670	675	5	415	137	<0.5	0.001	0.025
			E5313313	Void							
		nil sul	E5313315	675	680	5	2550	780	1.8	0.012	0.08
		tr py, po	E5313316	680	685	5	2040	546	0.6	0.01	0.047
		qtz, tr sul									
		tr cpy, py	E5313317	720	725	5	1730	522	0.8	0.002	0.08
		tr cpy, py	E5313318	725	730	5	2180	425	2.3	0.006	0.068
		tr cpy, py	E5313319	730	735	5	2070	842	2.3	0.005	0.098
		tr cpy, py, qtz vein	E5313321	735	740	5	1780	569	1.1	0.022	0.071
		tr py, qtz	E5313322	740	745	5	1600	464	<0.5	0.005	0.077
		tr py	E5313323	745	750	5	1020	580	<0.5	0.003	0.037
		<1% cpy	E5313324	750	755	5	1160	887	<0.5	0.003	0.054
		tr cpy	E5313325	755	760	5	2060	437	0.7	0.006	0.084
		1.5' qtz vein, tr py	E5313326	760	765	5	3460	817	1	0.01	0.154
		tr cpy	E5313327	765	770	5	815	369	<0.5	0.003	0.057
		<1% cpy	E5313328	770	775	5	1510	602	0.6	0.004	0.1
			E5313329	775	780	5	1440	366	<0.5	0.004	0.061

Billiken Management			PROJECT: K1-1				HOLE NO: K-11-23			PAGE: 6
			ANALYTICAL RESULTS							
FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
780.00	795.00	**Volcanoclastic Sediment**									
		This is the same as the last part of the mineralized zone but much less sulphides.	E5313331	780.00	785.00	5.00	291	163	1	0.001	0.01
795.00	808.00	**Psuedobreccia**									
		Well banded with intercalated white quartz rich layers with biotite and hornblende rich mafic bands. This is considered a poorly formed version of this unit.									
808.00	844.00	**Volcanoclastic Sediment**									
		Massive to well banded, fine grained, grey to dark green and composed of mainly hornblende, biotite and silica. The bedding is perpendicular to the CA. Some units have small black specks of biotite. The more mafic units may be tuff bands. Thereis very rare pyrite and pyrrhotite.									
844.00	888.00	**Volcanoclastic Sediment**									
		The rock changes from massive homogeneous bands and interbedded tuff to thick units of a salt and pepper textured rock composed mainly of hornblende and silica. There are also felsic units intercalated with the salt and pepper and mafic units. A tuff unit with possible large black stretched lapilli is located at 848-853.5. There are no sulphides.									
888.00	950.00	**Volcanoclastic Sediment**									
		very hard, massive and a light to to dark grey. The general rock below the									
	EOH										

Billiken Management

PROJECT: | HOLE NO: | PAGE:

FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
		BLANK	5313059				33.2	8.3	<0.5	0.01	0.00
		Standard - OREAS 13G	5313269				2580	2070	<0.5	0.22	0.13
		Pulp Replicate of 5313279	5313280				8860	969	3.20	0.06	0.34
		Standard - ME-9	5313289				6750	7810	2.60	0.10	1.27
		BLANK	5313299				14.5	6.6	<0.5	<0.001	0.001
		Standard - OREAS 13G	5313309				2450	2190	2.2	0.199	0.12
		Pulp Replicate of 5313319	5313320				1780	569	1.1	0.022	0.071
		Standard - ME-9	5313330				NSS	NSS	NSS	0.162	1.24

Hole ID	Box #	From (m)	To (m)
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Billiken Management

Project:	K1-1
Hole Number:	K-11-21
Units of Measurement:	feet

Location	**NTS Sheet:**	
	Township:	
	Claim No:	
	Grid:	K1-1 Local
	Easting:	10900E
	Northing:	300N
	Elevation:	
GPS Co-ordinates:	**Zone:**	U 15
(if applicable)	**Datum:**	NAD 83
	Easting:	688740E
	Northing:	5709759
Collar Dip:		-45
Collar Azimuth:		180
Hole Length:		610
Core Size:		TWB
Recovery:		99%
Logged By:		Howard lahti
Date:	**Start:**	November 5, 2011
	Finish:	November 6, 2011
Drilled by:		
Date:	**Start:**	November 4, 2011
	Finish:	November 5, 2011

INCLINATION TESTS

DEPTH	DIP	AZIMUTH
COLLAR	-45	180
90	-45.3	185.2
150	-45.4	183.4
310	-46	174.5
460	-46	169.8
610	-46.8	180.5

Comments

Good copper mineralization was encoountered at a shallow depth. This hole confirmed the up side mineralization found in K-11-19.

Billiken Management			PROJECT: K1-1				HOLE NO: K-11-21			PAGE: 2	
			ANALYTICAL RESULTS								
FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
0.00	45.00	Overburden (casing)									
45.00	78.00	**Metavolcanoclastic Sediment**									
		hornblende, with very thin bands of quartz and felsapar with a foliation of 85-									
78.00	151.00	**Psuedobreccia**									
		Mainly coarse grained composed of white silica with subangular to angular laths of black hornblende and very white albite. Within the psuedobreccia are thin bands of black laminated volcanoclastic sediment or mafic tuff. The foliation in the mafic bands 85-90º to CA. The are rare blebs/disseminations of chalcopyrite and rare pyrrhotite. From **93-104.5** is mafic tuff or volcanoclastic sediment. from 116-138 the psuedobreccia is highly altered with green epidote, orange kspar making the core very colorful. Parts of this section are fractured and then healed with epidote. The section 138-151 is a mixture of psuedobreccia and mafic tuff that is poorly devloped.									
		psuedobreccia	E5313069	125	130	5	1390	262	<0.5	0.009	0.063
		<<1% cpy	E5313070	130	135	5	1350	201	<0.5	0.011	0.052
		tr sul (py)	E5313071	135	140	5	1780	499	<0.5	0.021	0.106
		<1% cpy	E5313072	140	146	6	1050	460	<0.5	0.002	0.054
		<1% cpy po	E5313073	146	151	5	2830	474	1.4	0.012	0.131
151.00	300.00	**Copper Sulphide Zone**									
		The rock changes to black coarse grained rock composed mainly of biotite and chlorite, (actinolite) with a variable amount of chalcopyrite. The concentration can vary from 1-5% and can change over short distances. The mineralization is also concentrated along bands or in small patches. Some very narrow bands can have 10-12% chalcopyrite with minor pyrrhotite. There are rare white specks which may be pentlandite.									

Billiken Management			PROJECT: K1-1				HOLE NO: K-11-21			PAGE: 3	
FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
151.00	300.00	**Copper Sulphide Zone (Continued**									
		Mafic vol	E5313074	151	155	4	1080	683	0.9	<0.001	0.05
		Contact with zone	E5313075	175	180	5	261	490	<0.5	<0.001	0.03
		tr cpy	E5313076	180	185	5	393	538	0.8	<0.001	0.02
		tr cpy	E5313077	185	190	5	664	415	0.7	0	0.05
		1-3% cpy	E5313078	190	195	5	**8180**	1150	4.4	0.04	0.31
		2-4% cpy	E5313079	195	200	5	**5950**	891	3.1	0.03	0.22
		1-2% cpy	E5313080	200	205	5	**10200**	1510	4.7	0.07	0.4
		<1% cpy	E5313081	205	210	5	**9070**	1230	4	0.04	0.36
		2-4% cpy	E5313082	210	215	5	**9700**	1660	4.1	0.03	0.38
		1-3% cpy	E5313083	215	220	5	**9700**	1640	4.3	0.04	0.38
		2-4% cpy	E5313084	220	225	5	**10000**	1560	4.1	0.04	0.45
		1-2% cpy	E5313085	225	230	5	**4960**	967	2.1	0.01	0.22
		<1% cpy	E5313086	230	235	5	1790	345	<0.5	<0.001	0.07
		1-1.5% cpy	E5313087	235	240	5	**11500**	1070	5.8	0.04	0.32
		<1% cpy	E5313088	240	245	5	**7970**	504	2.5	0.05	0.22
		tr cpy	E5313089	245	250	5	**1920**	257	<0.5	0	0.08
		1-2% cpy	E5313090	250	255	5	**7510**	735	2.8	0.028	0.543
		2-4% cpy	E5313091	255	260	5	**7610**	718	3	0.021	0.146
		2-3% cpy	E5313092	260	265	5	**4970**	616	1	0.018	0.13
		1-1.5% cpy	E5313093	265	270	5	**5770**	842	3.3	0.017	0.225
		<1% cpy	E5313094	270	275	5	**4150**	664	1.3	0.013	0.172
		<<1% cpy	E5313095	275	280	5	368	213	<0.5	<0.001	0.017
		tr cpy	E5313096	280	285	5	1590	382	<0.5	0.003	0.066
		1-2% cpy	E5313098	285	290	5	**4250**	773	1	0.007	0.209
		1-2% cpy	E5313099	290	295	5	**6060**	879	2	0.013	0.214
		1-2% cpy End of Copper Zone	E5313100	295	300	5	**4580**	818	1.9	0.017	0.218
300.00	370.00	**Mafic /Intermediate Volcanics**									
		This section may be composed of metavolcanoclastic rocks. Rock is black to fine grained with parts laminated where bands are parallel to the foliation of 85-90º. Section with erratic trace chalcopyrite.									
		trace cpy	E5313101	300	305	5	699	222	<0.5	0.003	0.02
		trace cpy	E5313102	305	310	5	1050	253	<0.5	0.003	0.033
		trace cpy	E5313103	310	315	5	891	260	<0.5	<0.001	0.028

Billiken Management			PROJECT: K1-1				HOLE NO: K-11-21			PAGE: 4	
			ANALYTICAL RESULTS								
FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
300.00	370.00	**Mafic /Intermediate Volcanics (continued)**									
		trace cpy	E5313104	315	320	5	1930	385	<0.5	0.005	0.052
		trace cpy	E5313105	320	325	5	1270	347	<0.5	0.003	0.054
		trace cpy	E5313160	325	330	5	794	220	<0.5	0.002	0.028
		<1% cpy with 1.5 ft qtz vein	E5313161	330	335	5	2000	239	<0.5	0.01	0.049
		<<1% cpy	E5313162	335	340	5	1130	339	<0.5	0.005	0.071
		trace cpy, py, po	E5313163	340	345	5	1770	281	<0.5	0.006	0.057
		tr cpy	E5313164	345	350	5	1030	239	<0.5	0.013	0.042
		<1% cpy	E5313165	350	355	5	875	209	<0.5	0.005	0.037
		tr cpy	E5313166	355	360	5	1010	287	<0.5	0.002	0.042
		<1% cpy	E5313167	360	365	5	1560	377	<0.5	0.003	0.065
		trace cpy, py, po	E5313168	365	370	5	1000	236	<0.5	0.003	0.037
370.00	377.50	**Quartz Feldspar Porphyry**									
		Massive, hard, with the crystals all fuzzy due to partial melting during the metamorphic events.									
		nil sul	E5313170	370	377.5	7.5	93	14.6	<0.5	0.009	0.003
377.50	410.00	**Mafic Volcanics**									
		This section may be a metavolcanoclastic sediment that is composed mainly of hornblende with silica. It is fine grained massive and hard. There is minor epidote alteration. Magnetite starts at 387.									
		<1% cpy, 1% py	E5313171	377.5	380	2.5	**3550**	782	1.4	0.021	0.196
		<1% cpy, py, po	E5313172	380	385	5	**4020**	464	1.1	0.021	0.084
		tr cpy, Start Magnetite	E5313173	385	390	5	**4660**	801	1.7	0.02	0.195
		1% cpy, py	E5313174	390	395	5	**4550**	782	1.4	0.021	0.164
		1-2% cpy, py	E5313175	395	400	5	2550	547	<0.5	0.012	0.118
		tr cpy, py, po	E5313176	400	405	5	2810	501	<0.5	0.02	0.106
		tr sul	E5313177	405	410	5	2310	635	<0.5	0.008	0.111

Billiken Management			PROJECT: K1-1				HOLE NO: K-11-21			PAGE: 5	
			ANALYTICAL RESULTS								
FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
410.00	430.00	**Mafic Volcanics**									
		This rock may be a metavolcanoclastic sediment withsome tuff components. The main minralis hornblende an indication of lower amphibolite metamorphic facies.									
		<1% cpy	E5313178	410	415	5	**5020**	948	1.3	0.019	0.201
		1-2% cpy	E5313180	415	420	5	**3820**	787	<0.5	0.019	0.173
		<1% cpy, 1% py,po	E5313181	420	425	5	2390	620	<0.5	0.009	0.131
		<1% cpy, py,po	E5313182	425	430	5	**5870**	908	2.6	0.013	0.222
430.00	449.00	**Iron Formation**									
		Pale grey, siliceous, very hard and massive. Section has 3-8% disseminated magnetite.									
		<<1% cpy, <5% Mag	E5313183	430	435	5	**3810**	766	0.7	0.02	0.173
		tr sul, mag	E5313184	435	440	5	2990	1120	3.4	0.015	0.151
		tr sul, mag	E5313185	440	445	5	**3220**	1040	1.9	0.02	0.129
		Mag, mafic vol	E5313186	445	450	5	**3010**	1190	2.9	0.016	0.154
449.00	498.50	**Metavolcanoclastic Sediment**									
		Fine grained, massive black, hard mainly hornblende with trace sulphides									
		barren rock mag	E5313187	450	455	5	**3190**	761	1.8	0.012	0.097
		<<1% cpy, mag	E5313188	455	460	5	2840	769	1.3	0.012	0.1
		brare blebs of cpy <1% cpy, mag	E5313189	460	465	5	**3320**	873	1.7	0.018	0.162
		tr cpy, mag	E5313191	465	470	5	1830	474	<0.5	0.006	0.094
		tr py, rare cpy	E5313192	470	475	5	1550	512	<0.5	0.007	0.075
		<<1% cpy, mag	E5313193	475	480	5	1890	596	<0.5	0.003	0.083
		erratic rare cpy, mag	E5313194	480	485	5	**3220**	522	2.2	0.015	0.106
		barren rock End of Mag	E5313195	485	492	7	2120	785	<0.5	0.009	0.076
498.50	510.00	**Psuedobreccia**									
		The unit is poorly developed with well banded silica rich bands intercalated with narrow bands composed of biotite, hornblende and chlorite aproximately perpendicular to the CA.									

Billiken Management			PROJECT: K1-1	HOLE NO: K11-21	PAGE: 6

FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
			ANALYTICAL RESULTS								
510.00	530.00	**Metavolcanoclastic Sediment**									
		This unit is well banded and may interbedded mafic tuff. The bedding and foliation is about perpendicular to the CA. The last trace chalcopyrite, pyrite and pyrrhotite was found at 521 ft.									
530.00	569.00	Metavolcanoclastic Sediments/Tuff									
		Interbedded, undeformend bands of felsic and intermediate bands. The main minerals are hornblende and silica making the core hard. The core is a pale grey with the narrow banding at 90º to the CA.									
569.00	610.00	**Metavolcanoclastic Sediment**									
		Similar to the previous section but has more biotite. The core is hard and is undeformed with no sulphides.									
	EOH										

Billiken Management			PROJECT:				HOLE NO:		PAGE:		
FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
		Standard - ME-9	5313049				**6820**	8250	5.3	0.115	1.41
		BLANK	5313107				103	19.9	<0.5	<0.001	0.002
		Standard - OREAS 13G	5313108				2460	2400	1.9	0.207	0.121
		Pulp Replicate of 5313096	5313097				1770	411	<0.5	0.004	0.062
		Standard - ME-9	5313106				**6920**	9190	3.8	0.109	1.18
		BLANK	5313169				40.6	11.5	<0.5	<0.001	0.002
		Standard - OREAS 13G	5313179				2360	2260	1.8	0.206	0.14
		Pulp Replicate of 5313189	5313190				**3800**	849	2.3	0.027	0.171

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Billiken Management

Project:	K1-1
Hole Number:	K-11-19
Units of Measurement:	Feet

Location	**NTS Sheet:**	
	Township:	Ponsford Lake Area
	Claim No:	CLM212
	Grid:	Local
	Easting:	10900
	Northing:	500N
	Elevation:	
GPS Co-ordinates:	**Zone:**	15
(if applicable)	**Datum:**	NAD83
	Easting:	688193
	Northing:	5709784
Collar Dip:		-60
Collar Azimuth:		180
Hole Length:		750
Core Size:		BTW(42mm)
Recovery:		
Logged By:		Howard Lahti
Date:	**Start:**	November 2, 2011
	Finish:	November 4, 2011
Drilled by:		Cartwright
Date:	**Start:**	November 2, 2011
	Finish:	November 3, 2011

INCLINATION TESTS		
DEPTH	DIP	AZIMUTH
COLLAR	-45	180
150	42.3	187.6
310	42.7	174.7
470	44	171.3
630	-45.3	172.8
790	-47.2	183.9

Comments

This hole was located to under cut K-11-21 located 250ft to the south. The best mineralization was down at 332.1-341.8 (9.7ft) est cpy 1%, 341.8-347.5 (5.7ft) 3-5% and 347.5-429.3 (81.8ft). Also a 1" massive pyrrhotite vein was intersected at 231.25-231.75 a pyrrhotite rich zone had a nickel concentration of 2.5 % with 0.3% nickel beside the vein.

Billiken Management			PROJECT: K1-1				HOLE NO: K-11-19				PAGE: 2 of 6	
			ANALYTICAL RESULTS									
FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag ppm	Au ppm	Pd ppm	Pt ppm
0.00	45.00	**Overburden Casing**										
45.00	229.00	**Mafic/Intermediate Tuff**										
		Finely laminated, black to dark gray, hard, with very fine bands of quartz and feldspar. Main mineral hornblende, with minor biotite. Godd foliation at about 85º. Section with rare white quartz veinlets (some with kspar) that can cut actross the foliation. Spme possible black streatched lapilli at 157 ft. At 174 the start of much more epidote alteration with some silicification. The epidote alteration is very erratic with the most intense zone at 184. The section ends with a 2 ft quartz vein at 229 to 231.	E5313023	220.00	225.00	5.00	996	288	<0.5	0.008	0.027	0.012
			E5313024	225.00	231.00	6.00	1140	379	<0.5	0.007	0.048	0.021
231.00	289.00	**Interbedded Mafic Volcanics/Psuedobreccia**										
		Black massive Mafic tuff intercalated with thick bands of psuedobreccia. The psuedobreccia is composed of variable amounts of quartz, and angular to subanglular laths of hornblende (biotite) and minor black chlorite. The rock also has numerous white crystals of bright white albite a common alteration mineral. It is possible these rocks are volcanoclastic sediments that have been metamorphosed. The mafic portions have a well developed foliation of 85.º-90º to CA. From 231.25-231.75 is a pyrrhotite rich zone with the sulphides parallel to the foliation. At the beginning of the zone is a 1" massive pyrrhotite breccia veinlet with trace very fine grained pentlandite. The XRF instrument gave an assay of 2.5% ni and 29 gm/t silver in the massive vein an only 0.2% Ni in the weakly mineralized part of the zone. There is erratic pyrrhotite and chaalcopyrite mineralization down to 289 with a few 1 foot long sections with a slight enrichment in the amount of sulphides. The mineraization occurs as dissemination/blebs with a total sulphide content of 0.5% to 1.5% over short distances.										
		1" Po, with f gr pent, tr cpy ave 5-8% sulphides mainly po	E5313010	231.25	235.00	3.75	2340	720	1	0.018	0.149	0.036
		erratic tr po, cpy	E5313011	235.00	240.00	5.00	614	233	<0.5	0.003	0.02	0.017
		erratic tr po, cpy	E5313012	240.00	245.00	5.00	934	355	0.7	0.008	0.043	0.028
		erratic tr po, cpy	E5313013	245.00	250.00	5.00	439	230	<0.5	0.015	0.027	0.013
		erratic tr po, cpy	E5313014	250.00	255.00	5.00	1470	466	0.7	0.008	0.05	0.026
		erratic tr po, cpy	E5313015	255.00	260.00	5.00	483	219	<0.5	0.002	0.016	0.01
		erratic tr po, cpy	E5313016	260.00	265.00	5.00	1370	407	0.6	0.009	0.127	0.049

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FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag ppm	Au ppm	Pd ppm	Pt ppm
231.00	289.00	**Interbedded Mafic Volcanics/Psuedobreccia. (Continued)**										
		erratic tr po, cpy	E5313017	265.00	270.00	5.00	793	320	<0.5	0.004	0.044	0.017
		erratic tr po, cpy	E5313018	270.00	275.00	5.00	839	340	0.6	0.004	0.037	0.019
		erratic tr po, cpy	E5313020	275.00	280.00	5.00	609	122	<0.5	0.016	0.013	0.017
		erratic tr po, cpy	E5313021	280.00	285.00	5.00	2590	312	1.7	0.011	0.088	0.027
		erratic tr po, cpy	E5313022	285.00	290.00	5.00	2900	241	1.5	0.014	0.061	0.015
289.00	299.50	**Mafic Volcanics**										
		Black, banded, composed of hornblende, biotite and chlorite? The foliation/bedding varies from 85-90º.										
299.50	309.00	**Fault/Shear**										
		Black, coarse grained massive biotite and chlorite with possible actinolite. Part of core broken Parts of core possibly totally altered and re-crystallized mafic dykes. Section with rare fine grained sulphides.										
309.00	332.00	**Mafic Volcanics**										
		Difficult to identify original lithology. Rocks are possible mixture of mafic volcanics and mafic intrusive rocks totally altered to biotite, chlorite and actinolite and all original structures destroyed. Section has trace chalcopyrite and pyrrhotite.										
332.00	341.80	**Weak Copper Zone**										
		This part of the core is volvanoclastic sediment that has mafic units with a low concentration of chalcopyrite.										
		tr cpy	E5313025	335.00	340.00	5.00	736	286	<0.5	0.004	0.022	0.01
		tr cpy	E5313026	340.00	341.80	1.80	1730	212	0.7	0.008	0.012	0.011

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FROM	TO	DESCRIPTION	ANALYTICAL RESULTS									
			SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag ppm	Au ppm	Pd ppm	Pt ppm
341.80	374.50	**Main Copper Zone**										
		The disseminated chalcopyrite is in a coarse grained very dark rock composed mainly of chlorite, biotite and actinolite. The chalcopyrite concentration averages about 2-3% but can reach upto 8-12% over very short distances.										
		tr cpy	E5313027	341.80	345.00	3.20	7080	1140	2.7	0.034	0.283	0.083
		tr cpy	E5313028	345.00	350.00	5.00	3380	949	1	0.022	0.23	0.032
		2-3% locally 3-5% cpy, po	E5313030	350.00	355.00	5.00	8030	1400	3.7	0.042	0.387	0.096
		2-3% cpy, po	E5313031	355.00	360.00	5.00	8940	1350	3.7	0.044	0.358	0.128
		1-3% cpy, po	E5313032	360.00	365.00	5.00	7380	1350	3.1	0.042	0.389	0.127
		1-2% cpy, po	E5313033	365.00	370.00	5.00	5130	762	2	0.024	0.199	0.082
		2-4% cpy, po	E5313034	370.00	374.50	4.50	11200	1150	5	0.073	0.371	0.14
374.50	429.30	**Weaker Mineralized Zone**										
		The rock is probably a highly altered volcanoclastic sediment and mafic tuff composed of hornblende, biotite silica and minor chlorite. The mineraization is very erratic with thin bands with 2-5% chalcopyrite. The averaage concentration is <1% chalcopyrite.										
		<1-1.5% cpy	E5313035	374.50	380.00	5.50	4150	690	1.5	0.014	0.189	0.041
		<1.5% cpy	E5313036	380.00	385.00	5.00	4960	788	2.1	0.012	0.203	0.05
		0.5-2% cpy erratic	E5313037	385.00	390.00	5.00	4610	1300	2	0.019	0.342	0.075
		<1% cpy, tr po	E5313038	390.00	395.00	5.00	6050	1090	2.5	0.031	0.298	0.089
		<1% cpy, tr po, erratic	E5313039	395.00	400.00	5.00	7610	1060	3	0.038	0.311	0.087
		tr cpy, po	E5313041	400.00	405.00	5.00	1270	332	<0.5	0.006	0.064	0.036
		tr cpy, po	E5313042	405.00	410.00	5.00	5970	777	2.4	0.033	0.259	0.074
		<1%cpy, po	E5313043	410.00	415.00	5.00	859	303	<0.5	0.017	0.067	0.018
		<<1%tr cpy, po	E5313044	415.00	420.00	5.00	2960	500	1.3	0.02	0.121	0.043
		<<1%tr cpy, po	E5313045	420.00	425.00	5.00	3550	635	1.4	0.016	0.187	0.056
		<<1%tr cpy, po	E5313046	425.00	429.30	4.30	6670	492	4.3	0.007	0.068	0.031
			E5313047	429.30	435.00	5.70	1830	239	0.7	0.008	0.032	0.012
			E5313048	435.00	440.00	5.00	1880	357	0.8	0.017	0.07	0.024

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FROM	TO	DESCRIPTION	ANALYTICAL RESULTS									
			SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag ppm	Au ppm	Pd ppm	Pt ppm
429.30	445.70	**Mafic Volcanoclastic Sediments**										
		Rock dark grey, hard, composed of hornblende, biotite trace chlorite and variable amounts of silica.	5313050	470	475	5	794	217	<0.5	0.006	0.042	0.009
			5313051	475	480	5	1990	287	0.5	0.004	0.071	0.02
			5313052	480	485	5	4230	505	1	0.012	0.172	0.047
445.70	505.50	**Volcanoclastic Sediment**	5313053	590	595	5	3730	784	1.1	0.014	0.148	0.057
			5313054	595	600	5	1670	518	<0.5	0.004	0.059	0.026
		Intercalated mafic and felsic bands some with thin banding aproximately perpendicular to CA.. The mafic units have biotite and chlorite alteration while the felsic bands are basically unaffected.	5313055	600	605	5	2220	532	1.1	0.011	0.102	0.038
			5313056	605	610	5	1300	301	<0.5	0.017	0.063	0.02
505.50	519.25	**Quartz Feldspar Porphyry**										
		Light grey, very hard, crystals fuzzy due to re-melting. Rock is undeformed and does not contain any sulphides.										
519.25	583.00	**Volcanoclastic Sediment**										
		This section is composed of biotite, chlorite, (actinolite), silica and variable amounts of magnetite.. The section starts to show evidence of deformation. There is a **major fault from 532-583** where the mafic lithologies have been totally altered to coarse grained biotite and chlorite. The fault has probably intermixed with large fragments of mafic intrusive rocks such as thin dykes that intruded the falt system. The section has also numerous small kink folds. There is also a glossy soft shiny purplish colored mineral that is slippery like talc. This may be the alteration mineral comes form the mafic intrusive rocks. Sulphide mineralization is minimal.										
583.00	608.25	**Volcnoclastic Sediment/Tuff**										
		This section gradually changes from lithologies similar to above to a normal volcanoclastic sediment free from deformation. The more mafic units are more suseptable to alteration and deformation. The foliation becomes less intense but remains parallel to the bedding. There are rare 2-3" thick bands of disseminated chalcopyrite. Hornblende increases as there is commenserate decrease in the quantity of biotite and chlorite.										

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FROM	TO	DESCRIPTION	ANALYTICAL RESULTS									
			SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag ppm	Au ppm	Pd ppm	Pt ppm
608.25	643.30	**Psuedobreccia**										
		This section is composed of thin intercalated bands of mafic and silica rich rock with a foliation of 70-90º. The mineral crystals are much smaller than that of the previous units. There is a quartz vein at the lower contact that extends from 643.3 to 645.9.										
645.90	800.00	**Volcanoclastic Sediment**										
		The sediments becomes very hard, massive and is composed of fine grained hornblende and silica. There are blebs and stringers of quartz-feldspar scattered throughout the core. The mafic parts can have blastomorphs of a black mineral that formed during metamorphism giveing a porphyritic texture. There are very thin seams of pyrrhotite and very rare chalcopyrite specks.										
	EOH											

Billiken Management

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FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Au ppb	Pd ppb	Pt ppb
		Blank	5313019				32	22.9	0.001	0.002	<0.005
		Standard - OREAS 13G	5313029				2770	2330	0.223	0.126	0.222
		Pulp Replicate of 5313039	5313040				7360	1020	0.04	0.29	0.08
		Standard - ME-9	5313049				6820	8250	0.115	1.41	0.747

Hole ID	Box #	From (m)	To (m)
	1		
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Billiken Management

Project:	K1-1
Hole Number:	K-11-13
Units of Measurement:	feet

Location	**NTS Sheet:**	
	Township:	
	Claim No:	
	Grid:	
	Easting:	L8700E
	Northing:	700N
	Elevation:	
GPS Co-ordinates:	**Zone:**	15
(if applicable)	**Datum:**	Nad 83
	Easting:	688070
	Northing:	5709859
Collar Dip:		-60
Collar Azimuth:		180
Hole Length:		840
Core Size:		TWB
Recovery:		
Logged By:		Howard Lahti
Date:	**Start:**	June 24, 2011
	Finish:	June 26,00
Drilled by:		Cartwright
Date:	**Start:**	June 23, 2011
	Finish:	June 25, 2011

INCLINATION TESTS

DEPTH	DIP	AZIMUTH
COLLAR	-60	180
200	59.2	178
400	-59.6	181.6
600	58.8	23.2?
800	-59	185

Comments

This hole is located to test the pyrrhotite-nickel zone 100ft to the east and 100ft deeper. The main zones of chalcopyrite enrichment are as follows: 139-160, 227-250, 525-540,565-585, 595-610.9 and the pyrrhotite Zone? 775-815. The copper rich zone have a average concentration of 1-2% chalcopyrite with very little pyrrhotite and pyrite which is found mainly in fractures. This zone is much reduced when compared to the zone found in K-11-07 200ft to the west.

Billiken Management			PROJECT: K1-1				HOLE NO: K-11-13			PAGE: 2	
			ANALYTICAL RESULTS								
FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
0.00	20.00	Overburden (30ft casing)									
20.00	121.30	Volcanoclastic Sediment (Tuff)									
		This section is finely laminated bands of quartz rich and more mafic bands all with a foliation/bedding of 60°. At 25-28ft are large rounded white quartz porphroblasts that may have been originally lapilli. The finely laminated bands has erratic trace pyrite. The prominant minerals are quartz and hornblende. This section has a few white quartz veins some with kspar alteration. At 43.1ft is a 6" band ofsediment totally altered with epidote and lesser amounts of kspar.									
121.30	127.60	**Quartz Porphyry**									
		This dyke is dark gray, massive except where a shear cuts the dyke. Due to the re-melting of the dyke the crystals are very fuzzy.									
127.60	139.00	**Volcanoclastic Sediment**									
		The sediments is the same as before the porphyry.	985984	135.00	139.00	5.00	373	215	0.3	3	28
		barren rock									
139.00	280.00	**Volcanoclastic Sediment IF**									
		The section of quartz and hornblende changes to sediments altered with chlorite and biotite. The rock has disseminated fine to medium grained magnetite with a concentration of 5-8%. There are small sections with remnant hornblende. With in the IF is a copper enrichment zone that extends from 139-160ft. The mineralization is in the rock that has been altered to chlorite and biotite. The best copper rich section occurs at 157 where there is a 10" zone that has 8-10% chalcopyrite. From **174 to 227** the IF changesdramatically with the chlorite and biotite alteation disappearing. The unit is very homogenious, dark gray with about 3-8% disseminated magnetite. From 227-280+ the If has minor chalcopyrite mineralization. The mineralogy changes back again to rock with extensive chlorite-biotite alteration. There are narrow bands of massive biotite.									

Billiken Management			PROJECT:				HOLE NO:		PAGE:		
FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
139.00	280.00	**Volcanoclastic Sediment IF (Continued)**									
		2-3% cpy	985985	139	145	6	3490	863	1.7	14	437
		1-3 % cpy	985986	145	150	5	4040	861	2.3	29	160
		1-2% cpy	985987	150	155	5	2510	1140	1.3	12	136
		1-3 % cpy	985988	155	160	5	2560	1280	0.9	17	107
		tr cpy	985989	160	165	5	549	861	< 0.3	2	37
		barren rock	985990	165	170	5	528	710	< 0.3	< 2	36
		tr py	985992	224	227	5	1890	1290	0.7	11	79
		1-2% cpy	985993	227	230	3	3530	1350	1.5	11	96
		tr cpy	985994	230	235	5	1450	613	0.8	6	65
		1-2 % cpy, mass biot	985996	235	240	5	2440	1200	1.1	14	124
		1-3 cpy, biot	985998	235	245	5	5100	1350	1.9	14	177
		patchy, 1% cpy	985999	245	250	5	3640	1110	1.9	48	118
		tr cpy	1040008	250	255	5	1400	836	1.2	5	79
		tr sul	1040001	255	260	5	3120	1320	1	9	129
		1% cpy	1040002	260	265	5	1100	876	0.5	3	47
		<1% cpy	1040003	265	270	5	949	796	0.6	4	25
		mag, tr cpy	1040004	270	275	5	1090	870	0.8	3	27
		mag, tr cpy, po,py	1040006	275	280	5	1110	853	0.8	4	28
		mag, tr py	1040007	280	285	5	2400	1040	1.2	5	26
280.00	700.00	**Volcanoclastic Sediment**									
		These sediments have units with disseminated magnetite with a few narrow bands with thin seams of massive magnetite. Most of the bands with diagenic magnetite dissappear after 595ft. The IF is not well developed as there are many intercalated non-magnetic beds mixed in with the magnetite enriched units. The core has changed the alteration from hornblende to chlorite and narrow bands of massive biotite. A massive white quartz vein extends from 603.7-610.9. It has two narrow less than 1" of massive pyrrhotite with coarse pyrite and a fair amount of chalcopyrite and trace small grains of pentlandite. This type of minerlization was seen in K-11-07. The average grade of the chalcopyrite is 1-2% although there are short 4" section with 2-4%.									
		tr sul	1040010	285	290	5	1030	954	0.4	15	39
		<1% cpy	1040011	290	295	5	701	939	< 0.3	7	26
		mag, tr cpy,po	1040012	295	300	5	785	893	0.3	59	31

Billiken Management			PROJECT: K1-1				HOLE NO: K-11-13			PAGE: 4	
FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
280.00	700.00	**Volcanoclastic Sediment (continued)**									
		mag, tr sul	1040013	300	305	5	448	851	< 0.3	6	23
		mag, tr sul	1040014	305	310	5	685	795	0.3	8	31
		mag, tr cpy, po	1040016	310	315	5	1060	983	0.4	4	33
		mag, tr sul	1040017	315	320	5	846	959	0.3	< 2	44
		mag, tr cpy,py	1040018	320	325	5	917	946	< 0.3	4	34
		mag, tr sul	1040019	325	330	5	514	790	0.3	3	28
		mag, tr py	1040020	330	335	5	1220	1090	0.5	8	51
		mag, tr py	1040021	335	340	5	640	1000	< 0.3	< 2	54
		1% cpy, py	1040022	340	345	5	729	1000	< 0.3	< 2	43
		tr sul	1040023	345	350	5	678	874	0.4	5	49
		mag, tr sul	1040024	350	355	5	1250	882	0.5	2	71
		mag, tr sul	1040025	355	360	5	723	694	0.4	5	48
		mag, tr cpy	1040027	360	365	5	2440	1080	0.9	3	85
		mag, tr cpy	1040028	365	370	5	2270	996	1	9	88
		tr py, fract	1040029	370	375	5	2220	1110	0.9	10	92
		tr, py, cpy	1040031	375	380	5	1330	1100	0.5	34	43
		very soft, mag, tr py	1040033	380	385	5	3010	1260	2.4	14	113
		mag, tr py very soft	1040034	385	390	5	1990	1180	1	32	86
		tr py	1040036	390	395	5	2850	1380	1.2	16	119
		mag, tr py, po	1040037	395	400	5	2730	1200	0.9	28	102
		shear, tr py	1040038	400	405	5	1520	904	0.6	6	52
		mag, tr py	1040039	405	410	5	1030	808	0.4	4	29
		patchy, 1% cpy	1040041	410	415	5	1360	838	0.8	14	46
		tr cpy, py	1040042	415	420	5	3860	1480	1.4	21	128
		1% py, tr po, tr cpy	1040043	420	425	5	3340	1360	1.4	15	105
		tr py, cpy	1040045	425	430	5	3070	1520	1.3	11	103
		shear, tr py	1040046	430	435	5	1840	1120	0.9	8	107
		mag, tr cpy, py, po	1040047	435	440	5	3030	943	1.4	41	96
		mag, tr cpy, py, po	1040048	440	445	5	2880	997	1.5	18	110
		bleb cpy, py	1040049	445	450	5	2190	1030	0.9	5	103
		tr sul	1040051	450	455	5	1730	621	1.1	6	68
		tr cpy	1040052	455	460	5	1790	797	1	6	90
		tr cpy, py	1040053	460	465	5	1310	599	1	7	78
		tr sul	1040054	465	470	5	1300	548	0.9	5	63
		tr cpy, py	1040055	470	475	5	1500	808	0.9	11	87
		few blebs cpy	1040056	475	480	5	3330	1190	2.3	11	129

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FROM	TO	DESCRIPTION	ANALYTICAL RESULTS								
			SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
280.0	700.0	**Volcanoclastic Sediment (continued)**									
		rare bleb cpy	1040057	480	485	5	2630	1070	1.3	7	100
		tr sul	1040058	485	490	5	1240	970	0.6	5	53
		tr py	1040059	490	495	5	1170	959	0.6	2	65
		tr sul	1040060	495	500	5	1340	995	0.9	18	59
		barren	1040062	500	505	5	522	842	0.5	3	41
		tr py	1040063	505	510	5	1260	986	0.7	7	70
		barren	1040064	510	515	5	821	825	0.6	3	50
		tr py	1040066	515	520	5	1480	913	0.8	4	62
		tr py	1040068	520	525	5	1760	959	0.8	5	76
		1-2% cpy	1040069	525	530	5	2350	749	1.2	20	67
		1% cpy, py	1040071	530	535	5	2740	752	1.4	20	98
		1-2% cpy, 1/4" po vein	1040072	535	540	5	4920	793	2.6	21	285
		barren	1040073	540	545	5	1220	599	0.6	6	87
		<1% cpy, po	1040074	555	560	5	1080	544	0.6	3	62
		barren	1040076	560	565	5	425	474	0.4	10	58
		barren	1040077	565	570	5	4360	1040	2.3	16	121
		1-2% cpy, po	1040078	570	575	5	2570	911	1.2	16	132
		1-2% cpy	1040080	575	580	5	2860	772	1.6	11	98
		1% cpy	1040081	580	585	5	3090	1150	1.6	13	132
		mag, <1% cpy, po,py	1040082	585	590	5	2100	1040	0.8	55	109
		tr sul	1040083	590	595	5	1810	926	0.9	9	75
		1/2 " po vein, tr cpy	1040086	595	600	5	5030	1290	2.2	38	171
		tr sul	1040087	600	603.6	3.6	6600	1410	3.1	89	183
		Qtz Vein, 2-3% cpy, po, py	1040088	603.6	608	4.4	5650	3280	2.3	113	296
		Qtz Vein, <1% cpy, po, py	1040089	608	610.9	2.9	3070	986	1.6	12	92
		barren	1040090	610.9	615	4.1	893	426	0.6	4	70
		barren	1040091	650	655	5	1200	383	0.9	5	40
		large bleb cpy, silver sul, pent?	1040092	655	660	5	2650	594	1.3	11	71
		barren	1040093	690	695	5	1190	489	0.5	4	58
		6" patch po, cpy, pent?	1040094	695	700	5	1000	2410	0.7	5	160
700.0	780.0	**Volcanoclastic Sediment**									
		Massive to banded, black, mainly hornblende and quartz. Locally the core can be magnetic and can have white quartz spots giving the rock a porphyritic texture. Core has trace pyrrhotite, pyrite and very rare chalcopyrite.									

Billiken Management

PROJECT: K1-1 | HOLE NO: K-11-13 | PAGE: 6

FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu ppm	Ni ppm	Ag g/t	Au ppb	Pd ppb
			ANALYTICAL RESULTS								
700.0	780.0	**Volcanoclastic Sediment (continued)**									
			1040095	700	705	5	2140	651	1.1	3	85
			1040097	705	710	5	1020	536	0.7	3	62
			1040098	710	715	5	1850	606	1	4	68
			1040099	715	720	5	2050	1210	1	4	104
			1040101	720	725	5	161	414	< 0.3	9	15
			1040103	725	730	5	446	518	0.3	< 2	29
			1040104	770	772.3	2.3	1310	659	0.6	< 2	45
			1040106	772.3	775	2.7	1590	774	0.8	2	44
			1040107	775	780	5	2630	921	1.4	13	103
780.00	820.00	**Volcanoclastic Sediment**									
		The sediments have an increase in pyrrhotite, chalcopyrite, pyrite and the alteration mineral chlorite. In the section 795-780 has several spots with masssive pyrrhotite with the largest 6" thick of semi-massive pyrrhotite with pyrite and tiny crystals of pentlandite. From 790-795 the amount of pyrrhotite drops of dramatically but remains at 1-4% total sulphides. The core has undergone severe tectonic deformation with isoclinal folding, shears and narrow breccia zones. The pyrrhotite enrich zone has been reduced from the mineralization that was found in K-11-07. This zone is usually found below the chalcopyrite mineralization.									
		chl, 1-2% po, tr cpy	1040108	780	785	5	1490	1290	0.6	8	94
		15-20% po, py 1-2% cpy, shear	1040109	785	790	5	2270	2260	0.9	5	190
		2-4% po in shear, tr cpy	1040111	790	795	5	1190	869	0.6	6	54
		3-5% po,py, tr cpy shear	1040112	795	800	5	4210	1730	2.5	20	133
		2-3% po, tr cpy	1040113	800	805	5	2220	782	1.3	9	69
		5-7% f gr po,py, tr cpy	1040115	805	810	5	2970	889	1.4	13	110
		1-3%, po, py	1040116	810	815	5	858	439	0.7	6	21
		minor, sul in Qtz vein	1040117	815	820	5	329	299	0.4	< 2	21
820.00	840.00	**Volcanoclastic Sediment**									
		The sediments have changed back to hornblende and quartz with no chlorite and biotite. There is now only trace amounts of pyrite. The core is very hard and there is less deformation.									
		EOH									

Billiken Management

PROJECT:	HOLE NO:	PAGE: 7

FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu %	Ni ppm	Ag g/t	Au ppb	Pd ppb
			985991	Blank			9	10	0.7	< 2	< 5
			985995	Standard -			5200		1.1	1020	125
			985997	1/4 Cut Du			4400	1370	1.7	14	170
			1040005	Standard -			> 10000	10	88.5	334	4470
			1040009	1/4 Cut Du			1550	839	1	4	78
			1040015	Blank			7	7	0.4	< 2	< 5
			1040026	Blank			8	7	0.4	< 2	< 5
			1040030	Standard -			5740	6290	1.2	1110	87
			1040032	1/4 Cut Du			1270	1000	0.5	11	46
			1040035	Coarse Re			1960	1160	0.9	14	83
			1040040	Standard -			> 10000	10	89.3	389	4030
			1040044	1/4 Cut Du			3430	1460	1.4	17	104
			1040050	Blank			11	6	0.4	< 2	< 5
			1040061	Blank			11	8	0.4	< 2	< 5
			1040065	Standard -			5560	6300	1.2	975	124
			1040067	1/4 Cut Du			1660	1000	0.9	6	74
			1040070	Coarse Re			2620	783	1.4	12	74
			1040075	Standard -			> 10000	8	79.4	335	3950
			1040079	1/4 Cut Du			2390	934	1.2	11	126
			1040084	VOID							
			1040085	Blank			19	25	< 0.3	< 2	< 5
			1040096	Blank			28	10	0.3	14	< 5
			1040100	Standard -			5500	5900	1.2	1010	104
			1040102	1/4 Cut Du			458	495	< 0.3	< 2	26
			1040105	Coarse Re			1310	673	0.7	< 2	41
			1040110	Standard -			> 10000	11	90.5	215	4040
			1040114	1/4 Cut Du			2380	763	1.5	26	66

Hole ID	Box #	From (m)	To (m)
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Billiken Management

Project: K1-1

Hole Number: K-11-09

Units of Measurement: Feet

Location
- **NTS Sheet:**
- **Township:** Ponsford Lake Area
- **Claim No:** CLM213
- **Grid:** Local
- **Easting:** L9300
- **Northing:** 570N
- **Elevation:**

GPS Co-ordinates: (if applicable)
- **Zone:** 15
- **Datum:** NAD83
- **Easting:** 688250
- **Northing:** 5709833

Collar Dip: -60
Collar Azimuth: 180
Hole Length: 550
Core Size: BTW(42mm)
Recovery:

Logged By: Fortunato Milanes
Date: Start: June 12, 2011 Finish: June 13, 2011

Drilled by: Cartwright Drilling
Date: Start: June 11, 2011 Finish: June 13, 2011

INCLINATION TESTS		
DEPTH	DIP	AZIMUTH
COLLAR	-60	180
30	-60.5	185.2
200	-60.1	354.4
400	-59.7	178
550	-60	173.7

Comments
This the first hole drilled at L9300
Drilling intercepted three sequences of mineralized zones from 85-152; 152-193.25 and
193.25-464 each sequence with different cpy and po content.

Billiken Management

PROJECT: K1-1 | HOLE NO: K-11-09 |

FROM	TO	DESCRIPTION	ANALYTICAL RESULTS									
			SAMPLE	FROM	TO	LENGTH	Cu (ppm)	Cu%	Ni (ppm)	Pd (ppb)	Pt (ppb)	Au (ppb)
0.00	19.40	**Overburden**										
19.40	85.00	**Mafic Volcanics**										
		Light gray to gray amphibolite, in most parts unaltered with some short sections that are chloritized and biotized particularly from 60-64 and 55-68, respectively; rock is black on fresh surface; foliated, unmineralized, gradually grades to chloritized amphibolite from 84-85.										
85.00	152.00	**Mafic Volcanics**										
		Alternating sequence of chloritized-biotized amphibolite and brecciated/sheared amphibolite; the chloritized-biotized amphibolite is greenish-gray color with greasy feel while the brecciated/sheared amphibolite is green-white color with Hb and quartz in crude alignment; the brecciated/sheared portion is 33% by volume of the interval; cpy as specks and blebs noticeably greater in occurrence in brecciated portions than the chloritized-biotized sections; cpy 2-4% in chloritized-biotized amphibolite and 4-6% in brecciated portions; brownish metallic platy minerals but not magnetic present in fractures.	985549	85.00	90.00	5.00	351		264	14	10	2
			985551	90.00	95.00	5.00	724		351	27	16	5
			985552	95.00	100.00	5.00	976		350	44	20	7
			985553	100.00	105.00	5.00	612		311	15	9	4
			985555	105.00	110.00	5.00	1040		372	35	15	5
			985556	110.00	115.00	5.00	610		339	30	21	2
			985557	115.00	120.00	5.00	1180		679	78	30	10
			985558	120.00	125.00	5.00	2520		818	100	32	18
			985559	125.00	130.00	5.00	1570		669	95	45	18
			985561	130.00	135.00	5.00	2110		652	92	26	37
			985562	135.00	140.00	5.00	**4790**		1000	148	41	37
			985563	140.00	145.00	5.00	**3600**		838	116	40	26
			985564	145.00	152.00	7.00	**4290**		977	177	65	32
152.00	193.25	**Brecciated Mafic Volcanics**										
		Coarse grained; green-white angular fragments of amphibolites and quartz as cementing material; with crude alignment of fragments; cpy as specks with concentrations in places; cpy 5-7%;	985565	152.00	156.00	4.00	**>10000**	**1.36**	930	275	39	115
			985566	156.00	160.00	4.00	**3670**		703	112	40	18
			985567	160.00	165.00	5.00	**3560**		889	131	34	20
		152.0-156.0: 5-7% cpy	985568	165.00	170.00	5.00	**3060**		497	55	17	17
		170.0-178.0: 5% cpy	985569	170.00	175.00	5.00	**7860**		703	116	56	39
		granite dikes at 182-182.6 and 185.2-187.8	985570	175.00	180.00	5.00	**3680**		878	127	59	24
			985572	180.00	185.00	5.00	1100		295	25	9	6
			985573	185.00	190.00	5.00	944		158	24	60	8
			985574	190.00	195.00	5.00	2660		490	72	16	20

Billiken Management

PROJECT: K1-1	HOLE NO: K-11-09	PAGE: 3 of 4

FROM	TO	DESCRIPTION	ANALYTICAL RESULTS									
			SAMPLE	FROM	TO	LENGTH	Cu (ppm)	Cu%	Ni (ppm)	Pd (ppb)	Pt (ppb)	Au (ppb)
193.25	464.00	**Mafic Volcanics**										
		Alternating sequence of chloritized amphibolite and sheared/brecciated amphibolite; the chloritized amphibolite is greenish-gray with greasy feel while the sheared/brecciated amphibolite is green-white; cpy is 2-4%; po nil; sequence is very homogenous except for a short interval 245.25-252.3 where the rock is silicified volcanic, light gray color and unmineralized.	985576	195.00	200.00	5.00	2970		854	116	37	15
			985578	200.00	205.00	5.00	**5090**		1110	170	59	29
			985579	205.00	210.00	5.00	**3920**		1210	165	62	25
			985581	210.00	215.00	5.00	**3450**		768	136	34	13
			985582	215.00	220.00	5.00	1950		492	56	24	9
			985583	220.00	225.00	5.00	878		270	26	9	6
			985584	225.00	230.00	5.00	1830		438	51	19	10
			985586	230.00	235.00	5.00	**4020**		950	164	76	22
			985587	235.00	240.00	5.00	1960		539	99	25	8
			985588	240.00	245.25	5.25	**4960**		1080	205	65	24
			985590	245.25	252.30	7.05	**5500**		1070	208	61	25
			985591	252.30	256.00	3.70	**4700**		891	158	44	24
			985592	256.00	260.00	4.00	**4400**		860	146	47	29
			985593	260.00	265.00	5.00	2380		618	86	119	8
			985594	265.00	270.00	5.00	2940		732	104	55	7
			985596	270.00	275.00	5.00	1820		482	60	34	5
			985597	275.00	280.00	5.00	2780		765	113	41	11
			985598	280.00	285.00	5.00	2990		1390	234	141	20
			985599	285.00	290.00	5.00	**4400**		743	145	69	21
			985600	290.00	295.00	5.00	**3490**		986	130	43	13
			985601	295.00	300.00	5.00	2300		552	70	21	8
			985602	300.00	305.00	5.00	**4680**		981	194	57	14
			985603	305.00	310.00	5.00	**5580**		1100	195	61	16
			985604	310.00	315.00	5.00	**5130**		1130	205	56	9
			985605	315.00	320.00	5.00	**6540**		1120	222	55	41
			985607	320.00	325.00	5.00	2920		1120	196	57	15
			985608	325.00	330.00	5.00	2680		1080	211	66	7
			985609	330.00	335.00	5.00	**3030**		730	128	38	14
			985611	335.00	340.00	5.00	**4630**		1020	147	40	20
			985613	340.00	345.00	5.00	1280		375	45	26	3
			985614	345.00	350.00	5.00	2580		739	99	36	12
			985616	350.00	355.00	5.00	2860		800	181	77	9
			985617	355.00	360.00	5.00	2910		1010	203	50	7
			985618	360.00	365.00	5.00	**3750**		873	143	45	20
			985619	365.00	370.00	5.00	**4720**		847	181	67	10
			985621	370.00	375.00	5.00	2540		825	122	28	7
			985622	375.00	380.00	5.00	702		452	40	11	2

Billiken Management

PROJECT: K1-1 | HOLE NO: K-11-09 |

FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu (ppm)	Cu%	Ni (ppm)	Pd (ppb)	Pt (ppb)	Au (ppb)
			ANALYTICAL RESULTS									
			985623	380.00	385.00	5.00	1020		512	43	20	2
			985625	385.00	390.00	5.00	**3710**		765	119	60	20
			985626	390.00	395.00	5.00	1400		307	27	16	5
			985627	395.00	400.00	5.00	**3870**		663	115	37	16
			985628	400.00	405.00	5.00	**4320**		1330	195	63	13
			985629	405.00	410.00	5.00	**4920**		944	147	44	17
			985631	410.00	415.00	5.00	**5860**		892	166	48	23
			985632	415.00	420.00	5.00	**4480**		1070	122	46	12
			985633	420.00	425.00	5.00	**3980**		1120	137	44	19
			985634	425.00	430.00	5.00	2990		673	63	22	10
			985635	430.00	435.00	5.00	**3250**		624	76	35	9
			985636	435.00	440.00	5.00	2720		995	156	49	8
			985637	440.00	445.00	5.00	2810		866	150	34	16
			985638	445.00	450.00	5.00	**3270**		761	110	35	20
			985639	450.00	455.00	5.00	**4560**		842	131	50	26
			985640	455.00	460.00	5.00	**4520**		749	113	34	22
			985642	460.00	464.00	4.00	2610		480	41	19	8
464.00	466.00	**Granite**										
		Highly fractured										
466.00	480.25	**Metavolcanic**										
		Generally light gray, silicified volcanic grading to amphibolitic in some portions; hard and dense core; unmineralized										
480.25	484.75	**Granite**										
		Medium grained; pinkish; with some pyrites along fractures										
484.75	491.70	**Mafic Volcanic**										
		Slightly magnetic, chloritized and biotized amphibolite schist; greenish- gray; cpy 1-2%; po 2-3%; with some silvery brown platy minerals (pentlandite?)	985643	484.75	491.70	6.95	2270		807	96	35	11
494.70	505.70	**Metavolcanic**										
		Silicified to amphibolitic; generally light gray; foliated;with minor cpy specks at 500.5ft										
505.70	550.00	**Mixed Granodiorite and Granite**										
		Medium grained; dense and hard; unmineralized										
		EOH										

Billiken Management

PROJECT: | HOLE NO: | PAGE:

FROM	TO	DESCRIPTION	ANALYTICAL RESULTS										
			SAMPLE	FROM	TO	LENGTH	Cu (ppm)	Cu%	Ni (ppm)	Pd (ppb)	Pt (ppb)	Au ppb	Ag g/t
		Standard - 1	985550									25	
		1/4 Cut Duplicate of 985553	985554	100	105	5	633		319	13	9	4	0.4
		Blank	985560				15		5	0	0	0	0.5
		Blank	985571				46		12	0	0	0	0.6
		Standard - 2	985575				340		8140	65	30	7	0.0001
		1/4 Cut Duplicate of 985576	985577	195	200	5	2980		929	122	39	20	1.6
		Coarse Reject of 985579	985580	205	210	5	4030		1280	167	67	13	1.7
		Standard - 1	985585							0	0	28	
		1/4 Cut Duplicate of 985588	985589	240	245.25	5.25	4390		970	163	58	19	2.3
		Blank	985595				57		34	0	0	0	0.3
		Blank	985606				22		7	0	0	0	0.4
		Standard - 2	985610				369		8410	66	38	17	0.0001
		1/4 Cut Duplicate of 985611	985612	335	340	5	1190		390	45	24	3	0.6
		Coarse Reject of 985614	985615	345	350	5	3060		742	93	35	6	1.3
		Standard - 1	985620									24	
		1/4 Cut Duplicate of 985623	985624	380	385	5	1440		518	47	14	3	0.8
		Blank	985630				15		5	0	0	0	0.4
		Blank	985641				12		6	0	0	0	0.4

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Billiken Management

Project:		K1-1
Hole Number:		K-11-05
Units of Measurement:		Feet
Location	**NTS Sheet:**	
	Township:	Ponsford Lake Area
	Claim No:	CLM212
	Grid:	Local
	Easting:	7600E
	Northing:	750N
	Elevation:	
GPS Co-ordinates:	**Zone:**	15
(if applicable)	**Datum:**	NAD83
	Easting:	687745
	Northing:	5709842
Collar Dip:		-50
Collar Azimuth:		180
Hole Length:		675
Core Size:		BTW(42mm)
Recovery:		
Logged By:		Fortunato Milanes
Date:	**Start:**	June 4, 2011
	Finish:	June 5, 2011
Drilled by:		Cartwright Drilling
Date:	**Start:**	June 3, 2011
	Finish:	June 5, 2011

INCLINATION TESTS		
DEPTH	**DIP**	**AZIMUTH**
COLLAR	-50	180
50	-46.9	189.1
250	-45.5	158.2
450	-44.6	189.5
670	-44.8	148.6

Comments

This hole undercuts K386 to test the copper mineralization at lower level

The hole intercepted a mineralized zone from 214 to 560ft with the main mineralization from 280 to 520ft.

Billiken Management

PROJECT: K1-1 | HOLE NO: K-11-05 |

FROM	TO	DESCRIPTION	ANALYTICAL RESULTS									
			SAMPLE	FROM	TO	LENGTH	Cu (ppm)	Cu%	Ni (ppm)	Pd (ppb)	Pt (ppb)	Au (ppb)
0.00	38.75	**Overburden**										
38.75	118.00	**Mafic Volcanics**										
		Differentially metamorphosed to amphibolites and metavolcanics;										
		amphibolite is dark gray, fine grained, thinly foliated, chloritized from										
		39-41ft; becomes lighter gray from 50-64ft; some fractures with pyrites;										
		68.5-83.0: metavolcanics, light gray color, fine granular, with amphibolite										
		lenses that are in sharp contact with metavolcanics										
		83.0-118.0: amphibolites with diss pyrites, competent core										
118.00	129.50	**Metavolcanics**										
		Fine grained, silicified, biotized; light purple-gray color; breaks in flat										
		surface almost like foliation or banding surface										
129.50	203.50	**Mafic Volcanic**										
		Amphibolite with some silica veins <6" long; cpy present between 190-	847612	190.00	195.00	5.00	871		158	30	8	5
		200 up to 1.5%;										
203.50	214.00	**Mafic Volcanics**										
		Weathered and slightly altered volcanics, fine grained, greenish-gray,										
		easily breaks to pieces; numerous criss-crossing microfractures,										
		unmineralized										
214.00	280.00	**Mafic Volcanics (Mineralized)**										
		Mainly amphibolites with dispersed cpy mineralization										
		218.3-219.1: cpy 1-2%, po 5%	847613	217.50	220.00	2.50	**3980**		2030	559	68	14
		223-224: some patches of cpy 1%	847614	220.00	225.00	5.00	339		248	29	12	<2
		230.8-232.0: cpy 1-3%	847615	225.00	230.00	5.00	69		177	10	<5	9
		234-235: cpy 1-2%	847617	230.00	235.00	5.00	2310		1630	435	137	17
		242.7 and 251.7: cpy along foliation	847618	235.00	240.00	5.00	256		146	12	7	<2
		259-263: cpy dispersed in places and along foliation @271 & 272; 1%;	847619	240.00	245.00	5.00	272		126	10	<5	<2
			847621	245.00	250.00	5.00	204		126	9	7	<2
			847623	250.00	255.00	5.00	213		144	9	7	<2
			847624	255.00	260.00	5.00	126		287	5	<5	5
			847626	260.00	265.00	5.00	456		149	15	6	4
			847627	265.00	270.00	5.00	376		194	21	11	3
			847628	270.00	275.00	5.00	196		176	20	13	<2
			847629	275.00	280.00	5.00	234		192	23	12	<2

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FROM	TO	DESCRIPTION	ANALYTICAL RESULTS									
			SAMPLE	FROM	TO	LENGTH	Cu (ppm)	Cu%	Ni (ppm)	Pd (ppb)	Pt (ppb)	Au (ppb)
280.00	520.00	**Mafic Volcanics (Mineralized)**										
		Greenish-gray, foliated, amphibolite; slightly chloritized; magnetic from	847631	280.00	285.00	5.00	679		192	32	15	5
		337-410; pyrrhotite visible from 349-410; po 2-4% ; chalcopyrite	847632	285.00	290.00	5.00	553		242	28	11	3
		present in all runs but at different concentrations ranging from 1-3%;	847633	290.00	295.00	5.00	2770		548	134	38	20
		very homogenous rock; massive pyrrhotite present between 510-520	847635	295.00	300.00	5.00	3250		614	121	45	25
		approaching 30-35%;	847636	300.00	305.00	5.00	2570		924	248	94	15
			847637	305.00	310.00	5.00	2320		420	101	33	17
		280-290: cpy present between 283-285; 1-2%	847638	310.00	315.00	5.00	205		142	19	9	<2
		290-300: cpy visible 291-294 and 296-300; 1-2%	847639	315.00	320.00	5.00	396		207	41	19	3
		300-310: cpy visible between 301-304 and 309-310: 1-2%	847641	320.00	325.00	5.00	1210		256	52	16	11
		310-320: cpy visible between 317-320: 1-2%	847642	325.00	330.00	5.00	601		180	20	13	4
		320-330: cpy visible between 320-328; 1-2%	847643	330.00	335.00	5.00	360		221	31	15	<2
		330-340: cpy visible between 334-340; 1-2% ; magnetic at 337	847644	335.00	340.00	5.00	1790		760	142	43	16
		340-350: whole run with visible cpy; po visible between 349-350	847645	340.00	345.00	5.00	2830		970	334	131	24
		350-360: diss cpy 1%; po visible at 356.5	847646	345.00	350.00	5.00	2730		1050	372	106	22
		360-370: diss cpy; 2-3% between 365-370	847647	350.00	355.00	5.00	2200		1200	325	102	17
		370-380: cpy and po visible; some cpy concentration at 378	847648	355.00	360.00	5.00	694		742	202	55	6
		380-390: cpy concentration between 388-390 about 5%	847649	360.00	365.00	5.00	1150		776	156	43	10
		390-400: 4-5" long patch of cpy and po at 397.5; other cpy as diss	847650	365.00	370.00	5.00	2810		1010	518	123	34
		400-410: disseminated cpy & po; cpy 2-3%	847652	370.00	375.00	5.00	1430		940	370	126	16
		410-420: cpy as diss and patches	847653	375.00	380.00	5.00	2960		1230	455	181	77
		420-430: concentration of cpy at midportion over a 1ft section	847654	380.00	385.00	5.00	1060		871	280	110	11
		430-440: diss cpy with concentration from 439-440	847656	385.00	390.00	5.00	2740		407	132	45	17
		440-450: cpy <1%	847658	390.00	395.00	5.00	2470		994	332	93	23
		450-460: slightly magnetic, cpy <1%	847659	395.00	400.00	5.00	1000		1350	305	147	17
		460-470: concentration of cpy between 464.5-470; slightly magnetic	847661	400.00	405.00	5.00	2720		931	330	60	14
		470-480: cpy along foliations 1-2%	847662	405.00	410.00	5.00	2650		1290	391	101	24
		480-490: cpy 2-3%	847663	410.00	415.00	5.00	7230		967	638	135	100
		490-500: cpy 1%	847664	415.00	420.00	5.00	1730		656	125	47	31
		500-510: cpy 1-2%	847666	420.00	425.00	5.00	2330		653	279	90	18
		510-520: pentlandite/po/magnetite @ 510-511, 502.25-503.25,	847667	425.00	430.00	5.00	3780		477	165	72	27
		517-518.75 - 30-35%, cpy 2-3%	847668	430.00	435.00	5.00	1370		523	80	23	9
			847670	435.00	440.00	5.00	2030		531	124	40	15
			847671	440.00	445.00	5.00	1030		438	65	18	6
			847672	445.00	450.00	5.00	916		343	153	31	18
			847673	450.00	455.00	5.00	887		580	89	23	7
			847674	455.00	460.00	5.00	609		250	76	16	4
			847676	460.00	465.00	5.00	1780		807	182	79	14

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FROM	TO	DESCRIPTION	SAMPLE	FROM	TO	LENGTH	Cu (ppm)	Cu%	Ni (ppm)	Pd (ppb)	Pt (ppb)	Au (ppb)
			847677	465.00	470.00	5.00	**5170**		523	150	51	41
			847678	470.00	475.00	5.00	1760		245	41	20	16
			847679	475.00	480.00	5.00	1160		235	50	36	33
			847680	480.00	485.00	5.00	2510		239	39	21	35
			847681	485.00	490.00	5.00	**4770**		403	77	167	48
			847682	490.00	495.00	5.00	1310		253	34	29	6
			847683	495.00	500.00	5.00	1170		221	29	17	6
			847684	500.00	505.00	5.00	1560		267	36	26	10
			847685	505.00	510.00	5.00	1290		398	42	41	15
			847687	510.00	515.00	5.00	**3170**		**3840**	506	106	13
			847688	515.00	520.00	5.00	**8230**		984	269	38	32
520.00	560.00	**Mafic Volcanic (Slightly Mineralized)**										
		Greenish-gray amphibolitic rock, slightly chloritized with some portions	847689	520.00	525.00	5.00	1520		763	415	150	13
		slightly magnetic; diminished cpy content compared to above interval;	847691	525.00	530.00	5.00	1310		816	229	82	12
		cpy 1-2%; po not visible except for a 1" wide po/magnetite band at 551.25	847693	530.00	535.00	5.00	2750		314	60	33	17
			847694	535.00	540.00	5.00	1430		599	249	67	23
			847696	540.00	545.00	5.00	1960		770	204	51	15
			847697	545.00	550.00	5.00	429		200	38	19	5
			847698	550.00	555.00	5.00	1160		569	91	18	8
			847699	555.00	560.00	5.00	1560		347	42	16	10
560.00	675.00	**Mafic Volcanic**										
		Generally amphibolitic with some metavolcanics in places; foliated,										
		560.0-610.0: light greenish gray color										
		610.0-675.0: dark greenish gray color										
		whole section is unmineralized										
		EOH										

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FROM	TO	DESCRIPTION	ANALYTICAL RESULTS									
			SAMPLE	FROM	TO	LENGTH						

Hole ID	Box #	From (m)	To (m)
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