Assessment Report
On
Metallurgical Testing

Rockstone Property
Thunder Bay Mining Division
Northwestern Ontario

Prepared for
Greencastle Resources Ltd.
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SUMMARY

This report includes the metallurgical testing done by SGS Laboratories on the Rockstone Graphite Property. This work compliments an earlier report dated January 8th, 2015 and filed as assessment work by the same authors.

Clark Exploration Consulting of Thunder Bay, Ontario was contracted by Greencastle Resources to conduct follow up work on its Rockstone Property (the "Property") to re-evaluate the potential for economic graphite mineralization. Drilling of geophysical anomalies in 2012 by Greencastle Resources targeting VMS mineralization encountered a 24 metre section of graphitic argillite which was not evaluated at the time for graphitic carbon (Cg).

The Rockstone Property is located on Marks and Adrian Townships in northwestern Ontario, approximately 55 km west of Thunder Bay and 20 km southwest of Kakabeka Falls (Figures 1 and 2). The Property consists of 15 staked, unpatented claims totalling 100 units (1,600 ha).

The Rockstone property is located within the Superior Province of the Canadian Shield and sits within the eastern portion of the Shebandowan Greenstone Belt (Berger and Rogers, 1995). The property also covers portions of the Shebandowan and Greenwater assemblages which are primarily supracrustal rocks. The area of interest in this program lies within the Greenwater assemblage of volcanic and associated metasediments. The Greenwater assemblage is most commonly associated with volcanogenic and magmatic base metal mineralization (Corfu and Stott 1998) whereas the deformation and magmatic events at the time of deposition of the Shebandowan assemblage is temporally associated with gold mineralization (Stott and Schnieders 1983; Jobin-Bevans, Kelso and Cullen 2006).

In 2012 Greencastle drilled three VMS targets, totalling 724m on the Rockstone Property The mineralization that Greencastle is targeting on its Rockstone Property is primarily copper-zinc VMS mineralization, as was intersected in drill hole GC-12-01 between 60.5 m and 84.5 m which returned 0.82% Zn, 0.15% Cu over 24 metres in a graphitic argillite unit. The unit is thinly bedded, graphite rich, very fine grained, dark grey to black in colour. The mineralized zone is within a brittle brecciated zone with angular clasts ranging in size from 3mm-5cm (syntectonic breccia). Mineralization occurs within the white carbonate/quartz matrix to the clasts as stringers and pods of pyrite+pyrrhotite (1-5%) with lesser reddish brown sphalerite and chalcopyrite.

Recent work by Zenyatta Ventures Ltd. on its Albany Graphite Project prompted Greencastle Resources to look at the 2012 drill intersection for potentially economic graphite. The pulps from this 24 m interval were subsequently analysed for carbon as graphite and returned 25% graphite over the 24 m section, using the graphitic carbon by LECO analytical procedure.

Working under the guidance of Dr. Jim Pirie at Greencastle Resources, Clark Exploration conducted a multi-phased assessment of the prospect through assaying of pulps, mineralogical studies, ground prospecting, ground geophysics (VLF) and, finally, metallurgical testing by SGS Laboratories in Lakefield, Ontario.

Preliminary results from the metallurgical processing (generation of a concentrate through flotation) suggest that the carbon rich intersection is too contaminated with other silicate minerals to make an economic concentrate. Final results are not available at the time of writing this report.

Assuming that this intersection potentially represents VMS mineralization remobilized into a distal-type setting, then the clusters of AEM conductors near the currently tested drill targets may be considered for further exploration for proximal-type VMS mineralization. Followup of the graphite mineralization should continue as a secondary target.

A Phase 1 exploration program of ground geophysics, mapping and sampling at an estimated cost of $108,500 is recommended to evaluate the Property. The ground geophysics will be comprised of magnetic and electromagnetic surveys on cut lines. Due to the lack of outcrop and known complexity of folding and deformation of the supracrustal rocks, the magnetic survey will help define the geological stratigraphy and structure. The electromagnetic survey will be used to better refine the VTEM anomalies in preparation for diamond drilling. The mapping and sampling will assess the geological environment around the conductive zones and assist in defining stratigraphic and structural setting of potential drill targets.

Once the results of the Phase 1 field work and detailed evaluation of the geophysical data are available, a number of targets will be identified and it is anticipated that a diamond drilling program of 2,000 metres in 8 holes at an estimated cost of $340,000 will test the priority targets.

INTRODUCTION

This report includes the metallurgical testing done by SGS Laboratories on the Rockstone Graphite Property. This work compliments an earlier report dated January 8th, 2015 and filed as assessment work by the same authors.

Clark Exploration Consulting of Thunder Bay, Ontario was contracted by Greencastle Resources to conduct follow up work on its Rockstone Property (the "Property") to re-evaluate the potential for economic graphite mineralization. Drilling of geophysical anomalies in 2012 by Greencastle Resources targeting VMS mineralization encountered a 24 metre section of graphitic argillite which was not evaluated at the time for graphitic carbon (Cg).

The report and recommendations are based on:

1/ Public data archived at the Ministry of Northern Development, Mines and Forestry ("MNDMF"), Thunder Bay Resident Geologist's Office, Thunder Bay, Ontario, and on the MNDM website (www.geologyontario.mndm.gov.on.ca/);

2/ Participation in the exploration on the property by S. Siemieniuk, D. Cullen and G. Clark from 2012 to 2014.

PROPERTY DESCRIPTION AND LOCATION

The Rockstone Property is located on Marks and Adrian Townships in northwestern Ontario, approximately 55 km west of Thunder Bay and 20 km southwest of Kakabeka Falls (Figures 1 and 2).

The Property consists of 15 staked, unpatented claims totalling 100 units (1,600 ha). The claim dispositions are listed in Table 1 below.

Table 1. Rockstone Property Claims

Claim No.	Township	Date Recorded	Due Date	Work Required	Units
4250262	Adrian	May 6, 2011	May 6, 2015	$2,400	6
4250263	Marks	June 1, 2011	Jan 30, 2015	$2,686	12
4250265	Adrian	May 6, 2011	May 6, 2015	$4,800	12
4250266	Adrian	May 6, 2011	May 6, 2015	$1,600	4
4250267	Marks	May 6, 2011	May 6, 2015	$1,600	4
4250270	Marks	May 6, 2011	May 6, 2015	$3,200	8
4211678	Marks	Sept 1, 2006	Jan 27, 2015	$2,800	12
4252355	Marks	Feb 12, 2010	Feb 12, 2016	$1,600	4
4263721	Marks	June 1, 2011	June 1, 2015	$1,600	4
4263722	Marks	June 1, 2011	June 1, 2015	$1,600	4
4268128	Marks	June 27, 2012	Jan 30, 2015	$1,600	4
4271690	Marks	April 14, 2014	April 14, 2016	$800	2
4271691	Marks	April 14, 2014	April 14, 2016	$6,400	16
4271692	Marks	April 14, 2014	April 14, 2016	$1,600	4
4271693	Marks	April 14, 2014	April 14, 2016	$1,600	4
Total				**$38,886**	**100**

The Ontario Mining Act requires Exploration Permits or Plans for exploration on Crown Lands. The permits and plans are obtained from the MNDM. The processing periods are 50 days for a permit and 30 days for a plan while the documents are reviewed by the Ministry and presented to the Aboriginal communities whose traditional lands will be impacted by the work. Discussion with the First Nation on access and potential economic benefit is recommended by the Ontario Government and authors.

The government of Ontario requires expenditures of $400 per year per unit for staked claims, prior to expiry, to keep the claims in good standing for the following year. The work report must be submitted by the expiry date.

No mineral resources, reserves or mine existing prior to the mineralization described in this report are known by the authors to occur on the Property. There are no known environmental liabilities associated with the Property.

ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

The Rockstone Property is located on Marks and Adrian Townships in northwestern Ontario, approximately 55 km west of Thunder Bay and 20 km southwest of Kakabeka Falls (Figures 1 and 2). The property is accessible by road, by way of the Trans-Canada Highway (Highway 17) and the regional highway 590, which goes south from just west of Kakabeka Falls, from which the Boreal Forest Road extends to the west across a large area as a primary forestry access road. The property is accessible by a series of logging roads extending north and south of the Boreal Forest Road, and also by the Adrian Lake Road that extends north from Highway 590. The main lines of the Canadian Pacific and Canadian National railways run through Kakabeka Falls. Major electrical power lines follow the route of Highway 17 and the railways.

Figure 1. Location Map

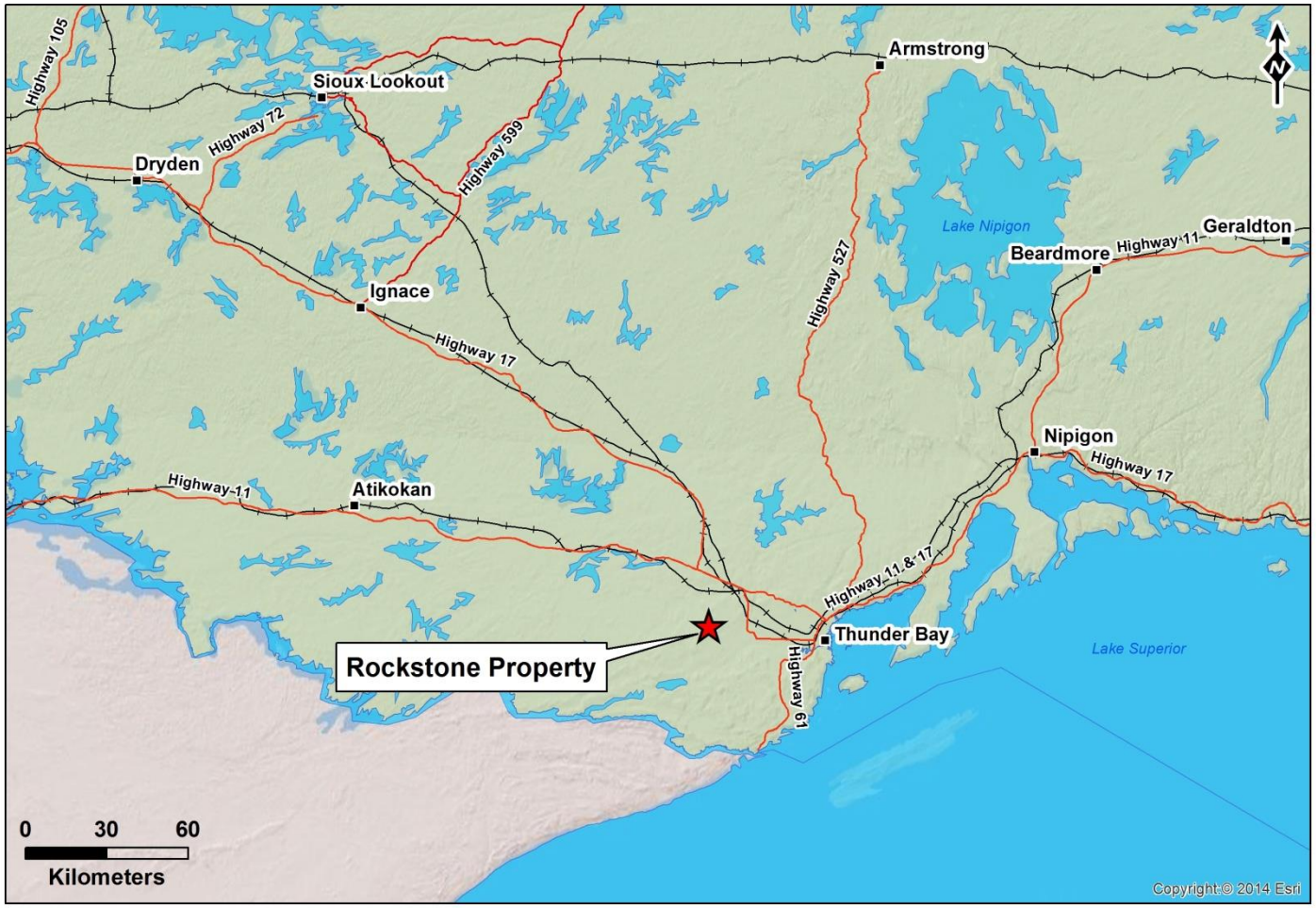
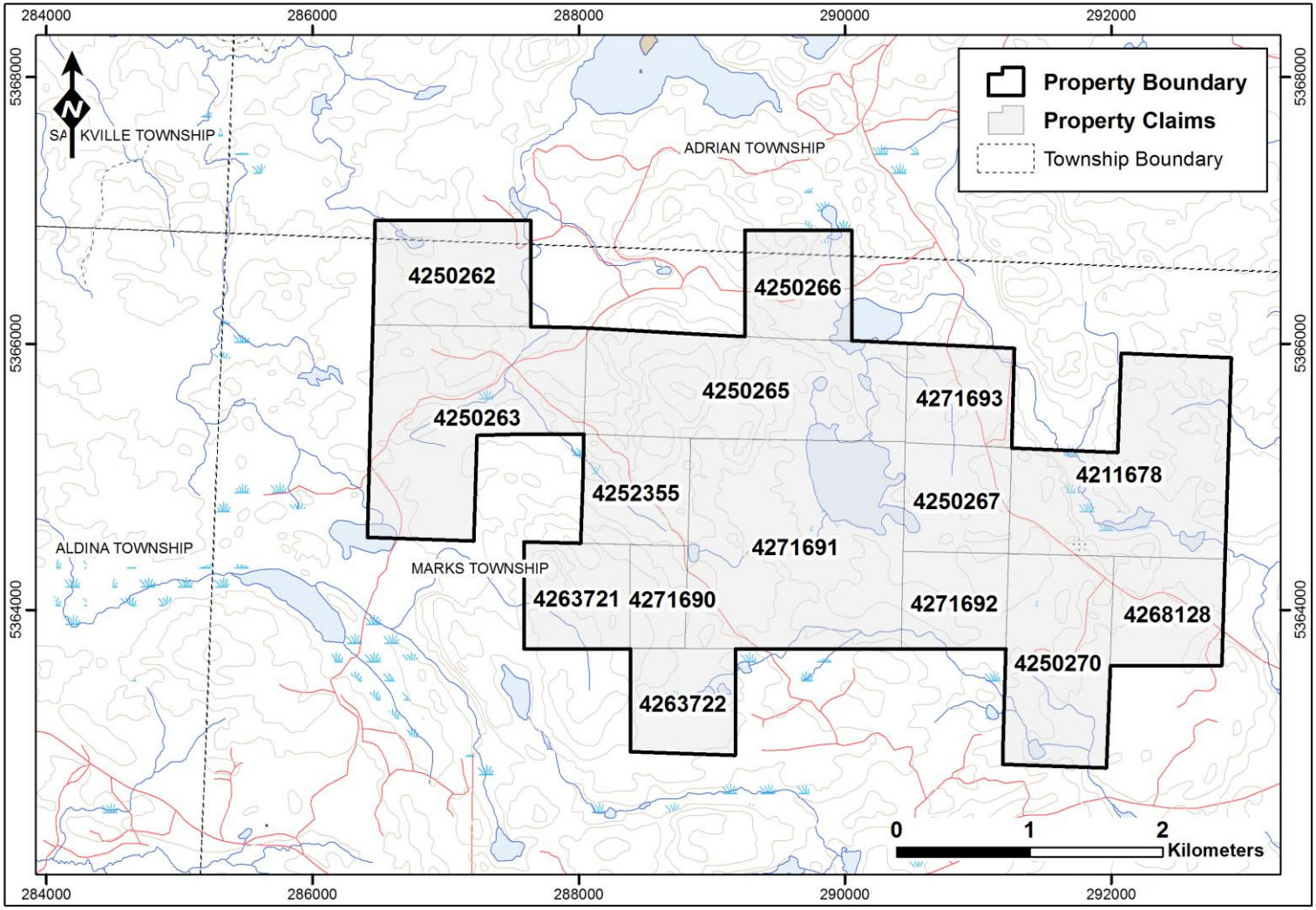


Figure 2. Rockstone Property Claims



EXPLORATION HISTORY

1957: New Fortune Mines drilled one hole of 145 ft. on an outcrop of magnetite iron formation on what is now claim 4211678 of the Property, and intersected 80 ft. of 30.82% iron. No other elements were assayed for.

1961: Hanna Mining Company conducted a detailed magnetometer survey and geological mapping covering parts of claims 4250267, 4271692, 4250270, 4211678 and 4268128 on the east side of the current Property. The survey was conducted as a follow up to the previous work by New Fortune Mines in order to better define the iron formation, and the survey outlined a narrow, folded band of iron formation.

1962: Hanna Mining Company completed another magnetometer and geological survey in the area, this time further east, and it appears it may have only touched on the easternmost part of the Property.

1996: Cumberland Resources Ltd. conducted a soil geochemistry survey on a grid which was mostly on claims 4271692, 4250270 and 4211678 of the current Property. The grid consisted of 12 km of line, and a total of 174 B-horizon soil samples were collected at 50m intervals and analyzed by the ICP method for 32 elements. The results were described as being inconclusive, with the best anomaly being achieved from zinc. A continuous zinc anomaly with values ranging from 100 to 288 ppm extends for 2000m on the west end of the grid, with background values for zinc on the property said to be less than 40 ppm (McCrindle 1996). Further work was recommended, including mapping and, where possible, lithogeochemical and assay sampling in order to try to determine the cause of the soil anomalies.

1997: Cumberland Resources Ltd. conducted magnetic and electromagnetic surveys (VLF and Max-Min II+) over a 9.9 km grid that covered the area of the soil geochemistry anomaly outlined the previous year and described above. The magnetic survey was interpreted as defining magnetite rich iron formations toward the eastern part of the survey, while the Max-Min II+ survey did not locate any conductive trends, but did produce readings in the eastern part of the grid consistent with the presence of strong magnetite iron formations (Middaugh 1997).

2001- 2002: Candor Ventures Ltd. conducted geophysics consisting of magnetometer and Max-Min I electromagnetic surveys on a property that covered claim 4250266 and the north quarter of claim 4250265 in the northern part of the current Property. The two most significant EM conductors were subsequently drilled in winter 2002, with one of the holes (TL-02-02) being on claim 4250266 of Greencastle's Property. Candor was interested in gold at the time, and in both drill holes the conductors were identified as graphitic sediments, so they recommended no further work.

However, it should be noted that graphite is now one of the current targets for economic mineralization by Greencastle.

2001: Whalen Resources Ltd. conducted a program of digging test pits and trenches on what is now claim 4250270 of the current Property. A total of 34 test pits were dug at least 7m deep to try to locate bedrock, and where bedrock was exposed a 2-3m trench was dug until the overburden got too deep. Four trenches were dug of varying length for a total length of approximately 170m. The trenching showed that the area was underlain by deformed mafic pillowed volcanic, though only one trench exhibited mineralization, with ~1% fine grained disseminated pyrite in a siliceous, altered, mafic volcanic (Spence 2001). No samples were taken during the program.

2004: GLR Resources Inc. performed an airborne time domain electromagnetic (TDEM) geophysical survey which covered all of claim 4250262 and approximately 90% of claim 4250263 at the west side of the current Property. Only several weak EM anomalies were located on Greencastle's Property.

2007: In 2007 Sabina Silver Corporation conducted a versatile time domain electromagnetic (VTEM) geophysical survey over a large property, which included all of Greencastle's current Property. This survey was subsequently used as the basis for the 2012 diamond drilling program by Greencastle. Since Greencastle is a subsidiary of Greencastle, with Greencastle owning 65% of Greencastle, the exploration and drilling done by Greencastle will be discussed in detail in Items 9 and 10, "Exploration" and "Drilling".

2012: Using an airborne VTEM and magnetic survey carried out by Sabina Silver Corp. over the Rockstone property in 2007 (Figure 4), Greencastle reviewed a number of the VTEM anomalies using the Maxwell plate modeling method by Geotech Ltd. and selected four separate, potential base metal volcanogenic massive sulphide (VMS) targets to be tested by diamond drilling. A total of 916 meters were drilled in four holes on these targets. It should be noted that since this work Greencastle returned a number of the claims constituting the Property, and one of the holes drilled in 2012 (GC-12-03) is no longer on the current Property. The drilling on the current Property totalled 724m, and the holes are shown in Figure 4. The best intersection was found in drill hole GC-12-01 between 60.5 m and 84.5 m which returned 0.82% Zn, 0.15% Cu over 24 metres within a graphitic argillite unit.

Table 2. Greencastle 2012 Drill Hole Summary

Hole Number	Easting	Northing	Length (m)	Dip	Azimuth
GC-12-01	291260	5364780	201	-45	42.5
GC-12-02	290260	5365599	261	-45	66
GC-12-03*	291208	5368638	192	-45	65
GC-12-04	288210	5365180	262	-45	215

*Note: Hole GC-12-03 is not located on Greencastle's current Property.

The best intersection was found in drill hole GC-12-01 between 60.5 m and 84.5 m which returned 0.82% Zn, 0.15% Cu over 24 metres within a graphitic argillite unit. The unit is thinly bedded graphite-rich, very fine grained, dark grey to black in colour. The mineralization occurs within a brittle brecciated zone with angular clasts ranging in size from 3mm-5cm (syntectonic breccia). Mineralization occurs within the white carbonate/quartz matrix to the clasts as stringers and pods of pyrite+pyrrhotite (1-5%) with lesser reddish brown sphalerite and chalcopyrite. The pulps from this 24 m interval were subsequently analysed for carbon as graphite and returned 25% graphite over the 24 m section, using the graphitic carbon by LECO analytical procedure.

In GC-12-04, two weakly mineralized zones were identified: 0.32% Zn over 2.5 m from 177.8 m to 180.3 m and 0.15% Zn over 20.2 m from 182.3 to 202.5 m.

In September 2012, Greencastle contracted Crone Geophysics to conduct 3D Borehole Pulse Electromagnetic Surveys on the four holes and again interpreted the results using the Maxwell plate modelling method. This work identified several anomalous conductive features which should be re-evaluated for further exploration.

GEOLOGICAL SETTING AND MINERALIZATION

Regional Geology

The area around the Property is underlain by Neoarchean rocks of the Shebandowan Greenstone Belt, within the Wawa Subprovince of the Superior Province and by Paleo-Mesoproterozoic rocks of the Southern Province. (Rogers and Berger, 1995). The Shebandowan Greenstone Belt is fault-bounded to the north by metasedimentary and felsic intrusive rocks of the Quetico Subprovince and is overlain to the south by Paleoproterozoic metasedimentary rocks of the Animikie Group also known as the Gunflint and Rove Formations (Figure 3) (Bajc 1999). The Neoarchean rocks of the Shebandowan Greenstone Belt are composed mainly of ultramafic, mafic, intermediate and felsic metavolcanic rocks. Related intrusive rocks include peridotite, gabbro, felsic porphyries, and clastic and chemical metasedimentary rocks (Rogers and Berger, 1995). The supracrustal rocks are divided into two assemblages based on morphology, composition, structure and metamorphism which correlate with the Greenwater and Shebandowan assemblages described in the work of Carter (1990) (Berger and Rogers 1995).

The Greenwater assemblage is most commonly associated with volcanogenic and magmatic base metal mineralization (Corfu and Stott 1998) whereas the deformation and magmatic events in the Shebandowan assemblage are temporally associated with gold mineralization (Stott and Schnieders 1983; Jobin-Bevans, Kelso and Cullen 2006).

Property Geology

The Rockstone Property sits within the eastern portion of the Shebandowan Greenstone Belt (Rogers and Berger, 1995). and is underlain primarily by supracrustal rocks of the Greenwater assemblage of metavolcanics and associated metasediments (Figure 3).

The rocks types found within the property boundary include; mafic, ultramafic, intermediate metavolcanics, coarse clastic metasedimentary rocks, dacitic and andesitic flows, tuffs and breccias, felsic to intermediate metavolcanics, alkaline metavolcanic rocks, and metasedimentary rocks comprised of: conglomerate, arkose, arenite, wacke, sandstone, siltstone, and graphitic argillite. There is a fault running northwest – southeast through the property and there are two iron occurrences within the property boundary. Portions of the property are also underlain by mafic intrusive rocks (Bajc, 1999).

Mineralization

The mineralization that Greencastle is targeting on the Rockstone Property is primarily copper-zinc volcanogenic massive sulphide (VMS) mineralization, as was intersected in drill hole GC-12-01 between 60.5 m and 84.5 m which returned 0.82% Zn, 0.15% Cu over 24 metres in a graphitic argillite unit. The unit is thinly bedded, graphite rich, very fine grained, dark grey to black in colour. The mineralized unit occurs within a brittle brecciated zone with angular clasts ranging in size from 3mm-5cm (syntectonic breccia). Mineralization occurs within the white carbonate/quartz matrix to the clasts as stringers and pods of pyrite+pyrrhotite (1-5%) with lesser reddish brown sphalerite and chalcopyrite. Assuming that this intersection potentially represents VMS mineralization remobilized into a distal-type setting, then the clusters of AEM conductors near the currently tested drill targets may be considered for further exploration for proximal-type VMS mineralization.

The pulps from the 24 m interval in GC-12-01 were subsequently analysed for carbon as graphite and returned 25% graphite over the 24 m section, using the graphitic carbon by LECO analytical procedure.

Greencastle is following up on the potential of graphite mineralization as a secondary target.

Figure 3. Regional and Property Geology

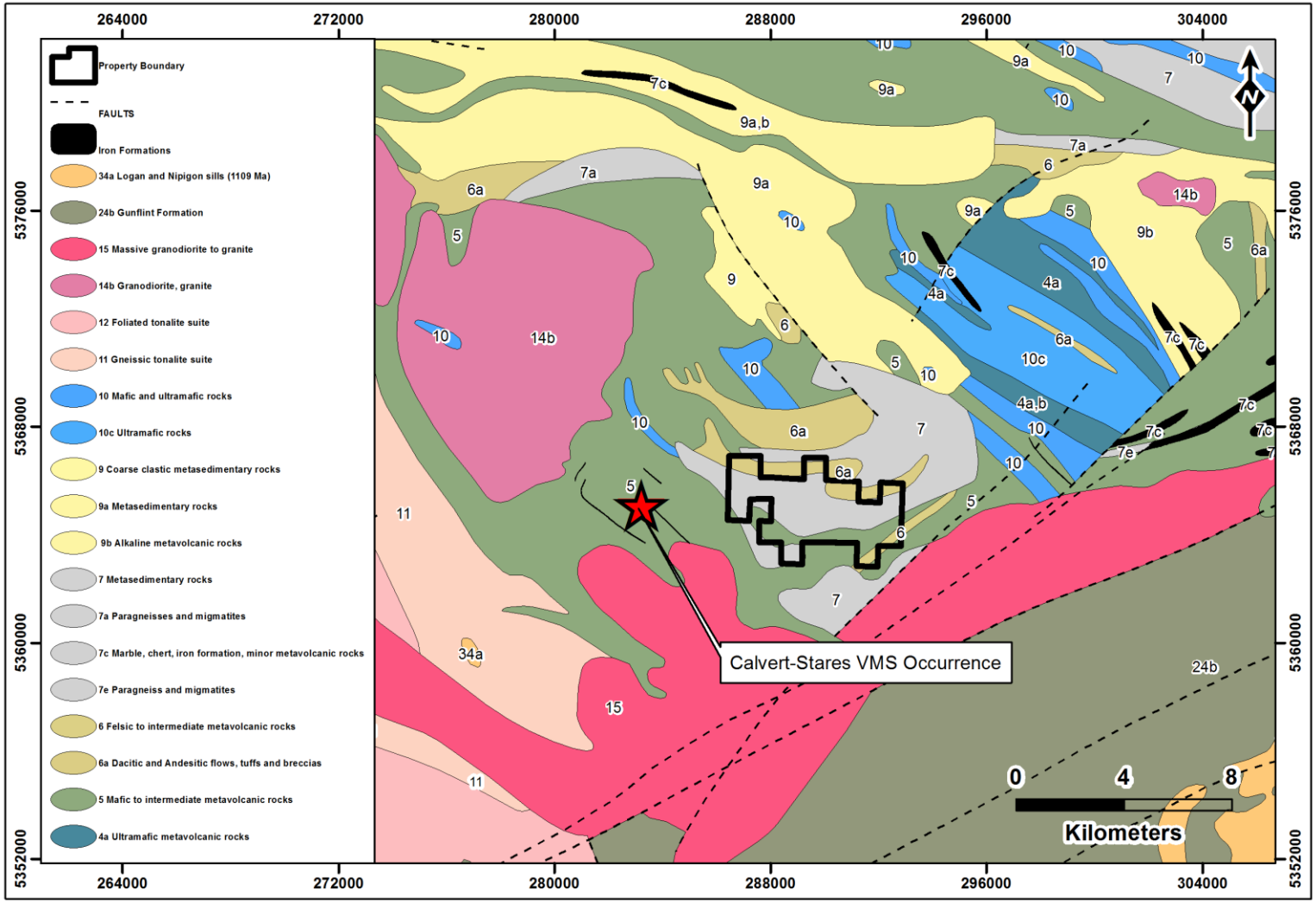
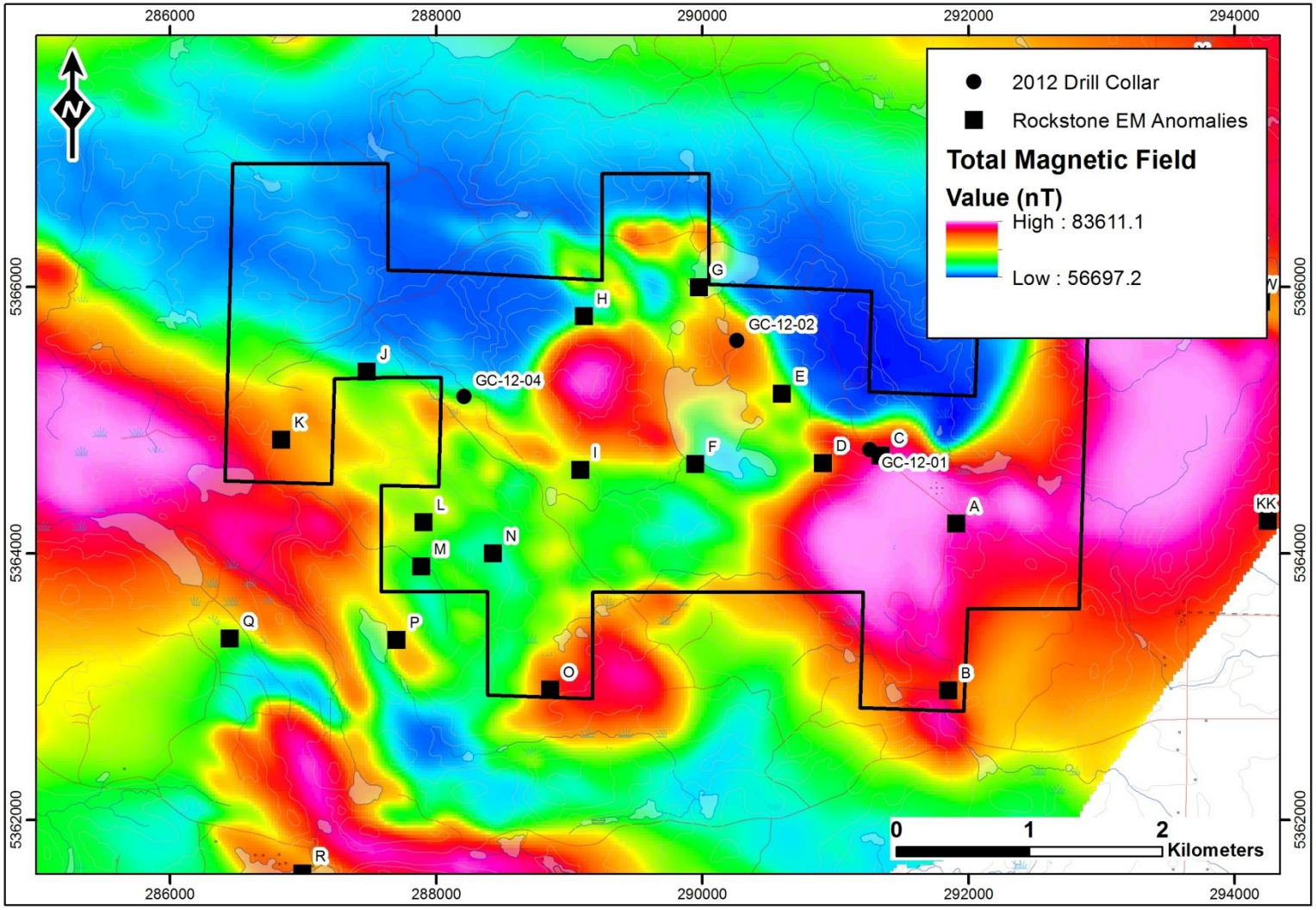


Figure 4. Property Compilation.



2014 EXPLORATION PROGRAM

Recent work by Zenyatta Ventures Ltd. on its Albany Graphite Project prompted Greencastle Resources to look at the 2012 drill intersection for potentially economic graphite.

Working under the guidance of Dr. Jim Pirie at Greencastle Resources, Clark Exploration conducted a multi-phased assessment of the prospect through assaying of pulps, mineralogical studies, ground prospecting, ground geophysics (VLF) and, finally, metallurgical testing by SGS Laboratories in Lakefield, Ontario.

Metallurgical Testing

As mentioned previously, ¼'d core of the graphitic intersection has been sent to SGS Laboratories for metallurgical testing. A copy of the final report by SGS is included as Appendix A.

INTERPRETATION AND CONCLUSIONS

The work done on the Property to date has indicated the presence of low grade copper-zinc volcanogenic massive sulphide (VMS) mineralization. The 2012 drilling by Greencastle drill tested three of the airborne conductive targets and confirmed that the geology over the general area has potential for base metal VMS mineralization since moderate Zn-Cu mineralization (0.82% Zn, 0.15% Cu over 24 metres) was encountered in one hole, while all holes encountered graphitic argillite rock units within a sequence of intermediate to felsic metavolcanics. The pulps from this 24 m interval were subsequently analysed for carbon as graphite and returned 25% graphite over the 24 m section, using the graphitic carbon by LECO analytical procedure.

Preliminary results from the metallurgical processing (generation of a concentrate through flotation) suggest that the carbon rich intersection is too contaminated with other silicate minerals to make an economic concentrate of graphite.

In GC-12-04, two weakly mineralized zones were identified: 0.32% Zn over 2.5 m from 177.8 m to 180.3 m and 0.15% Zn over 20.2 m from 182.3 to 202.5 m.

Down-hole pulse EM surveys of each hole suggest a number of off-hole conductive targets which require follow-up evaluation and possible testing as part of a future phase of drilling in the area to identify a potential larger source of VMS mineralization. Assuming that these drill intersections potentially represents base metal mineralization remobilized into a distal-type setting, then a number of the clusters of AEM conductors near the currently tested drill targets within the Property boundaries should be considered for further exploration for proximal-type VMS mineralization.

RECOMMENDATIONS

A Phase 1 exploration program of ground geophysics, mapping and sampling at an estimated cost of $108,500 is recommended to evaluate the Property. The ground geophysics will be comprised of magnetic and electromagnetic surveys on cut lines. Due to the lack of outcrop and known complexity of folding and deformation of the supracrustal rocks, the magnetic survey will help define the geological stratigraphy and structure. The electromagnetic survey will be used to better refine the VTEM anomalies (Figure 4) in preparation for diamond drilling. The mapping and sampling will assess the geological environment around the conductive zones and assist in defining stratigraphic and structural setting of potential drill targets.

Once the results of the Phase 1 field work and detailed evaluation of the geophysical data are available, a number of targets will be identified and it is anticipated that a diamond drilling program of 2,000 metres in 8 holes at an estimated cost of $340,000 will test the priority targets.

Proposed Budget

Phase 1

Line Cutting (50 kilometres @ $850/kilometre)	42,500
Magnetic Survey (50 kilometres @ $180/kilometre)	9,000
Electromagnetic Survey (30 kilometres @ $300/kilometre)	9,000
Geophysical Supervision & Interpretation (10 days @ $1,000/day)	10,000
Mapping & Sampling (20 days @ $1,200/day)	24,000
Assays (100 samples @ $40/sample)	4,000
Reports and Maps	5,000
Contingencies	5,000
TOTAL Phase 1	**$108,500**

Phase 2

Diamond Drilling (2,000 metres@ $120 /metre)	240,000
Geology, Logging, Sampling, Splitting etc ($30/metre)	60,000
Assaying, Analyses (250 samples @ $40)	10,000
Contingency	30,000
TOTAL Phase 2	**$340,000**
TOTAL Phase 1 & Phase 2	**$448,500**

ITEM 27: REFERENCES

Note: Notations listed in the references below in the format "AFRI 52A05SW0021" refer to assessment files archived with the Ontario Ministry of Northern Development and Mines, Thunder Bay Resident Geologist's Office, Thunder Bay, Ontario, and on the MNDM website (www.geologyontario.mndm.gov.on.ca/).

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APPENDICES

APPENDIX A

SGS Report

An Investigation into

A PRELIMINARY FLOWSHEET DEVELOPMENT PROGRAM FOR THE ROCKSTONE GRAPHITE PROPERTY

prepared for

GREENCASTLE RESOURCES LTD.

Project 14748-001 – Final Report
March 4, 2015

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Member of the SGS Group (SGS SA)

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Executive Summary

One sample received on the 2nd of September, 2014, weighing approximately 22.7 kg, was used for this testwork. The sample was mixed, crushed, homogenized, and split into 1 kg charges. A head sample was taken for both head assay and mineralogical analysis. A batch flotation program was then undertaken to focus on the possibility of producing a final flotation concentrate grading greater than 90% C(t), at the most coarse grind size possible. Each flotation test used 1 kg batches of the crushed material (minus 6 mesh).

The main composite was submitted for assaying. Table 1 shows the major head assay results for the main composite.

Table 1: Test Sample Head Assay Results

Element		Main Composite
C (t)	%	26.2
C (g)	%	25.3
S	%	4.77
$S^{=}$	%	4.43
Al	%	5.21
Cu	%	0.13
Fe	%	6.73
Zn	%	0.76

XRD analysis confirms that the main gangue minerals of consequence are quartz and moderate amounts of feldspars. Minor amounts of pyrrhotite, pyrite, and mica were also detected. Chalcopyrite and chlorite were detected in trace amounts.

One polished section of the main composite was prepared and examined with an optical microscope using reflected light. Volumetric and liberation determinations of the minerals were completed using the optical point counting technique. Volumetric results revealed that the head sample contains approximately 53.5% gangue, 37.4% graphite, and 9.1% sulphides. Graphite is poorly liberated and typically occurring either as graphite rich aggregates that host multiple micrometric inclusions of silicate gangue or as fine-grained intergrowths within gangue. Clean individual graphite platy particles are rare and the silicate minerals associated with the graphite are very fine grained (<10 µm). The majority of the graphite is finer than 50 µm with major micro-inclusion gangue activity. This indicates that the ore must be ground at least finer than a P_{80} of 50 µm to achieve adequate concentrate grade and sufficient recovery.

The sulphides contained within the sample are generally coarse but are typically associated with silicates as attachments or inclusions.

A concentrate sample was also taken for optical mineralogy. The graphite still has many micro-inclusions of quartz and silicates, even as low as 5 to 10 µm particles. This suggests it will be very difficult to achieve a final carbon grade of >90% in the final cleaner flotation concentrate.

Table 2 shows the main rougher flotation results focusing on the pH of the slurry. Each 1 kg charge was ground in a steel rod mill for 15 minutes. The resulting slurry was rougher floated for a total of 8 minutes. The rougher tailing was reground for a further 5 minutes in a steel rod mill and re-floated as a rougher scavenger for an additional 4 minutes. Tests F2 and F13 were conducted at natural pH. Test F9 was conducted at a pH of 12 and test F10 was completed at a pH of 10. The grind P_{80} of test F2 was 106 µm, whilst all other tests were run at a P_{80} of 125 µm.

Table 2: Rougher Flotation Results

Test No.	Rougher Flotation Concentrate			Rougher Scav Flotation Concentrate			Overall Flotation Concentrate		
	Mass	Carbon		Mass	Carbon		Mass	Carbon	
	%	Grade, %	Recovery, %	%	Grade, %	Recovery, %	%	Grade, %	Recovery, %
F2	39.4	35.7	58.7	32.2	30.3	40.7	71.6	33.3	99.4
F9	61.7	34.1	84.2	14.8	24.0	14.3	76.5	32.1	98.5
F10	64.4	34.1	87.6	15.5	19.5	12.0	79.9	31.3	99.6
F13	60.2	34.6	86.5	15.7	19.3	12.6	75.9	31.4	99.1

The overall results for each test were very similar, with comparable total recoveries of ~99% and carbon grades of ~32% C(t) being recorded. The individual results for test F2 were quite different from the other tests, which may be a function of the finer grind size. The pH difference across tests F9, F10, and F13 appears to make very little difference to the stage and overall results. The rougher flotation concentrate grades appear reasonably stable between 34% – 35% carbon. The carbon upgrade ratio from head grade to rougher concentrate grade is small, at 1.3.

The mineralogy results, along with the small upgrade ratios observed in the rougher flotation tests, indicate that significant regrinding is required to achieve the required viable carbon cleaner concentrate grades (>90% C(t)). Four cleaner flotation tests were carried out to determine if a carbon grade of >90% C(t) was indeed achievable. The rougher concentrate was reground in ceramic media and floated over 3 stages of cleaner flotation. The third cleaner concentrate was reground a second time in ceramic media and again floated over a 2nd 3 stage flotation circuit. Finally, the sixth cleaner concentrate was again reground in ceramic media and cleaned over another 3 stage flotation circuit. The grind size of the 9th cleaner concentrate in tests F6, F7, F8, and F12 were 13 µm, 25 µm, 12 µm, and 15 µm, respectively. Table 3 shows the relevant results over the four tests.

Table 3: Cleaner Flotation Results

Test No.	Rougher Concentrate			9th Cleaner Concentrate		
	Mass	Carbon		Mass	Carbon	
	%	Grade, %	Recovery, %	%	Grade, %	Recovery, %
F6	67.5	35.2	95.2	14.9	55.9	33.5
F7	64.8	34.3	90.6	27.8	50.8	57.5
F8	30.2	33.4	39.3	5.08	65.3	12.9
F12	59.0	37.0	86.8	20.9	58.8	48.9

The highest carbon grade achieved was 65.3% C(t) in test F8. This result could also be anomalous with the poor rougher results with this test compared to the other rougher flotation results. The results indicate that a P_{80} of significantly less than 10 µm is needed to achieve the required target carbon grades that would be useful in the graphite industry. At this point in time with the current technology in place, this deposit would be deemed as unviable to process, as the gangue material (specifically quartz and feldspars) are too intertwined with the graphite at such fine grain sizes to be economically viable to liberate.

Introduction

This report presents results from the batch flotation development program completed on the Rockstone deposit ore on behalf of Greencastle Resources Ltd. The Rockstone project is located between Shebandowan and Thunder Bay in north-west Ontario. The main purpose of the project was to produce high quality carbon flotation concentrate that could be suitable for further hydrometallurgical testing.

The test program was directed by Mr. Jim Pirie of Greencastle Resources Ltd., where the testwork results were forwarded to him as they became available over the course of the program.

Russell McCarley
Senior Metallurgist, Mineral Processing

Dan Imeson, M.Sc.
Manager, Mineral Processing

Experimental work by: Marteen Lortie
Report preparation by: Russell McCarley
Reviewed by: Alicia Kavish, Dan Imeson

Testwork Summary

Approximately 23 kg of sample was received on the 2nd of September, 2014. The entire sample was mixed, crushed to minus 6 mesh, homogenized, and split into 1 kg batches.

A head sub-sample was taken and assayed for carbon speciation, sulphur speciation, and a full ICP-OES scan.

A second head sub-sample was taken for mineralogical analysis using X-Ray Diffraction (XRD) and optical techniques.

The results are summarized in the following sections, and full details of the described work are appended.

1. Sample Receipt and Preparation

1.1. Sample Receipt

One Rubbermaid container, weighing approximately 23 kg, was received at SGS Lakefield on the 2nd of September, 2014 on behalf of Greencastle Resources Ltd. for testwork.

1.2. Sample Preparation

The entire received sample was thoroughly mixed and crushed to minus 6 mesh. The resulting crushed material was homogenized thoroughly and split into 1 kg charges.

1.2.1. Head Assay Results

A sub-sample was assayed for carbon speciation, sulphur speciation, and a full ICP-OES scan. Table 4 shows the head assay carbon and sulphur speciation results, while the results from the ICP scan are shown in Table 5. Based on assay results, the majority of carbon appears to be graphite, and the majority of sulphur occurs as sulphides.

Table 4: Test Sample Carbon and Sulphur Speciation Assay Results

Element		Main Composite
C (t)	%	26.2
C (g)	%	25.3
TOC	%	0.10
CO_3	%	0.41
S	%	4.77
$S^=$	%	4.43
SO_4	%	0.10
S^0	%	<0.05

Table 5: ICP Scan Results on Test Samples

ICP-OES Scan		Main Composite
Ag	g/t	<4.0
Al	g/t	52,100
As	g/t	<30
Ba	g/t	562
Be	g/t	1.24
Bi	g/t	<20
Ca	g/t	7,720
Cd	g/t	14
Co	g/t	143
Cr	g/t	234
Cu	g/t	1,270
Fe	g/t	67,300
K	g/t	14,600
Li	g/t	32
Mg	g/t	8,610
Mn	g/t	209
Mo	g/t	16
Na	g/t	16,400
Ni	g/t	420
P	g/t	442
Pb	g/t	122
Sb	g/t	<10
Se	g/t	<30
Sn	g/t	<20
Sr	g/t	129
Ti	g/t	2,060
Tl	g/t	<30
U	g/t	<20
V	g/t	83
Y	g/t	28
Zn	g/t	7,610

Full head assay data can be viewed in Appendix A.

2. Mineralogy Testwork

2.1. Head XRD Mineralogy

The X-Ray Diffraction (XRD) analysis indicates that the main crystalline mineral components of the head sample are quartz with moderate amounts of plagioclase. Minor amounts of pyrrhotite, mica, and pyrite are also present. Chalcopyrite and chlorite were present in trace amounts.

The XRD technique did not detect graphite in appreciable quantities, as suggested by the head grade, due to two factors. Firstly, the graphite peak is very close to the quartz peak, which is the main gangue phase. This may cause the graphite peak to be overshadowed due to peak overlap with the quartz mineral. Secondly, the graphite mineral is not well crystalline in nature and is difficult to identify by the XRD method.

2.2. Head Optical Mineralogy

The as-received sample was stage-ground to a P_{80} of 300 µm to help with liberation of contained graphite analysis. One polished section was prepared and examined with an optical microscope using reflected light. Volumetric and liberation determinations of the minerals were completed using the optical point counting technique.

Volumetric results reveal that the head sample contains approximately 53.5% gangue, 37.4% graphite, and 9.1% sulphides.

Graphite is poorly liberated and typically occurring either as graphite rich aggregates that host multiple micrometric inclusions of silicate gangue or as fine-grained intergrowths within gangue. Clean individual graphite platy particles are rare and the silicate minerals associated with the graphite are very fine grained (<10 µm). The majority of the graphite is finer than 50 µm with major micro-inclusion gangue activity. This indicates that the ore must be ground to least finer than a P_{80} of 50 µm to achieve adequate concentrate grade at sufficient recovery.

The sulphides contained within the sample are generally coarse but are typically associated with silicates as attachment or inclusions.

Figure 1 illustrates the fine grained nature of the graphite particles indicated by the black grains. The non-sulphide gangue is also very fine. The photo also shows the relative coarseness of the bright sulphide minerals (mainly pyrite).

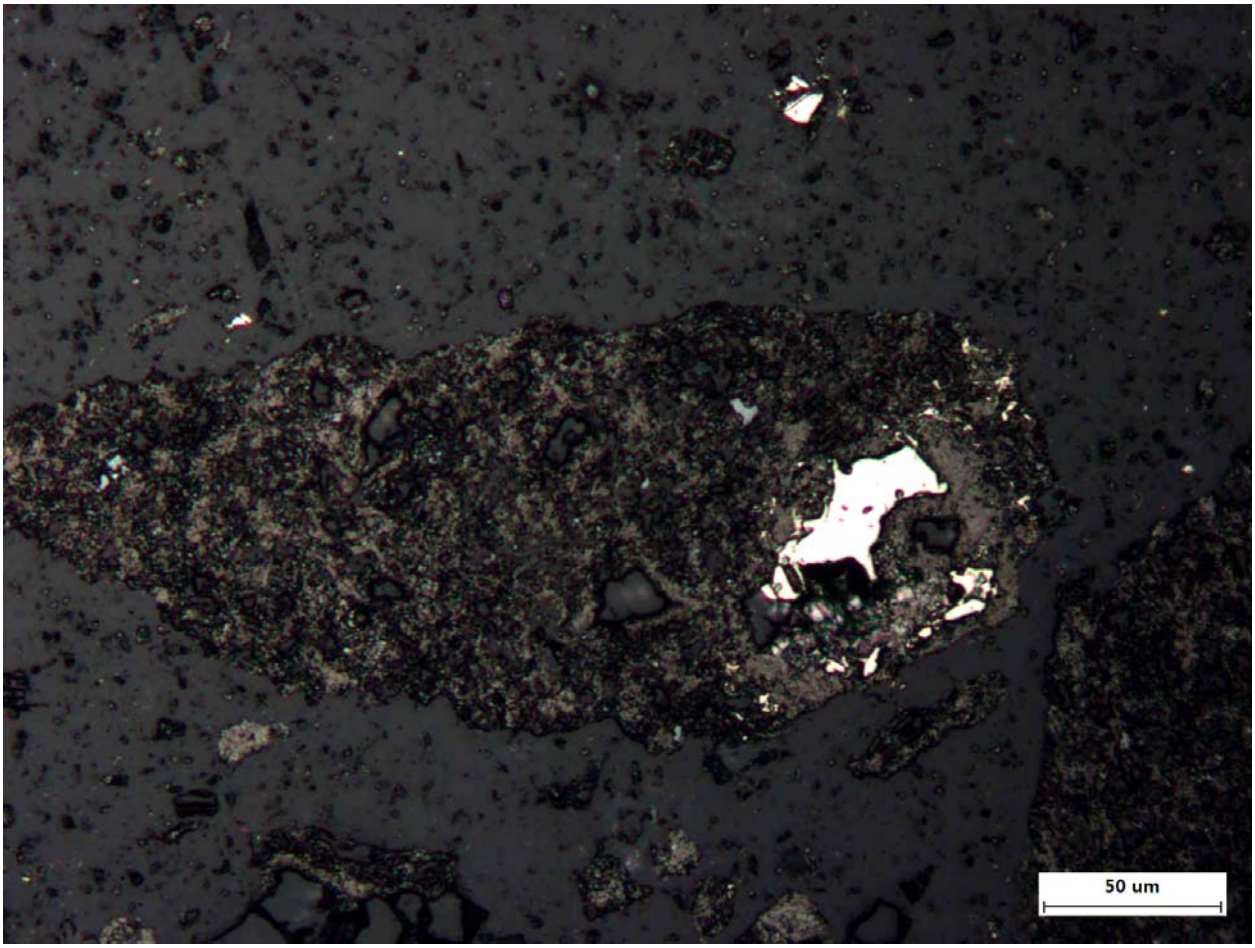

Figure 1: Optical Photomicrograph of Feed Head Sample

2.3. Concentrate Optical Mineralogy

A concentrate sample from test F8 was also taken for optical mineralogy. Figure 2 shows that the graphite still has many micro-inclusions of quartz and silicates, even as low as 5 to 10 µm particles. This suggests it will be very difficult to achieve a final carbon grade of >90% in the final cleaner flotation concentrate.

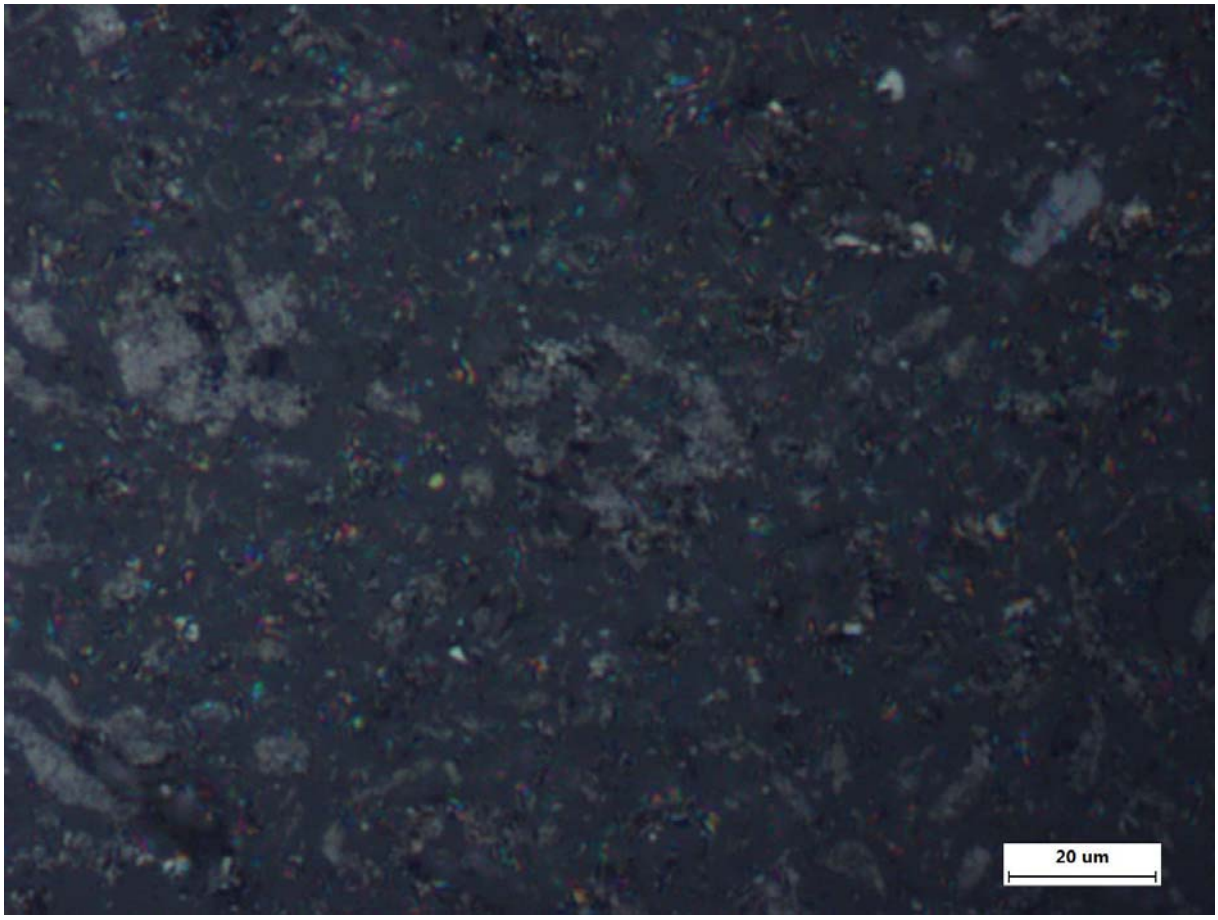

Figure 2: Optical Photomicrograph of Concentrate Sample

The full mineralogical report can be viewed in Appendix B.

3. Metallurgical Test Program

The metallurgical test program included:

- Batch rougher flotation testwork – to achieve high carbon recovery at the lowest mass pull to the rougher concentrate possible;
- Batch cleaner flotation testwork – to generate final flotation concentrate of more than 90% C(t).

3.1. Batch Rougher Flotation Testwork

The potential for carbon recovery by flotation was initially evaluated by flash flotation followed by rougher flotation of the flash flotation tails after regrinding of the Main Composite. A 1 kg charge was ground for 15 minutes in ceramic media and flash floated for a period of 4 minutes. The resulting flash flotation tailings were reground further for another 7 minutes in a conventional rod mill. Once reground, the slurry

was subjected to 4 minutes of rougher flotation. Table 6 shows the conditions used for the test, and Table 7 tabulates the relevant results.

Table 6: F1 Flotation Test Conditions

Test No.	Reagent Addition (g/t)		Flash Froth Time (min)	Rougher Froth Time (min)	Rougher Tail P_{80} (µm)	pH
	Fuel Oil	MIBC				
F1	40	40	4	4	304	7.3-7.6

Table 7: F1 Flotation Test Results

Test No.	Flash Flotation Concentrate			Rougher Flotation Concentrate			Overall Flotation Concentrate		
	Mass	Carbon		Mass	Carbon		Mass	Carbon	
	%	Grade, %	Recovery, %	%	Grade, %	Recovery, %	%	Grade, %	Recovery, %
F1	22.5	38.4	36.2	35.4	32.4	47.9	57.9	34.7	84.1

The major purpose of the test was to investigate the kinetic curve of the flash and rougher flotation steps. After 4 minutes of flash flotation, a concentrate of ~38% C(t) was possible at a carbon recovery of ~36%, whilst pulling 22.5% of the mass to concentrate. An extra ~48% carbon recovery, at a grade of 32.4% C(t), was generated by regrinding the flash flotation tail and floating the ground material for an extra 4 minutes. The results indicated that flash flotation is not a worthwhile processing technique to be considered due to the relatively low upgrade ratio of the graphitic material into the flash flotation concentrate.

A successive round of tests was completed by grinding 1 kg samples for 15 minutes in a standard steel rod mill to attain a P_{80} of ~175 µm. The resulting slurry was floated for 8 minutes. The rougher tails were then ground for a further 5 minutes in a steel rod mill to attain a P_{80} of ~125 µm. The resulting slurry was then floated for an additional 4 minutes and the final product was characterized as rougher tailings. Table 8 illustrates the conditions used for each test, while Table 9 tabulates the relevant results.

Table 8: F2, F9, F10, and F13 Test Conditions

Test No.	Reagent Addition (g/t)			Rougher Froth Time (min)	Rougher Scav Froth Time (min)	Rougher Scav Tail P_{80} µm	pH
	Fuel Oil	MIBC	Lime				
F2	60	60	-	8	4	106	7.0-7.8
F9	60	60	2440	8	4	125	12.0
F10	60	60	1180	8	4	125	10.0
F13	60	60	-	8	4	125	7.5-7.7

Table 9: F2, F9, F10, and F13 Test Results

Test No.	Rougher Flotation Concentrate			Rougher Scav Flotation Concentrate			Overall Flotation Concentrate		
	Mass	Carbon		Mass	Carbon		Mass	Carbon	
	%	Grade, %	Recovery, %	%	Grade, %	Recovery, %	%	Grade, %	Recovery, %
F2	39.4	35.7	58.7	32.2	30.3	40.7	71.6	33.3	99.4
F9	61.7	34.1	84.2	14.8	24.0	14.3	76.5	32.1	98.5
F10	64.4	34.1	87.6	15.5	19.5	12.0	79.9	31.3	99.6
F13	60.2	34.6	86.5	15.7	19.3	12.6	75.9	31.4	99.1

The results indicate that, whilst excellent carbon recoveries were recorded for each test, the carbon grade remained relatively low compared to the head grade of 26.2% carbon. In order to achieve the high recoveries of >99%, the mass pull from each test was very high with over 70% of the mass reporting to both of the concentrates. The varying pH of each test did not seem to make any difference in the results.

Test F11 included a pre-float targeting the sulphide material in the main composite. A 1 kg charge was ground to a P_{80} of 177 µm and PAX was added to help float the sulphide material from the head slurry for 1 minute. The pre-float tailing was dosed with fuel oil and MIBC as per the standard rougher flowsheet, and floated for another 8 minutes. Table 10 illustrates the conditions used for the test, while Table 11 tabulates the relevant results.

Table 10: F11 Test Conditions

Test No.	Reagent Addition (g/t)			Pre-Float Froth Time (min)	Rougher Froth Time (min)	Rougher Scav Tail P_{80} µm	pH
	Fuel Oil	MIBC	PAX				
F11	40	40	25	1	8	177	7.3-7.6

Table 11: F11 Test Results

Test No.	Pre-Float Concentrate			Rougher Flotation Concentrate			Overall Flotation Concentrate		
	Mass	Carbon		Mass	Carbon		Mass	Carbon	
	%	Grade, %	Recovery, %	%	Grade, %	Recovery, %	%	Grade, %	Recovery, %
F11	5.79	44.6	10.3	65.1	34.0	88.5	70.9	34.9	98.8

The pre-float concentrate produced a higher carbon grade than any of the previous rougher flotation tests. This may be due to the fact that graphitic carbon is, by nature, easily floatable and highly hydro-phobic. The fast floating graphite particles were concentrated along with the sulphide species into the pre-float concentrate. The rougher flotation concentrate results were very similar to the previous tests.

Figure 3 illustrates the carbon grade/recovery relationships over each of the rougher flotation tests completed. Only three tests produced concentrates greater than 40% C(t). The other tests hovered around the 35% C(t) grade line as the recovery increased.

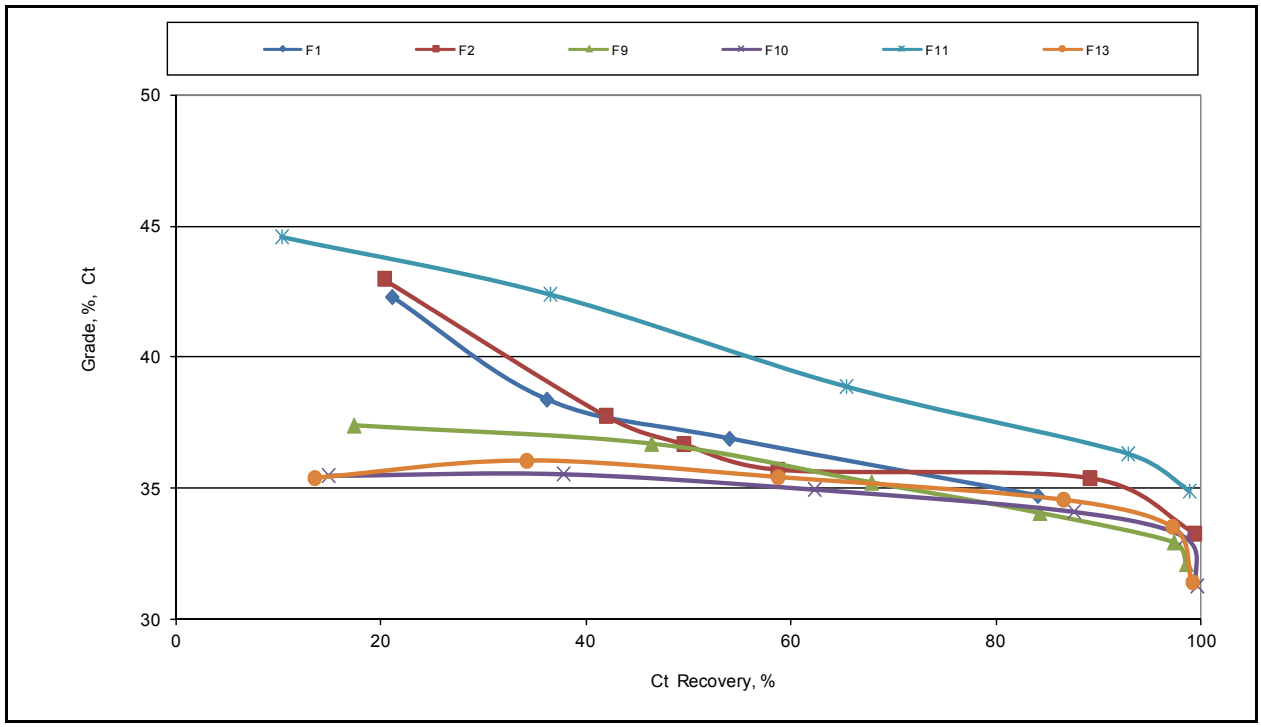

Figure 3: Rougher Flotation Grade/Recovery Curves

Further batch rougher flotation test data can be viewed in Appendix C.

3.2. Batch Cleaner Flotation Testwork

A number of cleaning flotation tests were carried out on the main composite to determine the effect on carbon grade and recovery with variable regrind grain size. Flotation tests F3 and F4 were carried out using a regrind time of 15 and 30 minutes, respectively, in a mill using ceramic media. The P_{80} of each test was 45 and 30 µm, respectively. Each re-ground slurry was subjected to a 4 stage flotation cleaner circuit in order to improve on the carbon grade and maintaining high carbon recovery. Table 12 illustrates the conditions used for the test, while Table 13 tabulates the relevant results.

Table 12: F3 and F4 Test Conditions

Test No.	Reagent Addition (g/t)		Primary Grind Time (min)	Rougher Froth Time (min)	Regrind Time (min)	Cleaner Froth Time (min)	Rougher Tail P_{80} (µm)	4th Cl. Con. P_{80} (µm)
	Fuel Oil	MIBC						
F3	80	80	10	8	15	4 x 4	357	45
F4	80	80	10	8	30	4 x 4	346	30

Table 13: F3 and F4 Test Results

Test No.	Rougher Concentrate			4th Cleaner Concentrate		
	Mass	Carbon		Mass	Carbon	
	%	Grade, %	Recovery, %	%	Grade, %	Recovery, %
F3	55.6	35.5	79.4	16.8	48.1	32.6
F4	61.7	25.2	81.3	23.2	45.7	55.3

The carbon grades in the 4th cleaner concentrate did not improve markedly over the rougher concentrate grades in tests F3 and F4. The carbon recovery in each test also dropped significantly over the rougher flotation results.

Test F5 was undertaken to add a second regrind step into the flowsheet to investigate whether a more staged regrind was necessary to improve carbon grade. The rougher concentrate was ground for 15 minutes with ceramic media and subjected to a 3 stage cleaner flotation circuit. The 3rd cleaner concentrate was reground for a second time for 15 minutes and the subsequent ground material was subjected to another 3 stage cleaner flotation circuit. Table 14 illustrates the conditions used for the test, while Table 15 tabulates the relevant results.

Table 14: F5 Test Conditions

Test	Reagent Addition (g/t)		Primary Grind Time	Rougher Froth	Regrind Time	Cleaner Froth	Rougher Tail P_{80}	6th Cl. Con. P_{80}
No.	Fuel Oil	MIBC	(min)	Time (min)	(min)	Time (min)	(µm)	(µm)
F5	150	150	15	8	2 x 15	6 x 4	188	20

Table 15: F5 Test Results

Test No.	Rougher Concentrate			6th Cleaner Concentrate		
	Mass	Carbon		Mass	Carbon	
	%	Grade, %	Recovery, %	%	Grade, %	Recovery, %
F5	44.9	34.1	63.7	9.85	54.9	22.5

Adding a second regrind and a further 3 stage flotation circuit improved the carbon grade by up to 10%. The carbon recovery declined significantly to 22.5%, however. The rougher flotation performance was also significantly lower than the previous tests.

Four more flotation tests were completed, incorporating a third regrind stage and the addition of a third round of a 3 stage cleaner flotation circuit, hence, making a total of 9 stages of cleaner flotation. A third stage regrind P_{80} of between 10 – 20 µm was recorded for each test. Table 16 illustrates the conditions used for the test, while Table 17 tabulates the relevant results.

Table 16: F6, F7, F8, and F12 Test Conditions

Test	Reagent Addition (g/t)		Primary Grind Time	Rougher Froth	Regrind Time	Cleaner Froth	Rougher Tail P_{80}	9th Cl. Con. P_{80}
No.	Fuel Oil	MIBC	(min)	Time (min)	(min)	Time (min)	(µm)	(µm)
F6	220	220	15	8	3 x 20	9 x 4	173	13
F7	220	220	15	8	3 x 30	9 x 4	177	25
F8	230	230	15	8	45, 15	9 x 4	177	12
F12	220	220	15	8	3 x 45	9 x 4	207	15

Table 17: F6, F7, F8, and F12 Test Results

Test No.	Rougher Concentrate			9th Cleaner Concentrate		
	Mass	Carbon		Mass	Carbon	
	%	Grade, %	Recovery, %	%	Grade, %	Recovery, %
F6	67.5	35.2	95.2	14.9	55.9	33.5
F7	64.8	34.3	90.6	27.8	50.8	57.5
F8	30.2	33.4	39.3	5.08	65.3	12.9
F12	59.0	37.0	86.8	20.9	58.8	48.9

Even at a P_{80} as low as 12 µm, the carbon grade did not reach 66% C(t). This indicates that the grind size of the material must be finer than 10 µm to have any chance at producing a concentrate carbon grade of over 90%. This is almost prohibitive with today's current technology.

The batch cleaner flotation testwork results are presented in Appendix D.

4. Conclusions and Recommendations

The tests performed in this project indicated:

- The test sample contained, on average, 26.2% carbon, of which, the majority of this was of graphitic nature. The test sample also contained 4.77% sulphur, of which, 4.43% of this was in the form of sulphides.

- Mineralogy on the test sample indicated that the major minerals were quartz and graphite with moderate amounts of plagioclase. Minor amounts of pyrrhotite, mica, and pyrite are also present. Chalcopyrite and chlorite were present in trace amounts. Mineralogical assessment also indicated that the graphite is poorly liberated and typically occurring either as graphite rich aggregates that host multiple micrometric inclusions of silicate gangue or as fine-grained intergrowths within gangue. The silicate minerals associated with the graphite are very fine grained (<10 µm). The majority of the graphite is finer than 50 µm with major micro-inclusion gangue activity. This indicates that the ore must be ground to least finer than a P_{80} of 50 µm to achieve adequate concentrate grade at sufficient recovery.

- None of the flotation flowsheets attempted was able to produce a graphite concentrate grading >90% C(t) at reasonable graphite recovery. The highest graphite grade achieved was 65.3% C(t) at a very fine P_{80} grind size of 12 µm.

Under the assumption that the test sample was representative of the resource, further flotation testwork is not recommended given the poor results obtained in this program.

Appendix A – Head Assay Data

14748-001		GreenCastle Resources
Element		**Main Composite**
C (t)	%	26.2
C (g)	%	25.3
TOC	%	0.10
CO_3	%	0.41
S	%	4.77
$S^{=}$	%	4.43
SO_4	%	0.10
S^0	%	<0.05
ICP-Scan		
Ag	g/t	<4.0
Al	g/t	52,100
As	g/t	<30
Ba	g/t	562
Be	g/t	1.24
Bi	g/t	<20
Ca	g/t	7,720
Cd	g/t	14
Co	g/t	143
Cr	g/t	234
Cu	g/t	1,270
Fe	g/t	67,300
K	g/t	14,600
Li	g/t	32
Mg	g/t	8,610
Mn	g/t	209
Mo	g/t	16
Na	g/t	16,400
Ni	g/t	420
P	g/t	442
Pb	g/t	122
Sb	g/t	<10
Se	g/t	<30
Sn	g/t	<20
Sr	g/t	129
Ti	g/t	2,060
Tl	g/t	<30
U	g/t	<20
V	g/t	83
Y	g/t	28
Zn	g/t	7,610

Appendix B – Mineralogy Report

An Investigation into

THE MINERALOGICAL CHARATERIZATION OF ONE GRAPHITE FEED SAMPLE FROM THE ROCKSTONE PROPERTY LOCATED IN NORTHWEST ONTARIO

prepared for

GREENCASTLE RESOURCES

Project 14748-001– Final Report
November 17, 2014

NOTES

WARNING: The sample(s) to which the findings recorded herein (the "Findings") relate was(were) drawn and / or provided by the Client or by a third party acting at the Client's direction. The Findings constitute no warranty of the sample's representativeness of any goods and strictly relate to the sample(s). The Company accepts no liability with regard to the origin or source from which the sample(s) is/are said to be extracted.

ACCREDITATION: SGS Minerals Services Lakefield is accredited to the requirements of ISO/IEC 17025 for specific tests as listed on our scope of accreditation, including geochemical, mineralogical, and trade mineral tests. To view a list of the accredited methods, please visit the following website and search SGS Lakefield: *http://palcan.scc.ca/SpecsSearch/GLSearchForm.do*.

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Executive Summary

The mineralogical examination of one metallurgical feed, labelled Head Sample, was carried out using chemical analysis, optical microscopy, and X-ray diffraction (XRD) analysis. This characterization was requested by Mr. Russell McCarley of SGS Minerals Services who is conducting the beneficiation testwork on behalf of Greencastle Resources. The purpose of this test program was to determine the mineralogy of the sample and the liberation characteristics of the graphite and gangue minerals. A summary of the results is given below.

Sample Preparation

The sample was received as -6 mesh material but was further stage-ground to a P_{80} of 300 µm for the optical analysis. This was to determine if the liberation of graphite would be adequate to produce an acceptable concentrate grade at this grind target.

One polished section (PS) was prepared and examined with an optical microscope using reflected light. Volumetric and liberation determinations of the minerals were completed using the optical point counting method.

An additional representative sub-sample was riffled and pulverized for X-ray diffraction analysis to determine the gangue minerals.

Chemical Analysis and X-ray Diffraction (XRD)

The chemical assays were provided and are referenced under CA02476-SEP14. The major elemental compositions for sulphur (both total sulphur and sulphide sulphur) and carbon (both carbon total and graphitic carbon) are presented in Table 1. According to these results, graphitic carbon accounts for approximately 25% of the sample.

Table 1: Major Elemental Composition of the Head Sample

	C(total) %	C(graphite) %	S Total %	S(Sulphide)	SO4 %	Fe %	K %	Na %
Head Sample	26.2	25.3	4.77	4.43	0.1	6.73	1.46	1.64

X-Ray Diffraction Analysis (XRD)

XRD analysis indicates that the main crystalline mineral components of the head sample are quartz with moderate amounts of plagioclase, minor pyrrhotite, mica, and pyrite (Appendix A).

However, XRD analysis did not detect graphite in appreciable quantities, which should account for ~25% of the head sample as per the assay. This is attributed to:

1. The fact that graphite is not well “crystalline” and thus, difficult to identify by XRD method.
2. The graphite peak is close to the quartz peak which is the main gangue phase, and thus the graphite gets overshadowed due to peak overlap.

Optical Mineralogy Results

The volumetric results from the optical point counting reveal the sample consists mainly of gangue (54%), graphite (37%), and sulphides (9%).

Graphite is poorly liberated and typically occurs either as aggregates that host multiple micrometric inclusions of silicate gangue or as fine-grained intergrowths within gangue. Graphite ranges in size from <5 to 50 µm. Due to an excess of these micro-inclusions, the sample will most likely have to be ground to <50 µm to liberate the graphite and achieve an acceptable concentrate grade. Figure 1 and Figure 2 graphically illustrate the liberation data for both graphite and gangue, indicating that the graphite is not well liberated.

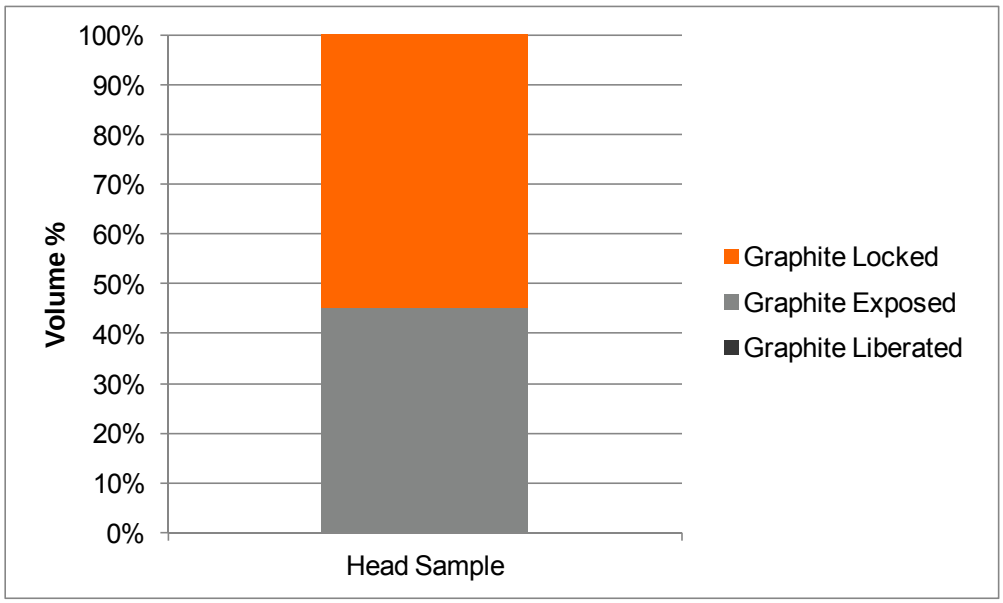


Figure 1: Liberation of Graphite in the Head Sample

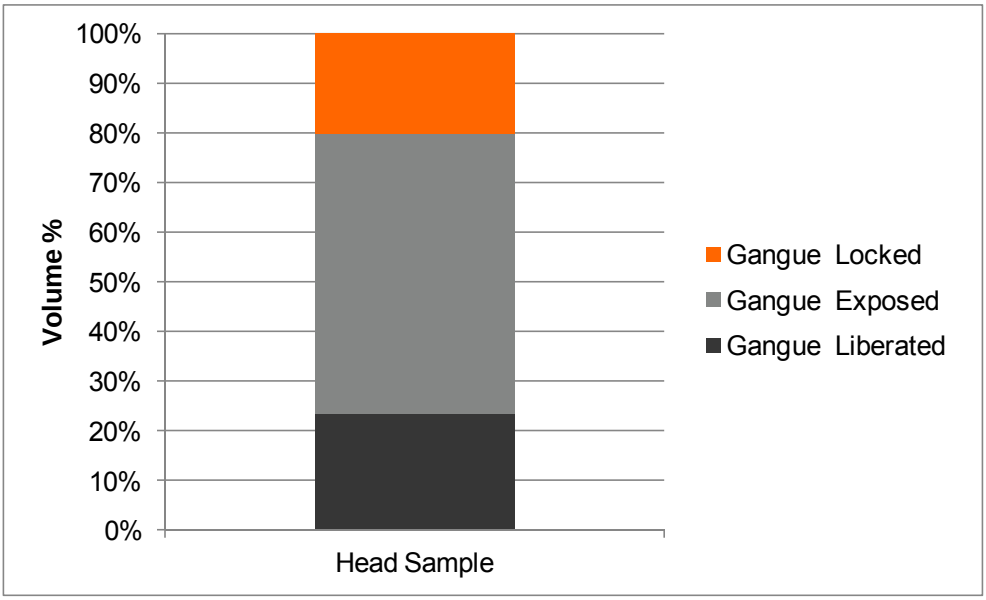


Figure 2: Liberation of Gangue in the Head Sample

Introduction

The mineralogical examination of one metallurgical feed, labelled Head Sample, was carried out using chemical analysis, optical microscopy and X-ray diffraction (XRD) analysis. This characterization was requested by Mr. Russell McCarley of SGS Minerals Services who is conducting the beneficiation testwork on behalf of Greencastle Resources. The purpose of this test program was to determine the mineralogy of the sample and determine the liberation characteristics of the graphite and gangue minerals. A summary of the results is given below.

Chris Gunning, H. B.Sc
Senior Mineralogist, Advanced Mineralogy Facility

Stephanie Downing, M.Sc
Manager, Advanced Mineralogy Facility

Sample Preparation by: Scott Young
Optical Mineralogy: Maria Mezei and Chris Gunning
Report preparation by: Chris Gunning
Report reviewed by: Tassos Grammatikopoulos, Alicia Kavish, Stephanie Downing

Testwork Summary

1. Sample Receipt and Preparation

This mineralogical examination of one metallurgical feed, labelled Head Sample, was carried out using chemical analysis, optical microscopy and X-ray diffraction (XRD) analysis. The LIMS number MI5016-SEP14 was assigned to the mineralogical work.

The sample was received as -6 mesh material but was further stage-ground to a P_{80} of 300 µm for the optical analysis. The scope was to determine if the liberation of graphite would be adequate to produce a reasonable concentrate grade at this grind target.

One polished section (PS) was prepared from the sample and examined with an optical microscope using reflected light. Volumetric and liberation analysis of the minerals was completed using the point count method.

An additional representative sub-sample was also riffled and pulverized for X-ray diffraction analysis to determine the gangue minerals.

2. X-Ray Diffraction Analysis

The results of the XRD analysis are given in Table 2 and the complete analyses are given in Appendix A. XRD analysis indicates that the main crystalline mineral components of the head sample consist mainly of quartz with moderate amounts of plagioclase, minor pyrrhotite, K-feldspar, mica, and pyrite.

The XRD results did not detect graphite in appreciable quantities which could be due to:

1. The fact that graphite is not well “crystalline” and thus, difficult to identify by XRD method.
2. The graphite peak is close to the quartz peak which is the main gangue phase and, thus the graphite gets overshadowed due to peak overlap.

Table 2: Summary of the XRD Restults

Crystalline Mineral Assemblage (relative proportions based on peak height)

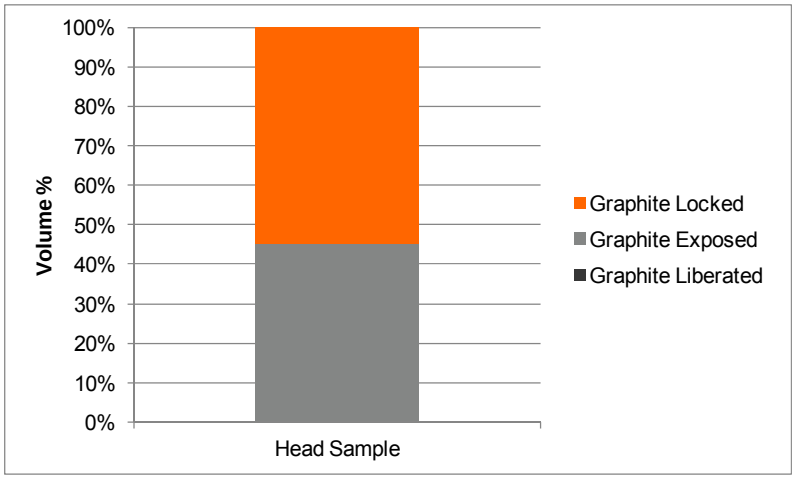
Sample ID	Major	Moderate	Minor	Trace
1. Head Sample	quartz	plagioclase	pyrrhotite, mica, pyrite, potassium-feldspar	*chalcopyrite, *chlorite, *graphite

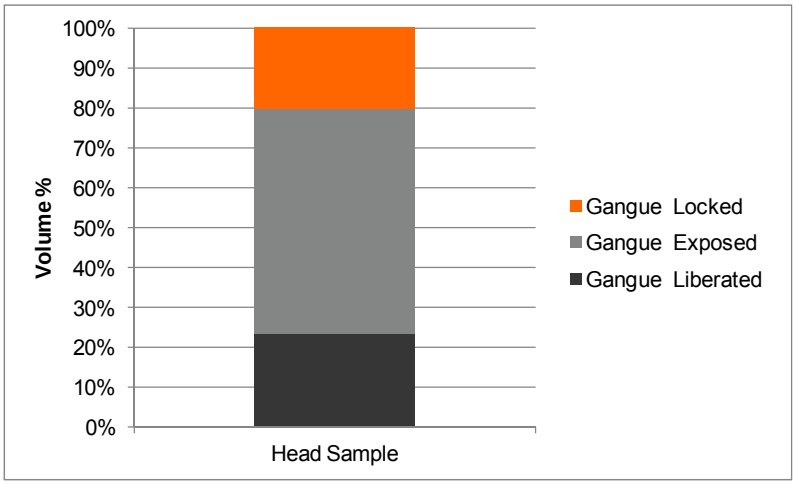
** tentative identification due to low concentrations, diffraction line overlap or poor crystallinity*

3. Optical Mineralogy Results

Optical microscopy was conducted using both reflected light at 50X to 500X magnifications. Observations are summarized below.

- The volumetric results from the optical point counting reveal the sample consists mainly of gangue (53.5%), graphite (37.4%), and sulphides (9.1%).
- Graphite is poorly liberated and typically occurring either as graphite rich aggregates that host multiple micrometric inclusions of silicate gangue or as fine-grained intergrowths within gangue. Clean individual graphite platy particles are rare and the silicate minerals associated with the graphite are very fine grained (<10 µm).
- The graphite ranges in size from <5 to 50 µm. Due to an excess of these micro inclusions, the sample will most likely have to be ground to <50 µm to achieve an adequate concentrate grade.
- Figure 3 graphically illustrates the volumetric liberation data for graphite, gangue, and sulphides.
- Sulphides (manly pyrite) are common and occur as coarse liberated particles (can be >500 µm), but are typically associated with the silicates as attachment or inclusions.
- Representative optical photomicrographs of graphite and associated gangue minerals taken in plane polarized reflected light (PPRL) are shown in Figure 4 and Figure 5.





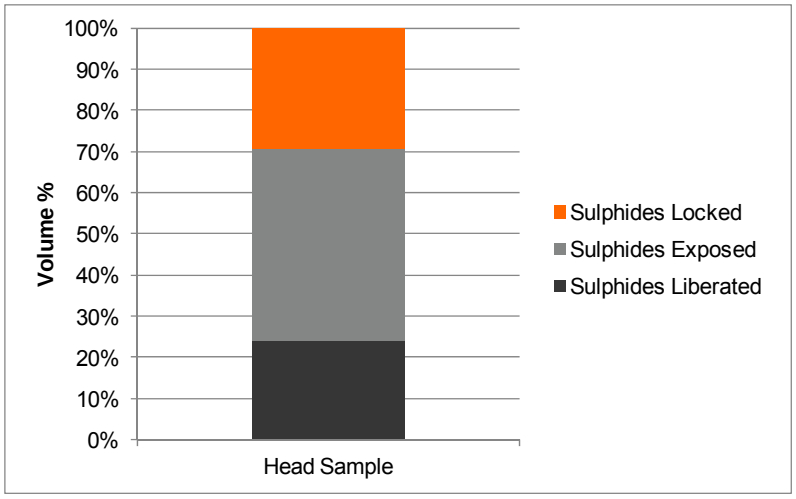


Figure 3: Liberation of Graphite, NSG, and Sulphides for the Head Sample

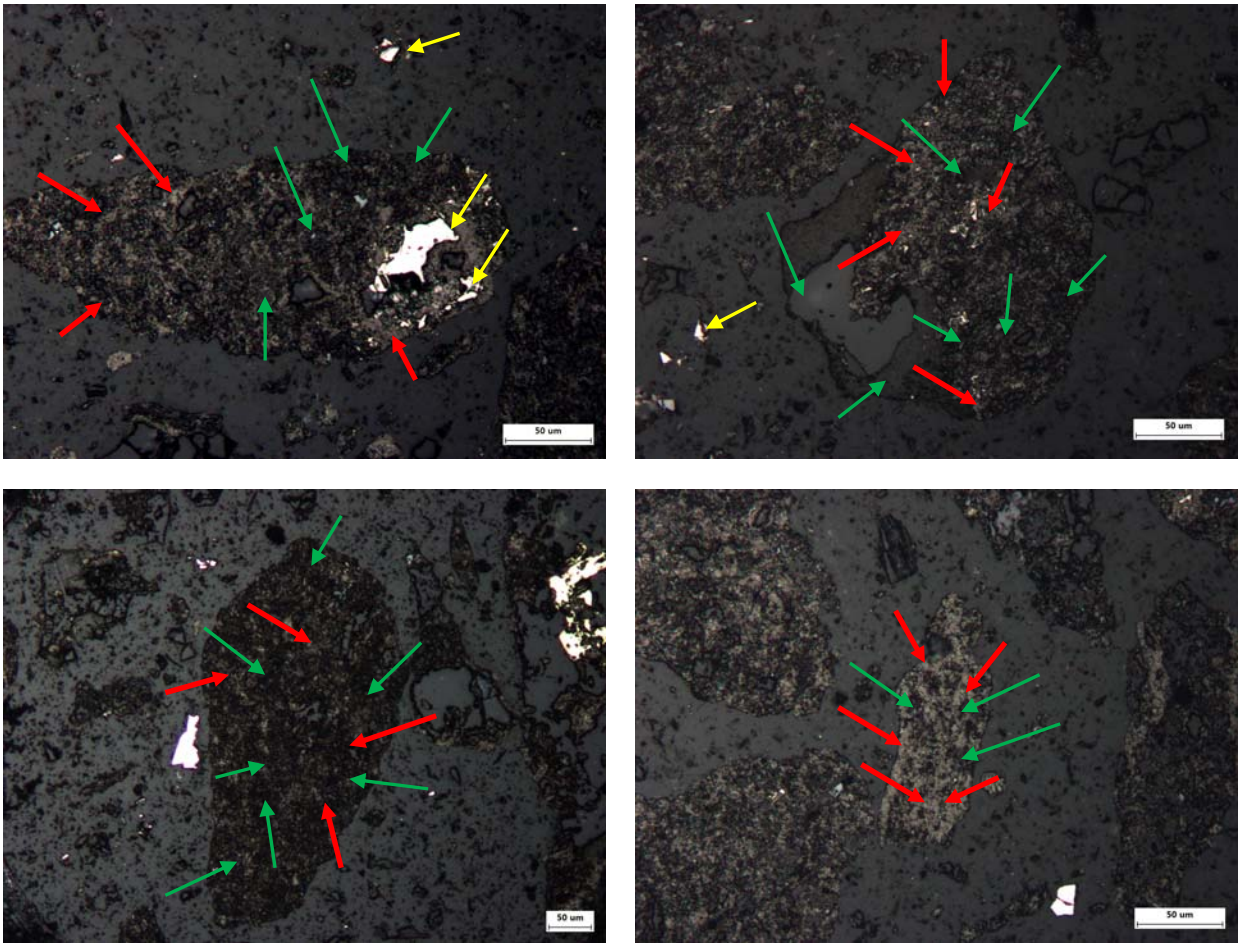


Figure 4: Optical Photomicrographs in Plane Polarized Reflected Light (PPRL) of the Feed Head Sample

The photomicrographs show coarse particles with very fine-grained graphite (red arrow) that ranges from <5 to ~50 µm in length with pervasive micrometric inclusions of silicates or NSG (non sulphide gangue minerals, green arrow). Overall graphite is poorly liberated in the sample. Sulphides are also present (yellow arrow).

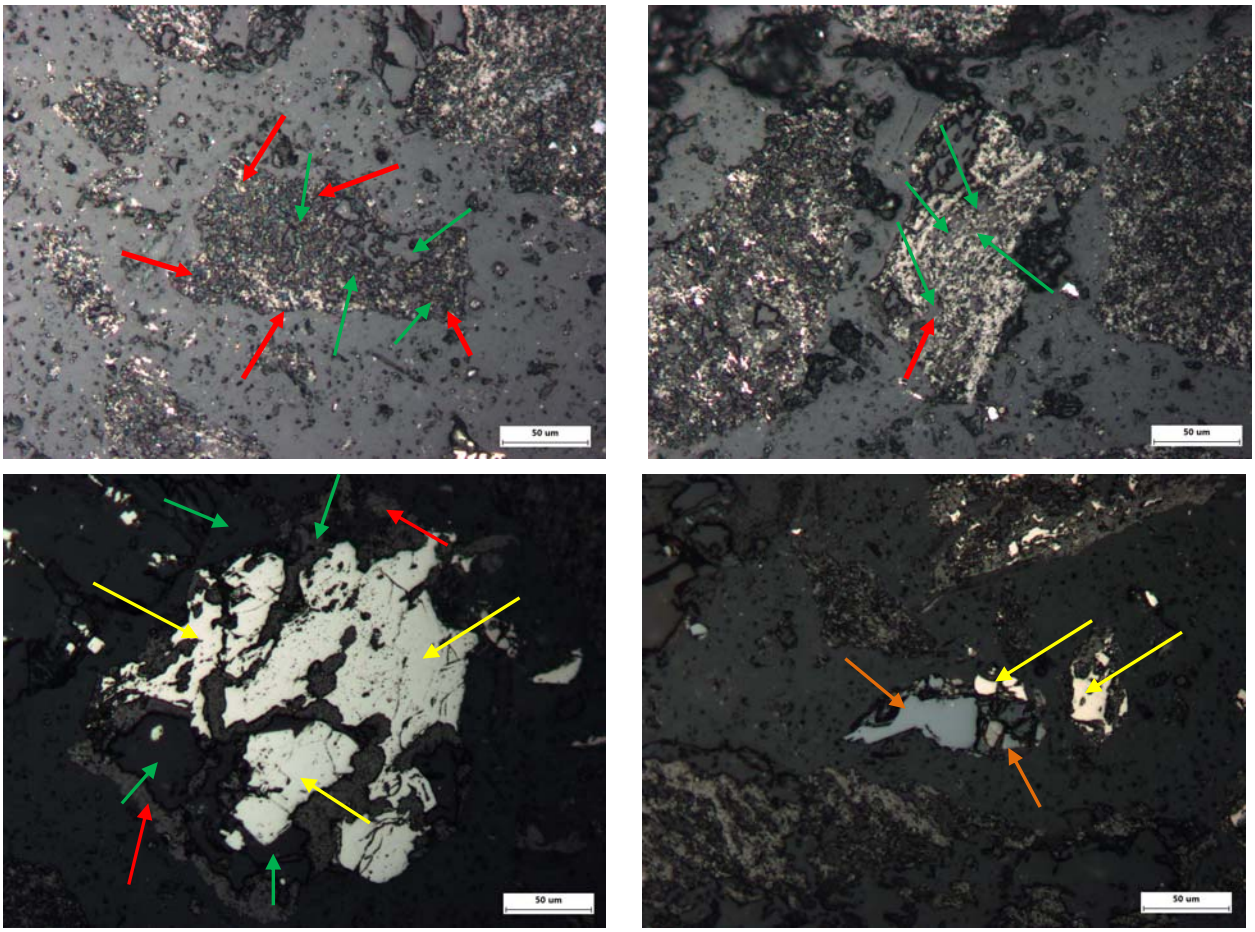


Figure 5: Optical Photomicrographs (PPRL) of the Feed Head Sample

The top two images show coarse particles with very fine-grained graphite (red arrow) that ranges from <5 to ~50 µm in length also with pervasive micro inclusions of silicates or NSG (non sulphide gangue minerals, green arrow).

The bottom left image illustrates coarse-grained pyrite (yellow arrow) intergrown with silicates and graphite. The image to the bottom right shows ilmenite (orange arrow) having silicate and sulphide attachments.

Appendix A – X-Ray Diffraction Results

Qualitative X-Ray Diffraction

Report Prepared for:	*Metallurgical Operations*
Project Number/ LIMS No.	*14748-001/MI5016-SEP14*
Sample Receipt:	*September 24, 2014*
Sample Analysis:	*September 27, 2014*
Reporting Date:	*October 1, 2014*

Instrument:	BRUKER AXS D8 Advance Diffractometer
Test Conditions:	Co radiation, 40 kV, 35 mA Regular Scanning: Step: 0.02°, Step time:0.2s, 2θ range: 3-70°
Interpretations :	PDF2/PDF4 powder diffraction databases issued by the International Center for Diffraction Data (ICDD). DiffracPlus Eva software.
Detection Limit :	0.5-2%. Strongly dependent on crystallinity.

Contents:

Connie Kot
Technologist, XRD

Kim Gibbs, H.B.Sc., P.Geo.
Senior Mineralogist

ACCREDITATION: SGS Minerals Services Lakefield is accredited to the requirements of ISO/IEC 17025 for specific tests as listed on our scope of accreditation, including geochemical, mineralogical and trade mineral tests. To view a list of the accredited methods, please visit the following website and search SGS Canada - Minerals Services - Lakefield: http://palcan.scc.ca/SpecsSearch/GLSearchForm.do.

Method Summary

The Qualitative Mineral Identification By XRD (ME-LR-MIN-MET-MN-D01) method used by SGS Minerals Services is accredited to the requirements of ISO/IEC 17025.

Mineral Identification and Interpretation:

Mineral identification and interpretation involve matching the diffraction pattern of an unknown test sample to patterns of single-phase reference materials. The reference patterns are compiled by the Joint Committee on Powder Diffraction Standards - International Center for Diffraction Data (JCPDS-ICDD) and released on software as a database of Powder Diffraction Files (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds. Mineral proportions are based on relative peak heights and may be strongly influenced by crystallinity, structural group or preferred orientations. Interpretations and relative proportions should be accompanied by supporting petrographic and geochemical data (Whole Rock Analysis, Inductively Coupled Plasma - Optical Emission Spectroscopy, etc.).

Summary of Qualitative X-ray Diffraction Results

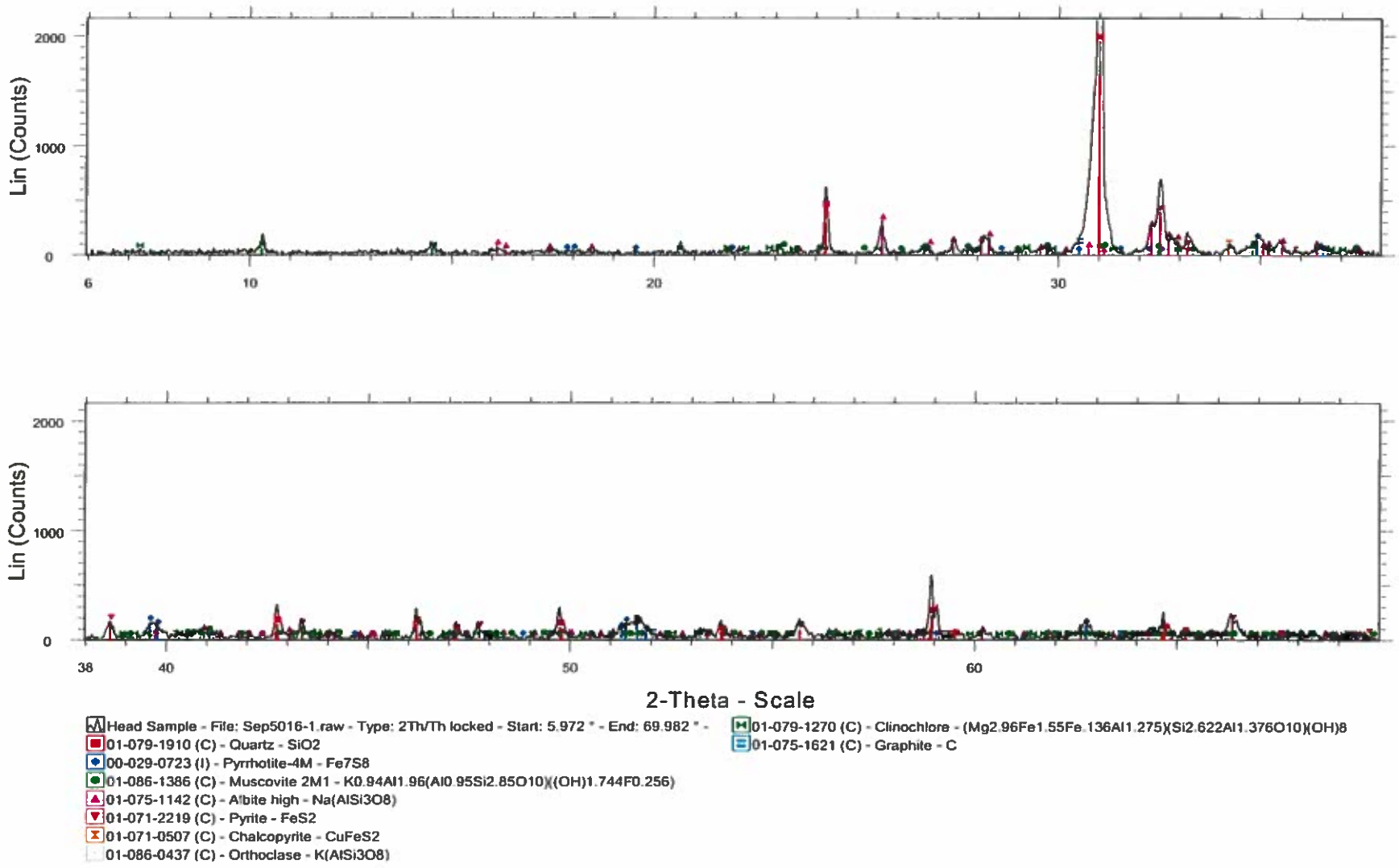
Crystalline Mineral Assemblage (relative proportions based on peak height)

Sample ID	Major	Moderate	Minor	Trace
1. Head Sample	quartz	plagioclase	pyrrhotite, mica, pyrite, potassium-feldspar	*chalcopyrite, *chlorite, *graphite

** tentative identification due to low concentrations, diffraction line overlap or poor crystallinity*

Mineral	Composition
Chalcopyrite	$CuFeS_2$
Chlorite	$(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$
Graphite	C
Mica	$K(Mg,Fe)Al_2Si_3AlO_{10}(OH)_2$
Plagioclase	$(NaSi,CaAl)AlSi_2O_8$
Potassium-Feldspar	$KAlSi_3O_8$
Pyrite	FeS_2
Pyrrhotite	$Fe_{(1-x)}S$
Quartz	SiO_2

Head Sample


Lin (Counts)
2000
1000
0
6
10
20
30
Lin (Counts)
2000
1000
0
38
40
50
60
2-Theta - Scale
Head Sample - File: Sep5016-1.raw - Type: 2Th/Th locked - Start: 5.972 ° - End: 69.982 ° -
01-079-1910 (C) - Quartz - SiO2
00-029-0723 (I) - Pyrrhotite-4M - Fe7S8
01-086-1386 (C) - Muscovite 2M1 - K0.94Al1.96(Al0.95Si2.85O10)((OH)1.744F0.256)
01-075-1142 (C) - Albite high - Na(AlSi3O8)
01-071-2219 (C) - Pyrite - FeS2
01-071-0507 (C) - Chalcopyrite - CuFeS2
01-086-0437 (C) - Orthoclase - K(AlSi3O8)
01-079-1270 (C) - Clinochlore - (Mg2.96Fe1.55Fe.136Al1.275)(Si2.622Al1.376O10)(OH)8
01-075-1621 (C) - Graphite - C

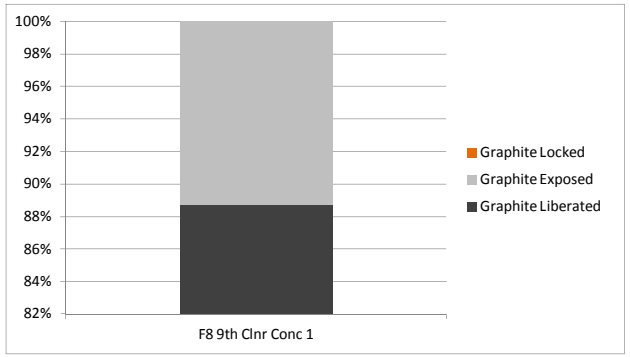
Greencastle Resources
14748-001
MI5025-OCT14

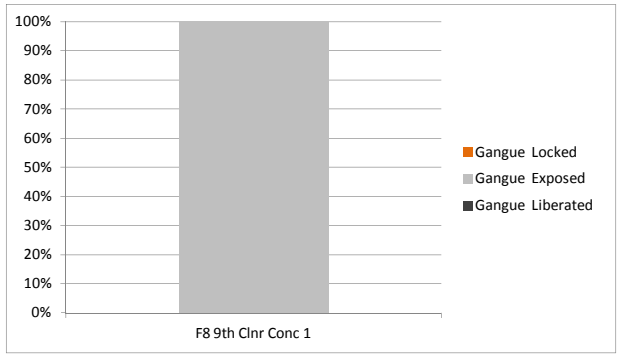
Mineral Distributions (Volume %)

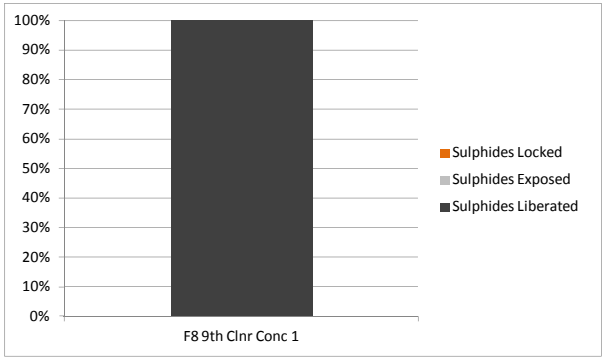
Sample ID	Graphite	Gangue	Sulphides
F8 9th Clnr Conc 1	88.1	11.6	0.3

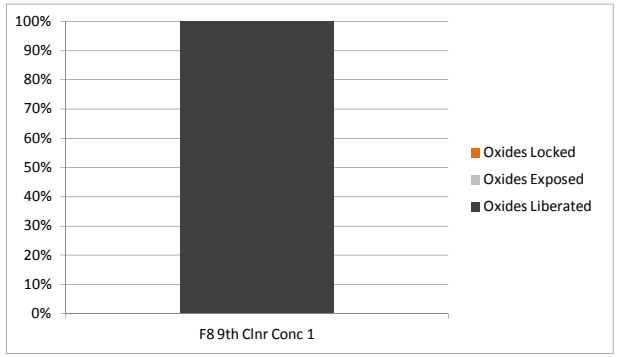
Liberation Data (Normalized %)

Sample ID	Graphite			Gangue			Sulphides			Oxides		
	Liberated	Exposed	Locked	Liberated	Exposed	Locked	Liberated	Exposed	Locked	Liberated	Exposed	Locked
F8 9th Clnr Conc 1	78.1	9.9	0.0	0.0	11.3	0.0	0.3	0.0	0.0	0.3	0.0	0.0









Appendix C – Batch Rougher Flotation Test Data

Test No.: F1 **Project No.**: 14748-001 **Operator**: ML **Date**: September 18,2014

Purpose: Initial batch flotation tests.

Procedure: As per below.

Feed: 1 kg of Master Composite

Grind: 15 minutes per 1kg in ceramic media

Regrind: 7 minutes in rod mill P_{80} = 304 µm

Conditions:

	Reagents added, grams per tonne				Time, minutes				
Stage	Fuel	MIBC			Grind	Cond.	Froth	pH	Ep (mV)
Grind					15				
Flash 1	10	10				1	2	7.3	0
Flash 2	10	10				1	2	7.5	-100
Regrind					7				
Rougher 1	10	10				1	2	7.5	-100
Rougher 2	10	10				1	2	7.6	-150
Total	40	40	0						

Stage	Rougher
Flotation Cell	2Kg
Speed: rpm	1800

* use as required - record

Metallurgical Balance - Rougher Kinetics

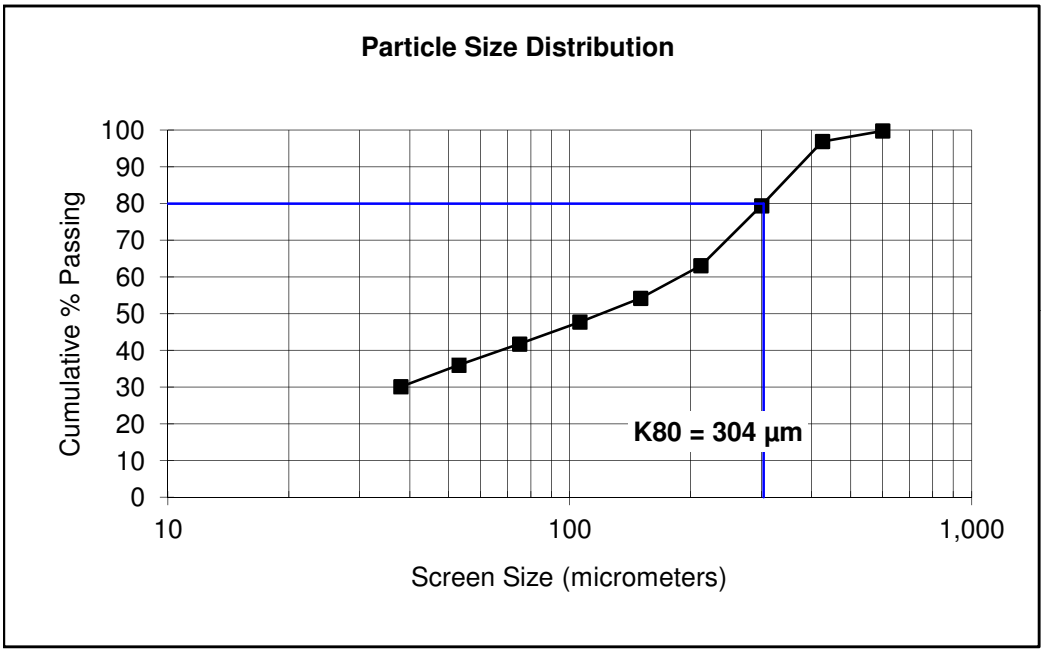
Product	**Weight**		**Assays %**	**% Distribution**
	g	**%**	**C (t)**	**C (t)**
Flash Con 1	119	11.9	42.3	21.1
Flash Con 2	106	10.6	34.0	15.1
Rougher Con 1	125	12.5	34.2	17.8
Rougher Con 2	229	22.9	31.4	30.1
Rougher Tail	420	42.1	9.08	16.0
Head (calc.)	999	100.0	23.9	100.0
(direct)			25.3	
Combined Products				
Flash Con 1		11.9	42.3	21.1
Flash Con 1+2		**22.5**	**38.4**	**36.2**
Rougher Con 1		12.5	34.2	17.8
Rougher Con 1 + 2		**35.4**	**32.4**	**47.9**
Rougher Tail		42.1	9.08	16.0
Head (calc.)		100.0	23.93	100.0

SGS Minerals Services
Size Distribution Analysis

Project No.
14748-001

Sample: **Ro Tail** Test No.: **F1**

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
28	600	0.3	0.2	0.2	99.8
35	425	4.3	2.9	3.1	96.9
48	300	26.0	17.5	20.6	79.4
65	212	24.3	16.4	36.9	63.1
100	150	13.2	8.9	45.8	54.2
150	106	9.6	6.5	52.3	47.7
200	75	8.9	6.0	58.3	41.7
270	53	8.5	5.7	64.0	36.0
400	38	8.8	5.9	69.9	30.1
Pan	-38	44.7	30.1	100.0	0.0
Total	**-**	**148.6**	100.0	**-**	**-**
K80	**304**				

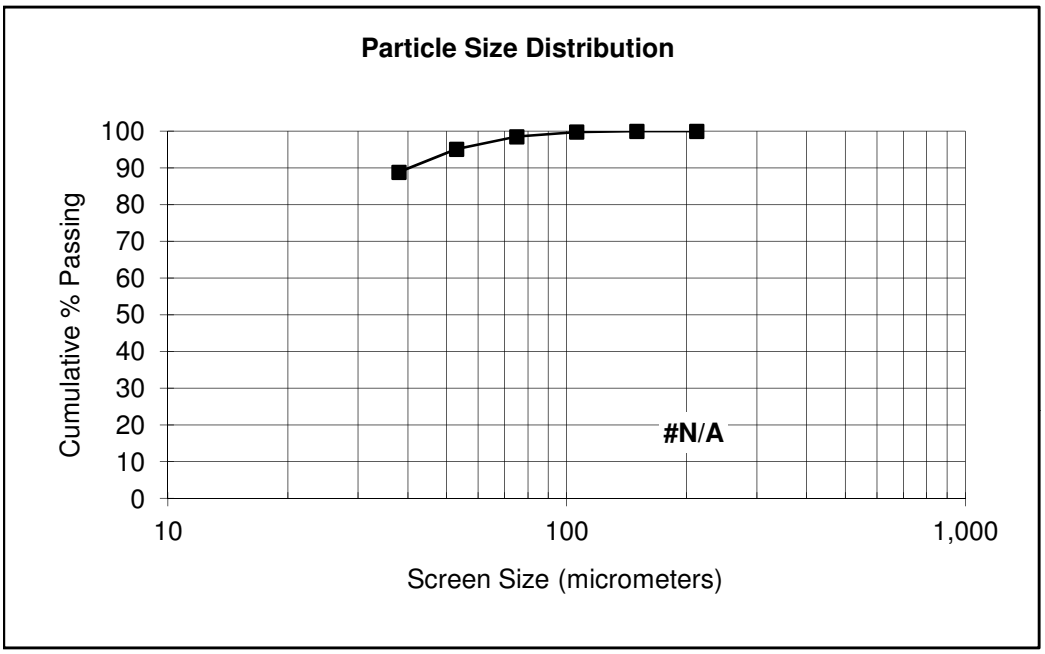


SGS Minerals Services
Size Distribution Analysis

Project No.
14743-001

Sample: **Flash Conc** Test No.: **F1**

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
65	212	0.0	0.0	0.0	100.0
100	150	0.0	0.0	0.0	100.0
150	106	0.2	0.2	0.2	99.8
200	75	1.2	1.3	1.5	98.5
270	53	3.2	3.4	4.9	95.1
400	38	5.9	6.3	11.1	88.9
Pan	-38	83.7	88.9	100.0	0.0
Total	**-**	**94.2**	100.0	**-**	**-**
K80	**#N/A**				



Test No.: F2 **Project No.**: 14748-001 **Operator**: ML **Date**: September 18,2014

Purpose: Initial batch flotation tests.

Procedure: As per below.

Feed: 1 kg of Master Composite

Grind: 7 minutes per 2kg in rod mill

Regrind: 7 minutes in rod mill P_{80} = 106 µm

Conditions:

	Reagents added, grams per tonne				Time, minutes				
Stage	Fuel	MIBC			Grind	Cond.	Froth	pH	Ep (mV)
Grind					7				
Rougher 1	10	10				1	2	7.0	75
Rougher 2	10	10				1	2	7.5	0
Rougher 3	10	10				1	2	7.8	-100
Rougher 4	10	10				1	2	7.7	-100
Regrind					7				
Scav 1	10	10				1	2	7.5	-125
Scav 2	10	10				1	2	7.7	-125
Total	60	60	0						

Stage	Rougher
Flotation Cell	2KG
Speed: rpm	1800

* use as required - record

Metallurgical Balance - Rougher Kinetics

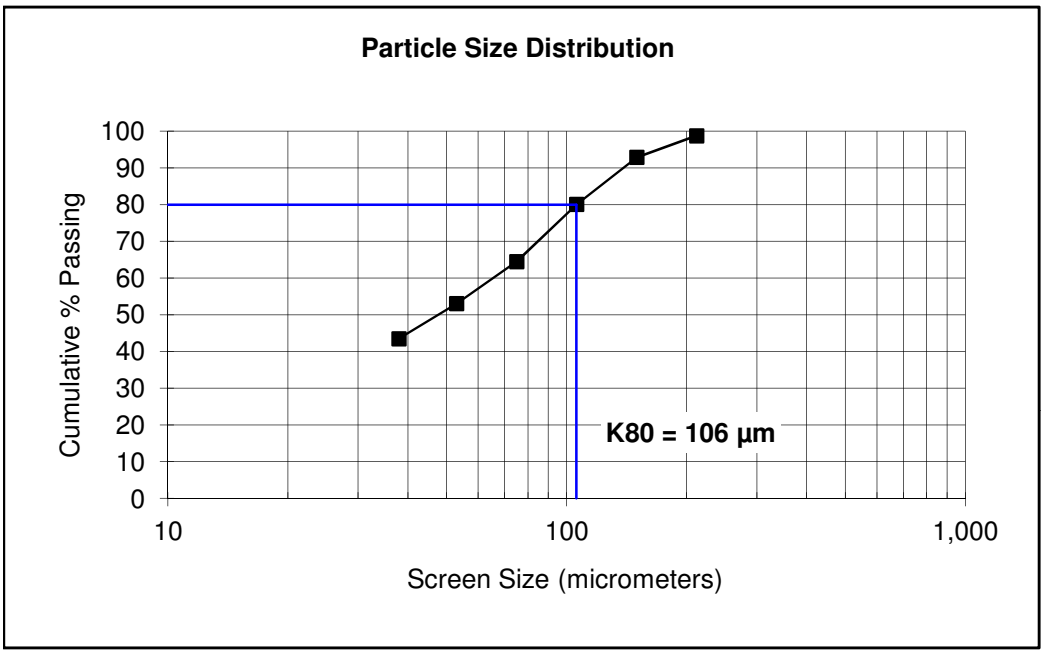
Product	**Weight**		**Assays %**	**% Distribution**
	g	**%**	**C (t)**	**C (t)**
Rougher Con 1	113.8	11.3	43.0	20.3
Rougher Con 2	153.5	15.3	33.9	21.6
Rougher Con 3	57.5	5.73	31.7	7.57
Rougher Con 4	70.7	7.05	31.2	9.16
Rougher Scav Con 1	210.6	21.0	34.8	30.4
Rougher Scav Con 2	112.5	11.2	21.9	10.2
Rougher Tail	284.4	28.4	0.55	0.65
Head (calc.)	1003	100.0	24.0	100.0
(direct)			25.3	
Combined Products				
Rougher Con 1		11.3	43.0	20.3
Rougher Con 1 - 2		26.7	37.8	41.9
Rougher Con 1 - 3		32.4	36.7	49.5
Rougher Con 1 - 4		**39.4**	**35.7**	**58.7**
Ro Scav Con 1		21.0	34.8	30.4
Ro Scav Con 1 - 2		**32.2**	**30.3**	**40.7**
Rougher Tail		28.4	0.55	0.65
Head (calc.)		100.0	24.00	100.0

SGS Minerals Services
Size Distribution Analysis

Project No.
14748-001

Sample: **Ro Tail** Test No.: **F2**

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
65	212	2.1	1.2	1.2	98.8
100	150	10.2	5.9	7.1	92.9
150	106	22.3	12.8	19.9	80.1
200	75	27.0	15.6	35.5	64.5
270	53	19.9	11.5	46.9	53.1
400	38	16.6	9.6	56.5	43.5
Pan	-38	75.5	43.5	100.0	0.0
Total	**-**	**173.6**	100.0	**-**	**-**
K80	**106**				



Test No.: F9 **Project No.**: 14748-001 **Operator**: ML **Date**: Nov 24, 2014

Purpose: Initial batch flotation tests.

Procedure: As per below.

Feed: 1 kg of Master Composite

Grind: 15 minutes per 2kg in rod mill P_{80} = 177 µm

Regrind: 5 minutes in rod mill P_{80} = 125 µm

Conditions:

	Reagents added, grams per tonne				Time, minutes				
Stage	Fuel	MIBC	Lime		Grind	Cond.	Froth	12 pH	Ep (mV)
Grind					15				
								7.5	-50
Rougher 1	10	10	1900			1	2	12.0	-200
Rougher 2	10	10				1	2	12.0	-50
Rougher 3	10	10				1	2	12.0	-50
Rougher 4	10	10				1	2	12.0	-40
Regrind					5				
Scav 1	10	10	540			1	2	12.0	-25
Scav 2	10	10				1	2	12.0	0
Total	60	60	2440						

Stage	Rougher
Flotation Cell	2KG
Speed: rpm	1800

* use as required - record

Metallurgical Balance - Rougher Kinetics

Product	**Weight**		**Assays %**			**% Distribution**		
	g	**%**	**C (t)**	**S**	**Fe**	**C (t)**	**S**	**Fe**
Rougher Con 1	117.6	11.6	37.4	2.15	4.23	17.4	6.24	7.63
Rougher Con 2	202.5	19.9	36.3	2.26	4.42	29.0	11.3	13.7
Rougher Con 3	167.8	16.5	32.4	2.60	4.73	21.5	10.8	12.2
Rougher Con 4	138.6	13.7	30.0	3.10	5.33	16.4	10.6	11.3
Rougher Scav Con 1	122.0	12.0	27.2	3.25	5.12	13.1	9.79	9.58
Rougher Scav Con 2	28.6	2.82	10.6	5.01	8.01	1.20	3.54	3.51
Rougher Tail	238.2	23.5	1.57	8.12	11.5	1.48	47.8	42.0
Head (calc.)	1015	100.0	25.0	3.99	6.42	100.0	100.0	100.0
(direct)			25.3	4.77	6.73			
Combined Products								
Rougher Con 1		11.6	37.4	2.15	4.23	17.4	6.24	7.63
Rougher Con 1 - 2		31.5	36.7	2.22	4.35	46.4	17.5	21.4
Rougher Con 1 - 3		48.1	35.2	2.35	4.48	67.8	28.3	33.5
Rougher Con 1 - 4		**61.7**	**34.1**	**2.52**	**4.67**	**84.2**	**38.9**	**44.9**
Ro Scav Con 1		12.0	27.2	3.25	5.12	13.1	9.79	9.58
Ro Scav Con 1 - 2		**14.8**	**24.0**	**3.58**	**5.67**	**14.3**	**13.3**	**13.1**
Rougher Tail		23.5	1.57	8.12	11.5	1.48	47.8	42.0
Head (calc.)		100.0	24.96	3.99	6.42	100.0	100.0	100.0

Test No.: F10 **Project No.**: 14748-001 **Operator**: ML **Date**:Nov,24,2014

Purpose: Batch flotation tests with pH 10.

Procedure: As per below.

Feed: 1 kg of Master Composite

Grind: 15 minutes per 2kg in rod mill P_{80} = 177 µm

Regrind: 5 minutes in rod mill P_{80} = 125 µm

Conditions:

	Reagents added, grams per tonne				Time, minutes				
Stage	Fuel	MIBC	lime		Grind	Cond.	Froth	10 pH	Ep (mV)
Grind					15				
								7.5	-50
Rougher 1	10	10	450			1	2	10.0	-240
Rougher 2	10	10	300			1	2	10.0	-50
Rougher 3	10	10	110			1	2	10.0	-25
Rougher 4	10	10	100			1	2	10.0	0
Regrind					5				
Scav 1	10	10	120			1	2	10.0	50
Scav 2	10	10	100			1	2	10.0	50
Total	60	60	1180						

Stage	Rougher
Flotation Cell	2KG
Speed: rpm	1800

* use as required - record

Metallurgical Balance - Rougher Kinetics

Product	**Weight**		**Assays %**			**% Distribution**		
	g	**%**	**C (t)**	**S**	**Fe**	**C (t)**	**S**	**Fe**
Rougher Con 1	105.5	10.5	35.5	2.64	5.02	14.9	6.41	7.84
Rougher Con 2	162.2	16.1	35.6	2.54	4.64	22.9	9.48	11.1
Rougher Con 3	180.9	18.0	34.1	2.49	4.71	24.5	10.4	12.6
Rougher Con 4	198.0	19.7	32.2	2.75	4.60	25.3	12.5	13.5
Rougher Scav Con 1	101.9	10.1	26.9	3.37	5.08	10.9	7.90	7.66
Rougher Scav Con 2	53.4	5.32	5.35	7.53	9.75	1.13	9.25	7.70
Rougher Tail	202.7	20.2	0.51	9.45	13.2	0.41	44.1	39.6
Head (calc.)	1005	100.0	25.1	4.33	6.73	100.0	100.0	100.0
(direct)			25.3	4.77	6.73			
Combined Products								
Rougher Con 1		10.5	35.5	2.64	5.02	14.9	6.41	7.84
Rougher Con 1 - 2		26.6	35.6	2.58	4.79	37.8	15.9	19.0
Rougher Con 1 - 3		44.7	35.0	2.54	4.76	62.3	26.3	31.6
Rougher Con 1 - 4		**64.4**	**34.1**	**2.61**	**4.71**	**87.6**	**38.8**	**45.1**
Ro Scav Con 1		10.1	26.9	3.37	5.08	10.9	7.90	7.66
Ro Scav Con 1 - 2		**15.5**	**19.5**	**4.80**	**6.69**	**12.0**	**17.2**	**15.4**
Rougher Tail		20.2	0.51	9.45	13.2	0.41	44.1	39.6
Head (calc.)		100.0	25.1	4.33	6.73	100.0	100.0	100.0

Test No.: F11 **Project No.**: 14748-001 **Operator**: ML **Date**:Nov,24,2014

Purpose: Batch flotation tests with natural pH and sulphide pre-float.

Procedure: As per below.

Feed: 1 kg of Master Composite

Grind: 15 minutes per 2kg in rod mill P_{80} = 177 µm

Conditions:

	Reagents added, grams per tonne				Time, minutes				
Stage	Fuel	MIBC	lime	PAX	Grind	Cond.	Froth	10 pH	Ep (mV)
Grind					15				
								7.5	-50
Prefloat				25			1	7.6	-50
Rougher 1	10	10				1	2	7.3	-240
Rougher 2	10	10				1	2	7.4	-50
Rougher 3	10	10				1	2	7.5	-25
Rougher 4	10	10				1	2	7.5	0
Total	40	40							

Stage	Rougher
Flotation Cell	2KG
Speed: rpm	1800

* use as required - record

Metallurgical Balance - Rougher Kinetics

Product	**Weight**		**Assays %**			**% Distribution**		
	g	**%**	**C (t)**	**S**	**Fe**	**C (t)**	**S**	**Fe**
Prefloat Con 1	58.2	5.8	44.6	1.75	3.95	10.3	2.48	3.54
Rougher Con 1	158.2	15.7	41.6	1.95	4.09	26.2	7.52	10.0
Rougher Con 2	206.3	20.5	35.2	2.40	4.32	28.9	12.1	13.7
Rougher Con 3	220.0	21.9	31.4	2.67	4.58	27.5	14.3	15.5
Rougher Con 4	69.3	6.9	21.7	4.23	6.35	5.98	7.15	6.78
Rougher Tail	292.5	29.1	1.00	7.92	11.2	1.16	56.5	50.5
Head (calc.)	1005	100.0	25.0	4.08	6.46	100.0	100.0	100.0
(direct)			25.3	4.77	6.73			
Combined Products								
Prefloat Con 1		**5.8**	**44.6**	**1.75**	**3.95**	**10.3**	**2.48**	**3.54**
Rougher Con 1		15.7	41.6	1.95	4.09	26.2	7.52	10.0
Rougher Con 1 - 2		36.3	38.0	2.20	4.22	55.1	19.6	23.7
Rougher Con 1 - 3		58.2	35.5	2.38	4.36	82.5	33.9	39.2
Ro Scav Con 1 - 4		**65.1**	**34.0**	**2.58**	**4.57**	**88.5**	**41.1**	**46.0**
Rougher Tail		29.1	1.00	7.92	11.2	1.16	56.5	50.5
Head (calc.)		100.0	25.0	4.08	6.46	100.0	100.0	100.0

Test No.: F13 **Project No.**: 14748-001 **Operator**: ML **Date**:Dec,12,2014

Purpose: Batch flotation tests at natural pH.

Procedure: As per below.

Feed: 1 kg of Master Composite

Grind: 15 minutes per 2kg in rod mill P_{80} = 177 µm

Regrind: 5 minutes in rod mill P_{80} = 125 µm

Conditions:

	Reagents added, grams per tonne				Time, minutes				
Stage	Fuel	MIBC	lime		Grind	Cond.	Froth	10 pH	Ep (mV)
Grind					15				
								7.5	50
Rougher 1	10	10				1	2	7.6	25
Rougher 2	10	10				1	2	7.5	-50
Rougher 3	10	10				1	2	7.7	-50
Rougher 4	10	10				1	2	7.6	-75
Regrind					5				
Scav 1	10	10				1	2	7.5	-75
Scav 2	10	10				1	2	7.6	-100
Total	60	60							

Stage	Rougher
Flotation Cell	2KG
Speed: rpm	1800

* use as required - record

Metallurgical Balance - Rougher Kinetics

Product	**Weight**		**Assays %**			**% Distribution**		
	g	**%**	**C (t)**	**S**	**Fe**	**C (t)**	**S**	**Fe**
Rougher Con 1	92.5	9.19	35.4	2.77	5.29	13.5	5.36	7.21
Rougher Con 2	137.2	13.6	36.5	2.59	4.79	20.7	7.44	9.7
Rougher Con 3	171.6	17.0	34.6	2.69	4.75	24.5	9.7	12.0
Rougher Con 4	205.0	20.4	32.9	2.96	4.96	27.8	12.7	15.0
Rougher Scav Con 1	95.5	9.5	27.0	3.31	5.37	10.6	6.62	7.56
Rougher Scav Con 2	62.4	6.20	7.59	6.88	9.27	1.96	8.99	8.52
Rougher Tail	242.7	24.1	0.86	9.69	11.2	0.86	49.2	40.0
Head (calc.)	1007	100.0	24.1	4.74	6.74	100.0	100.0	100.0
(direct)			25.3	4.77	6.73			
Combined Products								
Rougher Con 1		9.2	35.4	2.77	5.29	13.5	5.36	7.21
Rougher Con 1 - 2		22.8	36.1	2.66	4.99	34.2	12.8	16.9
Rougher Con 1 - 3		39.9	35.4	2.67	4.89	58.7	22.5	28.9
Rougher Con 1 - 4		**60.2**	**34.6**	**2.77**	**4.91**	**86.5**	**35.2**	**43.9**
Ro Scav Con 1		9.5	27.0	3.31	5.37	10.6	6.62	7.56
Ro Scav Con 1 - 2		**15.7**	**19.3**	**4.72**	**6.91**	**12.6**	**15.6**	**16.1**
Rougher Tail		24.1	0.86	9.69	11.2	0.86	49.2	40.0
Head (calc.)		100.0	24.1	4.74	6.74	100.0	100.0	100.0

Appendix D – Batch Cleaner Flotation Test Data

Test No.: F3 **Project No.**: 14748-001 **Operator**: ML **Date**: September 26,2013

Purpose: Initial batch flotation tests.

Procedure: As per below.

Feed: 1 kg of Master Composite

Grind: 10 minutes per 1kg in rod mill P_{80} = 357 µm

Regrind: 15 minutes with ceramic media P_{80} = 45 µm

Conditions:

Stage	Reagents added, grams per tonne				Time, minutes			pH	Ep (mV)
	Fuel	MIBC			Grind	Cond.	Froth		
Grind					10				
Rougher 1	10	10				1	2	7.4	-75
Rougher 2	10	10				1	2	7.5	-50
Rougher 3	10	10				1	2	7.6	-75
Rougher 4	10	10				1	2	7.6	-100
Regrind					15				
Cleaner 1	0,10	0,10				1	2,2	7.5	-175
Cleaner 2	0,10	0,10				1	2,2	7.5	-200
Cleaner 3	0,10	0,10				1	2,2	7.6	-250
Cleaner 4	0,10	0,10				1	2,2	7.5	-275
Total	100	90	0						

Stage		
Flotation Cell	2Kg	
Speed: rpm	1800	

* use as required - record

Metallurgical Balance - Rougher Kinetics

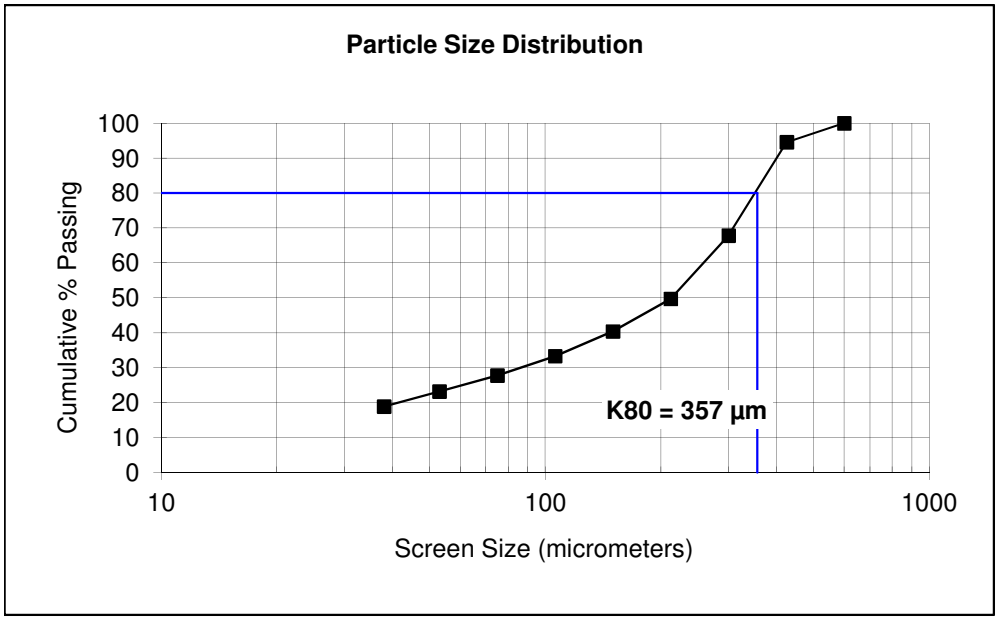
Product	**Weight**		**Assays %**	**% Distribution**
	g	**%**	**C (t)**	**C (t)**
4th Cleaner Con	167.1	16.8	48.1	32.6
4th Cleaner Tail	5.8	0.58	28.2	0.66
3rd Cleaner Tail	8.2	0.83	19.7	0.66
2nd Cleaner Tail	28.3	2.85	25.2	2.89
1st Cleaner Tail	341.8	34.5	30.7	42.6
Rougher Tail	440.9	44.4	11.5	20.6
Head (calc.)	992.1	100.0	24.84	100.0
(direct)			25.3	
Combined Products				
4th Cleaner Con		16.8	48.1	32.6
4CC + 4CT		17.4	47.4	33.3
4CC + 4CT + 3CT		18.3	46.2	33.9
4CC + 4CT + 3CT + 2CT		21.1	43.3	36.8
4CC + 4CT + 3CT + 2CT + 1CT		55.6	35.5	79.4
Rougher Tail		44.4	11.50	20.6
Head (calc.)		100.0	24.84	100.0

SGS Minerals Services
Size Distribution Analysis

Project No.
14748-001

Sample: **Ro Tail** Test No.: **F3**

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
28	600	0.0	0.0	0.0	100.0
35	425	8.2	5.4	5.4	94.6
48	300	40.5	26.8	32.2	67.8
65	212	27.4	18.1	50.3	49.7
100	150	14.1	9.3	59.6	40.4
150	106	10.7	7.1	66.7	33.3
200	75	8.4	5.6	72.2	27.8
270	53	6.9	4.6	76.8	23.2
400	38	6.5	4.3	81.1	18.9
Pan	-38	28.6	18.9	100.0	0.0
Total	**-**	**151.3**	100.0	**-**	**-**
K80	**357**				

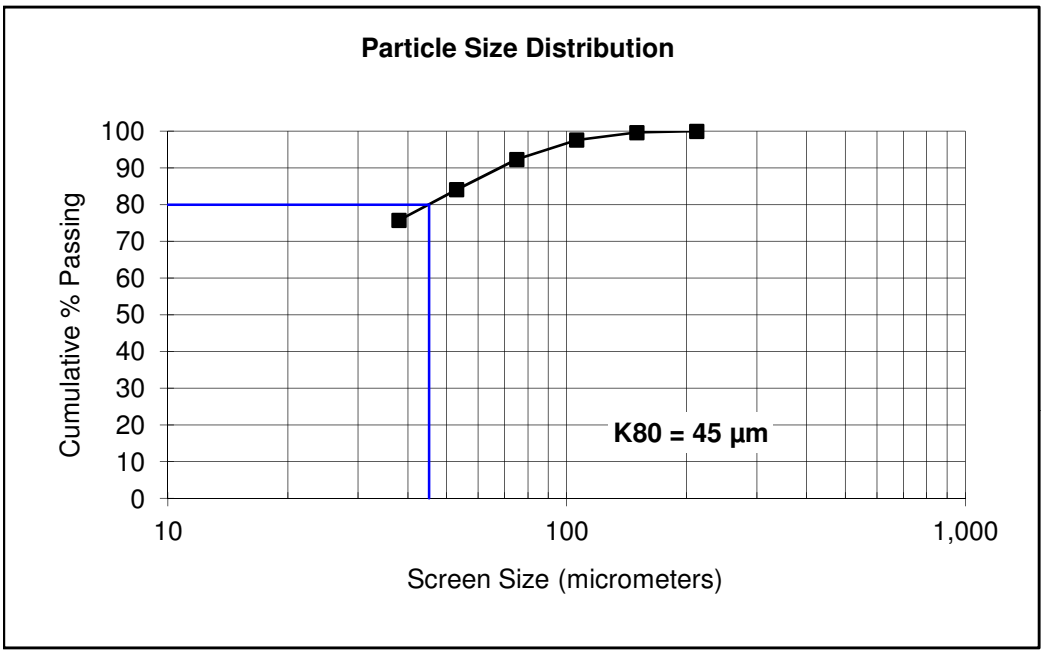


SGS Minerals Services
Size Distribution Analysis

Project No.
14748-001

Sample: **4th Clnr Conc** Test No.: **F3**

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
65	212	0.0	0.0	0.0	100.0
100	150	0.3	0.3	0.3	99.7
150	106	1.8	2.1	2.4	97.6
200	75	4.6	5.3	7.7	92.3
270	53	7.2	8.2	15.9	84.1
400	38	7.3	8.4	24.3	75.7
Pan	-38	66.1	75.7	100.0	0.0
Total	**-**	**87.3**	100.0	**-**	**-**
K80	**45**				



Test No.: F4 **Project No.**: 14748-001 **Operator**: BC **Date**: September 26,2013

Purpose: Initial batch flotation tests.

Procedure: As per below.

Feed: 1 kg of Master Composite

Grind: 10 minutes per 1kg in rod mill P_{80} = 346 µm

Regrind: 30 minutes with ceramic media

Conditions:

	Reagents added, grams per tonne				Time, minutes				
Stage	Fuel	MIBC			Grind	Cond.	Froth	pH	Ep (mV)
Grind					10				
Rougher 1	10	10				1	2	7.5	75
Rougher 2	10	10				1	2	7.5	-50
Rougher 3	10	10				1	2	7.6	-75
Rougher 4	10	10				1	2	7.6	-100
Regrind					30				
Cleaner 1	0,10	0,10				1	2,2	7.5	-150
Cleaner 2	0,10	0,10				1	2,2	7.6	-175
Cleaner 3	0,10	0,10				1	2,2	7.6	-225
Cleaner 4	0,10	0,10				1	2,2	7.6	-275
Total	80	80							

Stage		
Flotation Cell	2Kg	
Speed: rpm	1800	

* use as required - record

Metallurgical Balance - Rougher Kinetics

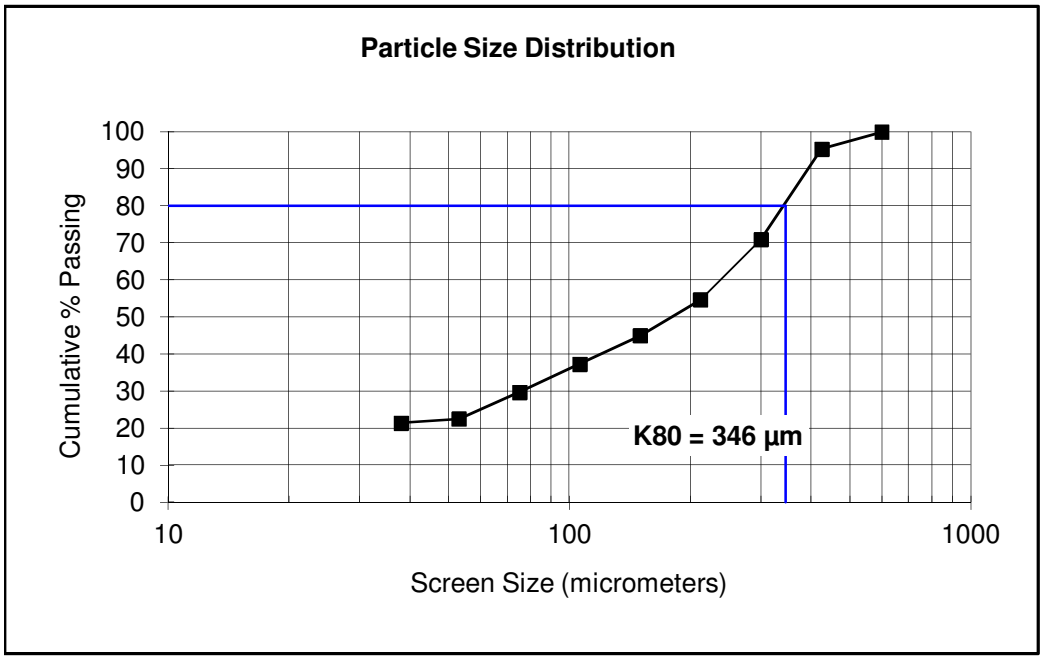
Product	**Weight**		**Assays %**	**% Distribution**
	g	**%**	**C (t)**	**C (t)**
4th Cleaner Con	231.1	23.2	45.7	55.3
4th Cleaner Tail	9.4	0.94	17.6	0.87
3rd Cleaner Tail	18.7	1.87	22.4	2.19
2nd Cleaner Tail	54.5	5.46	29.2	8.33
1st Cleaner Tail	302.1	30.3	9.24	14.6
Rougher Tail	381.6	38.3	9.38	18.7
Head (calc.)	997.4	100.0	19.2	100.0
(direct)			25.3	
Combined Products				
4th Cleaner Con		23.2	45.7	55.3
4CC + 4CT		24.1	44.6	56.1
4CC + 4CT + 3CT		26.0	43.0	58.3
4CC + 4CT + 3CT + 2CT		31.5	40.6	66.7
4CC + 4CT + 3CT + 2CT + 1CT		61.7	25.2	81.3
Rougher Tail		38.3	9.38	18.7
Head (calc.)		100.0	19.16	100.0

SGS Minerals Services
Size Distribution Analysis

Project No.
14748-001

Sample: **Ro Tail** Test No.: **F4**

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
28	600	0.2	0.1	0.1	99.9
35	425	7.6	4.6	4.7	95.3
48	300	40.2	24.4	29.1	70.9
65	212	26.8	16.2	45.3	54.7
100	150	16.0	9.7	55.0	45.0
150	106	12.7	7.7	62.7	37.3
200	75	12.5	7.6	70.3	29.7
270	53	11.9	7.2	77.5	22.5
400	38	1.8	1.1	78.6	21.4
Pan	-38	35.3	21.4	100.0	0.0
Total	**-**	**165.0**	100.0	**-**	**-**
K80	**346**				



Test No.: F5 **Project No.**: 14748-001 **Operator**: ML **Date**: October 3,2013

Purpose: Initial batch cleaner flotation tests.

Procedure: As per below.

Feed: 1 kg of Master Composite

Grind: 15 minutes per 1kg in rod mill P_{80} = 188 µm

Regrind: 10 minutes with ceramic media P_{80} = 76 µm
10 minutes with ceramic media P_{80} = 20 µm

Conditions:

	Reagents added, grams per tonne				Time, minutes				
Stage	Fuel	MIBC			Grind	Cond.	Froth	pH	Ep (mV)
Grind					15				
	10	10				1	2	7.5	75
Rougher 2	10	10				1	2	7.4	-50
Rougher 3	10	10				1	2	7.4	-50
Rougher 4	10	10				1	2	7.4	-100
Regrind					10				
Cleaner 1	10+10	10+10				1	2+2	7.5	-150
Cleaner 2	10+10	10+10				1	2+2	7.4	-175
Cleaner 3	0+10	0+10				1	2+2	7.3	-175
Regrind					10				
Cleaner 4	10+10	10+10				1	2+2	7.2	-190
Cleaner 5	10+10	10+10				1	2+2	7.2	-200
Cleaner 6	10+10	10+10				1	2+2	7.1	-225
Total	80	90							

Stage		
Flotation Cell	4L	
Speed: rpm	1800	

* use as required - record

Metallurgical Balance - Rougher Kinetics

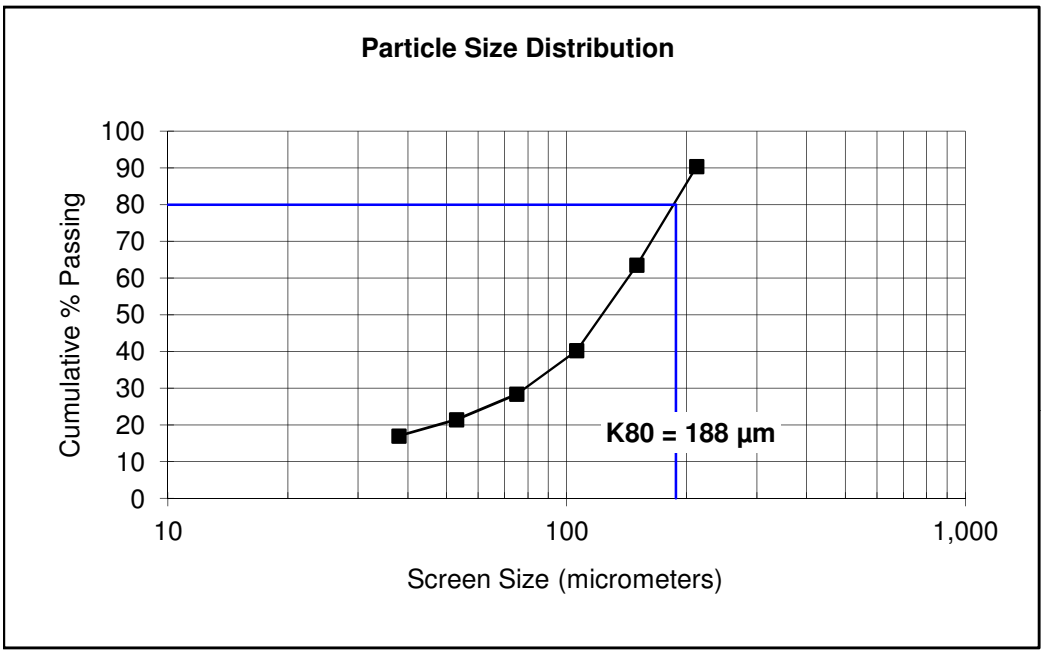
Product	**Weight**		**Assays %**	**% Distribution**
	g	**%**	**C (t)**	**C (t)**
6th Cleaner Con	98.9	9.85	54.9	22.5
6th Cleaner Tail	16.4	1.63	45.8	3.12
5th Cleaner Tail	16.2	1.61	39.1	2.63
4th Cleaner Tail	43.0	4.28	36.6	6.53
3rd Cleaner Tail	35.3	3.52	29.3	4.29
2nd Cleaner Tail	55.7	5.55	27.7	6.40
1st Cleaner Tail	184.9	18.4	23.8	18.3
Rougher Tail	553.4	55.1	15.8	36.3
Head (calc.)	1004	100.0	24.0	100.0
(direct)			25.3	
Combined Products				
6th Cleaner Con		9.85	54.9	22.5
6CC + 6CT		11.49	53.6	25.6
6CC + 6-5CT		13.10	51.8	28.3
6CC + 6-4CT		17.38	48.1	34.8
4CC + 6-3CT		20.90	44.9	39.1
4CC + 6-2CT		26.45	41.3	45.5
4CC + 6-1CT		44.9	34.1	63.7
Rougher Tail		55.1	15.8	36.3
Head (calc.)		100.0	24.0	100.0

SGS Minerals Services
Size Distribution Analysis

Project No.
14748-001

Sample: **Ro Tail** Test No.: **F5**

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
65	212	14.0	9.6	9.6	90.4
100	150	39.2	26.9	36.5	63.5
150	106	33.9	23.3	59.8	40.2
200	75	17.3	11.9	71.7	28.3
270	53	10.1	6.9	78.6	21.4
400	38	6.5	4.5	83.0	17.0
Pan	-38	24.7	17.0	100.0	0.0
Total	**-**	**145.7**	100.0	**-**	**-**
K80	**188**				

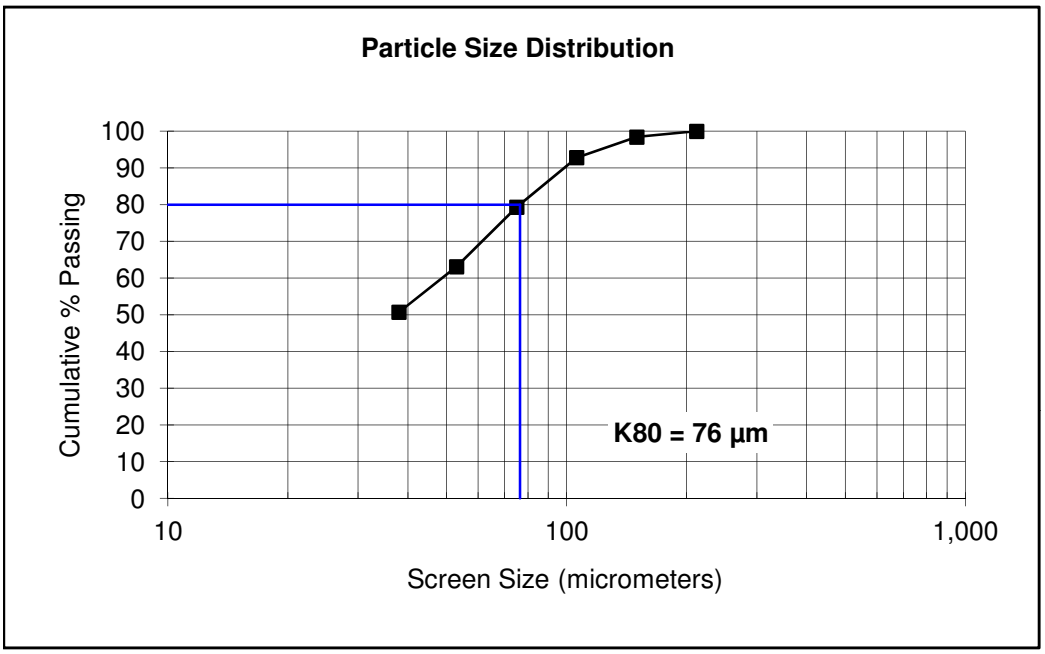


SGS Minerals Services
Size Distribution Analysis

Project No.
14748-001

Sample: **1st Cl Tail** Test No.: **F5**

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
65	212	0.0	0.0	0.0	100.0
100	150	2.1	1.6	1.6	98.4
150	106	7.5	5.6	7.2	92.8
200	75	18.0	13.5	20.7	79.3
270	53	21.6	16.2	36.9	63.1
400	38	16.6	12.4	49.3	50.7
Pan	-38	67.6	50.7	100.0	0.0
Total	**-**	**133.4**	100.0	**-**	**-**
K80	**76**				

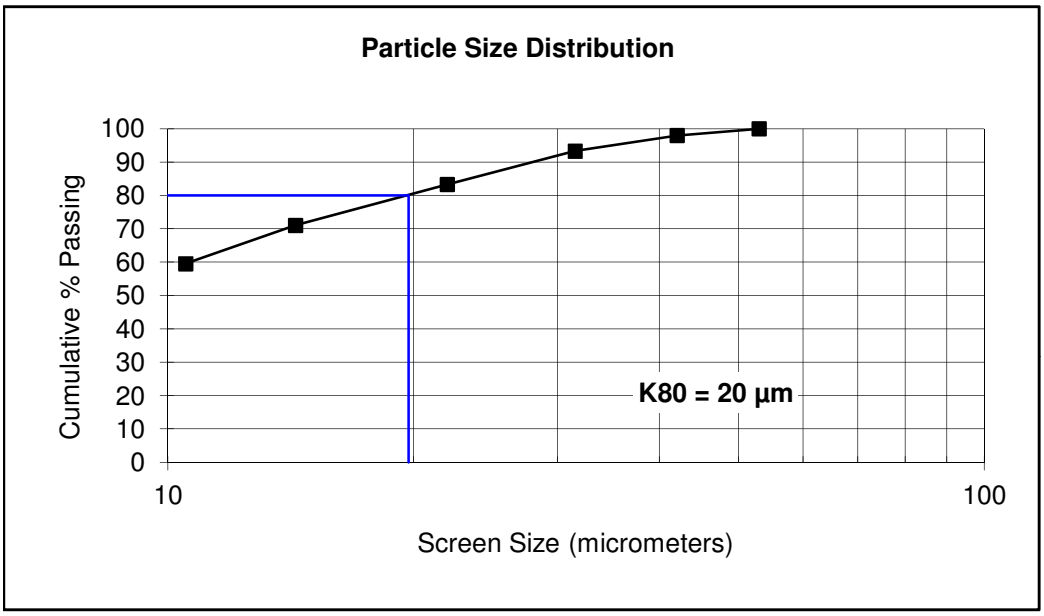


SGS Minerals Services
Size Distribution Analysis

Project No.
14748-001

Sample: **6th Cl Con** Test No.: **F5**

Dry Solids S.G.=		**2.60**	Water Temperature =		**18.00 Cº**
Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
270	53	0.0	0.0	0.0	100.0
	42	1.1	2.0	2.0	98.0
	32	2.5	4.6	6.7	93.3
	22	5.4	10.0	16.7	83.3
	14	6.6	12.2	28.9	71.1
	11	6.2	11.5	40.4	59.6
	-11	32.1	59.6	100.0	0.0
Total	**-**	**53.9**	100.0	**-**	**-**
K80	**20**				



Test No.: F6 **Project No.**: 14748-001 **Operator**: ML **Date**: October 3,2013

Purpose: Initial batch cleaner flotation tests.

Procedure: As per below.

Feed: 1 kg of Master Composite

Grind: 15 minutes per 1kg in rod mill P_{80} = 173 µm

Regrind: 20 minutes with ceramic media P_{80} = 136 µm
20 minutes with ceramic media P_{80} = 32 µm
20 minutes with ceramic media P_{80} = 13 µm

Conditions:

	Reagents added, grams per tonne				Time, minutes				
Stage	Fuel	MIBC			Grind	Cond.	Froth	pH	Ep (mV)
Grind					15				
Rougher 1	10	10				1	2	7.6	75
Rougher 2	10	10				1	2	7.5	0
Rougher 3	10	10				1	2	7.5	-50
Rougher 4	10	10				1	2	7.4	-100
Regrind 1					20				
Cleaner 1	10+10	10+10				1	2+2	7.2	-150
Cleaner 2	10+10	10+10				1	2+2	7.3	-175
Cleaner 3	10+10	10+10				1	2+2	7.2	-175
Regrind 2					20				
Cleaner 4	10+10	10+10				1	2+2	7.3	-200
Cleaner 5	10+10	10+10				1	2+2	7.4	-210
Cleaner 6	10+10	10+10				1	2+2	7.2	-225
Regrind 2					20				
Cleaner 7	10+10	10+10				1	2+2	7.4	-200
Cleaner 8	10+10	10+10				1	2+2	7.4	-200
Cleaner 9	10+10	10+10				1	2+2	7.4	-200
Total	40	40							

Stage	4L
Flotation Cell	1800
Speed: rpm	

* use as required - record

Metallurgical Balance - Rougher Kinetics

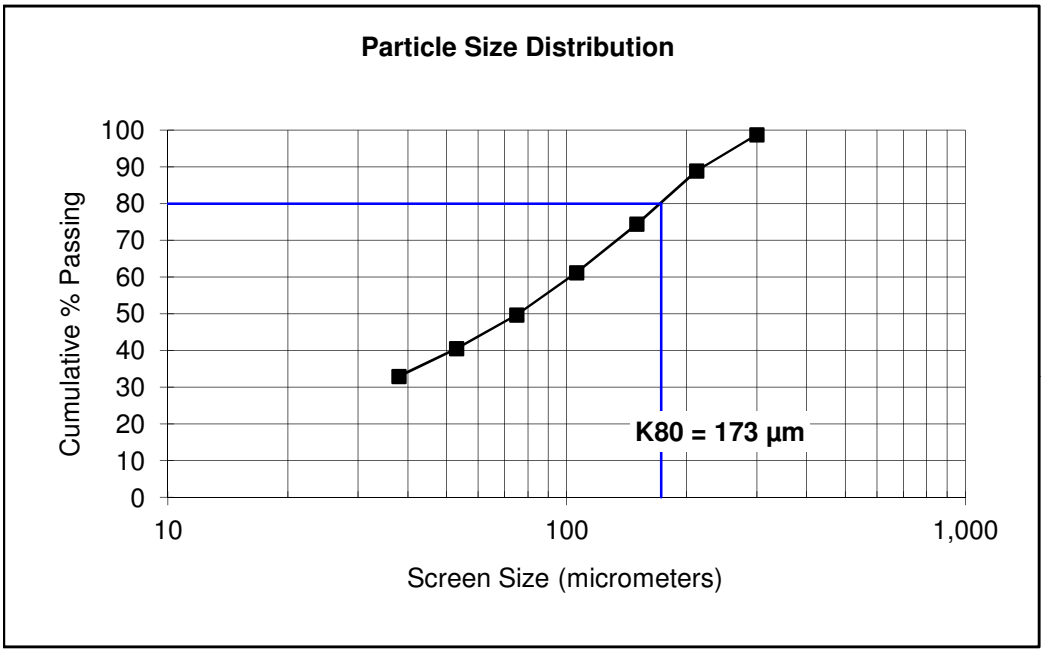
Product	Weight		Assays %	% Distribution
	g	%	C (t)	C (t)
9th Cleaner Con	149.3	14.9	55.9	33.5
9th Cleaner Tail	15.5	1.55	41.5	2.58
8th Cleaner Tail	9.4	0.94	33.4	1.26
7th Cleaner Tail	14.4	1.44	27.8	1.61
6th Cleaner Tail	14.0	1.40	33.0	1.85
5th Cleaner Tail	11.4	1.14	23.7	1.08
4th Cleaner Tail	52.2	5.22	33.7	7.06
3rd Cleaner Tail	39.9	3.99	28.9	4.63
2nd Cleaner Tail	40.3	4.03	19.1	3.09
1st Cleaner Tail	327.9	32.8	29.3	38.6
Rougher Tail	325.0	32.5	3.66	4.77
Head (calc.)	999	100.0	24.9	100.0
(direct)			25.3	
Combined Products				
9th Cleaner Con		14.9	55.9	33.5
9CC+9CT		16.5	54.5	36.1
9CC+9CT+8CT		17.4	53.4	37.3
9CC+9CT+8CT+7CT		18.9	51.4	38.9
9CC+9CT+8CT+7CT+6CT		20.3	50.2	40.8
9CC + 5-9CT		21.4	48.8	41.9
9CC + 4-9CT		26.6	45.8	48.9
9CC + 3-9CT		30.6	43.6	53.6
9CC + 2-9CT		34.7	40.8	56.7
9CC + 1-9CT		67.5	35.2	95.2
Rougher Tail		32.5	3.66	4.77
Head (calc.)		100.0	24.9	100.0

SGS Minerals Services
Size Distribution Analysis

Project No.
14748-001

Sample: **Ro Tail** Test No.: **F6**

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
48	300	1.9	1.2	1.2	98.8
65	212	15.3	9.8	11.1	88.9
100	150	22.6	14.5	25.6	74.4
150	106	20.5	13.2	38.8	61.2
200	75	17.9	11.5	50.3	49.7
270	53	14.3	9.2	59.5	40.5
400	38	11.7	7.5	67.1	32.9
Pan	-38	51.2	32.9	100.0	0.0
Total	**-**	**155.4**	100.0	**-**	**-**
K80	**173**				

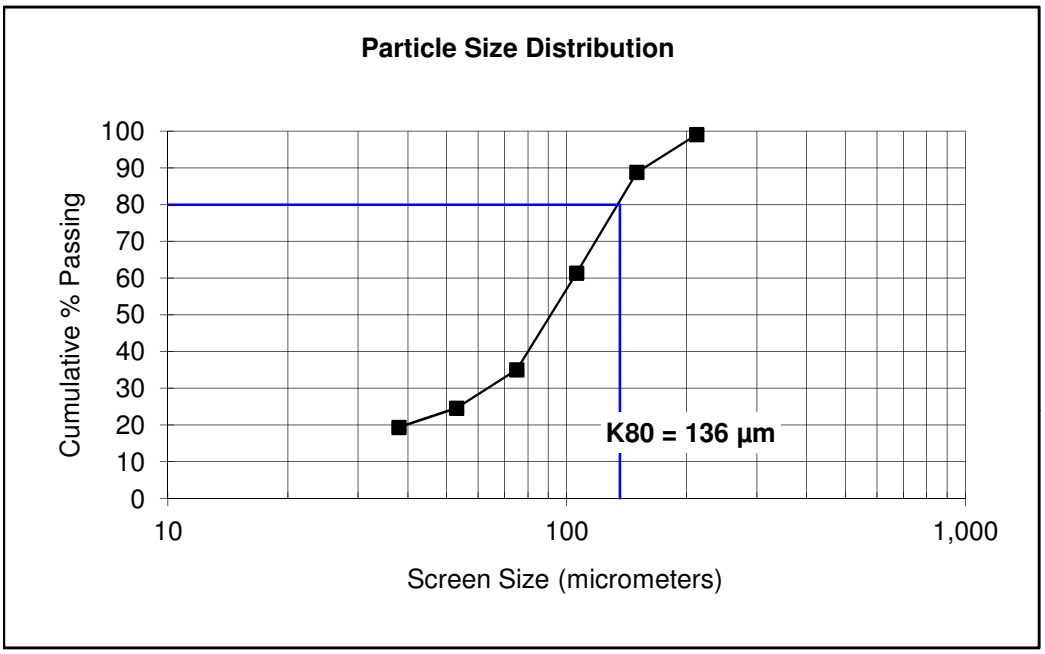


SGS Minerals Services
Size Distribution Analysis

Project No.
14748-001

Sample: **1st Cl Tail** Test No.: **F6**

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
65	212	1.5	0.9	0.9	99.1
100	150	16.5	10.3	11.2	88.8
150	106	44.1	27.4	38.6	61.4
200	75	42.4	26.4	65.0	35.0
270	53	16.8	10.4	75.4	24.6
400	38	8.4	5.2	80.7	19.3
Pan	-38	31.1	19.3	100.0	0.0
Total	**-**	**160.8**	100.0	**-**	**-**
K80	**136**				

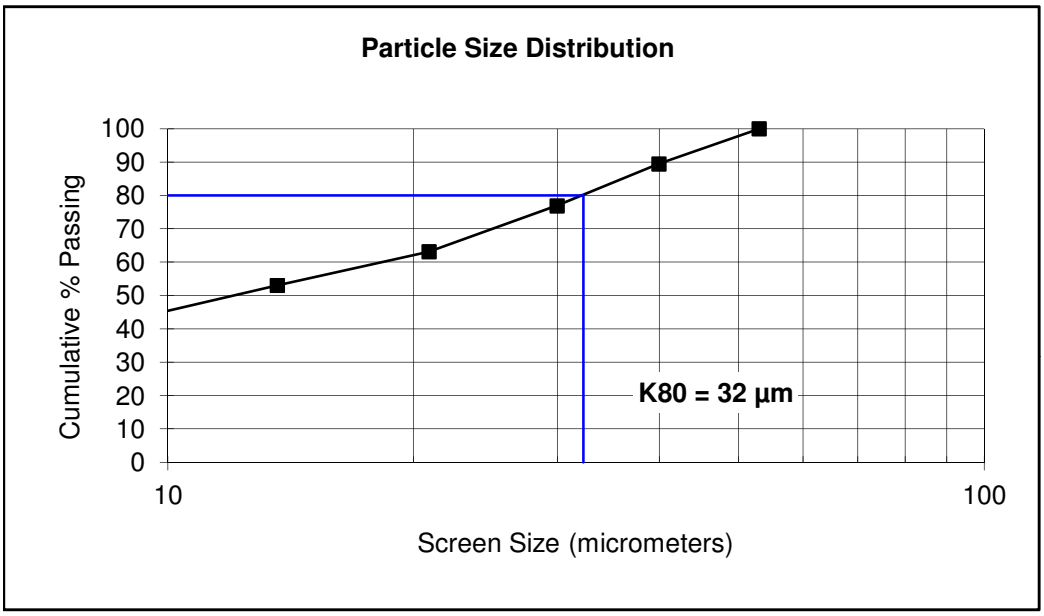


SGS Minerals Services
Size Distribution Analysis

Project No.
14748-001

Sample: **4th Cl Tail** Test No.: **F6**

Dry Solids S.G.=		**2.77**	Water Temperature =		**18.00 Cº**
Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
270	53	0.0	0.0	0.0	100.0
	40	2.6	10.5	10.5	89.5
	30	3.1	12.6	23.1	76.9
	21	3.4	13.8	36.8	63.2
	14	2.5	10.1	47.0	53.0
	10	1.9	7.7	54.7	45.3
	-10	11.2	45.3	100.0	0.0
Total	**-**	**24.7**	100.0	**-**	**-**
K80	**32**				

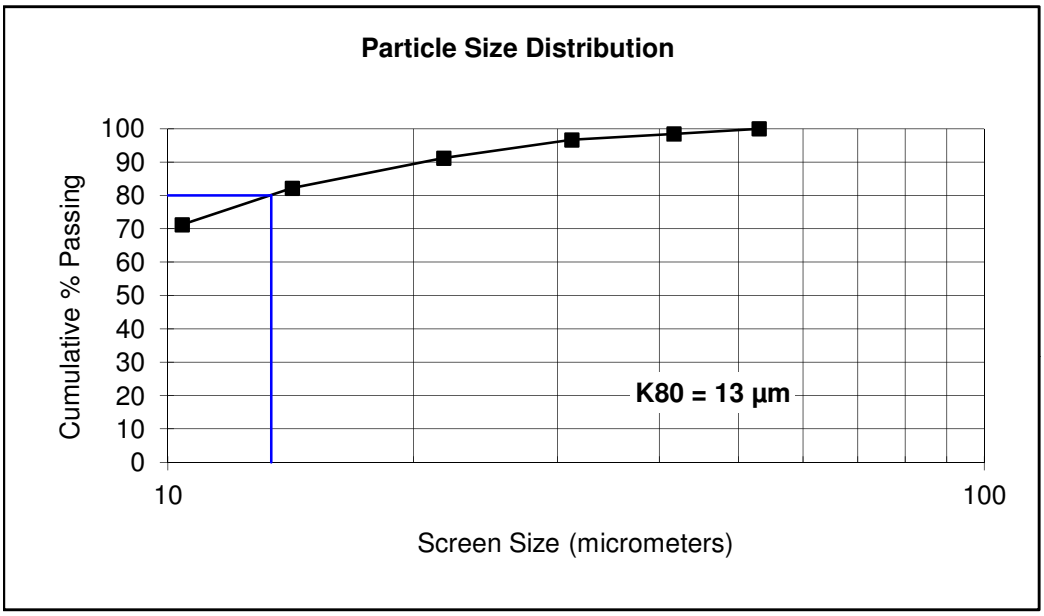


SGS Minerals Services
Size Distribution Analysis

Project No.
14748-001

Sample: **9th Cl Con** Test No.: **F6**

Dry Solids S.G.=		**2.63**	Water Temperature =		**18.00 Cº**
Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
270	53	0.0	0.0	0.0	100.0
	42	0.8	1.6	1.6	98.4
	31	0.9	1.8	3.3	96.7
	22	2.8	5.5	8.8	91.2
	14	4.6	9.0	17.8	82.2
	10	5.6	11.0	28.8	71.2
	-10	36.4	71.2	100.0	0.0
Total	**-**	**51.1**	100.0	**-**	**-**
K80	**13**				



Result Analysis Report

Sample Name:
14748-001 F6 7th Cl Tail - Average

SOP Name:
Defaultar

Measured:
October 7, 2014 6:22:14 AM

Sample Source & type:

Measured by:
LR_Malvern1

Analysed:
October 7, 2014 6:22:16 AM

Sample bulk lot ref:
ar

Result Source:
Averaged

Particle Name:
Default

Accessory Name:
Hydro 2000G (A)

Analysis model:
General purpose

Sensitivity:
Enhanced

Particle RI:
1.520

Absorption:
0.1

Size range:
0.020 to 2000.000 um

Obscuration:
12.26 %

Dispersant Name:
Water

Dispersant RI:
1.330

Weighted Residual:
0.805 %

Result Emulation:
Off

Concentration:
0.0069 %Vol

Span :
4.124

Uniformity:
1.28

Result units:
Volume

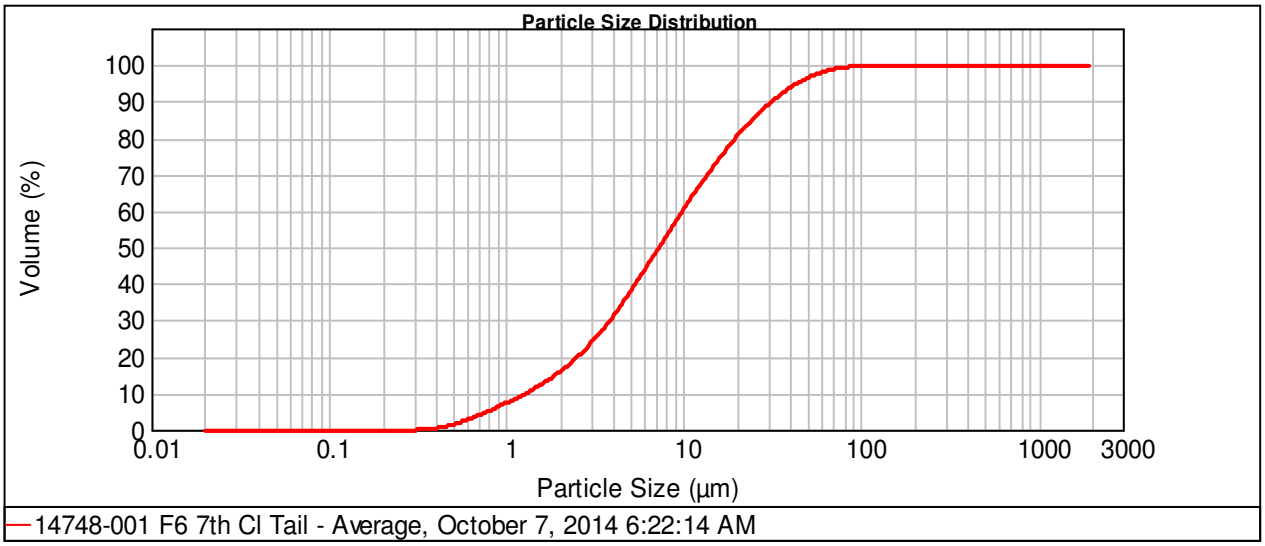
Specific Surface Area:
1.8 m²/g

Surface Weighted Mean D[3,2]:
3.331 um

Vol. Weighted Mean D[4,3]:
12.590 um

---

d(0.1): 1.284 um **d(0.5):** 7.237 um **D(0.80) : 19.51 µm**



Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
0.010	0.00	0.105	0.00	1.096	8.31	11.482	65.03	120.226	100.00	1258.925	100.00
0.011	0.00	0.120	0.00	1.259	9.78	13.183	69.24	138.038	100.00	1445.440	100.00
0.013	0.00	0.138	0.00	1.445	11.38	15.136	73.25	158.489	100.00	1659.587	100.00
0.015	0.00	0.158	0.00	1.660	13.14	17.378	77.03	181.970	100.00	1905.461	100.00
0.017	0.00	0.182	0.00	1.905	15.14	19.953	80.55	208.930	100.00	2187.762	100.00
0.020	0.00	0.209	0.00	2.188	17.41	22.909	83.81	239.883	100.00	2511.886	100.00
0.023	0.00	0.240	0.00	2.512	20.00	26.303	86.78	275.423	100.00	2884.032	100.00
0.026	0.00	0.275	0.00	2.884	22.93	30.200	89.45	316.228	100.00	3311.311	100.00
0.030	0.00	0.316	0.02	3.311	26.22	34.674	91.82	363.078	100.00	3801.894	100.00
0.035	0.00	0.363	0.18	3.802	29.85	39.811	93.86	416.869	100.00	4365.158	100.00
0.040	0.00	0.417	0.60	4.365	33.80	45.709	95.58	478.630	100.00	5011.872	100.00
0.046	0.00	0.479	1.26	5.012	38.02	52.481	96.97	549.541	100.00	5754.399	100.00
0.052	0.00	0.550	2.12	5.754	42.43	60.256	98.06	630.957	100.00	6606.934	100.00
0.060	0.00	0.631	3.15	6.607	46.97	69.183	98.86	724.436	100.00	7585.776	100.00
0.069	0.00	0.724	4.31	7.586	51.56	79.433	99.41	831.764	100.00	8709.636	100.00
0.079	0.00	0.832	5.58	8.710	56.14	91.201	99.76	954.993	100.00	10000.000	100.00
0.091	0.00	0.955	6.91	10.000	60.65	104.713	99.94	1096.478	100.00		

Operator notes:

Test No.: F7 **Project No.**: 14748-001 **Operator**: ML **Date**: 17-Oct-14

Purpose: Initial batch cleaner flotation tests.

Procedure: As per below.

Feed: 1 kg of Master Composite

Grind: 15 minutes per 1kg in rod mill P_{80} = 177 µm

Regrind: 30 minutes with ceramic media P_{80} = 128 µm
30 minutes with ceramic media P_{80} = 36 µm
30 minutes with ceramic media P_{80} = 25 µm

Conditions:

	Reagents added, grams per tonne				Time, minutes				
Stage	Fuel	MIBC			Grind	Cond.	Froth	pH	Ep (mV)
Grind					15				
Rougher 1	10	10				1	2	7.6	75
Rougher 2	10	10				1	2	7.5	0
Rougher 3	10	10				1	2	7.5	-25
Rougher 4	10	10				1	2	7.4	-75
Regrind 1					30				
Cleaner 1	10+10	10+10				1	2+2	7.2	-150
Cleaner 2	10+10	10+10				1	2+2	7.3	-175
Cleaner 3	10+10	10+10				1	2+2	7.2	-175
Regrind 2					20				
Cleaner 4	10+10	10+10				1	2+2	7.3	-200
Cleaner 5	10+10	10+10				1	2+2	7.3	-225
Cleaner 6	10+10	10+10				1	2+2	7.2	-225
Regrind 2					20				
Cleaner 7	10+10	10+10				1	2+2	7.4	-200
Cleaner 8	10+10	10+10				1	2+2	7.4	-200
Cleaner 9	10+10	10+10				1	2+2	7.5	-225
Total	40	40							

Stage		
Flotation Cell	4L	
Speed: rpm	1800	

* use as required - record

Metallurgical Balance - Rougher Kinetics

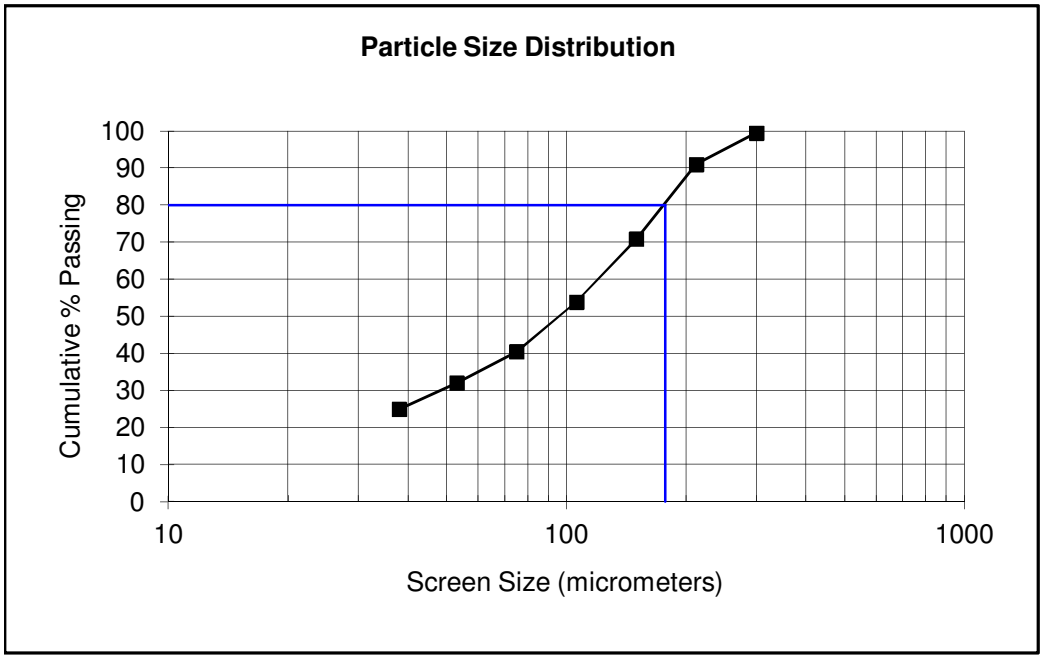
Product	**Weight**		**Assays %**	**% Distribution**
	g	**%**	**C (t)**	**C (t)**
9th Cleaner Con	275.7	27.8	50.8	57.5
9th Cleaner Tail	4.1	0.41	7.18	0.12
8th Cleaner Tail	8.8	0.89	15.4	0.56
7th Cleaner Tail	27.8	2.80	27.7	3.16
6th Cleaner Tail	11.3	1.14	21.6	1.00
5th Cleaner Tail	11.9	1.20	6.04	0.30
4th Cleaner Tail	24.6	2.48	16.1	1.63
3rd Cleaner Tail	14.3	1.44	6.10	0.36
2nd Cleaner Tail	46.9	4.73	14.4	2.77
1st Cleaner Tail	217.6	21.9	25.9	23.1
Rougher Tail	348.8	35.2	6.58	9.43
Head (calc.)	992	100.0	24.5	100.0
(direct)			25.3	
Combined Products				
9th Cleaner Con		27.8	50.8	57.5
9CC+9CT		28.2	50.2	57.6
9CC+9CT+8CT		29.1	49.1	58.2
9CC+9CT+8CT+7CT		31.9	47.2	61.4
9CC+9CT+8CT+7CT+6CT		33.0	46.3	62.4
9CC + 5-9CT		34.2	44.9	62.7
9CC + 4-9CT		36.7	43.0	64.3
9CC + 3-9CT		38.2	41.6	64.7
9CC + 2-9CT		42.9	38.6	67.4
9CC + 1-9CT		64.8	34.3	90.6
Rougher Tail		35.2	6.58	9.43
Head (calc.)		100.0	24.5	100.0

SGS Minerals Services
Size Distribution Analysis

Project No.
14748-001

Sample: **RO Tail** Test No.: **F7**

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
48	300	0.8	0.5	0.5	99.5
65	212	12.8	8.5	9.0	91.0
100	150	30.5	20.2	29.1	70.9
150	106	25.7	17.0	46.1	53.9
200	75	20.3	13.4	59.6	40.4
270	53	12.8	8.5	68.0	32.0
400	38	10.7	7.1	75.1	24.9
Pan	-38	37.7	24.9	100.0	0.0
Total	**-**	**151.3**	100.0	**-**	**-**
K80	**177**				

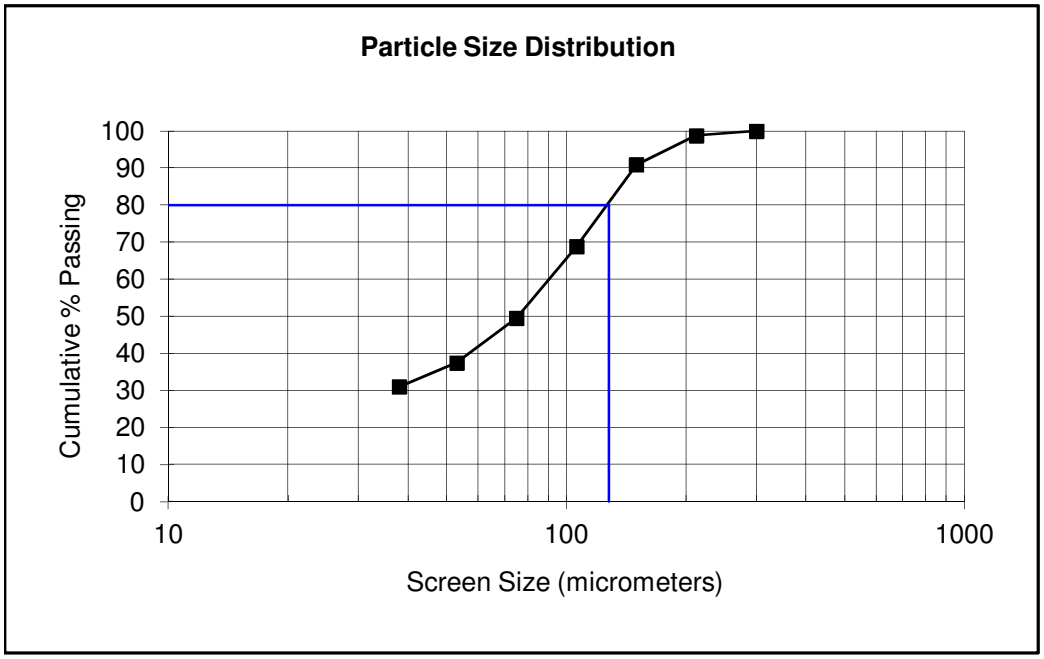


SGS Minerals Services
Size Distribution Analysis

Project No.
14748-001

Sample: **Ro Tail** Test No.: **F7**

Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
48	300	0.0	0.0	0.0	100.0
65	212	2.0	1.3	1.3	98.7
100	150	12.6	7.9	9.1	90.9
150	106	35.3	22.1	31.2	68.8
200	75	30.7	19.2	50.5	49.5
270	53	19.3	12.1	62.6	37.4
400	38	10.3	6.4	69.0	31.0
Pan	-38	49.5	31.0	100.0	0.0
Total	**-**	**159.7**	100.0	**-**	**-**
K80	**128**				

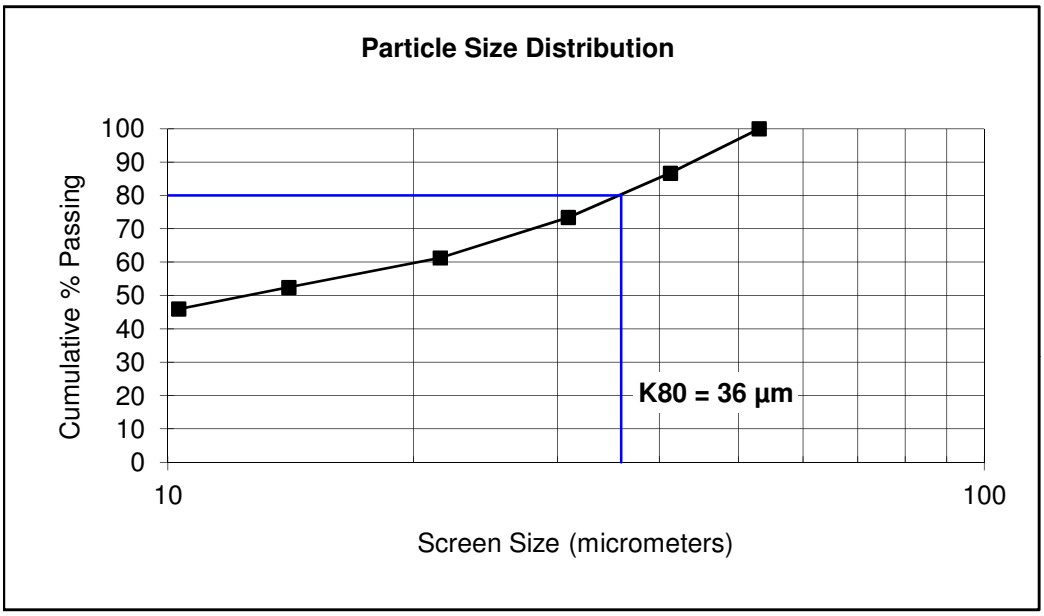


SGS Minerals Services
Size Distribution Analysis

Project No.
14748-001

Sample: **7th Cl Con** Test No.: **F7**

Dry Solids S.G.=		**2.75**	Water Temperature =		**16.00 Cº**
Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
270	53	0.0	0.0	0.0	100.0
	41	3.3	13.3	13.3	86.7
	31	3.3	13.3	26.6	73.4
	22	3.0	12.1	38.7	61.3
	14	2.2	8.9	47.6	52.4
	10	1.6	6.5	54.0	46.0
	-10	11.4	46.0	100.0	0.0
Total	**-**	**24.8**	100.0	**-**	**-**
K80	**36**				

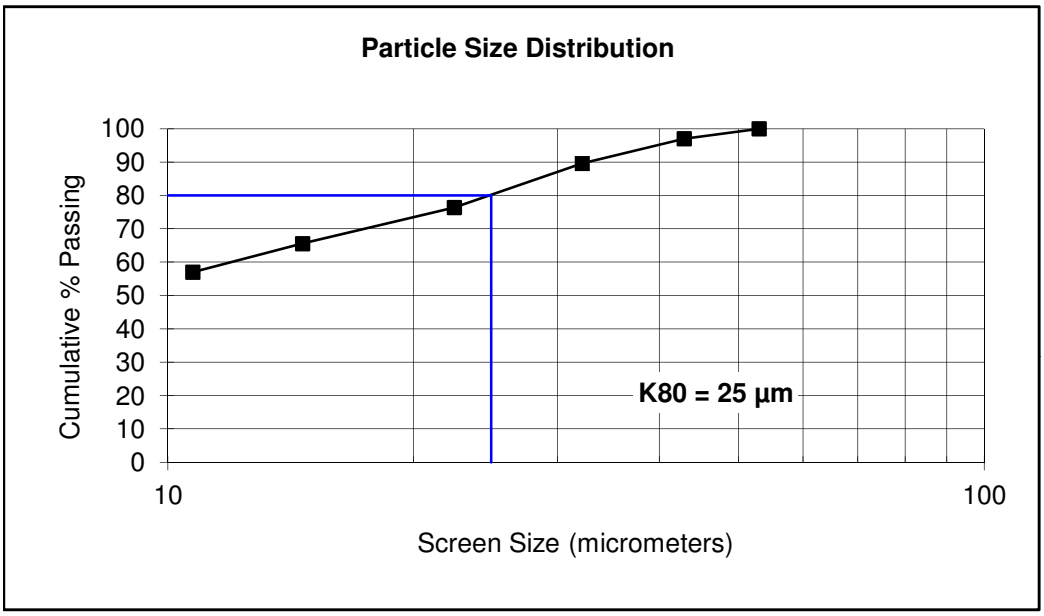


SGS Minerals Services
Size Distribution Analysis

Project No.
14748-001

Sample: **9th Cl Con** Test No.: **F7**

Dry Solids S.G.=		**2.62**	Water Temperature =		**16.00 Cº**
Size		Weight	% Retained		% Passing
Mesh	µm	grams	Individual	Cumulative	Cumulative
270	53	0.0	0.0	0.0	100.0
	43	1.5	3.0	3.0	97.0
	32	3.7	7.4	10.4	89.6
	22	6.6	13.2	23.6	76.4
	15	5.4	10.8	34.4	65.6
	11	4.3	8.6	43.0	57.0
	-11	28.5	57.0	100.0	0.0
Total	**-**	**50.0**	100.0	**-**	**-**
K80	**25**				



Test No.: F8 **Project No.**: 14748-001 **Operator**: ML **Date**: 20-Oct-14

Purpose: Initial batch cleaner flotation tests.

Procedure: As per below.

Feed: 1 kg of Master Composite

Grind: 15 minutes per 1kg in rod mill P_{80} = 177 µm

Regrind: 45 minutes with ceramic media P_{80} = 17 µm

15 minutes with ceramic media P_{80} = 12 µm

Conditions:

	Reagents added, grams per tonne				Time, minutes				
Stage	Fuel	MIBC			Grind	Cond.	Froth	pH	Ep (mV)
Grind					15				
Rougher 1	10	10				1	2	7.5	50
Rougher 2	10	10				1	2	7.6	0
Rougher 3	10	10				1	2	7.6	-75
Rougher 4	10	10				1	2	7.5	-125
Regrind 1					45				
				~17 um					
Cleaner 1	10+10	10+10				1	2+2	7.6	-125
Cleaner 2	10+10	10+10				1	2+2	7.6	-125
Cleaner 3	10+10	10+10				1	2+2	7.5	-150
Regrind 2					0				
Cleaner 4	10+10	10+10				1	2+1.5	7.5	-175
Cleaner 5	10+10	10+10				1	2+1.5	7.5	-200
Cleaner 6	10+10	10+10				1	2+1.5	7.5	-200
Regrind 2					15				
Cleaner 7	10+10	10+10				1	2+1	7.4	-200
Cleaner 8	10+10	10+10				1	2+1	7.4	-225
Cleaner 9 #1	10	10				1	1	7.5	-250
Cleaner 9 #2	10	10				1	1	7.5	-250
Cleaner 9 #3	10	10				1	1	7.4	-250
Total	70	70							

Stage		
Flotation Cell	4L	
Speed: rpm	1800	

* use as required - record

Metallurgical Balance - Rougher Kinetics

Product	**Weight**		**Assays %**	**% Distribution**
	g	**%**	**C (t)**	**C (t)**
9th Cleaner Con	50.9	5.08	65.3	12.9
9th Cleaner Tail	1.5	0.15	42.4	0.25
8th Cleaner Tail	5.5	0.55	45.7	0.97
7th Cleaner Tail	10.5	1.05	39.6	1.61
6th Cleaner Tail	7.3	0.73	51.0	1.44
5th Cleaner Tail	8.1	0.81	46.1	1.45
4th Cleaner Tail	11.8	1.18	40.7	1.86
3rd Cleaner Tail	15.9	1.59	22.1	1.36
2nd Cleaner Tail	33.7	3.36	22.5	2.94
1st Cleaner Tail	157.9	15.8	23.7	14.5
Rougher Tail	698.9	69.8	22.4	60.7
Head (calc.)	1002	100.0	25.7	100.0
(direct)			25.3	

Combined Products			
9th Cleaner Con	5.1	65.3	12.9
9CC+9CT	5.2	64.6	13.1
9CC+9CT+8CT	5.8	62.8	14.1
9CC+9CT+8CT+7CT	6.8	59.3	15.7
9CC+9CT+8CT+7CT+6CT	7.6	58.5	17.2
9CC + 5-9CT	8.4	57.3	18.6
9CC + 4-9CT	9.5	55.2	20.5
9CC + 3-9CT	11.1	50.5	21.8
9CC + 2-9CT	14.5	44.0	24.8
9CC + 1-9CT	30.2	33.4	39.3
Rougher Tail	69.8	22.4	60.7
Head (calc.)	100.0	25.7	100.0

MASTERSIZER 2000 64

Result Analysis Report

Sample Name:
14748-001 f8 1st clnr feed - Average

Sample Source & type:
ml

Sample bulk lot ref:

SOP Name:
Defaultar

Measured by:
LR_Malvern1

Result Source:
Averaged

Measured:
October 20, 2014 11:56:47 AM

Analysed:
October 20, 2014 11:56:49 AM

Particle Name:
Default

Particle RI:
1.520

Dispersant Name:
Water

Accessory Name:
Hydro 2000G (A)

Absorption:
0.1

Dispersant RI:
1.330

Analysis model:
General purpose

Size range:
0.020 to 2000.000 um

Weighted Residual:
0.677 %

Sensitivity:
Enhanced

Obscuration:
11.15 %

Result Emulation:
Off

Concentration:
0.0077 %Vol

Specific Surface Area:
1.33 m²/g

Span :
2.981

Surface Weighted Mean D[3,2]:
4.509 um

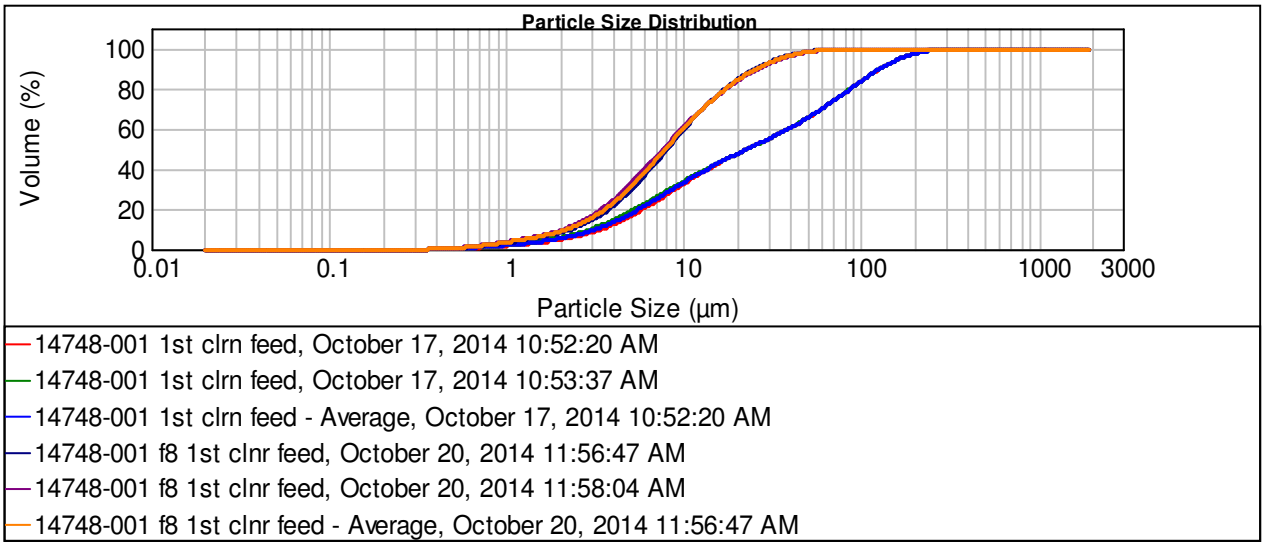
Uniformity:
0.927

Vol. Weighted Mean D[4,3]:
11.487 um

Result units:
Volume

---

d(0.1): 2.199 um **d(0.5):** 7.853 um **D(0.80) : 17.14 µm**



Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
0.010	0.00	0.105	0.00	1.096	4.10	11.482	66.01	120.226	100.00	1258.925	100.00
0.011	0.00	0.120	0.00	1.259	4.94	13.183	71.26	138.038	100.00	1445.440	100.00
0.013	0.00	0.138	0.00	1.445	5.88	15.136	76.07	158.489	100.00	1659.587	100.00
0.015	0.00	0.158	0.00	1.660	6.97	17.378	80.41	181.970	100.00	1905.461	100.00
0.017	0.00	0.182	0.00	1.905	8.29	19.953	84.26	208.930	100.00	2187.762	100.00
0.020	0.00	0.209	0.00	2.188	9.93	22.909	87.63	239.883	100.00	2511.886	100.00
0.023	0.00	0.240	0.00	2.512	12.00	26.303	90.52	275.423	100.00	2884.032	100.00
0.026	0.00	0.275	0.00	2.884	14.59	30.200	92.98	316.228	100.00	3311.311	100.00
0.030	0.00	0.316	0.00	3.311	17.79	34.674	95.00	363.078	100.00	3801.894	100.00
0.035	0.00	0.363	0.01	3.802	21.62	39.811	96.62	416.869	100.00	4365.158	100.00
0.040	0.00	0.417	0.10	4.365	26.08	45.709	97.87	478.630	100.00	5011.872	100.00
0.046	0.00	0.479	0.36	5.012	31.12	52.481	98.78	549.541	100.00	5754.399	100.00
0.052	0.00	0.550	0.76	5.754	36.63	60.256	99.39	630.957	100.00	6606.934	100.00
0.060	0.00	0.631	1.28	6.607	42.47	69.183	99.78	724.436	100.00	7585.776	100.00
0.069	0.00	0.724	1.89	7.586	48.49	79.433	99.96	831.764	100.00	8709.636	100.00
0.079	0.00	0.832	2.58	8.710	54.51	91.201	100.00	954.993	100.00	10000.000	100.00
0.091	0.00	0.955	3.31	10.000	60.40	104.713	100.00	1096.478	100.00		

Operator notes:

Test No.: F12 **Project No.**: 14748-001 **Operator**: ML **Date**: 12-Dec-14

Purpose: Batch cleaner flotation tests with sodium silicate.

Procedure: As per below.

Feed: 1 kg of Master Composite

Grind: 15 minutes per 1kg in rod mill P_{80} = 207 µm

Regrind: 45 minutes with ceramic media P_{80} = 53 µm
45 minutes with ceramic media P_{80} = 26 µm
45 minutes with ceramic media P_{80} = 15 µm

Conditions:

	Reagents added, grams per tonne				Time, minutes			
Stage	Fuel	MIBC	Sodium Silicate	Lime	Grind	Cond.	Froth	10 pH
Grind					15			
								7.4
Rougher 1	10	10		530		1	2	10.0
Rougher 2	10	10		260		1	2	10.5
Rougher 3	10	10		120		1	2	10.1
Rougher 4	10	10		60		1	2	10.0
Regrind 1					45			
Cleaner 1	10+10	10+10	500	120		1	2+2	10.0
Cleaner 2	10+10	10+10		250		1	2+2	10.0
Cleaner 3	10+10	10+10		190		1	2+2	10.0
Regrind 2					45			
Cleaner 4	10+10	10+10	1000	0		1	2+2	10.0
Cleaner 5	10+10	10+10		380		1	2+2	10.0
Cleaner 6	10+10	10+10		100		1	2+2	10.0
Regrind 2					45			
Cleaner 7	10+10	10+10	1000	0		1	2+2	10.1
Cleaner 8	10+10	10+10		350		1	2+2	10.0
Cleaner 9	10+10	10+10		80		1	2+2	10.0
Total	220	220	2500	2440				

Stage		
Flotation Cell	4L	
Speed: rpm	1800	

* use as required - record

Metallurgical Balance - Rougher Kinetics

Product	**Weight**		**Assays %**	**% Distribution**
	g	**%**	**C (t)**	**C (t)**
9th Cleaner Con	208.5	20.9	58.8	48.9
9th Cleaner Tail	16.1	1.62	41.7	2.68
8th Cleaner Tail	11.1	1.11	23.3	1.03
7th Cleaner Tail	36.6	3.68	28.2	4.12
6th Cleaner Tail	6.7	0.67	20.3	0.54
5th Cleaner Tail	15.1	1.52	15.0	0.90
4th Cleaner Tail	85.4	8.58	30.2	10.3
3rd Cleaner Tail	13.5	1.36	5.46	0.29
2nd Cleaner Tail	65.2	6.55	23.3	6.06
1st Cleaner Tail	129.5	13.0	23.1	11.9
Rougher Tail	408.0	41.0	8.11	13.2
Head (calc.)	996	100.0	25.2	100.0
(direct)			25.3	
Combined Products				
9th Cleaner Con		20.9	58.8	48.9
9CC+9CT		22.6	57.6	51.6
9CC+9CT+8CT		23.7	56.0	52.6
9CC+9CT+8CT+7CT		27.3	52.2	56.8
9CC+9CT+8CT+7CT+6CT		28.0	51.5	57.3
9CC + 5-9CT		29.5	49.6	58.2
9CC + 4-9CT		38.1	45.2	68.5
9CC + 3-9CT		39.5	43.9	68.8
9CC + 2-9CT		46.0	40.9	74.9
9CC + 1-9CT		59.0	37.0	86.8
Rougher Tail		41.0	8.11	13.2
Head (calc.)		100.0	25.2	100.0

MASTERSIZER 2000

Result Analysis Report

Sample Name:
14748-001 F12 1st Cl Tail - Average

SOP Name:
Defaultar

Measured:
December-16-14 12:41:00 PM

Sample Source & type:

Measured by:
LR_Malvern1

Analysed:
December-16-14 12:41:02 PM

Sample bulk lot ref:
ar

Result Source:
Averaged

Particle Name:
Default

Accessory Name:
Hydro 2000G (A)

Analysis model:
General purpose

Sensitivity:
Enhanced

Particle RI:
1.520

Absorption:
0.1

Size range:
0.020 to 2000.000 um

Obscuration:
13.89 %

Dispersant Name:
Water

Dispersant RI:
1.330

Weighted Residual:
0.471 %

Result Emulation:
Off

Concentration:
0.0245 %Vol

Span :
2.457

Uniformity:
0.78

Result units:
Volume

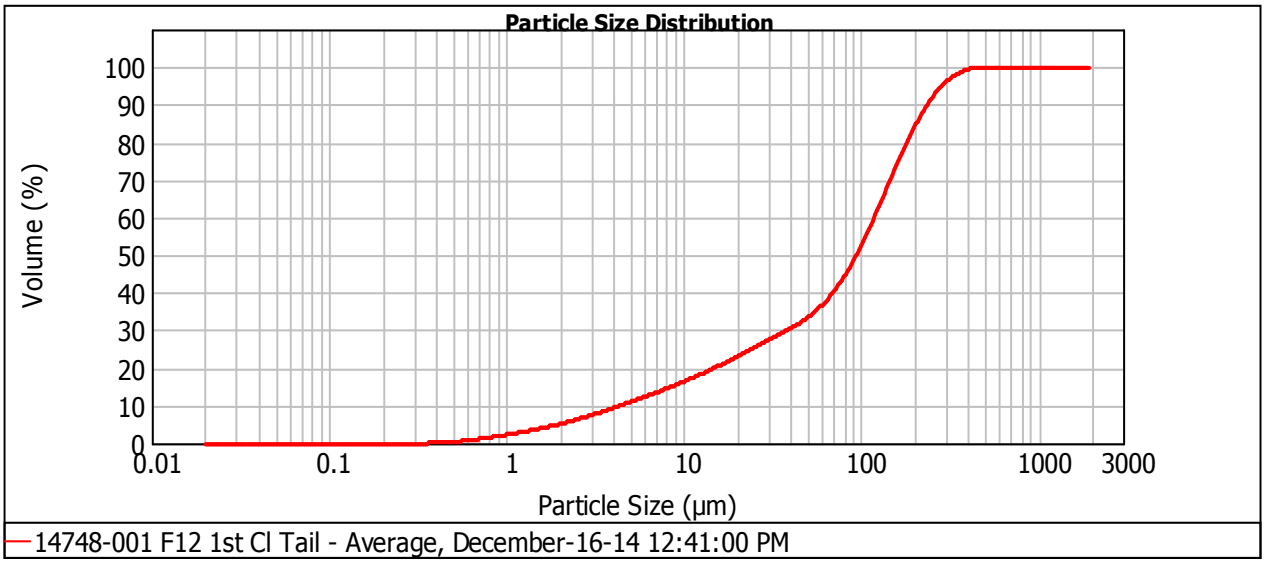
Specific Surface Area:
0.567 m²/g

Surface Weighted Mean D[3,2]:
10.581 um

Vol. Weighted Mean D[4,3]:
106.827 um

---

d(0.1): 4.365 um **d(0.5):** 93.161 um **d(0.8):** 179.267 um



Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
0.010	0.00	0.105	0.00	1.096	2.56	11.482	17.61	120.226	61.18	1258.925	100.00
0.011	0.00	0.120	0.00	1.259	3.07	13.183	18.89	138.038	67.80	1445.440	100.00
0.013	0.00	0.138	0.00	1.445	3.61	15.136	20.24	158.489	74.41	1659.587	100.00
0.015	0.00	0.158	0.00	1.660	4.21	17.378	21.65	181.970	80.65	1905.461	100.00
0.017	0.00	0.182	0.00	1.905	4.86	19.953	23.11	208.930	86.21	2187.762	100.00
0.020	0.00	0.209	0.00	2.188	5.57	22.909	24.59	239.883	90.87	2511.886	100.00
0.023	0.00	0.240	0.00	2.512	6.35	26.303	26.06	275.423	94.49	2884.032	100.00
0.026	0.00	0.275	0.00	2.884	7.19	30.200	27.52	316.228	97.09	3311.311	100.00
0.030	0.00	0.316	0.00	3.311	8.08	34.674	28.99	363.078	98.73	3801.894	100.00
0.035	0.00	0.363	0.01	3.802	9.02	39.811	30.54	416.869	99.65	4365.158	100.00
0.040	0.00	0.417	0.09	4.365	10.00	45.709	32.27	478.630	99.94	5011.872	100.00
0.046	0.00	0.479	0.27	5.012	11.00	52.481	34.33	549.541	100.00	5754.399	100.00
0.052	0.00	0.550	0.52	5.754	12.03	60.256	36.91	630.957	100.00	6606.934	100.00
0.060	0.00	0.631	0.84	6.607	13.08	69.183	40.18	724.436	100.00	7585.776	100.00
0.069	0.00	0.724	1.21	7.586	14.15	79.433	44.25	831.764	100.00	8709.636	100.00
0.079	0.00	0.832	1.63	8.710	15.25	91.201	49.17	954.993	100.00	10000.000	100.00
0.091	0.00	0.955	2.08	10.000	16.40	104.713	54.87	1096.478	100.00		

Operator notes:

MASTERSIZER 2000

Result Analysis Report

Sample Name:
14748-001 F12 4th Cl Tail - Average

SOP Name:
Defaultar

Measured:
December-16-14 12:23:51 PM

Sample Source & type:

Measured by:
LR_Malvern1

Analysed:
December-16-14 12:23:52 PM

Sample bulk lot ref:
ar

Result Source:
Averaged

Particle Name:
Default

Accessory Name:
Hydro 2000G (A)

Analysis model:
General purpose

Sensitivity:
Enhanced

Particle RI:
1.520

Absorption:
0.1

Size range:
0.020 to 2000.000 um

Obscuration:
17.16 %

Dispersant Name:
Water

Dispersant RI:
1.330

Weighted Residual:
0.478 %

Result Emulation:
Off

Concentration:
0.0171 %Vol

Span :
4.221

Uniformity:
1.31

Result units:
Volume

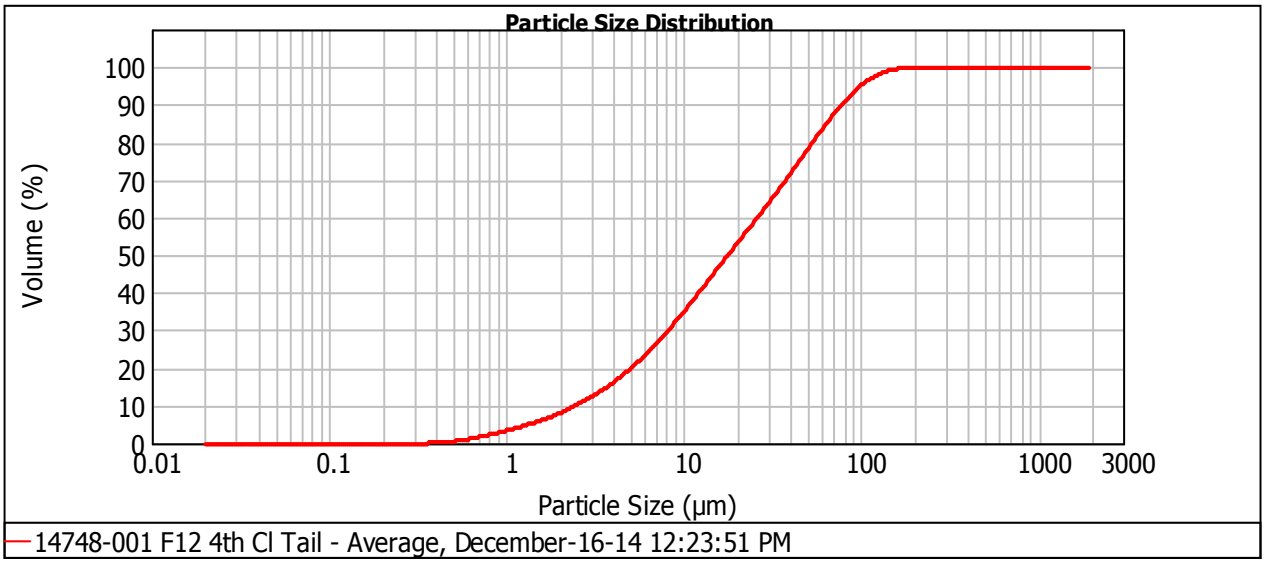
Specific Surface Area:
0.995 m²/g

Surface Weighted Mean D[3,2]:
6.032 um

Vol. Weighted Mean D[4,3]:
30.293 um

---

d(0.1): 2.448 um **d(0.5):** 17.627 um **d(0.8):** 52.879 um



Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
0.010	0.00	0.105	0.00	1.096	3.81	11.482	38.64	120.226	97.71	1258.925	100.00
0.011	0.00	0.120	0.00	1.259	4.62	13.183	42.29	138.038	98.88	1445.440	100.00
0.013	0.00	0.138	0.00	1.445	5.51	15.136	45.97	158.489	99.58	1659.587	100.00
0.015	0.00	0.158	0.00	1.660	6.51	17.378	49.63	181.970	99.90	1905.461	100.00
0.017	0.00	0.182	0.00	1.905	7.63	19.953	53.25	208.930	100.00	2187.762	100.00
0.020	0.00	0.209	0.00	2.188	8.88	22.909	56.86	239.883	100.00	2511.886	100.00
0.023	0.00	0.240	0.00	2.512	10.27	26.303	60.48	275.423	100.00	2884.032	100.00
0.026	0.00	0.275	0.00	2.884	11.82	30.200	64.16	316.228	100.00	3311.311	100.00
0.030	0.00	0.316	0.00	3.311	13.54	34.674	67.93	363.078	100.00	3801.894	100.00
0.035	0.00	0.363	0.01	3.802	15.45	39.811	71.81	416.869	100.00	4365.158	100.00
0.040	0.00	0.417	0.13	4.365	17.57	45.709	75.78	478.630	100.00	5011.872	100.00
0.046	0.00	0.479	0.38	5.012	19.91	52.481	79.78	549.541	100.00	5754.399	100.00
0.052	0.00	0.550	0.74	5.754	22.49	60.256	83.70	630.957	100.00	6606.934	100.00
0.060	0.00	0.631	1.20	6.607	25.31	69.183	87.41	724.436	100.00	7585.776	100.00
0.069	0.00	0.724	1.75	7.586	28.36	79.433	90.76	831.764	100.00	8709.636	100.00
0.079	0.00	0.832	2.38	8.710	31.62	91.201	93.65	954.993	100.00	10000.000	100.00
0.091	0.00	0.955	3.06	10.000	35.07	104.713	95.97	1096.478	100.00		

Operator notes:

MASTERSIZER 2000

Result Analysis Report

Sample Name:
14748-001 F12 7th Cl Tail - Average

SOP Name:
Defaultar

Measured:
December-16-14 12:01:29 PM

Sample Source & type:

Measured by:
LR_Malvern1

Analysed:
December-16-14 12:01:31 PM

Sample bulk lot ref:
ar

Result Source:
Averaged

Particle Name:
Default

Accessory Name:
Hydro 2000G (A)

Analysis model:
General purpose

Sensitivity:
Enhanced

Particle RI:
1.520

Absorption:
0.1

Size range:
0.020 to 2000.000 um

Obscuration:
18.52 %

Dispersant Name:
Water

Dispersant RI:
1.330

Weighted Residual:
0.832 %

Result Emulation:
Off

Concentration:
0.0141 %Vol

Span :
3.524

Uniformity:
1.12

Result units:
Volume

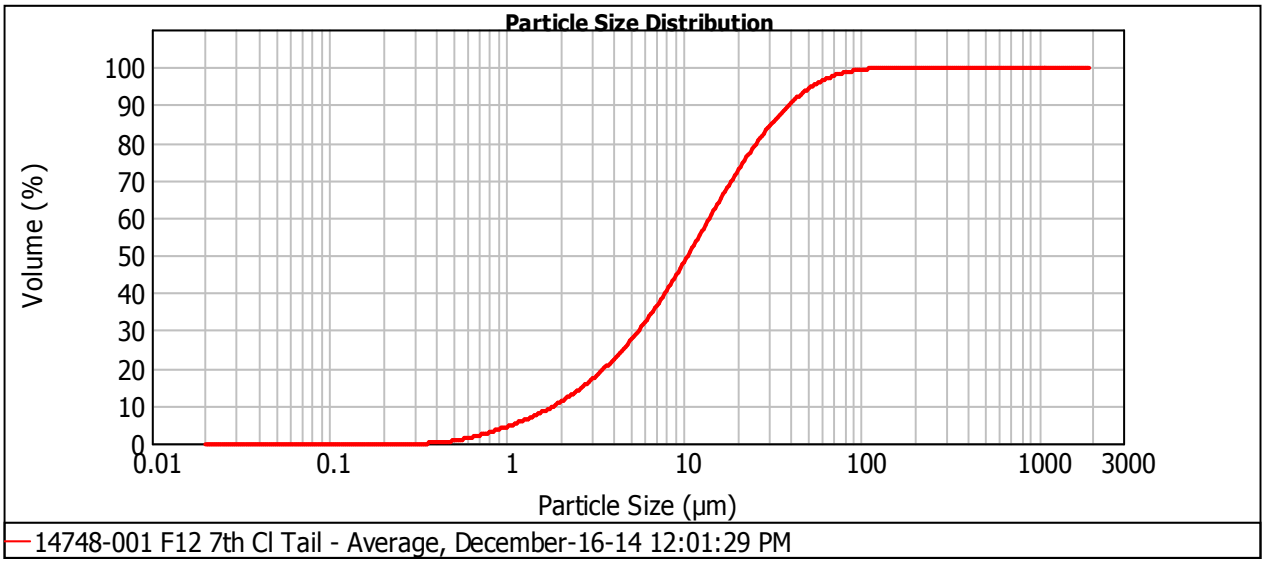
Specific Surface Area:
1.31 m²/g

Surface Weighted Mean D[3,2]:
4.590 um

Vol. Weighted Mean D[4,3]:
16.677 um

---

d(0.1): 1.861 um **d(0.5):** 10.535 um **d(0.8):** 25.697 um



Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
0.010	0.00	0.105	0.00	1.096	5.02	11.482	53.05	120.226	99.69	1258.925	100.00
0.011	0.00	0.120	0.00	1.259	6.12	13.183	57.99	138.038	99.80	1445.440	100.00
0.013	0.00	0.138	0.00	1.445	7.35	15.136	62.92	158.489	99.86	1659.587	100.00
0.015	0.00	0.158	0.00	1.660	8.73	17.378	67.72	181.970	99.91	1905.461	100.00
0.017	0.00	0.182	0.00	1.905	10.28	19.953	72.32	208.930	99.96	2187.762	100.00
0.020	0.00	0.209	0.00	2.188	12.02	22.909	76.65	239.883	100.00	2511.886	100.00
0.023	0.00	0.240	0.00	2.512	13.97	26.303	80.65	275.423	100.00	2884.032	100.00
0.026	0.00	0.275	0.00	2.884	16.14	30.200	84.29	316.228	100.00	3311.311	100.00
0.030	0.00	0.316	0.00	3.311	18.54	34.674	87.55	363.078	100.00	3801.894	100.00
0.035	0.00	0.363	0.01	3.802	21.20	39.811	90.41	416.869	100.00	4365.158	100.00
0.040	0.00	0.417	0.17	4.365	24.14	45.709	92.84	478.630	100.00	5011.872	100.00
0.046	0.00	0.479	0.48	5.012	27.38	52.481	94.86	549.541	100.00	5754.399	100.00
0.052	0.00	0.550	0.95	5.754	30.93	60.256	96.46	630.957	100.00	6606.934	100.00
0.060	0.00	0.631	1.56	6.607	34.81	69.183	97.67	724.436	100.00	7585.776	100.00
0.069	0.00	0.724	2.28	7.586	39.00	79.433	98.54	831.764	100.00	8709.636	100.00
0.079	0.00	0.832	3.10	8.710	43.47	91.201	99.11	954.993	100.00	10000.000	100.00
0.091	0.00	0.955	4.01	10.000	48.18	104.713	99.47	1096.478	100.00		

Operator notes:

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Deficiencies– Metallurgical Testing Assessment Report

May 7th, 2015

The metallurgical testing report is meant to compliment the earlier report on the property from 2014. The earlier work was filed without the current metallurgical work due to assessment work requirements. The metallurgical testing was done on hole GC-12-01 from 60.5 to 84.5 meters. A copy of the drill log, the drill section and a drillhole location map has been appended to this deficiency report in order to address concerns raised by MNDM assessors.

Signed,

Steven Siemieniuk, P.Geo.

May 7, 2015

Clark Exploration Consulting Inc.

Diamond Drill Core Logging Sheet - Header Page

Company / Owner / Optionee:	Greencastle
Property:	Rockstone
Project Number:	
Claim Number(s):	
Target:	Target "C"
Hole Number:	**GC-12-01**
Length:	201m
Core Size:	
Grid East:	
Grid North:	
UTM Easting:	291260
UTM Northing:	5364780
Datum and UTM Zone:	NAD83, Zone 16
Elevation:	
Planned Collar Orientation:	Az: 42.5, Dip: -45
Surveyed Collar Orientation:	
Magnetic Declination:	
Date Started:	05/07/2012
Date Completed:	06/07/2012
Drilling Company:	Chibougamau
Date Logged:	06-Jul-12
Logged By:	B. CLARK

Downhole Surveys

Instrument:

Depth	Dip	Azimuth	Mag	Comment
96				
201	-33.4	53.7	53884	

Core Storage:

Comments: Additional samples were taken to better "wing" the zone, they are highlighted in yellow (20-Sept-12)

Drillhole: GC-12-01

Major		Code	Minor		Description	Samples				QA/QC	Au	Cu	Pb	Zn	
From	To		From	To		Number	From	To	Length	S / B / D	ppm	ppm	ppm	ppm	
0.00	6.00				Casing to 6m, bedrock starts at 5.5m										
5.50	60.53				Intermediate Pyroclastic.										
					Flow to tuff/lapilli tuff, dark grey in colour, contains angular-subrounded clasts of quartz ranging is size from 1mm-1cm. Bedded/banded at 55° to core axis	741551	52.00	53.50	1.50		0.0120	34	5	73	
					Quartz veining ranging in widths from 2mm-2cm. Mineralization occurs as stringers + disseminated in host rock of pyrite+pyrrhotite (1-5%). More intense zones of mineralzation are 53m-53.9m and 55m-58.3m. Contact is at 60° to core axis, occurs over 0.5cm	741552					0.0070	62	12	80	
					7.47m to 8.5m Quartz vein										
					9m - 15.8m Lamprophyre Dike										
60.50	84.50				Metaseds - Graphitic Argillite-Mudstone										
					Thinly bedded graphite rich, v fine grained, dark grey to black in colour, brittle brecciated zone with angular clasts ranging in size from 3mm-5cm. (Syntectonic breccia) Mineralization occurs within white carbonate/quartz matrix to the clasts as stringers+pods of pyrite+pyrrhotite (1-5%) with reddish brown sphalerite and chalcopyrite.	741553	59.50	60.50	1.00		0.0080	143	17	68	
					Contact is obscured by broken core.	741554	60.50	62.00	1.50		0.0140	1457	160	9817	
						741555	62.00	63.50	1.50		0.0250	1555	116	9322	
						741556	63.50	65.00	1.50		0.0320	1598	130	9897	
					60.5m - 84.5 m : 0.82% Zn, 0.15% Cu	741557	65.00	66.50	1.50		0.0160	1935	122	8013	
						741558	66.50	68.00	1.50		0.0140	1673	83	8647	
						741559	68.00	69.50	1.50		0.0310	1828	190	10092	
						741560	69.50	71.00	1.50		0.0580	1785	143	10037	
						741561	71.00	72.50	1.50		0.0080	1769	144	10247	
						741562	72.50	74.00	1.50		<0.005	1802	99	7107	
						741563	74.00	75.50	1.50		<0.005	1573	129	9124	
						741564	75.50	77.00	1.50		<0.005	1428	122	8727	
						741565	77.00	78.50	1.50		0.0100	1515	136	9603	
						741566	78.50	80.00	1.50		<0.005	976	110	4462	
						741567	80.00	81.50	1.50		0.008	1066	206	6618	
						741568	81.50	83.00	1.50		<0.005	992	227	6910	
						741569	83.00	84.50	1.50		<0.005	748	126	3281	
84.50	133.30				Intermediate Pyroclastic.										

Drillhole: GC-12-01

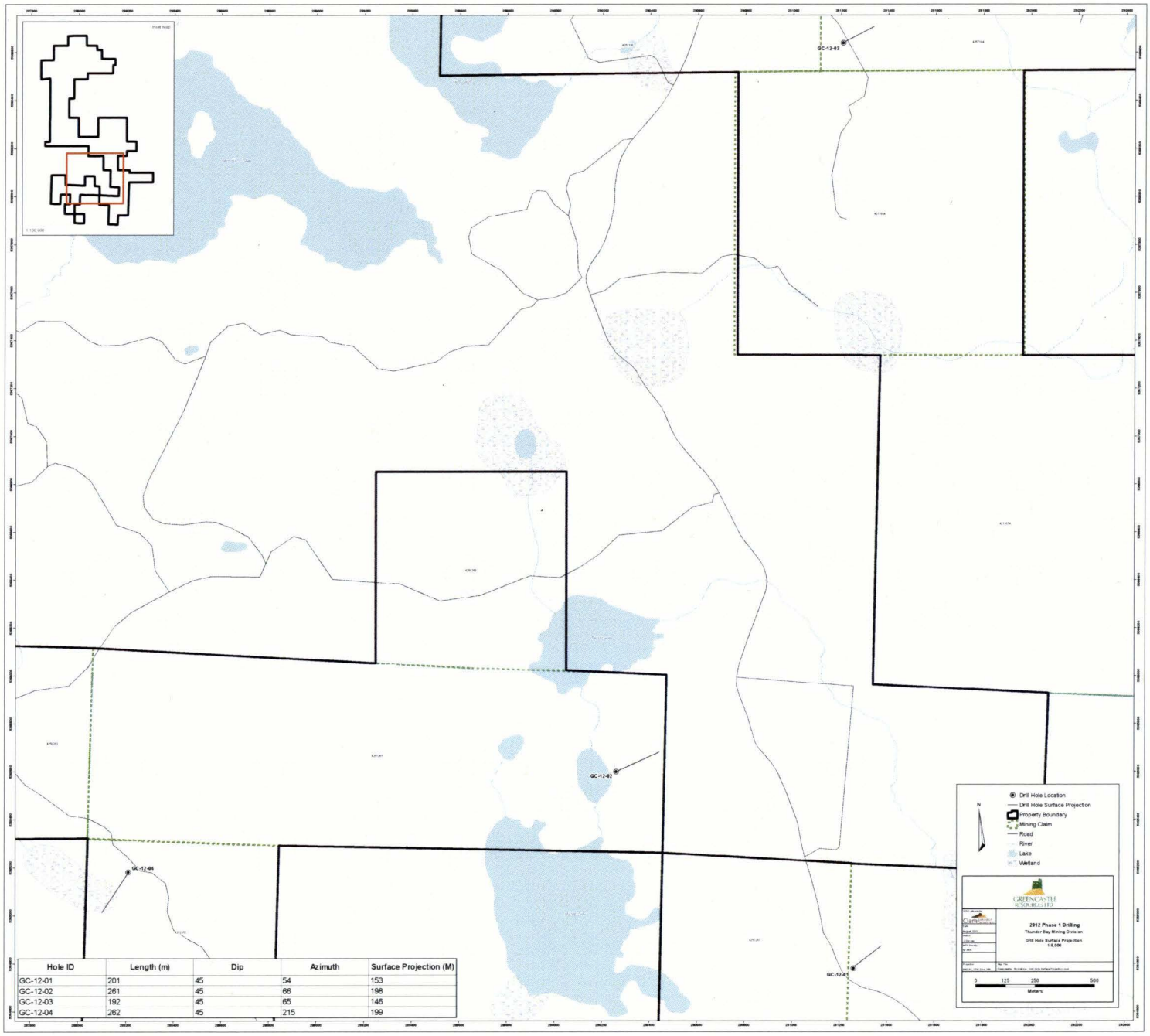
Major		Code	Minor		Description	Samples				QA/QC	Au	Cu	Pb	Zn
From	To		From	To		Number	From	To	Length	S / B / D	ppm	ppm	ppm	ppm
					Dark grey in colour, flow to tuff clasts ranging in size 1-4mm, angular to sub-rounded clasts. Foliated/bedded(?) at 60° to core axis. Mineralizaion consists of disseminated + stringers (1-3mm) of pyrite+pyrrhotite (1-3%). Quartz veins ranging from 1mm-5mm									
					111.6-113: contains felsic veins (kfsp, qtz, minor bt). Chilled margin									
					Stronger Mineralized zones: 120m-123m: stringers and disseminated pyrrhotite+pyrite (1-3%). 125-132m: stringers ranging from 1-4mm, pyrrhotite+pyrite (3%); minor pink elongate garnet grains locally	741570	121.00	122.00	1.00		<0.005	62	11	285
					133m kfsp clasts appear 1-3mm, increase in abundance towards contact.									
					Contact is sharp at 133.3m @60° to core axis									
133.30	136.60				Lamprophyre Dike									
					Dark grey-green, med to coarse grained massive, grains ranging in size from 2mm-7mm, contains common coarse biotite. Chlorite is more abundant around quartz veins (alteration). Porphyritic feldspar near the base .									
					Disseminated pyrrhotite+pyrite throughtout (1-3%)									
					Unit ends at quartz vein.									
136.60	153.60				Intermediate Volcanic Breccia									
					Debris flow(?), Dark grey in colour, quartz/carbonate flooded material, matrix contains biotite. Minor chlorite alteration present. Weakly foliated @50° to core axis.	741571	138.50	139.50	1.00		0.006	73	3	113
					Pyrite+pyrrotite occur as stringers and disseminated thoughout host rock (1-3%), stringer are mostly pyrrhotite with minro pyrtie ranging in width from 3mm-2.5cm.									
						741572	141.00	142.50	1.50		0.013	61	6	87
						741573	142.50	144.00	1.50		<0.005	32	2	80
						741574	144.00	145.50	1.50		<0.005	42	6	97
						741575	145.50	147.00	1.50		<0.005	28	8	91
						741576	147.00	148.50	1.50		<0.005	84	13	166
					152.4-153.0: Core missing.									
					Gradational contact, occurs over 1cm @~50° to core axis.									
153.60	180.10				Metasediments : Wacke - graphitic argillite	741577	153.60	154.60	1.00		<0.005	148	15	140
					Black-grey in colour, graphitic, weakly foliated @ 60° to core axis. Mineralization occurs as disseminated+stringers+pods of pyrrhotite+pyrite (1-5%).	741578	154.60	155.60	1.00		<0.005	77	<1	359
					Mostly contains grains <1mm	741579	156.00	157.00	1.00		<0.005	109	13	701
					Coarse grained sections between 160.7-161.5: disseminated pyrite+pyrrhotite (1%)	741580	157.00	158.00	1.00		0.008	114	14	639

Drillhole: GC-12-01

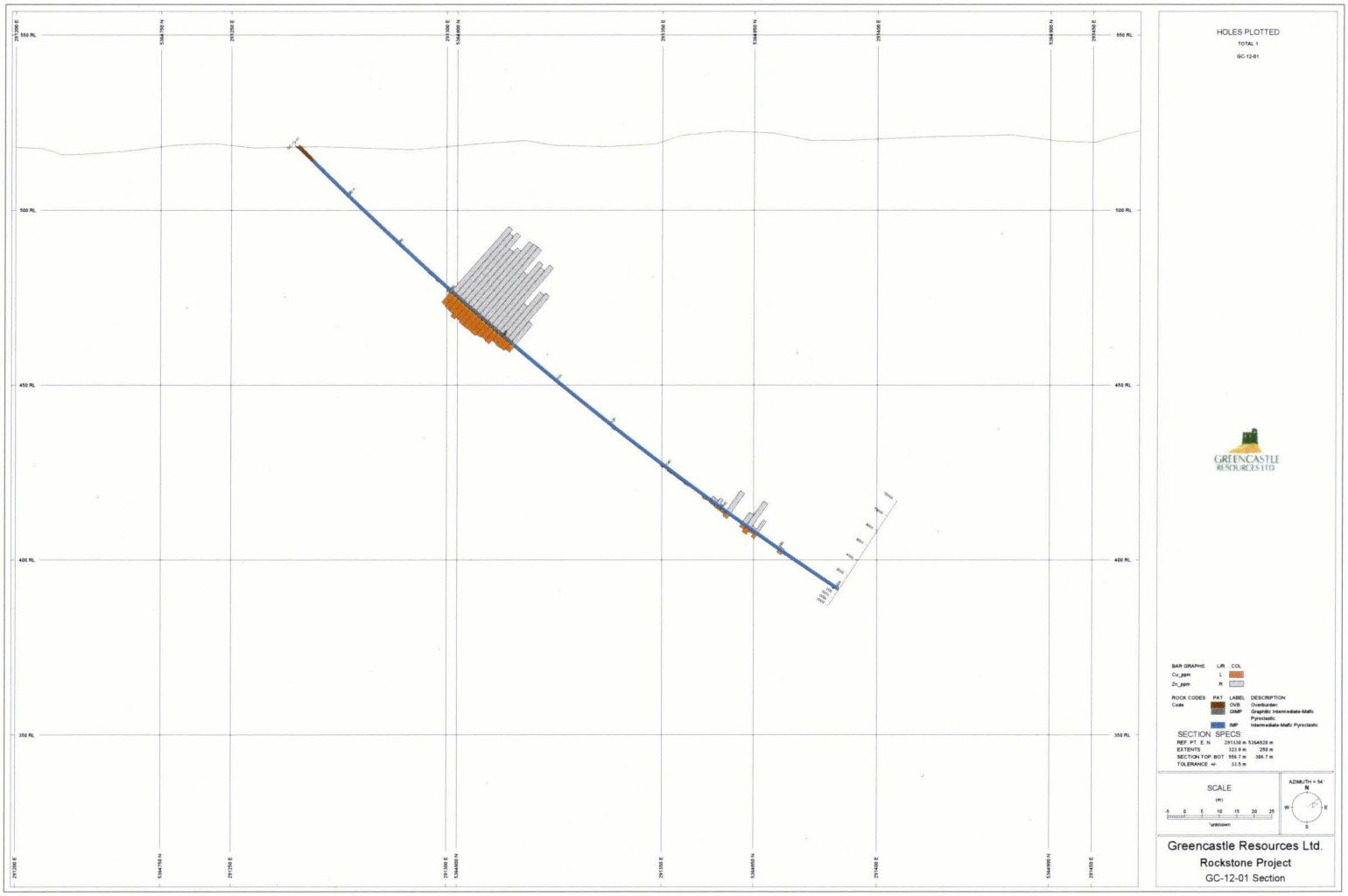
Major		Code	Minor		Description	Samples				QA/QC	Au	Cu	Pb	Zn
From	To		From	To		Number	From	To	Length	S / B / D	ppm	ppm	ppm	ppm
					161.5 - 170.3 Graphite increases significantly; locally beds 15-60 cm wide of less graphitic more silty to wacke material									
					177.1-177.5: Lamprophyre dike	741581	158.00	159.00	1.00		0.008	182	23	1045
					Contains quartz veins between 1-4mm in width	741582	159.00	160.00	1.00		<0.005	168	15	481
						741583	160.00	161.50	1.50		<0.005	184	15	175
					Contact is gradational, occurs over approximately 0.5cm, but @45° to core axis	741584	161.50	163.00	1.50		<0.005	426	88	3010
						741701	163.00	164.50	1.50		0.035	285	35	2675
						741702	164.50	166.00	1.50		0.026	295	35	1722
						741703	166.00	167.20	1.20		0.031	354	41	2818
						741585	167.20	168.70	1.50		0.007	288	50	1638
						741586	168.70	170.20	1.50		0.005	613	46	3578
						741587	170.20	171.70	1.50		0.005	166	20	566
						741588	171.70	172.70	1.00		0.005	453	33	1851
						741704	172.70	174.20	1.50		0.015	117	25	1062
						741705	174.20	175.70	1.50		0.014	189	27	1244
						741706	175.70	177.20	1.50		0.011	161	25	1121
						741707	177.20	178.70	1.50		0.017	165	29	867
						741708	178.70	180.20	1.50		0.012	195	28	1292
180.10	194.40				Intermediate Pyroclastic.									
					black-grey-green in colour, minor graphitic material, fine grained alternating beds(?)/bands(?) @ 60° to core axis of quartz+carbonate and host rock. Some zones of chloritic alteration (180.1-186m)	741589	180.20	181.70	1.50		0.006	236	18	483
					Mineralization occurs as stringers+disseminated pyrite (1-3%), mineralized zone between 180.1-184.6m after this vary sparse.	741590	181.70	182.70	1.00		<0.005	24	3	61
					186.8-188: Apperance of kfsp ~1-3mm within quartz+carbonate zones between fine grained black material with minor graphite.									
					Contact is sharp, is on an sharp angle and extends for 65cm @10° to core axis									
194.40	197.90				Lamprophyre dike									
					grey-green in colour, grain size 1-4mm, contains bt(40%)+chl(30%)+qtz(20%) +carbonate(10%).									
					Mineralization consists of disseminated pyrite + pyrrhotite (1-2%)									
					Contact is sharp but on an angle and extends over 5cm @35° to core axis. Pyrite veinlet along contact.									
197.90	201.00				Intermediate Pyroclastics.									

Drillhole: GC-12-01

Major		Code	Minor		Description	Samples				QA/QC	Au	Cu	Pb	Zn	
From	To		From	To		Number	From	To	Length	S / B / D	ppm	ppm	ppm	ppm	
					Black/grey-green in colour, fine grained, contains qtz+carbonate+ chlorite "zones" (quartz/carbonate veins which have caused alteration of host rock). Ranging in widths from 1mm-2cm. Veins @ ~50° to core axis.										
					Disseminated pyrite (<1%)										
					201= End of hole										
					Some relogging by J Pirie										



Hole ID	Length (m)	Dip	Azimuth	Surface Projection (M)
GC-12-01	201	45	54	153
GC-12-02	261	45	66	198
GC-12-03	192	45	65	146
GC-12-04	262	45	215	199


HOLES PLOTTED
TOTAL 1
GC-12-01
GREENCASTLE RESOURCES LTD
BAR GRAPHS L/R COL
Cu_ppm L
Zn_ppm R
ROCK CODES PAT LABEL DESCRIPTION
Code OVB Overburden
GMP Graphitic Intermediate-Mafic Pyroclastic
IMP Intermediate-Mafic Pyroclastic
SECTION SPECS
REF. PT. E, N 291330 m 5364530 m
EXTENTS 323.8 m 250 m
SECTION TOP, BOT 556.7 m 306.7 m
TOLERANCE +/- 33.5 m
SCALE
(m)
-5 0 5 10 15 20 25
unknown
AZIMUTH = 54°
N
W
E
S
Greencastle Resources Ltd.
Rockstone Project
GC-12-01 Section