mount burgess mining

ASX CODE: MTB

12 December 2018

Mr Chris Hesford
Listings Compliance (Perth)
ASX Compliance Pty Ltd
Level 40 Central Park
Perth WA 6000

Dear Mr Hesford,

AMENDMENT OF ANNOUNCEMENT

Please find attached an amended announcement to replace the announcements released to the market on 4 December 2018, headed **Vanadium Metal/Vanadium Pentoxide – Nxuu Deposit.**

RETRACTION OF ANNOUNCEMENTS

The Company will now retract the announcements of 4 December 2018, as it has been advised by ASX that they are not compliant with the 2012 JORC Code and therefore not compliant with the ASX Listing Rules.

Also the Company will now retract the announcement that it released to the market on 16 July 2018, headed **Continuous High Vanadium Zone – Nxuu Deposit, Botswana** as it has only now been advised by ASX that it is not compliant with the 2012 JORC Code and therefore not compliant with the ASX Listing Rules.

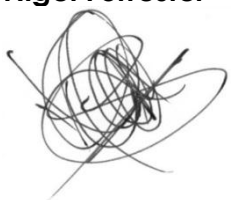
CAUTIONARY STATEMENT

The Company advises that investors should not rely on any of the following information for investment purposes:

- Information contained in the announcement released by the Company on 16 July 2018, headed **Continuous High Grade Vanadium Zone – Nxuu Deposit, Botswana**
- Information contained in the **Company's June 2018 Quarterly Report,** on pages 2, 3, and 4, released to the market on 30 July 2018, which repeated the information as released to the market on 16 July 2018.
- Information contained on page 11 of the announcement released by the Company on 24 September 2018, headed **Part 1 – Vanadium & Germanium at Nxuu/Kihabe Zn/Pb/Ag Deposits,** which repeated the information released to the market on 16 July 2018.
- Information contained in the two announcements released by the Company on 4 December 2018, headed **Vanadium Metal/Vanadium Pentoxide – Nxuu Deposit.**

Yours faithfully,

Nigel Forrester



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REPLACEMENT ANNOUNCEMENT RE VANADIUM METAL/VANADIUM PENTOXIDE – NXUU DEPOSIT

Recent mineralogical test work conducted by ALS Laboratories, Balcatta, Western Australia, on four of the Nxuu Deposit samples from fifteen HQ diamond core holes drilled in late 2017, has confirmed that the vanadate mineral hosting Vanadium metal and Vanadium Pentoxide is **DESCLOIZITE**.

Samples from the four HQ diamond core holes, previously confirmed by Intertek Genalysis, Maddington, Western Australia, as containing Vanadium metal assays, were selected for mineralogical and metallurgical test work.

These four HQ diamond core holes were selected on the basis that their samples which contained Vanadium metal assays represented, as close as possible, the estimated average Vanadium metal grade, returned from all fifteen holes drilled into the Nxuu Deposit in late 2017.

Details of the four HQ diamond core holes and the samples selected from those holes which contained Vanadium metal assays are as follows:

SAMPLE SUBMISSION NO: MTB7 – 11 - 2018

Drill Hole Number	Easting	Northing	Dip	Azimuth degs	EOH/RL (m)	From (m)	To (m)	Weight (kg)
NXDD029	509,000	7,821,900	-90	0	41.95/1131	38.00	39.58	2.3701
NXDD032	508,900	7,821,800	-90	0	50.95/1131	24.44	28.05	9.0550
						48.00	50.00	4.3539
NXDD034	508,850	7,821,800	-90	0	49.62/1131	12.00	16.00	9.3409
						17.95	20.69	5.7463
						24.80	26.97	5.5606
						29.00	31.00	3.6017
NXDD046	508,950	7,821,950	-90	0	20.95/1131	5.15	9.00	6.0373
						15.00	19.38	7.4328
TOTAL								**53.4986**

The 53.5 kg of samples from the four Nxuu Deposit HQ diamond core holes were composited by ALS Laboratories for planned mineralogical and metallurgical test work

The mineralogical test work conducted by ALS Laboratories on this sub-sample concluded:

- "Descloizite (PbZn(VO4)(OH)) is the dominant (and possibly only) Vanadium-bearing mineral identified in the sample".

This mineralogical test work further concluded:

- "Approximately 65% of descloizite is classified as either "liberated" or "high grade middlings". This descloizite is relatively coarse grained; P80 of "liberated" descloizite is 74 um and P80 of the "high grade middling" descloizite is 54 um".

- "The remaining 35% of the descloizite is less well liberated and also fine grained; P80 of medium grained Descloizite 31um, P80 of "low grade middlings" 25um and P80 of "locked" Descloizite 16 um".

The full Mineralogical Report prepared by ALS is shown as Appendix 1.

To date the Company has only ever reported Vanadium metal (V) assay results, as received from various assay laboratories.

The Vanadium metal content from the Nxuu Deposit assay results is part of the full mineral suite assayed for, which includes Zinc, Lead, Silver, Germanium and Vanadium.

As previously disclosed, the mineralogical test work conducted by ALS Labortories confirmed that the Vanadium vanadate host mineral is **DESCLOIZITE**.

The empirical formula for **DESCLOIZITE** is as confirmed by ALS and previously shown as $PbZn(V0_2)(OH)$.

The table below shows the percentages of the ELEMENT CONTENT of DESCLOIZITE and the COMPONENT HOSTS containing the elements in Descloizite.

With a gram molecular weight of 404.54 grams, the mineral/chemical make-up of Descloizite is as below:

(The gram molecular weight of Vanadium metal = 50.9 and thus is 12.59% of Descloizite.)

ELEMENT CONTENT	**COMPONENT HOST CONTAINING THE ELEMENT**
12.59% Vanadium metal (V) hosted within	22.48% Vanadium Pentoxide (V_2O_5)
16.16% Zinc (Zn) metal hosted within	20.12% ZnO
51.22% Lead (Pb) metal hosted within	55.17% PbO
0.25% Hydrogen (H) hosted within	2.23% H_2O
19.77% Oxygen (O)	____
100%	**100%**

The 22.48% Vanadium Pentoxide (V_2O_5) (as shown in the Table as the COMPONENT HOST CONTAINING THE ELEMENT Vanadium metal (V) of 12.50%), should not be construed as being the amount of V_2O_5 that can be recovered.

For the V_2O_5 content of 22.48% in Descloizite, please refer to the "Mineral Data of Descloizite" as outlined as above (http://webmineral.com/data/Descloizite.shtml#.XAh_sdszbcs).

The calculation below confirms the content of Vanadium and Vanadium Pentoxide when in Descloisite. Based on the molecular weights of Vanadium (V) = 50.9 and Oxygen (O) = 16 we have:

V_2O_5 = (50.9 x 2) + (16 x 5) = 181.8

Therefore the % of Vanadium (V) in V_2O_5= 50.9 X 2/181.8 = 101.8/181.8 = 56%
i.e. 56% V ≡100% V_2O_5
or 0.56% V ≡1% V_2O_5
and thus 1000ppm V ≡1000 x 1%/0.56% = 1786ppm V_2O_5

This means that when the mass (or percentage) of Vanadium metal (V) is reported as Vanadium Pentoxide (V_2O_5) the equivalent mass (or percentage) of V_2O_5 is increased by a factor of 1.786.

Intertek Genalysis is the laboratory that has conducted all assaying and re-checking of other laboratory assays in respect of all drilling conducted since 2003 on the Kihabe-Nxuu Deposit in Botswana. On 10 December 2018 Intertek Genalysis confirmed that that the conversion factor from V to V_2O_5 would be 1.78519.

Intertek Genalysis further confirmed:

- If the mineral is Descloizite, then the vanadium would be present as V2O5 (5+).
- Descloizite is $PbZn(VO_4)(OH)$
- This is the same as $2PbO.2ZnO.V_2O_5.H2O$

Oxide	Number	Mass	%
PbO	2	446.40	55.18
ZnO	2	162.74	20.12
V_2O_5	1	181.88	22.48
H_2O	1	18.00	2.22
		809.02	100.00

As V_2O_5 is a marketable product, metallurgical test work is planned to be conducted by the Company in order to determine to what extent V2O5 can be recovered from the Nxuu Deposit.

Only upon completion of metallurgical test work will the Company be able to determine the extent to which any V_2O_5 can be recovered.

Based on Vanadium metal assay results, the Company has now calculated the V_2O_5 grades of the fifteen HQ diamond core holes drilled into the Nxuu Deposit in 2017. The V_2O_5 grades have been calculated by multiplying the Vanadium grades by 1.785, being the percentage of Vanadium metal reported as V_2O_5.

The Vanadium assay results of the 15 HQ diamond core holes and the drill sections showing the intersections of Vanadium mineralisation of those 15 HQ diamond core holes were summarised when first released to the market on 3 April 2018.

In regard to the announcement released to the market on 16 July 2018, which detailed a higher grade Vanadium zone delineated by 10 drill holes within an area 270m X100m, the Company has been asked by ASX to <u>withdraw</u> the announcement as the area involved has not been subjected to a resource calculation compliant with the 2012 JORC Code. The area contained three historical drill holes (not shown) and the following seven HQ diamond core holes drilled in the area in 2017.

NXDD030, NXDD032, NXDD034, NXDD037, NXDD040, NXDD041 and NXDD043

The above drill holes are now shown in Table 1 outlining the V_2O_5 grades of each holes various intersections.

The Nxuu Deposit is a shallow basin shaped deposit where Zn/Pb/Ag/Ge/V_2O_5 mineralisation is hosted within a completely oxidised quartz wacke with a maximum depth of 60m.

Table 1 Nxuu Deposit - Drill Hole details showing widths of Vanadium metal and Vanadium Pentoxide Mineralised Zones

SECTION 1A

HOLE ID	COORDINATES		DIP	AZI-MUTH	EOH/RL	Vanadium Mineralisation (V)			V_2O_5
	Easting	Northing	Degs.	Degs.	(m)	Depth (m)	(m)	ppm	ppm
NXDD046	508,950	7,821,950	-90	0	20.95/1,131	5.00-10.00	5.00	509	908.56
						11.00-14.00	3.00	192	342.72
						15.00-19.39	4.39	1,805.00	3,221.92

SECTION 1

HOLE ID	COORDINATES		DIP	AZI-MUTH	EOH/RL	Vanadium Mineralisation (V)			V_2O_5
	Easting	Northing	Degs.	Degs.	(m)	Depth (m)	(m)	ppm	ppm
NXDD037	508,700	7,821,750	-90	0	41.95/1133	7.00-22.00	15.00	783	1,398
						23.00-24.00	1.00	123	210
						25.42-30.00	4.58	171	305
						31.00-34.00	3.00	182	325
						36.00-37.00	1.00	130	232
						39.00-40.00	1.00	167	298
NXDD043	508,750	7,821,800	-90	0	20.95/1132	6.95-9.00	2.05	104	186
						12.00-19.43	7.43	711	1,269
NXDD041	508,800	7,821,850	-90	0	11.95/1133	3.20-9.70	6.50	646	1,153

SECTION 2

HOLE ID	COORDINATES		DIP	AZI-MUTH	EOH/RL	Vanadium Mineralisation (V)			V_2O_5
	Easting	Northing	Degs.	Degs.	(m)	Depth (m)	(m)	ppm	ppm
NXDD036	508750	7,821,700	-90	0	50.95/1133	34.00-36.00	2.00	165	295
						38.00-39.00	1.00	486	867
						41.07-42.00	0.93	498	889
						49.00-49.64	0.64	968	1,728
NXDD030	508,800	7,821,750	-90	0	42.95/1132	3.00-25.00	22.00	1,832	3,270
					including	*3.00-5.00*	*2.00*	*4,414*	*7,879*
					and	*5.00-7.00*	*2.00*	*2,822*	*5,037*
					and	*8.00-10.00*	*2.00*	*2,538*	*4,530*
					and	*17.00-20.00*	*3.00*	*2,339*	*4,175*
						26.00-27.73	1.73	299	534
						38.00-40.58	2.58	154	275
NXDD034	508850	7,821,800	-90	0	49.62/113	5.15-20.69	15.54	558	996
						24.00-27.95	3.95	606	1,082
						29.00-31.00	2.00	782	1,396
NXDD040	508,900	7,821,850	-90	0	38.35/1131	19.70-21.14	1.44	144	257
						22.00-23.62	1.62	504	900
						29.88-34.00	4.12	2,199	3,925
						35.00-38.35	3.35	896	1,599
						22.00-23.62	1.62	504	900

SECTION 3

HOLE ID	COORDINATES		DIP	AZI-MUTH	EOH/RL	Vanadium Mineralisation (V)			V_2O_5
	Easting	Northing	Degs.	Degs.	(m)	Depth (m)	(m)	ppm	ppm
NXDD039	508,850	7,821,750	-90	0	53.95/1132	26.00-29.00	3.00	128	228
						31.00-32.00	1.00	217	387
						34.00-37.00	3.00	152	271
						49.07-51.62	2.55	600	1,071
NXDD032	508,900	7,821,800	-90	0	50.95/1132	9.15-23.00	13.85	357	637
						24.00-29.00	5.00	1,043	1,862
						35.00-37.00	2.00	131	234
						48.00-50.00	2.00	734	1,310
NXDD044	508,950	7,821,850	-90	0	44.95/1131	5.15-12.00	6.85	332	593
						13.00-17.03	4.03	319	569
						36.00-41.87	5.87	536	957
NXDD045	508,975	7,821,875	-90	0	43.85/1132	5.15-10.05	4.90	364	650
						35.00-38.45	3.45	486	867
						39.00-40.00	1.00	349	623
						40.53-41.36	0.83	2,569	4,586
NXDD029	509,000	7,821,900	-90	0	41.95/1131	7.00-7.40	0.40	233	416
						12.00-13.75	1.75	160	286
						15.00-16.00	1.00	175	312
						38.00-39.58	1.58	1,028	1,835

SECTION 4

HOLE ID	COORDINATES		DIP	AZI-MUTH	EOH/RL	Vanadium Mineralisation (V)			V_2O_5
	Easting	Northing	Degs.	Degs.	(m)	Depth (m)	(m)	ppm	ppm
NXDD033	508,900	7,821,750	-90	0	56.95/1132	47.00-53.62	6.62	665	1,187
NXDD031	508,980	7,821,820	-90	0	49.00/1131	46.00-47.00	1.70	965	1,722

Forward Looking Statement:

This report contains forward looking statements in respect of the projects being reported on by the Company. Forward looking statements are based on beliefs, opinions, assessments and estimates based on facts and information available to management and/or professional consultants at the time they are formed or made and are, in the opinion of management and/or consultants, applied as reasonably and responsibly as possible as at the time that they are applied.

Any statements in respect of Ore Reserves, Mineral Resources and zones of mineralisation may also be deemed to be forward looking statements in that they contain estimates that the Company believes have been based on reasonable assumptions with respect to the mineralisation that has been found thus far. Exploration targets are conceptual in nature and are formed from projection of the known resource dimensions along strike. The quantity and grade of an exploration target is insufficient to define a Mineral Resource. Forward looking statements are not statements of historical fact, they are based on reasonable projections and calculations, the ultimate results or outcomes of which may differ materially from those described or incorporated in the forward looking statements. Such differences or changes in circumstances to those described or incorporated in the forward looking statements may arise as a consequence of the variety of risks, uncertainties and other factors relative to the exploration and mining industry and the particular properties in which the Company has an interest.

Such risks, uncertainties and other factors could include but would not necessarily be limited to fluctuations in metals and minerals prices, fluctuations in rates of exchange, changes in government policy and political instability in the countries in which the Company operates.

Other important Information

Purpose of document: This document has been prepared by Mount Burgess Mining NL (MTB). It is intended only for the purpose of providing information on MTB, its project and its proposed operations. This document is neither of an investment advice, a prospectus nor a product disclosure statement. It does not represent an investment disclosure document. It does not purport to contain all the information that a prospective investor may require to make an evaluated investment decision. MTB does not purport to give financial or investment advice.

Professional advice: Recipients of this document should consider seeking appropriate professional advice in reviewing this document and should review any other information relative to MTB in the event of considering any investment decision.

Forward looking statements: This document contains forward looking statements which should be reviewed and considered as part of the overall disclosure relative to this report.

Disclaimer: Neither MTB nor any of its officers, employees or advisors make any warranty (express or implied) as to the accuracy, reliability and completeness of the information contained in this document. Nothing in this document can be relied upon as a promise, representation or warranty.

Proprietary information: This document and the information contained therein is proprietary to MTB.

Competent Person's Statement:

Mr Chris Campbell-Hicks, Metallurgist, FAusIMM (CP Metallurgy), MMICA, Non-Executive Director of the Company, who reviewed the content of the announcement, together with Appendix 1, has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2102 Edition of the JORC Code and has consented to the inclusion in respect of the matters based on the information in the form and context in which it appears.

Mr Campbell-Hicks has for a number of years whilst working with Coffey Mining and other consultancies and companies made contributions to numerous Scoping Studies, Pre-feasibility Studies and Feasibility Studies under the 2004 JORC Code, the 2012 JORC Code and the Canadian National Instrument (NI 43-101). As such he qualifies as a Competent Person for reporting on matters pertaining to metallurgy, process engineering and interpretation of test work results and data for the establishment of Design Criteria for such studies.

The following extract from the JORC Code 2012 Table 1 is provided for compliance with the Code requirements for the reporting of drilling results.

Section 1 Sampling Techniques and Data (Criteria in this section apply to all succeeding sections).

Criteria	JORC code explanation	Commentary
Sampling techniques	Nature and quality of sampling (eg cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling. • Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used. • Aspects of the determination of mineralisation that are Material to the Public Report. • In cases where 'industry standard' work has been done this would be relatively simple (eg 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (eg submarine nodules) may warrant disclosure of detailed information.	**Mount Burgess Mining Diamond Holes** Core was marked and collected in sample trays, visually logged and cut in half. Samples were collected as nominal 1m intervals but based on visible geology with minimum samples of 0.3m and maximum samples of 1.3m. Half of each core was retained on site in core trays and the other half was double bagged and sent for assay. All samples were pulverised to p80 75um and assayed via ICPMS/OES. All samples from the drill holes currently being reported on were assayed for Ag/Co/Cu/Ga/Ge/In/Pb/V/Zn
Drilling techniques	Drill type (eg core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc) and details (eg core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc).	**Mount Burgess Mining Diamond Holes** HQ diameter triple tube was used for diamond core drilling. As all holes drilled into the Nxuu deposit were vertical holes the diamond core was not orientated.
Drill sample recovery	Method of recording and assessing core and chip sample recoveries and results assessed. • Measures taken to maximise sample recovery and ensure representative nature of the samples. • Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material	**Mount Burgess Mining Diamond Holes** Sample recoveries were in general high and no unusual measures were taken to maximise sample recovery other than the use of triple tube core. Mount Burgess believes there is no evidence of sample bias due to preferential loss/gain of fine/coarse material.
Logging	Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies. • Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography. • The total length and percentage of the relevant intersections logged.	**Mount Burgess Mining Diamond Holes** Holes were logged in the field by qualified Geologists on the Company's log sheet template and of sufficient detail to support future mineral resource estimation: Qualitative observations covered Lithology, grain size, colour, alteration, mineralisation, structure. Quantitative logging included vein percent. SG calculations at ~5m intervals were taken in the DD holes. All holes were logged for the entire length of hole. Logs are entered into MTBs GIS database managed by MTB in Perth.
Sub-sampling techniques and sample preparation	If core, whether cut or sawn and whether quarter, half or all core taken. • If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry. • For all sample types, the nature, quality and appropriateness of the sample preparation technique. • Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples. • Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling. • Whether sample sizes are appropriate to the grain size of the material being sampled.	**Mount Burgess Mining Diamond Holes** HQ Core was sawn in half on site. Half of each core was retained on site in core trays and the other half was double bagged and labelled noting Hole# and interval both within the bag and on the bag. Sample bags were then placed in larger bags of ~40 individual samples and the larger bag also labelled describing the contents. Field duplicates were inserted at regular intervals. All samples currently being reported on and submitted for assaying were pulverised to p80 75um and assayed via ICPMS/OES. All samples currently being reported on were assayed for Ag/Co/Cu/Ga/Ge/In/Pb/V/Zn.

		All Mount Burgess Samples All samples were sent to Intertek Genalysis Perth, for assaying according to the following standard techniques: (a) Ore grade digest followed by ICP – OES finish for Silver, Lead, Vanadium & Zinc (b) Nitric acid/hydrofluoric acid specific digest for Germanium and Indium (c) Also 4 acid digest for silver, lead, zinc, germanium and gallium followed by AAS Mount Burgess quality control procedures include following standard procedures when sampling, including sampling on geological intervals, and reviews of sampling techniques in the field. The current laboratory procedures applied to the Mount Burgess sample preparation include the use of cleaning lab equip. w/ compressed air between samples, quartz flushes between high grade samples, insertion of crusher duplicate QAQC samples, periodic pulverised sample particle size (QAQC) testing and insertion of laboratory pulp duplicates QAQC samples according to Intertek protocols. Intertek inserts QA/QC samples (duplicates, blanks and standards) into the sample series at a rate of approx. 1 in 20. These are tracked and reported on by Mount Burgess for each batch. When issues are noted the laboratory is informed and investigation conducted defining the nature of the discrepancy and whether further check assays are required. The laboratory completes its own QA/QC procedures and these are also tracked and reported on by Mount Burgess. Acceptable overall levels of analytical precision and accuracy are evident from analyses of the routine QAQC data
Verification of sampling and assaying	The verification of significant intersections by either independent or alternative company personnel. • The use of twinned holes. • Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols. • Discuss any adjustment to assay data.	**All Mount Burgess Samples** Assay results for samples were received electronically from Intertek Genalysis and uploaded into MTB's database managed by MTB at its Perth Office. Analytical results for Vanadium (V) from diamond core holes being reported on have now been converted to V2O5 (Vandium Pentoxide) by multiplying the Vanadium grades by 1.785.
Location of data points	Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation. • Specification of the grid system used. • Quality and adequacy of topographic control.	**All Mount Burgess Holes** Drill hole collar locations were recorded at the completion of each hole by hand held Garmin 62S GPS with horizontal accuracy of approx. 5 metres • Positional data was recorded in projection WGS84 UTM Zone 34S. The accuracy provided by the system employed is sufficient for the nature of the exploratory program. Downhole surveys were not conducted.
Data spacing and distribution	Data spacing for reporting of Exploration Results. • Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied. • Whether sample compositing has been applied.	**All Mount Burgess Holes** Mount Burgess drilling campaigns were undertaken to validate historical drilling as well as to acquire further data for future resource estimation.. The data spacing and distribution is currently insufficient to establish the degree of geological and grade continuity appropriate for the estimation of Mineral Resources compliant with the 2012 JORC Code. Additional drilling is planned to determine the extent of mineralisation and estimate a Mineral Resource compliant with the JORC Code. Sample compositing was conducted on four Nxuu deposit drill holes, following receipt of assays from Intertek Genealysis, for the purpose of mineralogical and metallurgical test work.
Orientation of data in relation to geological structure	Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type. • If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.	**All Mount Burgess Holes** Mineralisation was typically intersected between -70 and -80 degrees to the drilling angle at the Kihabe Deposit and -90 degrees at the Nxuu Deposit and the Company believes that unbiased sampling was achieved.

Sample security	The measures taken to ensure sample security.	**All Mount Burgess Holes** Samples were taken by vehicle on the day of collection to MTB's permanent field camp, and stored there until transported by MTB personnel to Maun from where they were transported via regular courier service to laboratories in South Africa.
Audits or reviews	The results of any audits or reviews of sampling techniques and data.	**All Mount Burgess Holes** An independent Geologist was engaged to review sampling and logging methods on site at the commencement of the program.

Section 2 Reporting of Exploration Results (Criteria listed in the preceding section also apply to this section).

Criteria	JORC Code Explanation	Commentary
Mineral tenement and land tenure status	Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.	The Kihabe-Nxuu Project is located in north-western Botswana, adjacent to the border with Namibia. The Project is made up of one granted prospecting licence - PL 43/2016. This licence is 100% owned and operated by Mount Burgess. The title is current at the time of release of this report. PL 43/2016 is in an area designated as Communal Grazing Area.
	The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.	The licence is in good standing and no impediments to operating are currently known to exist.
Exploration done by other parties	Acknowledgment and appraisal of exploration by other parties.	The Geological Survey of Botswana undertook a program of soil geochemical sampling in 1998. As a result of this program, Billiton was invited to undertake exploration and drilling activities in and around the project area. Mount Burgess first took ownership of the project in 2003 and has undertaken exploration activities on a continual basis since then.
Geology	Deposit type, geological setting and style of mineralisation.	The Kihabe-Nxuu Project lies in the NW part of Botswana at the southern margin of the Congo craton The Gossan Anomaly is centred on an exposed gossan within the project. To the north of the project are granitoids, ironstones, quartzites and mica schists of the Tsodilo Hills Group covered by extensive recent Cainozoic sediments of the Kalahari Group. Below the extensive Kalahari sediments are siliciclastic sediments and igneous rocks of the Karoo Supergroup in fault bounded blocks. The geological controls on mineralisation at the Gossan Anomaly are largely unknown. The Company will focus future exploration efforts on understanding these controls and will inform the market as new information comes to hand.
Drill hole Information	A summary of all information material to the understanding of the exploration results including a tabulation of the following	Information material to the understanding of the exploration results reported by Mount Burgess is provided in the text of the public announcements released to the ASX.

Criteria	JORC Code Explanation	Commentary
	information for all Material drill holes: easting and northing of the drill hole collar elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar dip and azimuth of the hole down hole length and interception depth hole length If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.	No material information has been excluded from the announcements.
Data aggregation methods	In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (eg cutting of high grades) and cut-off grades are usually Material and should be stated. Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail. The assumptions used for any reporting of metal equivalent values should be clearly stated.	**All Mount Burgess Holes** No data aggregation methods have been used. Vanadium results are reported without a top cut but the Company has used 100 ppm as a bottom cut. Vanadium Pentoxide results are reported by multiplying the Vanadium results by 1.785.
Relationship between mineralisation widths and intercept lengths	These relationships are particularly important in the reporting of Exploration Results. If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported. If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (eg 'down hole length, true width not known').	**All Mount Burgess Holes** The geometry of the mineralisation with respect to the drill hole angle is typically between - 70 and -80 degrees ,at the Kihabe Deposit and -90 degrees at the Nxuu Deposit which is considered representative from a geological modelling perspective.
Diagrams	Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported These should include, but not be limited to a plan view of drill hole collar	**Billiton Percussion Holes** The Company has no available information for these holes other than collar and survey data and assay results

Criteria	JORC Code Explanation	Commentary
	locations and appropriate sectional views.	**All Mount Burgess Holes** Appropriate maps, sections and mineralised drill intersection details are provided in public announcements released to the ASX.
Balanced reporting	Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.	Exploration results reported in Mount Burgess public announcements and this report are comprehensively reported in a balanced manner.

Further work	The nature and scale of planned further work (eg tests for lateral extensions or depth extensions or large-scale step-out drilling). Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.	Further works planned at the Project include additional drilling and surface mapping at the Kihabe-Nxuu Zinc/Lead/Silver/Germanium and Vanadium Project.

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Quantitative Automated Mineralogical Analysis

conducted on a sample of

NXDD Comp

for

Mt Burgess Mining NL

A19449
MIN3533
Preliminary data only (revised report)

December 2018

SUMMARY

Two size fractions of a sample labelled NXDD Comp were submitted for mineralogical analysis. Sample NXDD Comp is a composite of the samples shown on the 'Sample details' page. A sub-sample of NXDD Comp was crushed to 100% passing 0.212 mm and then dry screened over a 0.075 mm screen.

Descloizite ($(PbZn(VO_4)(OH)$ is the dominant (and possibly only) vanadium-bearing mineral identified in the sample.

Approximately 65 % of the descloizite is classified as either 'liberated' or 'high grade middlings'. This descloizite is relatively coarse grained; P_{80} of 'liberated' descloizite is 74 µm and P_{80} of the high grade middling descloizite 54 µm.

The remaining 35 % of the descloizite is less well liberated and also finer-grained; P_{80} of medium grade descloizite 31 µm, P_{80} of 'low grade middlings' 25 µm and P_{80} of 'locked' descloizite 16 µm.

INTRODUCTION

Samples received

Two size fractions of a sample labelled NXDD Comp were submitted for mineralogical analysis. Sample NXDD Comp is a composite of the samples shown on the 'Sample details' page. A sub-sample of NXDD Comp was crushed to 100% passing 0.212 mm and then dry screened over a 0.075 mm screen. The table below includes assay data (ALS Assay Laboratory Balcatta) and key QEMSCAN analysis parameters are shown in the table below.

Sample	Fraction	Fraction weight %	QEMSCAN analysis mode	QEMSCAN analysis point spacing (µm)	QEMSCAN analysis time (hours)	Mineralogy block number
NXDD Comp	-0.212/+0.075 mm	60.3	Field Scan	6.0	3.0	MIN3533A1A
	-0.075 mm	39.7	PMA	2.5	3.0	MIN3533A2A

Sample preparation

The samples were riffle split to produce sub-samples of suitable size for making a QEMSCAN polished sections. The sub-samples were mixed with size-graded, high purity graphite to ensure particle separation and discourage density segregation. The sample-graphite mixtures were then set into a mould using a two-part epoxy resin, producing a representative sub-samples of randomly orientated particles. After curing, the resin blocks were cut back to expose fresh surfaces and progressively ground and fine-polished. Passing QA/QC checks, the sections were then carbon coated for electron beam conductivity and presented to the QEMSCAN for analysis.

Methods of analysis

QEMSCAN FieldScan

The QEMSCAN Field Scan (FS) mode was performed at an analysis point spacing of 6 µm for the polished block of the -0.212/+0.075 mm fraction.

QEMSCAN Particle Mineral Analysis

The QEMSCAN Particle Mineral Analysis (PMA) mode was performed at an analysis point spacing 2.5 µm for the polished block of the -0.075 mm fraction.

XRD

The samples were analysed using the X-ray diffraction technique in order to assist with mineral characterisation.

Semi-quantitative SEM-EDS analyses

Selected particles were analysed using manual SEM-EDS analyses. The data were used to assist with mineral characterisation.

Report prepared for

Greg Jones **(Senior Project Coordinator)**
ALS Metallurgy

Reported by

Dorrit de Nooy **(Principal Metallurgist)**
ALS Metallurgy

Approved by

Hamid Sheriff (**Group General Manager – Metallurgy Services)**

SAMPLE DETAILS

Sample submission sheet received from client

SAMPLE SUBMISSION N0: MTB7 – 11 - 2018

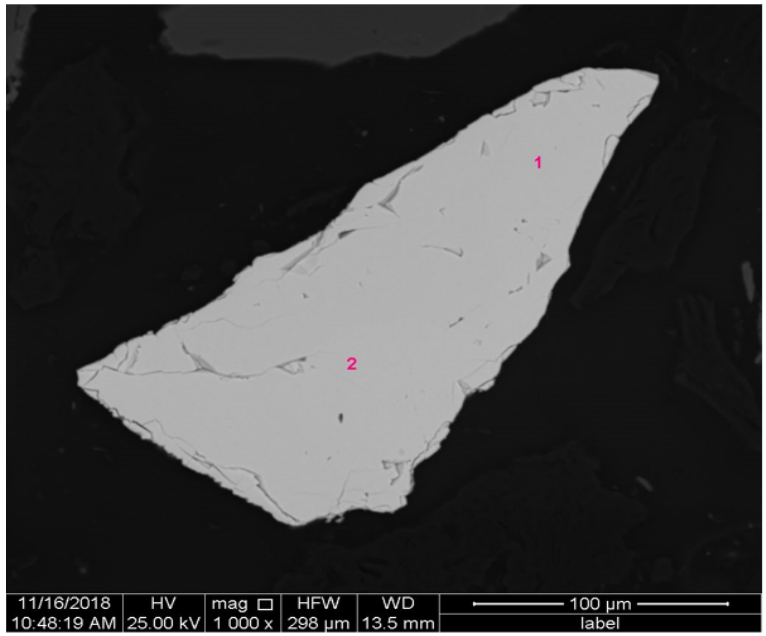
DRILL HOLE NUMBER	EASTING	NORTHING	DIP	AZIMUTH	EOH/RL (m)	FROM (m)	TO (m)	KG
NXDDO29	509,000	7,821,900	-90	0	41.95/1131	38.00.	39.58	2.3701
NXDD032	508,900	7,821,800	-90	0	50.95/1131	24.44	28.05	9.0550
						48.00	50.00	4.3539
NXDD034	508,850	7,821,800	-90	0	49.62/1131	12.00	16.00	9.3409
						17.95	20.69	5.7463
						24.80	26.97	5.5606
						29.00	31.00	3.6017
NXDD046	508,950	7,821,950	-90	0	20.95/1131	5.15	9.00	6.0373
						15.00	19.38	7.4328
TOTAL								53.4986

Sample inventory

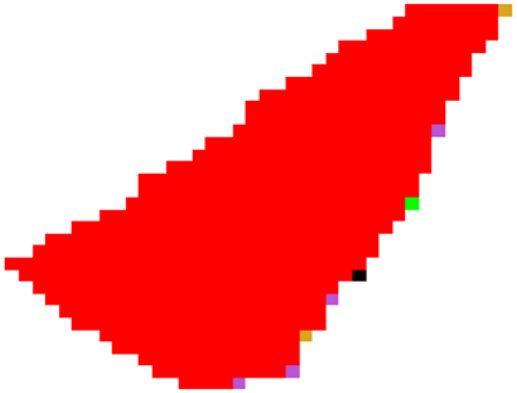
Sample inventory	
Sample ID	**Weight**
NXDD 29	
NXDD029-572	1590.0
NXDD029-573	889.8
NXDD 32	
NXDD032-264	1300.6
NXDD032-265	2508.5
NXDD032-266	2748.1
NXDD032-267	2991.5
NXDD032-293	1980.0
NXDD032-294	379.7
NXDD032-295	2150.2
NXDD 34	
NXDD034-351	2268.4
NXDD034-352	1847.9
NXDD034-353	3259.6
NXDD034-354	2795.7
NXDD034-358	1533.2
NXDD034-359	2091.7
NXDD034-360	2223.7
NXDD034-366	2906.9
NXDD034-367	3100.2
NXDD034-370	2621.8
NXDD034-371	2249.8
NXDD 46	
NXDD046-574	1318.4
NXDD046-575	530.7
NXDD046-576	710.7
NXDD046-577	1894.8
NXDD046-578	1858.6
NXDD046-579	1314.9
NXDD046-586	1507.9
NXDD046-587	1811.2
NXDD046-588	960.2
NXDD046-589	921.0
NXDD046-590	2430.5
NXDD046-591	442.4
Total mass	**59138.6**

EXAMPLE SEM IMAGES AND DATA

Example image 1



Min3533-Particle-01



'Galena/other Pb' was found to be mainly cerussite.

Spectrum	Pb	Cu	Zn	V	Fe	Mg	Al	Si	K	Ca	Ti	O	Total
Particle-01- 1	58.4		18.3	18.1								5.1	100.0
Particle-01- 2	58.8		17.9	18.3								5.0	100.0

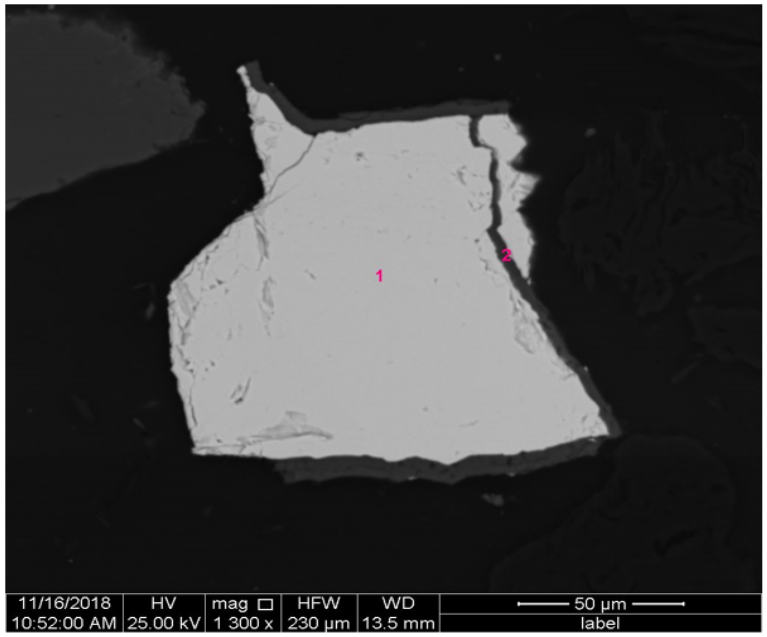
The composition data shown here is based on a normalized, standardless, semi-quantitative measurement.

Oxygen, the lightest element, is significantly underestimated.

Element	Pb	Cu	Zn	V	Fe	O	H	Total
Average of all descloizite analyses (original)	57.4	0.2	18.1	17.9	0.6	5.7		100.0
Average of all descloizite analyses (O adjusted to 20 %)	48.7	0.2	15.4	15.2	0.5	20.0		100.0
Descloizite (typical composition from www.webmineral.com)	51.2		16.2	12.6		19.8	0.3	100.0

The second table shows the average composition of the descloizite after oxygen is adjusted to 20%.

Example image 2



Min3533-Particle-03

'Galena/other Pb' was found to be mainly cerussite.

Spectrum	Pb	Cu	Zn	V	Fe	Mg	Al	Si	K	Ca	Ti	O	Total
Particle-03- 1	57.9	0.0	19.3	15.9	0.0							6.8	**100.0**
Particle-03- 2								55.7				44.3	**100.0**

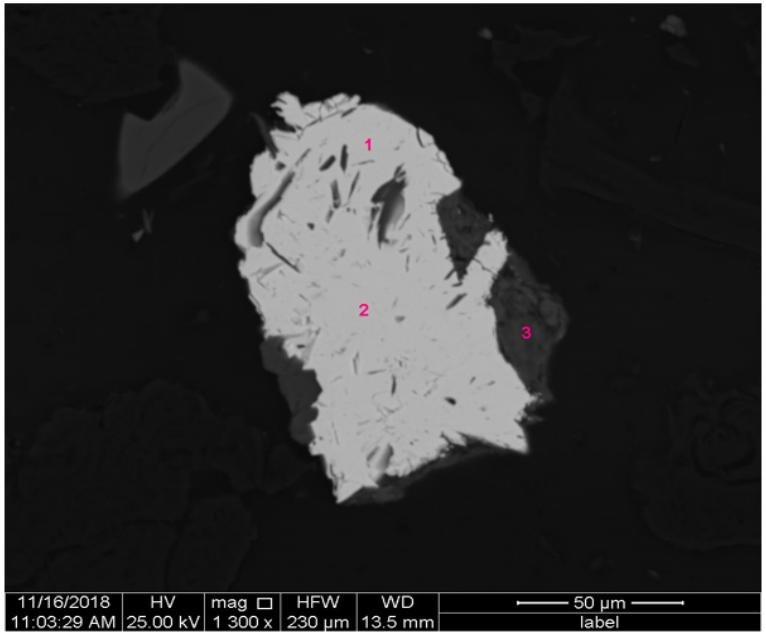
The composition data shown here is based on a normalized, standardless, semi-quantitative measurement.

Oxygen, the lightest element, is significantly underestimated.

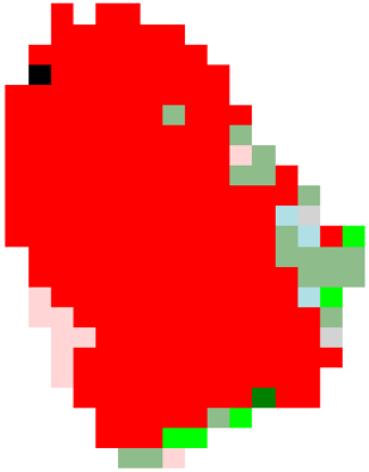
The second table shows the average composition of the descloizite after oxygen is adjusted to 20%.

Element	Pb	Cu	Zn	V	Fe	O	H	Total
Average of all descloizite analyses (original)	57.4	0.2	18.1	17.9	0.6	5.7		100.0
Average of all descloizite analyses (O adjusted to 20 %)	48.7	0.2	15.4	15.2	0.5	20.0		100.0
Descloizite (typical composition from www.webmineral.com)	51.2		16.2	12.6		19.8	0.3	100.0

Example image 3



Min3533-Particle-06



'Galena/other Pb' was found to be mainly cerussite.

Spectrum	Pb	Cu	Zn	V	Fe	Mg	Al	Si	K	Ca	Ti	O	Total
Particle-06- 1	58.5		17.8	17.2								6.5	**100.0**
Particle-06- 2	58.1		17.8	17.9								6.3	**100.0**
Particle-06- 3			1.7		8.9		18.6	25.8	3.5		0.7	40.8	**100.0**

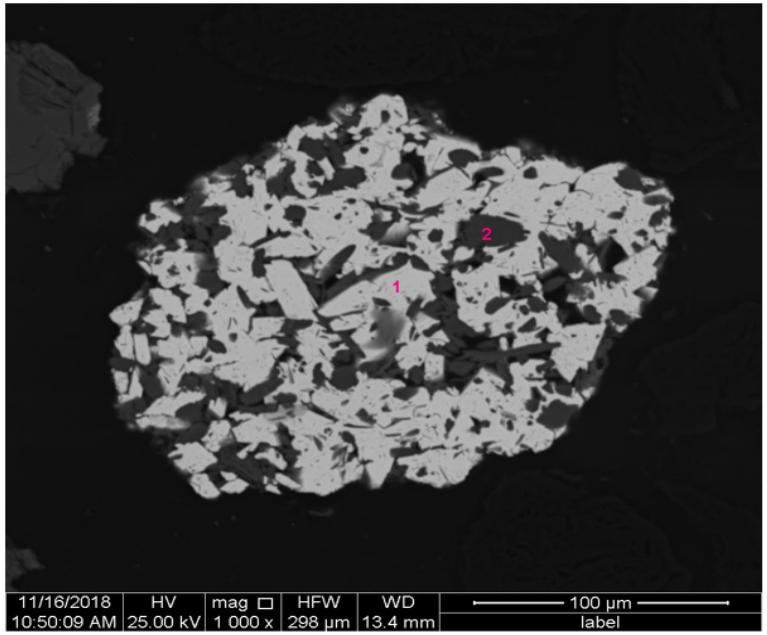
The composition data shown here is based on a normalized, standardless, semi-quantitative measurement.

Oxygen, the lightest element, is significantly underestimated.

Element	Pb	Cu	Zn	V	Fe	O	H	Total
Average of all descloizite analyses (original)	57.4	0.2	18.1	17.9	0.6	5.7		100.0
Average of all descloizite analyses (O adjusted to 20 %)	48.7	0.2	15.4	15.2	0.5	20.0		100.0
Descloizite (typical composition from www.webmineral.com)	51.2		16.2	12.6		19.8	0.3	100.0

The second table shows the average composition of the descloizite after oxygen is adjusted to 20%.

Example image 4



Min3533-Particle-02

'Galena/other Pb' was found to be mainly cerussite.

Spectrum	Pb	Cu	Zn	V	Fe	Mg	Al	Si	K	Ca	Ti	O	Total
Particle-02- 1	58.2	4.1	14.6	18.0								5.1	**100.0**
Particle-02- 2								56.0				44.0	**100.0**

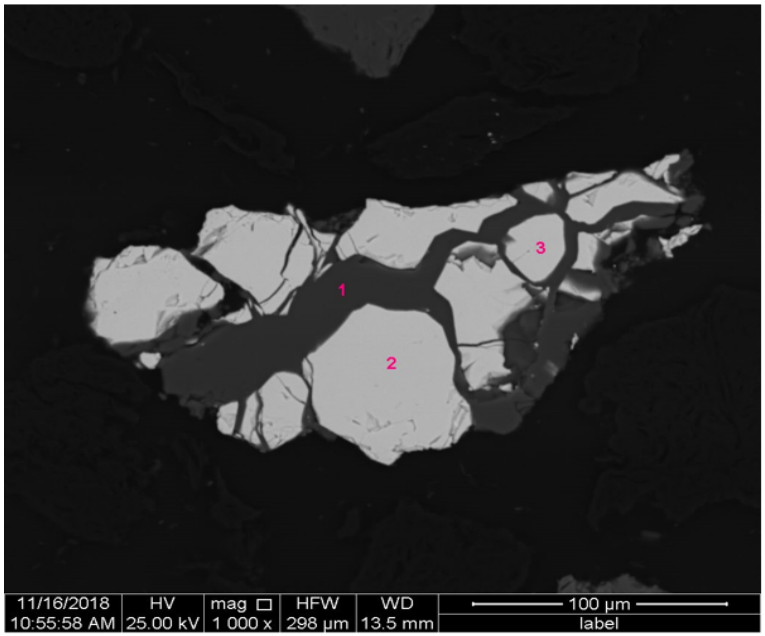
The composition data shown here is based on a normalized, standardless, semi-quantitative measurement.

Oxygen, the lightest element, is significantly underestimated.

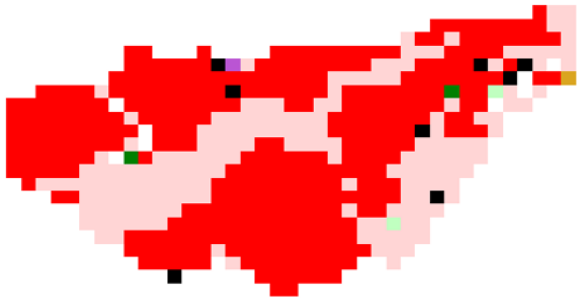
Element	Pb	Cu	Zn	V	Fe	O	H	Total
Average of all descloizite analyses (original)	57.4	0.2	18.1	17.9	0.6	5.7		100.0
Average of all descloizite analyses (O adjusted to 20 %)	48.7	0.2	15.4	15.2	0.5	20.0		100.0
Descloizite (typical composition from www.webmineral.com)	51.2		16.2	12.6		19.8	0.3	100.0

The second table shows the average composition of the descloizite after oxygen is adjusted to 20%.

Example image 5



Min3533-Particle-04



'Galena/other Pb' was found to be mainly cerussite.

Spectrum	Pb	Cu	Zn	V	Fe	Mg	Al	Si	K	Ca	Ti	O	Total
Particle-04- 1								55.3				44.7	100.0
Particle-04- 2	58.4		19.0	17.4								5.2	100.0
Particle-04- 3	54.2		19.2	20.8								5.9	100.0

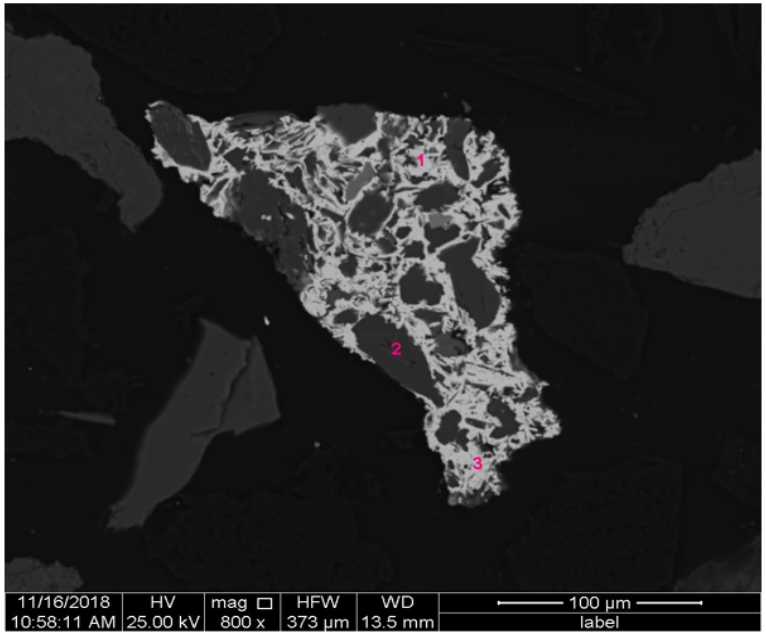
Element	Pb	Cu	Zn	V	Fe	O	H	Total
Average of all descloizite analyses (original)	57.4	0.2	18.1	17.9	0.6	5.7		100.0
Average of all descloizite analyses (O adjusted to 20 %)	48.7	0.2	15.4	15.2	0.5	20.0		100.0
Descloizite (typical composition from www.webmineral.com)	51.2		16.2	12.6		19.8	0.3	100.0

The composition data shown here is based on a normalized, standardless, semi-quantitative measurement.

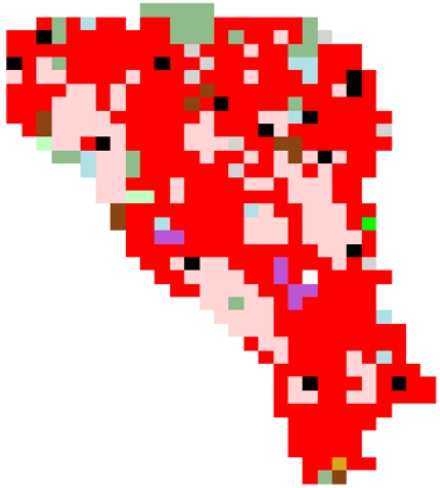
Oxygen, the lightest element, is significantly underestimated.

The second table shows the average composition of the descloizite after oxygen is adjusted to 20%.

Example image 6



Min3533-Particle-05



'Galena/other Pb' was found to be mainly cerussite.

Spectrum	Pb	Cu	Zn	V	Fe	Mg	Al	Si	K	Ca	Ti	O	Total
Particle-05- 1	56.1		18.5	17.8	1.4							6.4	**100.0**
Particle-05- 2							17.7	31.2	9.6			41.4	**100.0**
Particle-05- 3	57.0		17.3	18.3	1.4							6.0	**100.0**

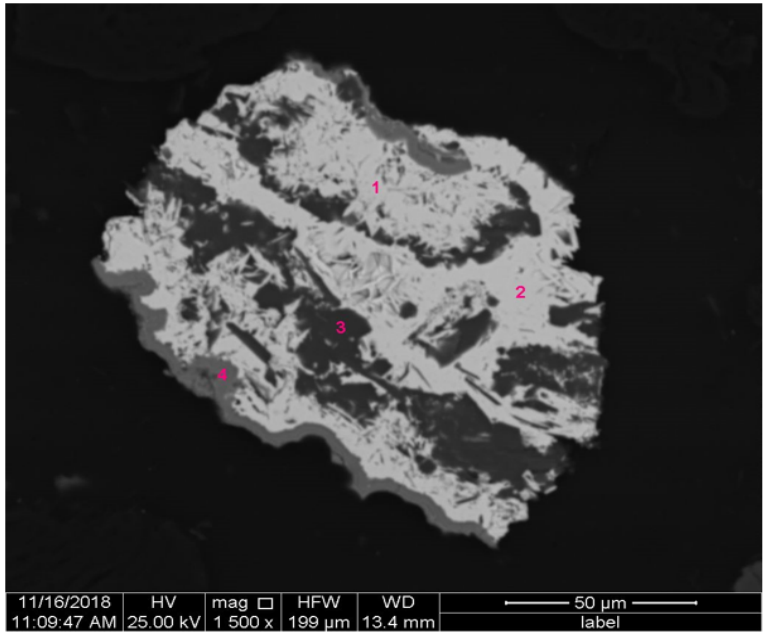
The composition data shown here is based on a normalized, standardless, semi-quantitative measurement.

Oxygen, the lightest element, is significantly underestimated.

Element	Pb	Cu	Zn	V	Fe	O	H	Total
Average of all descloizite analyses (original)	57.4	0.2	18.1	17.9	0.6	5.7		100.0
Average of all descloizite analyses (O adjusted to 20 %)	48.7	0.2	15.4	15.2	0.5	20.0		100.0
Descloizite (typical composition from www.webmineral.com)	51.2		16.2	12.6		19.8	0.3	100.0

The second table shows the average composition of the descloizite after oxygen is adjusted to 20%.

Example image 7



Min3533-Particle-07

'Galena/other Pb' was found to be mainly cerussite.

Spectrum	Pb	Cu	Zn	V	Fe	Mg	Al	Si	K	Ca	Ti	O	Total
Particle-07- 1	58.3		17.1	17.2	1.1							6.3	100.0
Particle-07- 2	58.2		17.6	17.9	0.0							6.3	100.0
Particle-07- 3								54.7				45.3	100.0
Particle-07- 4	1.7		2.9	0.5	72.0		0.7	1.1				21.1	100.0

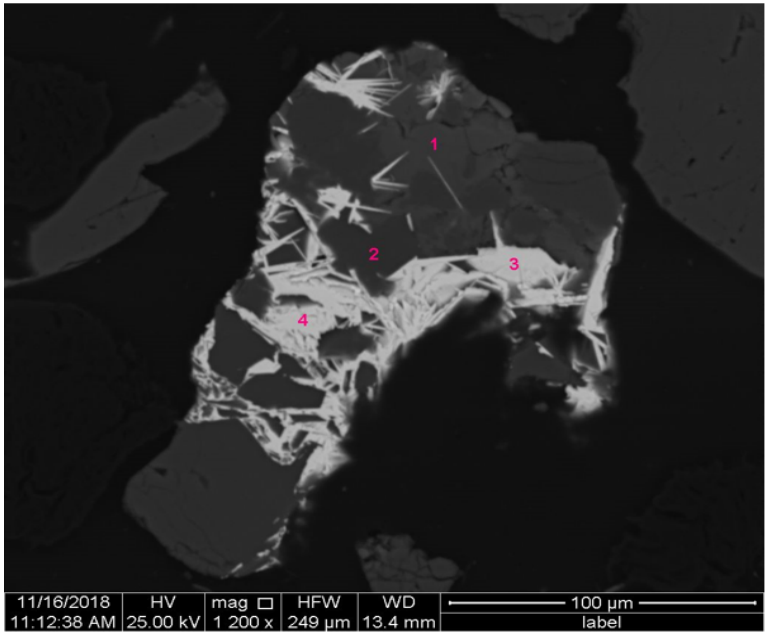
Element	Pb	Cu	Zn	V	Fe	O	H	Total
Average of all descloizite analyses (original)	57.4	0.2	18.1	17.9	0.6	5.7		100.0
Average of all descloizite analyses (O adjusted to 20 %)	48.7	0.2	15.4	15.2	0.5	20.0		100.0
Descloizite (typical composition from www.webmineral.com)	51.2		16.2	12.6		19.8	0.3	100.0

The composition data shown here is based on a normalized, standardless, semi-quantitative measurement.

Oxygen, the lightest element, is significantly underestimated.

The second table shows the average composition of the descloizite after oxygen is adjusted to 20%.

Example image 8



Min3533-Particle-08

Spectrum	Pb	Cu	Zn	V	Fe	Mg	Al	Si	K	Ca	Ti	O	Total
Particle-08- 1										55.9		44.1	**100.0**
Particle-08- 2								48.8				51.2	**100.0**
Particle-08- 3	57.0		18.6	17.5								7.0	**100.0**
Particle-08- 4	57.7		19.8	17.7								4.9	**100.0**

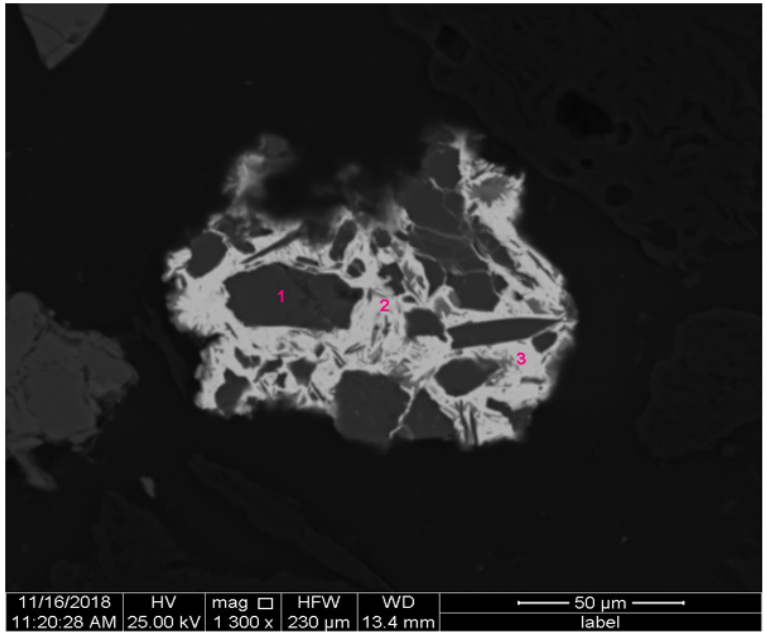
The composition data shown here is based on a normalized, standardless, semi-quantitative measurement.

Oxygen, the lightest element, is significantly underestimated.

Element	Pb	Cu	Zn	V	Fe	O	H	Total
Average of all descloizite analyses (original)	57.4	0.2	18.1	17.9	0.6	5.7		100.0
Average of all descloizite analyses (O adjusted to 20 %)	48.7	0.2	15.4	15.2	0.5	20.0		100.0
Descloizite (typical composition from www.webmineral.com)	51.2		16.2	12.6		19.8	0.3	100.0

The second table shows the average composition of the descloizite after oxygen is adjusted to 20%.

Example image 9



Min3533-Particle-09

'Galena/other Pb' was found to be mainly cerussite.

Spectrum	Pb	Cu	Zn	V	Fe	Mg	Al	Si	K	Ca	Ti	O	Total
Particle-09- 1								56.2				43.8	**100.0**
Particle-09- 2	56.7		18.2	19.1	1.2							4.9	**100.0**
Particle-09- 3	55.7		18.4	18.9	2.3							4.8	**100.0**

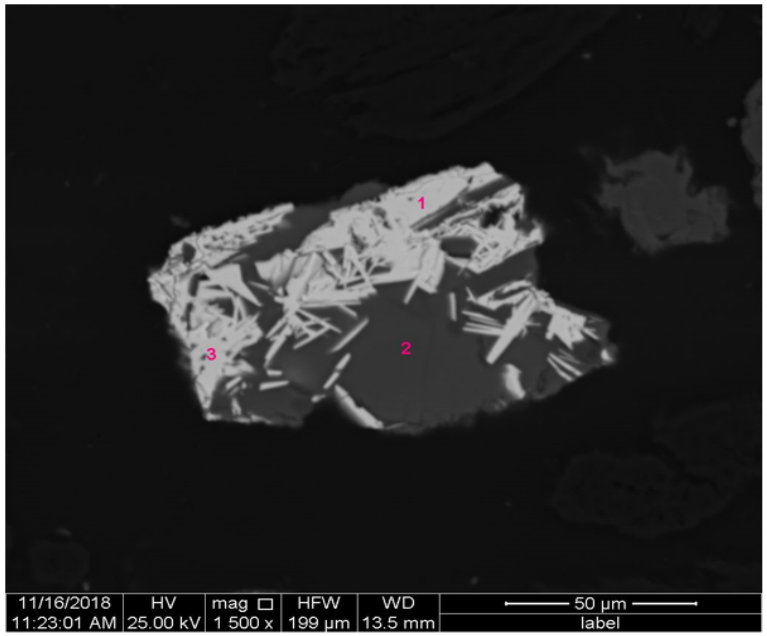
The composition data shown here is based on a normalized, standardless, semi-quantitative measurement.

Oxygen, the lightest element, is significantly underestimated.

Element	Pb	Cu	Zn	V	Fe	O	H	Total
Average of all descloizite analyses (original)	57.4	0.2	18.1	17.9	0.6	5.7		100.0
Average of all descloizite analyses (O adjusted to 20 %)	48.7	0.2	15.4	15.2	0.5	20.0		100.0
Descloizite (typical composition from www.webmineral.com)	51.2		16.2	12.6		19.8	0.3	100.0

The second table shows the average composition of the descloizite after oxygen is adjusted to 20%.

Example image 10



Min3533-Particle-10

'Galena/other Pb' was found to be mainly cerussite.

Spectrum	Pb	Cu	Zn	V	Fe	Mg	Al	Si	K	Ca	Ti	O	Total
Particle-10- 1	56.5		19.0	17.9	0.7							5.9	100.0
Particle-10- 2						0.6				56.7		42.7	100.0
Particle-10- 3	58.0		18.0	17.1	2.9							4.0	100.0

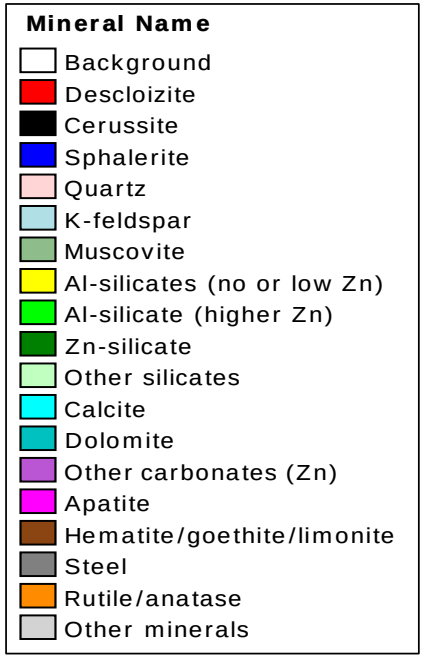
The composition data shown here is based on a normalized, standardless, semi-quantitative measurement.

Oxygen, the lightest element, is significantly underestimated.

The second table shows the average composition of the descloizite after oxygen is adjusted to 20%.

MINERAL GROUPS

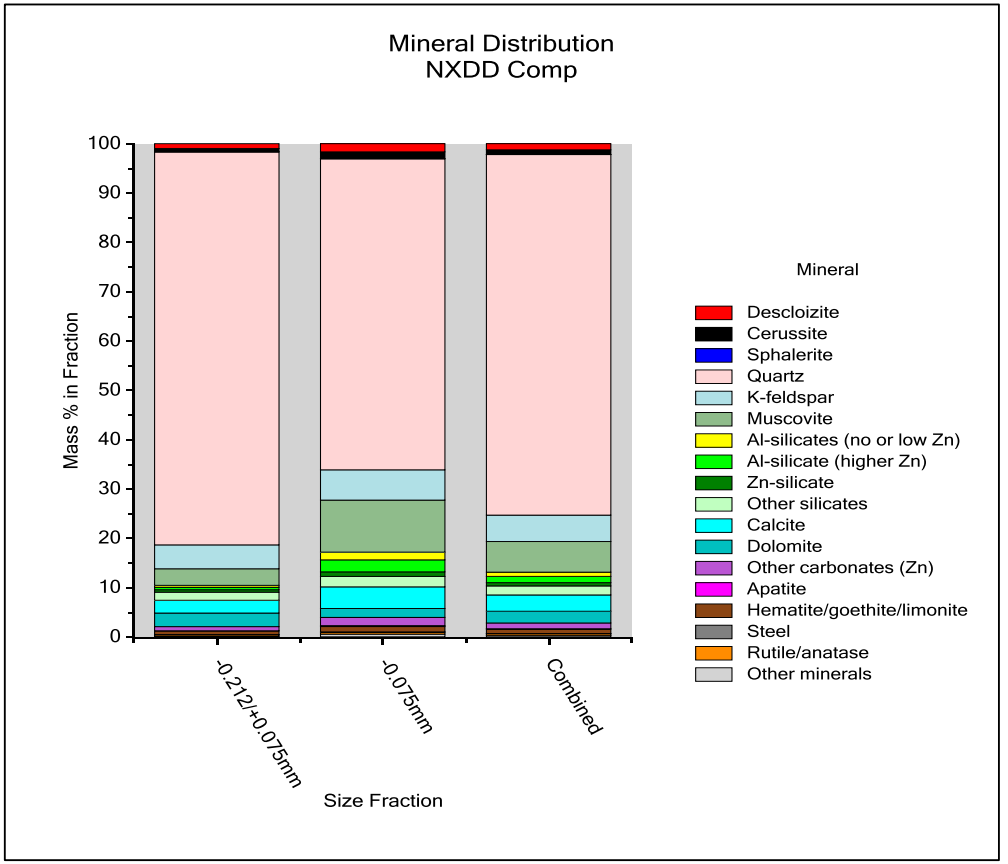
Mineral groups	Description
Descloizite	Dominated by descloizite ((PbZn(VO_4)(OH), see 'Example BSE images and comments' tab for more information.
Cerussite	Mainly cerussite ($PbCO_3$) but probably including other Pb phases. Requires further characterisation
Sphalerite	Assumed to by mainly sphalerite (ZnS) but may include other Zn-rich phases. Requires further characterisation.
Other sulphides	Other trace sulphides.
Quartz	SiO_2
K-feldspar	Mainly K-feldspar ($KAlSi_3O_8$)). Overlaps with muscovite to some extent.
Muscovite	Mainly K-Al-mica ($KAl_3Si_3O_{10}(OH,F)_2$) assumed to be muscovite. Overlaps with K-feldspar to some extent.
Al-silicates (no or low Zn)	Poorly characterised Al-silicates probably dominated by kaolinite and similar clay minerals some of which may have low Zn contents.
Al-silicate (higher Zn)	Poorly characterised Al-silicates probably dominated clay minerals having relatively high Zn contents.
Zn-silicate	A Zn-rich silicate assumed to be hemaimorphite ($Zn_4(Si_2O_7)(OH)_2 \cdot H_2O$. Requires further characterisation.
Other silicates	Trace amounts of other silicate minerals.
Calcite	Mainly calcite ($CaCO_3$).
Dolomite	Mainly dolomite-ankerite ($CaMg(CO_3)_2$).
Other carbonates (Zn)	Other carbonates minerals which include Zn-carbonates having variable Zn contents and probably including some of the Zn-rich carbonate smithsonite ($ZnCO_3$).
Apatite	Mainly apatite ($Ca_5(PO_4)_3(OH,F,Cl)$). Also includes trace Al-and Fe-phosphates
Hematite/goethite/limonite	Mainly limonite ($FeO(OH) \cdot nH_2O$) and goethite (FeO(OH)). This group may also include Fe-oxides such as hematite (Fe_2O_3)
Steel	Fe-Cr-Ni alloy most likely a contaminant from comminution.
Rutile/anatase	Mainly rutile or anatase (TiO_2) but may include other Ti-bearing minerals such as ilmenite ($FeTiO_3$) and titanite (sphene, $CaTiSiO_5$), Also includes the fine intergrowth between Ti minerals with other minerals.
Other minerals	All other minerals not included in the list above.



MINERAL ABUNDANCE

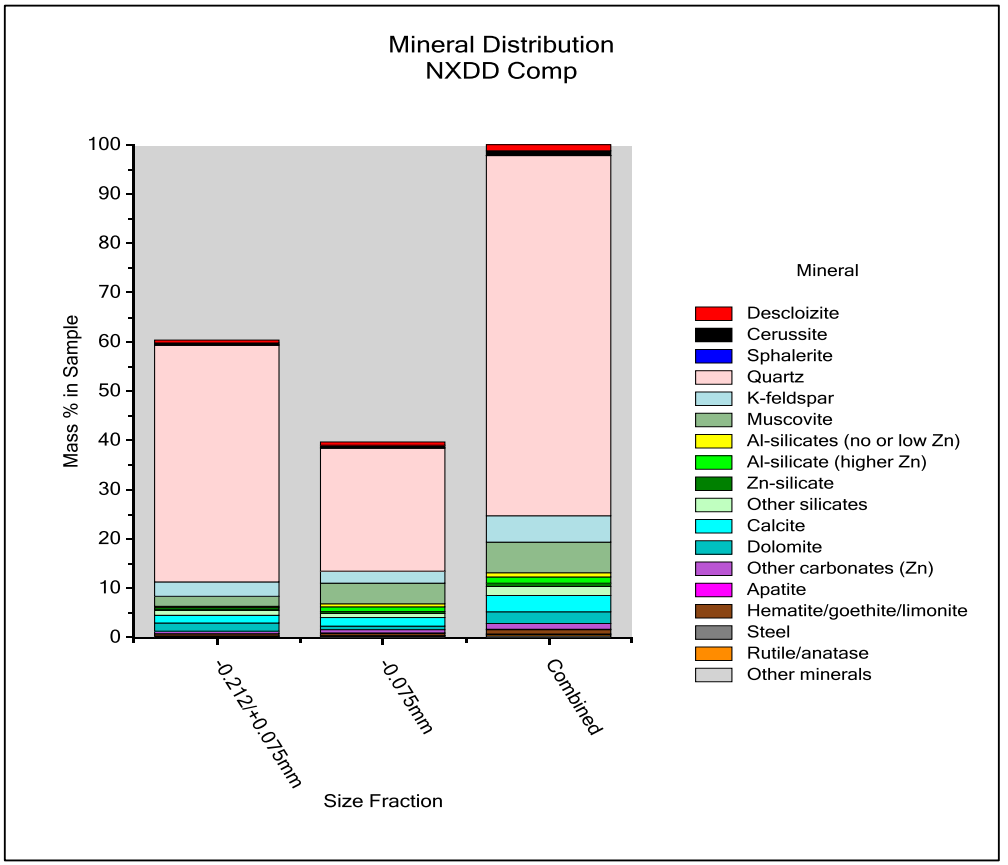
Mineral abundance (distribution in fractions)

Mineral group	NXDD Comp		
	-0.212/ +0.075mm	-0.075mm	Combined
	Mass% in fraction		
Descloizite	1.0	1.7	**1.2**
Cerussite	0.7	1.4	**1.0**
Sphalerite	0.0	0.0	**0.0**
Quartz	79.7	63.1	**73.1**
K-feldspar	4.8	6.1	**5.4**
Muscovite	3.4	10.6	**6.2**
Al-silicates (no or low Zn)	0.4	1.6	**0.9**
Al-silicate (higher Zn)	0.5	2.4	**1.3**
Zn-silicate	0.5	0.9	**0.7**
Other silicates	1.6	2.1	**1.8**
Calcite	2.6	4.4	**3.3**
Dolomite	2.8	1.8	**2.4**
Other carbonates (Zn)	0.8	1.7	**1.2**
Apatite	0.0	0.2	**0.1**
Hematite/goethite/limonite	0.8	1.1	**0.9**
Steel	0.0	0.1	**0.0**
Rutile/anatase	0.3	0.4	**0.3**
Other minerals	0.1	0.5	**0.3**
Total	**100**	**100**	**100**



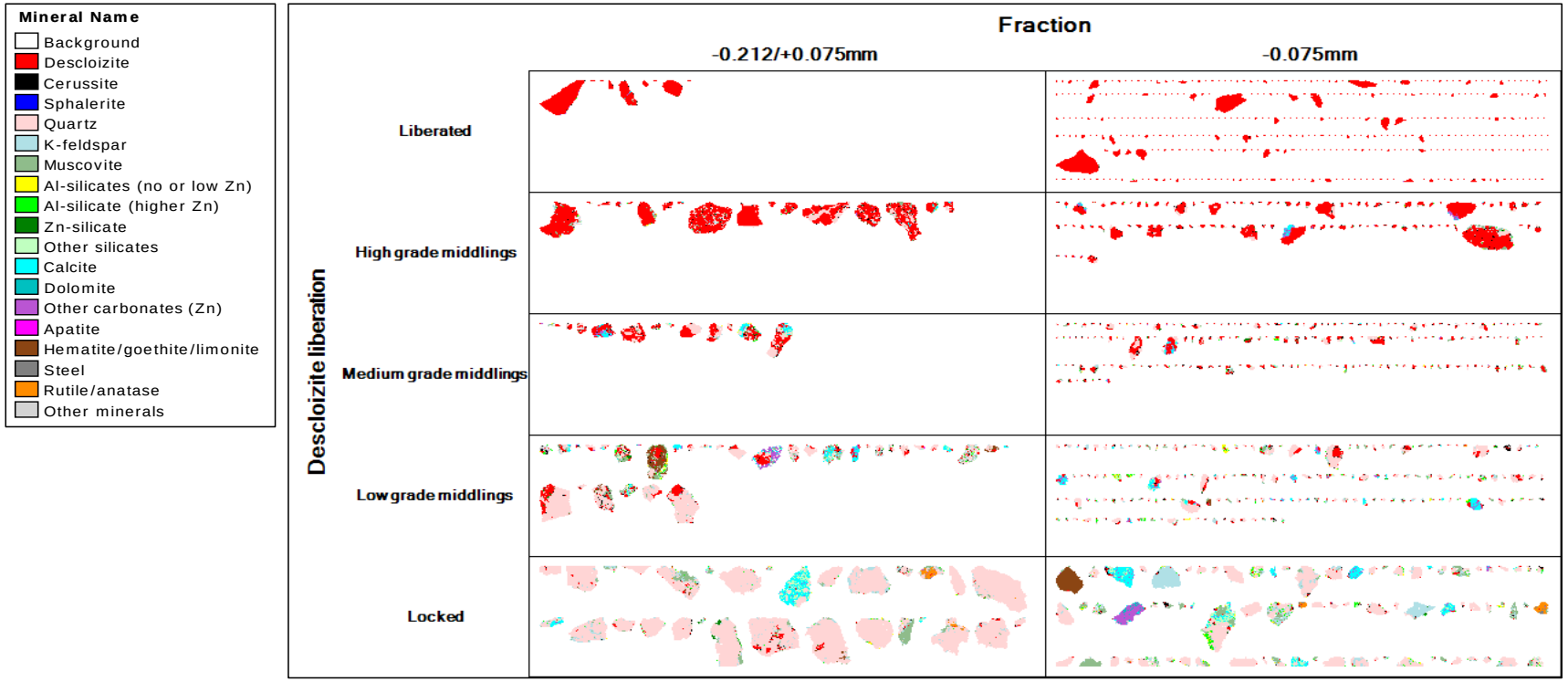
Mineral abundance (distribution in sample)

Mineral group	Nxuu Comp		
	-0.212/ +0.075mm	-0.075mm	Combined
	Mass% in sample		
Descloizite	**0.6**	**0.7**	**1.2**
Cerussite	0.4	0.5	**1.0**
Sphalerite	0.0	0.0	**0.0**
Quartz	48.1	25.0	**73.1**
K-feldspar	2.9	2.4	**5.4**
Muscovite	2.0	4.2	**6.2**
Al-silicates (no or low Zn)	0.2	0.6	**0.9**
Al-silicate (higher Zn)	0.3	1.0	**1.3**
Zn-silicate	0.3	0.4	**0.7**
Other silicates	1.0	0.8	**1.8**
Calcite	1.6	1.7	**3.3**
Dolomite	1.7	0.7	**2.4**
Other carbonates (Zn)	0.5	0.7	**1.2**
Apatite	0.0	0.1	**0.1**
Hematite/goethite/limonite	0.5	0.4	**0.9**
Steel	0.0	0.0	**0.0**
Rutile/anatase	0.2	0.2	**0.3**
Other minerals	0.1	0.2	**0.3**
Total	**60.3**	**39.7**	**100.0**
Weight % of size fraction	**60.3**	**39.7**	**100.0**



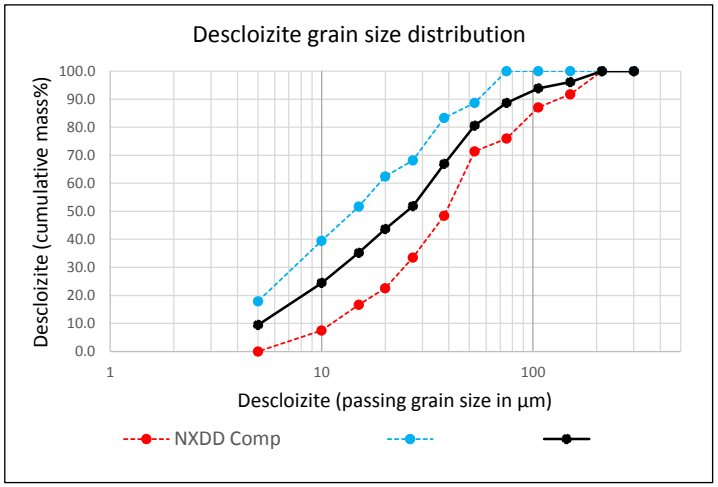
DESCLOIZITE LIBERATION

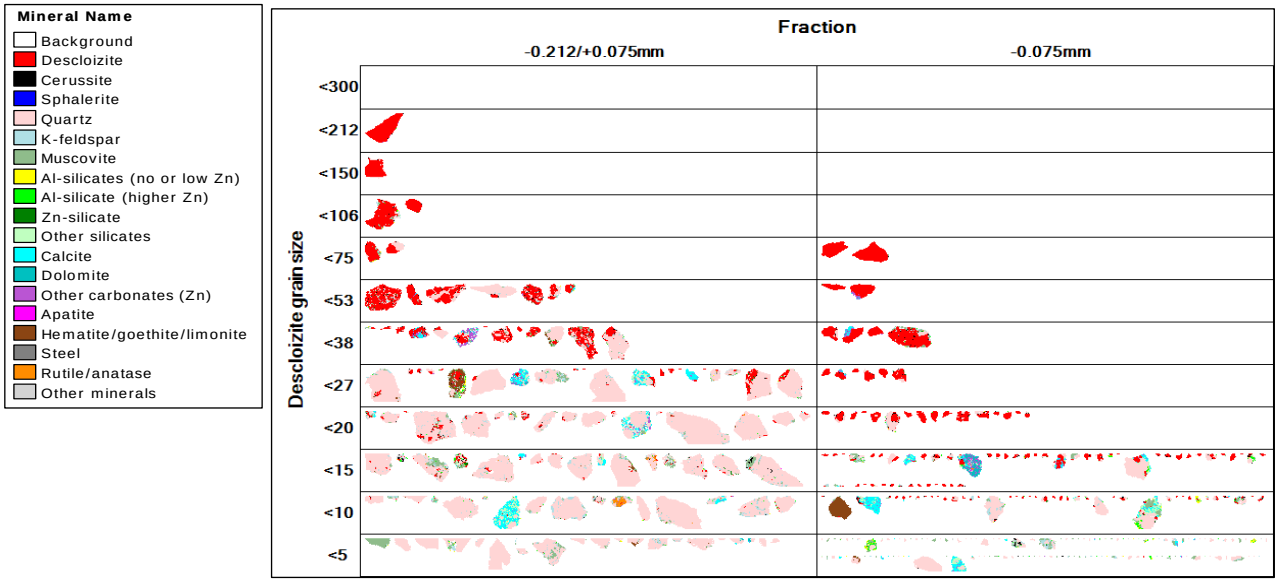
Liberation class (based on descloizite area%)		NXDD Comp		
		-0.212/ +0.075mm	-0.075mm	Combined
		Descloizite (mass%)		
Liberated	**>90**	14.4	37.8	**26.8**
High grade middlings	**60-90**	44.1	33.4	**38.4**
Medium grade middlings	**30-60**	11.0	11.8	**11.4**
Low grade middlings	**10-30**	10.6	7.5	**9.0**
Locked	**<10**	20.0	9.5	**14.5**
Total		**100.0**	**100.0**	**100.0**



GRAIN SIZE DISTRIBUTION

Grain size (passing size in µm)		NXDD Comp		
		-0.212/ +0.075mm	-0.075mm	Combined
		Descloizite (mass%)		
<300	300	100.0	100.0	**100.0**
<212	212	100.0	100.0	**100.0**
<150	150	91.8	100.0	**96.1**
<106	106	87.0	100.0	**93.9**
<75	75	75.9	100.0	**88.7**
<53	53	71.4	88.7	**80.6**
<38	38	48.4	83.3	**66.9**
<27	27	33.5	68.2	**51.8**
<20	20	22.6	62.4	**43.7**
<15	15	16.7	51.7	**35.2**
<10	10	7.5	39.5	**24.4**
<5	5	0.0	17.9	**9.5**
P_{80}		**86**	**36**	**52**
P_{50}		**39**	**14**	**25**
P_{20}		**18**	**5**	**9**

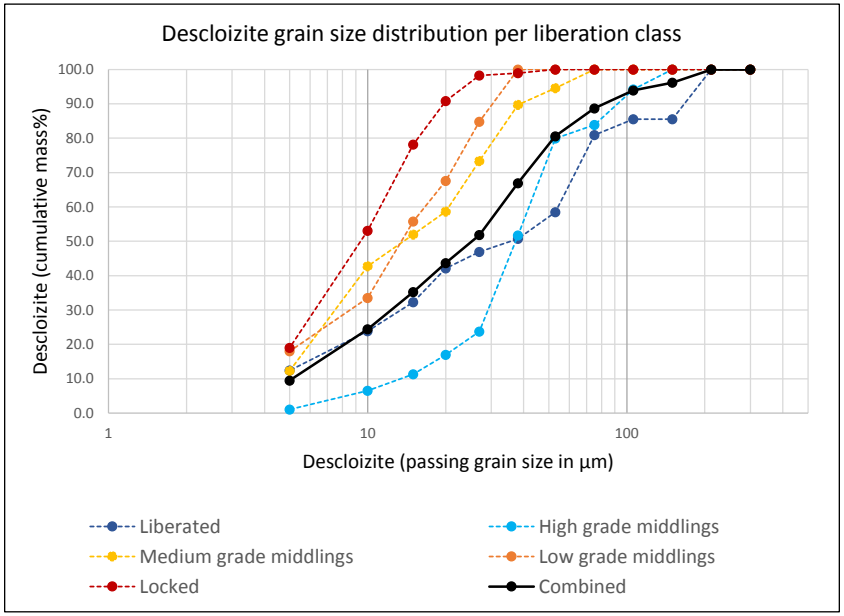




GRAIN SIZE DISTRIBUTION BY LIBERATION CLASS

Grain size (passing size in µm)		Liberated	High grade middlings	Medium grade middlings	Low grade middlings	Locked	Combined
		Descloizite (mass%)					
<300	300	100.0	100.0	100.0	100.0	100.0	**100.0**
<212	212	100.0	100.0	100.0	100.0	100.0	**100.0**
<150	150	85.5	100.0	100.0	100.0	100.0	**96.1**
<106	106	85.5	94.2	100.0	100.0	100.0	**93.9**
<75	75	80.9	83.8	100.0	100.0	100.0	**88.7**
<53	53	58.5	79.9	94.6	100.0	100.0	**80.6**
<38	38	50.7	51.7	89.7	100.0	98.9	**66.9**
<27	27	46.9	23.7	73.4	84.8	98.3	**51.8**
<20	20	42.1	16.9	58.6	67.6	90.8	**43.7**
<15	15	32.3	11.3	51.9	55.8	78.2	**35.2**
<10	10	23.9	6.5	42.7	33.5	53.0	**24.4**
<5	5	12.4	1.0	12.3	18.0	19.0	**9.5**
P_{80}		**74**	**54**	**31**	**25**	**16**	**52**
P_{50}		**36**	**37**	**14**	**14**	**10**	**25**
P_{20}		**8**	**23**	**6**	**6**	**5**	**9**

Mineral Name
- Background
- Descloizite
- Galena/other Pb
- Sphalerite
- Other sulphides
- Quartz
- K-feldspar
- Muscovite
- Al-silicates (+/- Zn)
- Zn-silicate
- Other silicates
- Calcite
- Dolomite
- Other carbonates (Zn)
- Apatite
- Limonite/goethite
- Other minerals



GLOSSARY OF TERMS

Assay Reconciliation

Assay reconciliation uses chemical assay data and compares them with QEMSCAN calculated elemental values.This approach is limited in its accuracy due to the fact that standardised or average densities and compositions are used for the mineral phases found, that might not correspond to the actual density and chemical composition of the phases present.

QEMSCAN elemental data should be considered indicative only as it is furthermore affected by:

(i) Low elemental values in the mineral lattice - these elements may fall below the QEMSCAN elemental peak detection limit and/or below EDS limits of detection and not be detected.

(ii) Elements found in low abundance minerals have higher error (function of particle statistics).

(iii) Elemental data collected from coarse particles generally has a higher degree of error (function of particle statistics and representativity).

Association

Mineral Association is a measure of spatial relationships in terms of shared grain boundaries and is essentially a measure of adjacency. The data represent normalised pixel transition numbers (grain contacts) created during the particle scans. A high association with background indicates significant surface exposure and/or liberation.

Back scattered electron (BSE) image

The backscattered electron images (BSE) represent a series of grey-scales varying from black to white with increasing average mineral density.

Bulk Mineral Analysis (BMA)

Bulk Mineral Analysis (BMA) is a one dimensional line scan method. Each block is scanned in the X direction, with the Y direction line spacing being set such that each particle is intersected approximately once. The entire block is scanned producing an extremely high statistical population with the random alignment of the particles ensuring appropriate sampling. This is a good analysis method for low grade species, as the intercept statistics are higher , but will only provide mineral abundance information with some accuracy.

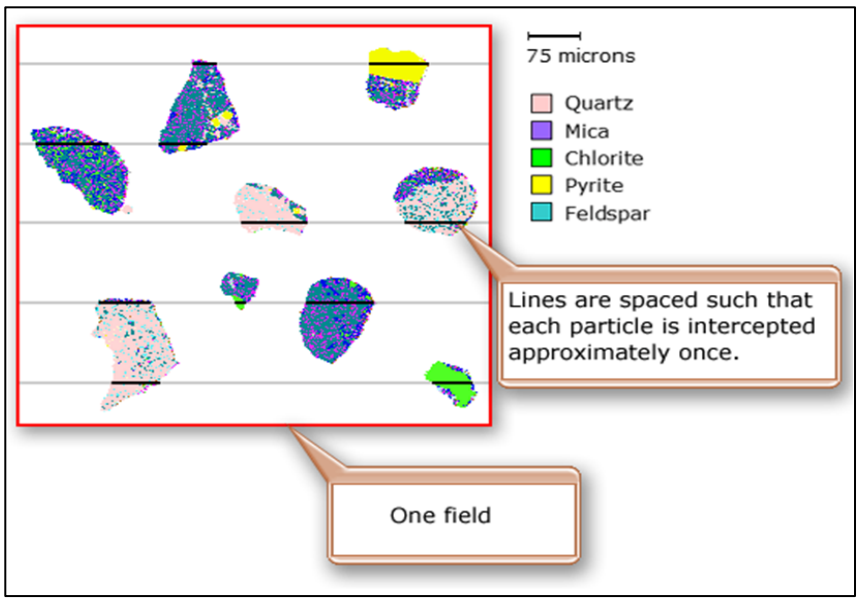


Figure 1 The line scan method used in BMA

Calculated Average Particle and Grain Size

Average particle and mineral grain size data are estimated from QEMSCAN image analysis based on the premise that the area of a grain in a two dimensional plane section is representative of the volume of that grain (Delesse's Principle, see **Stereology**). Grain size is calculated by using the diameter of a sphere (ESD) with the same surface-area as the measured grain. Although the data is based on a large number of random cross-sections through randomly oriented particles, both particle and grain sizes will be underestimated to some extent as illustrated in the figure below. Line A-B represents the polished surface in side view. The red lines represent the maximum diameter of the spheres. A random section through grains is much more likely to intersect grains at a point other than the maximum (red), thus resulting in an underestimation of the average grain sizes. The resolution is limited by the beam size and pixel spacing used to measure the samples. Results should be considered indicative only.

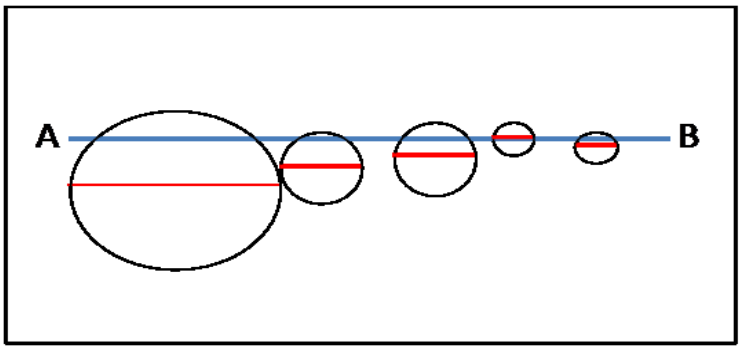


Figure 2 Line of section A-B through spherical grains showing there is a high probability of intersecting a cross section of a diameter less than the maximum (shown in red)

Calculated Grain Size Distribution

The calculated grain size distribution is presented as cumulative curves. The cumulative weight percentage of grains less than a given grain size for each size fraction is plotted against the logarithm of the particle size. The shape of each curve illustrates the distribution of grain sizes within each fraction. The relative position of each curve illustrates the relative grain size between samples with grain size decreasing towards the uppermost curves as shown by the hollow arrow in the figure below. For example the uppermost, black curve in the graph below shows that 80 mass % (P80) of the sample is less than 66 µm. The lowermost, blue curve in the graph below shows that 80 mass % (P80) of the sample is less than 313 µm.

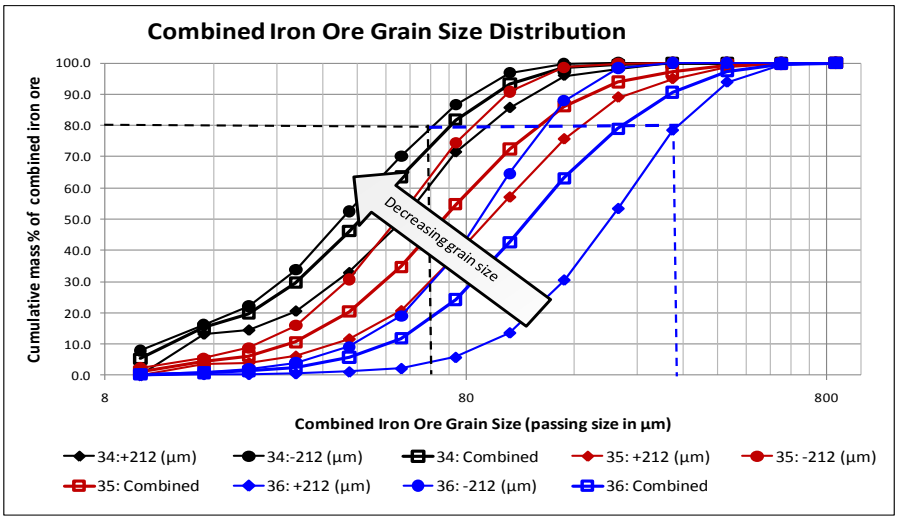


Figure 3 Cumulative grain size distribution curve

Deportment

Elemental deportment data quantify the average distribution of specific elements among minerals. Average chemical compositions and densities are assigned to each mineral phase to calculate deportment from image analysis area measurements. Data should be considered indicative only owing to Energy Dispersive Spectrometry (EDS) detection limits; phase variability; intricate textures; instrument resolution limits and non-stoichiometric mineral compositions. A larger uncertainty is present for elements with low abundance .

Exposure

Exposure data quantify the proportion of specific minerals that are in contact with resin (i.e. exposed at the particle surface). The measured particles have been subdivided according to the definitions below.

Exposure Class	Definitions
Exposed	>90 % of the target mineral is exposed at the surface of the particle
60 % - 90 % Exp	Between 61 % and 90 % of the target mineral is exposed
31 % - 60 % Exp	Between 31 % and 60 % of the target mineral is exposed
1 % - 30 % Exp	Between 1 % and 30 % of the target mineral is exposed
Encapsulated	The target mineral shows zero exposure

Field Scan (FS) Mode

The Field Scan mode allows full mapping of particles larger than the field of view (FOV) of the microscope at the given magnification. The sample surface is split into a series of grids, each representing a FOV. Every point in each field is then mapped at a user-defined pixel spacing to produce a full image of the field. Each field is measured with a minor overlap to facilitate digital stitching into a single composite image. This image may then be 'granulated' to separate particles from resin, if necessary.

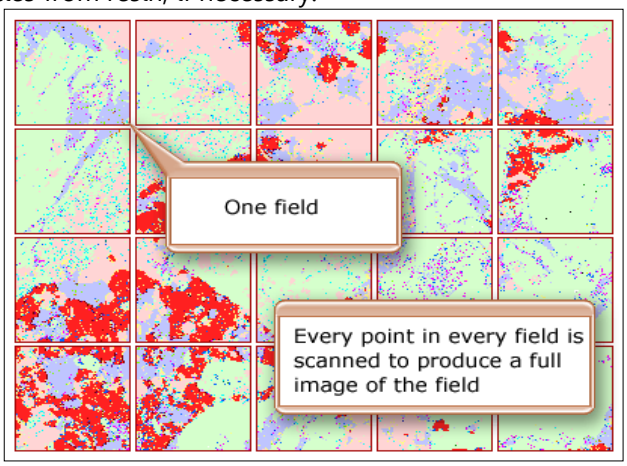


Figure 4 Field Scan (FS) Mode of analysis

Grain

Refers to an individual mineral ***grain***, as opposed to a ***particle*** which is an aggregate of mineral grains.

According to the QEMSCAN data, the "size" of the **particle** below is about 800 µm. It is made up of a large number of **grains** which are individually much smaller than the combined particle. For example, the QEMSCAN data indicates that the average (grain) size of the quartz in this particle is about 38 µm.

The calculated average size of the "ilmenite" in this particle is 34 µm but this dimension is fairly meaningless since the division between the "ilmenite " and "altered ilmenite" is arbitrary. When combined, the size of the "Ti-Fe-oxides" (in this case mainly "ilmenite" and "altered ilmenite") is 70 µm and the size of the combined silicates is about 160 µm.

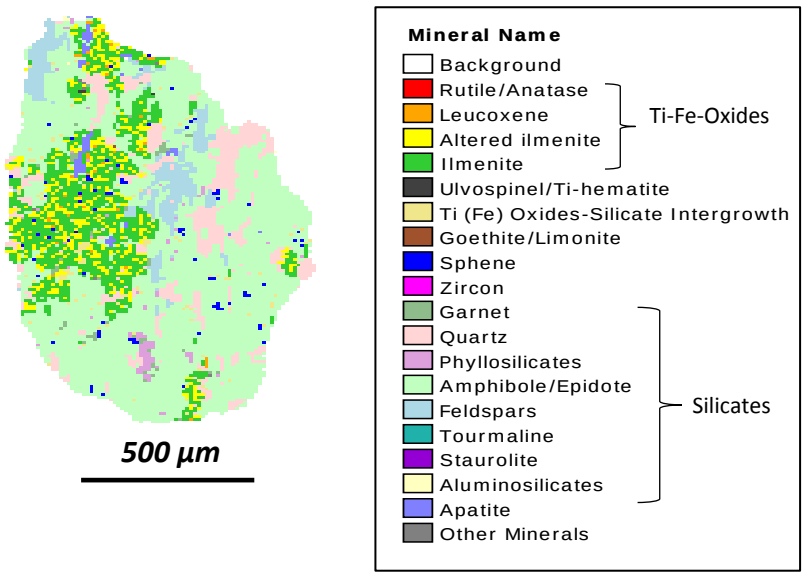


Figure 5 Mineral map of a 'particle', an aggregate of mineral 'grains'

Grain size

See **Grain** and **Calculated Average Particle and Grain Size**

Liberation

Mineral liberation examines the mineral composition on a particle by particle basis. It quantifies the degree of liberation (i.e. free versus composite particles) of the mineral of interest, calculated according to one of two methods, using area % or surface area % that the target mineral occupies within the particle.

Liberation data from 2D image analysis has an inherent **stereological** bias. The figure below illustrates the stereological bias for a two-phase system. A section through a composite particle with simple texture has a finite probability of sampling only one phase, leading to a systematic overestimation of mineral liberation. The extent of stereological bias depends on the texture of the ore.Samples containing mineral grains of a size comparable to the particle show the most bias. The schematic below demonstrates a variety of mineralogical textures. When many of the particles are composite and the texture is simple (as shown below), stereological bias is an important consideration.

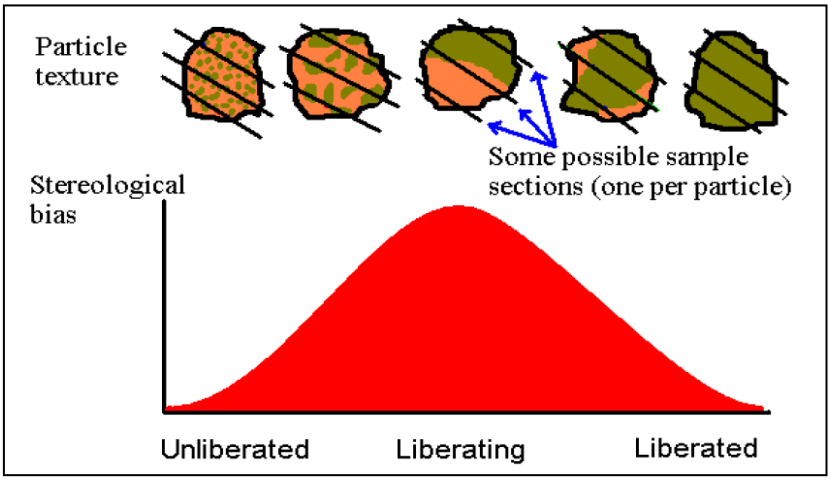


Figure 5 Schematic of stereological error in grade estimation by single sectioning of particles. The magnitude of stereological bias is shown as a function of particle texture, with sections (straight lines) through liberated and composite particles of similar size.

Locking

Locking characteristics describe the associations of minerals (not necessarily adjacent minerals) within a particle.

Liberation Class	Definition
Fully liberation	Target mineral comprises 100 % (by [area% OR surface area%]) of the particle
Well liberated	Target mineral comprises between 90 and 100 % (by [area% OR surface area%]) of the particle
High grade middlings	Target mineral comprises between 60 and 90 % (by [area% OR surface area%]) of the particle
Low grade middlings	Target mineral comprises between 30 and 60 % (by [area% OR surface area%]) of the particle
Very low grade middlings	Target mineral comprises between 10 and 30 % (by [area% OR surface area%]) of the particle
Locked	Target mineral makes up less than 10% (by [area% OR surface area%]) of the particle

Mineral Abundance

Mineral provides the weight % of each mineral within the sample analysed. It is calculated from area measurements and uses average mineral densities that have been assigned to each of the minerals in the database.

Mineral Groupings

QEMSCAN analysis generates an extensive list of mineral species. This is simplified using X-ray diffraction and semi-quantitative EDS microanalyses.

Mode of Measurement

Five different modes of measurement are available on the QEMSCAN:

1. The Particle Mineralogical Analysis mode (PMA)
2. Field Scan (FS)
3. Specific Mineral Search (SMS)/Trace Mineral Search (TMS)
4. Bulk MIneral Analysis mode (BMA)

Particle

An aggreate of mineral **grains**.

Particle Images

False colour images of mapped mineral distributions.
A random selection of particles have been presented, ordered by size.
Please note different size fractions have been analysed at different magnifications. Please refer to scale bars.

Particle Mineralogical Analysis mode (PMA)

PMA is a two dimensional analysis methodology in which the entire area of every particle falling within the measurement constraints is analysed. This allows for detailed characterisation of samples with particle size up to about 1 mm. During a PMA, the instrument conducts a Back Scatter Electron (BSE) scan to detect particles in the field. Detected particles are then measured.This mode of measurement produces particle images. A statistically robust, randomly selected sub-population of usually more than 3000 particles is analysed during a standard PMA.

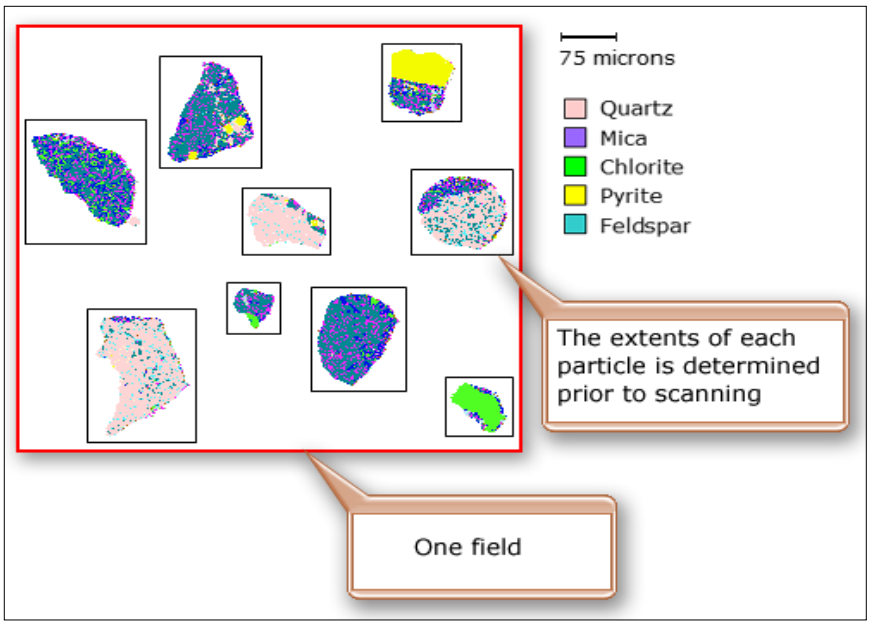


Figure 6 Particle Mineralogical Analysis (PMA) mode

QEMSCAN

History

QEMSCAN evolved from QEM*SEM, which is the Quantitative Evaluation of Materials using a SEM (Scanning Electron Microscope). It was developed by CSIRO in 1979. QEMSCAN® is the fully automated QEM*SEM based analysis system developed in the 1990s QEMSCAN is the fastest and most productive microbeam analysis system in the world. QEMSCAN instruments are capable of achieving 200,000 counts/ second, utilising digital pulse processors and light element x-ray EDS (Energy Dispersive Spectrum) detectors.

Measurement

QEMSCAN measures particles or sections by collecting individual EDX spectra (chemical information) and BSE value (average atomic number contrast) at every point (pixel) on a grid. Each point is then characterised as a mineral phase by referencing to a mineral compositional database **(Species Identification Protocol or SIP)**. 100 – 200 individual points can be measured per second. The length of time for a full measurement will depend on the data quality required and the spatial resolution that the measurement is performed at.

Greyscale BSE images provide qualitative compositional maps, **particle images**, which together with the chemical information is used. By QEMSCAN to positively identify the mineral/ phase present and to accurately determine grain and particle boundaries

QEMSCAN uses both the backscattered electron and energy dispersive X-ray signals to create digital images where each pixel corresponds to a mineral species.

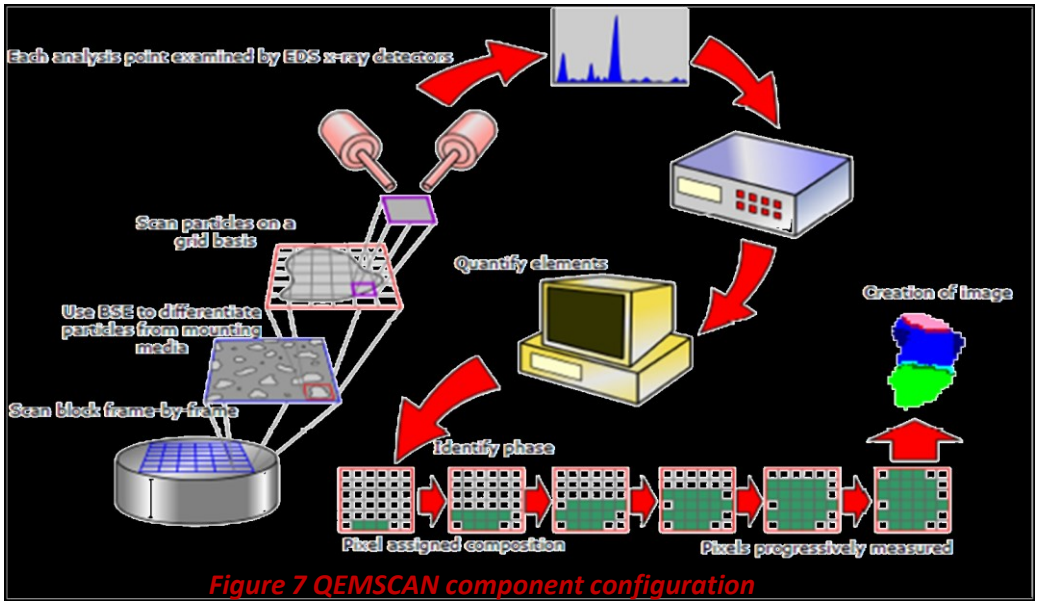


Figure 7 QEMSCAN component configuration

SIP (Species Identification Protocol)

A Species Identification Protocol, or SIP, is an extensive list of minerals the QEMSCAN refers to when analysing particles. There are a number of SIPs, each tailored towards specific mineral groupings or deposits. A SIP needs to be present before measurements can be made. The selected SIP should be suited to the samples being analysed. Where the optimal SIP is uncertain, one developed for samples of a similar nature will be used and adapted. Data reduction involves the classification of the particle analysis into various user specified mineral/chemical categories and size intervals. The classification categories are defined based on elemental X-ray intensities (X-ray counts), intensity ratios and stoichiometric criteria.

Size by Size Chemical Assay

Chemical assay results supplied to Mineralogy. Assay reconciliation is presented below comparing the QEMSCAN calculated elemental assay (black text) with the measured chemical assay (grey text).

Specific Mineral Search (SMS) / Trace Mineral Search (TMS)

Specific Mineral Search/ Trace Mineral Search is based on the PMA measurement mode, but only analyses a pre-set sub-population of the particles present. It is based on the premise that the phases of primary interest (i.e. target phases) have a specific backscatter electron intensity (BSE brightness). This enables each block to be scanned for particles containing phases with the selected BSE brightness range,, and only those of interest are fully analysed. As the entire block is scanned, this also produces the highest possible statistical population for a trace phase. The information obtained from a SMS/TMS measurement is similar to that from PMA measurement, but relates only to the sub-population analysed. This is a particularly good analysis method for determining losses of sulphides and precious metal phases to silicate-rich tails.

This mode is recommended for good statistics on the phases of interest in low/trace grade samples. It is faster than a PMA scan when grade is low and only target particles are of interest.

When a SMS is conducted, a BSE image of the field is created, this image is analysed to locate particles containing particles of BSE brightness in the range selected – other particles are ignored. The entire target particle is mapped, with x-rays being collected from each pixel on the particle - the resulting map identifies host minerals as well as the target minerals.

When only trace amounts of target minerals are present, creating BSE images of every field can be time consuming and fruitless as many fields will not contain the target phase. A TMS, or Trace Mineral Search, utilizes special hardware which continuously monitors BSE intensity and compares that signal to a preset BSE intensity threshold. If the target phase BSE is greater than the threshold, the location of the target phase within the field is recorded. After the BSE scan, fields containing the target phase are subjected to a Specific Mineral Search, while the remaining fields are ignored.

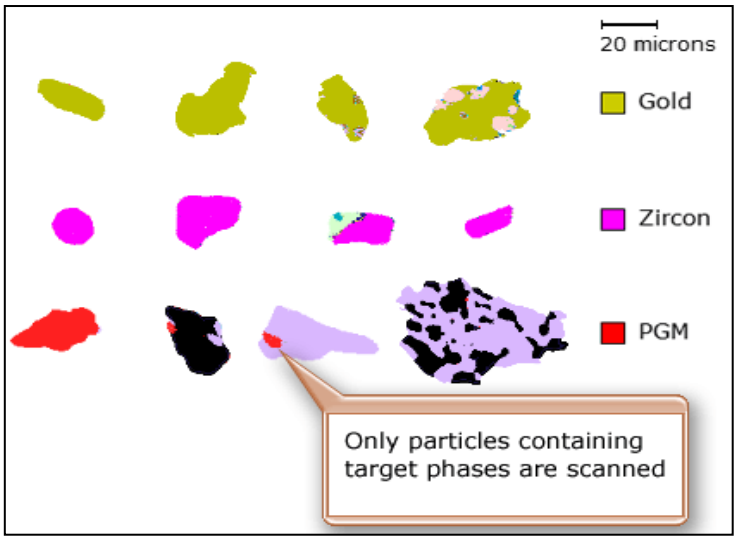


Figure 8 SMS (Specific Mineral Search)/ TMS (Trace Mineral Search) mode

Stereology

Stereology is based on Delesse's principle that the area of a mineral in a plane section provides an estimate of its volume percentage, assuming a set of randomly oriented grains in a homogenous sample. The shapes of minerals seen in a microscope image are planar sections of individual solid grains and the three dimensional extent of each grain cannot be directly measured. Stereology allows the extrapolation of quantitative 2D information from microscope images to an estimate of its percentage of volume in the solid. Stereology is the cornerstone of Automated Mineral Analysis (AMA) using QEMSCAN. The correct application of stereological principles and three dimensional sampling is vital to producing statistically valid data that is representative of the sample being analysed.

Trace Mineral Search (TMS)

Theoretical Grade Recovery

Theoretical Grade Recovery Curves are essentially a measure of particle liberation and dilution from which idealised maximum grade and recovery values have been calculated, for the submitted crush size.

Recovery increases as liberation decreases (i.e. the particles become binary and ternary particles) and the grade decreases (particles become diluted). The curves show the theoretical (i.e. uppermost) grade and recovery that could be expected in a perfect world if mineral liberation was the only factor affecting particle recovery (i.e. a perfect separation).

Although the curves are useful for comparing ores, it is important to understand that the mineralogical limiting grade and recovery values presented are unlikely to be reached during a real separation. The practical achievable grade and recovery will normally sit below the theoretical curves because numerous metallurgical, mineralogical and chemical factors interact during the separation in addition to liberation.

X-ray diffraction (XRD)

The three-dimensional structure of non-amorphous materials, such as minerals, is defined by regular, repeating planes of atoms that form a crystal lattice. When a focused X-ray beam interacts with these planes of atoms, part of the beam is transmitted, part is absorbed by the sample, part is refracted and scattered, and part is diffracted. Diffraction of an X-ray beam by a crystalline solid is analogous to diffraction of light by droplets of water, producing the familiar rainbow. X-rays are diffracted by each mineral differently, depending on what atoms make up the crystal lattice and how these atoms are arranged. An XRD pattern of a sample is the summation of diffraction patterns from each phase in that sample. This allows the identification of phases in the sample from their XRD patterns.

Because each crystalline material has a characteristic atomic structure, it will diffract X-rays in a unique characteristic pattern. The set of peaks produced for a particular phase can be used as a 'fingerprint' to identify it. A phase is a specific form of a particular mineral or other pure, crystalline material. Multiple phases can exist in the one sample simultaneously. The amount of each phase in a mixture will relate to how strong its signal is in the final pattern and this allows the quantification of phases in mixtures.

Peaks found on the spectra must have a high enough signal to be discriminated from the background noise. In addition, it is necessary to have secondary peaks that are used to confirm the primary peak as belonging to the particular mineral species in question. As a result, there are practical limitations to the minimum detectability of minerals in the sample. Some minerals may simply be reported as having trace amounts.

XRD provides a fast and reliable tool for routine mineral identification. XRD is particularly useful for identifying fine-grained minerals and mixtures or intergrowths of minerals, which may not lend themselves to analysis by other techniques.

The important result is which minerals are present, with less emphasis on quantity of each mineral. If the sample is a mixture, XRD data can be analyzed to determine the proportion of the different minerals present. Other information obtained can include the degree of crystallinity of the minerals present, possible deviations of the minerals from their ideal compositions (presence of element substitutions and solid solutions), the structural state of the minerals (which can be used to deduce temperatures and pressures of formation), and the degree of hydration for minerals that contain water in their structure.