

Mineral Resources Tasmania

Laboratory Report

LJN2019-060

LJN2017-115-15

MINERALOGICAL ANALYSES, ADELAIDE MINE, DUNDAS



An unpublished Mineral
Resources Tasmania Report for:

Adelaide Mining Co.

By: R.S. Bottrill and T Coyte

Date: 26 September 2022

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ABSTRACT

The samples submitted from the Adelaide mine were analysed and we confirmed many minerals including gibbsite, bindheimite, galena, Segnitite ($PbFe^{3+}_3AsO_4(AsO_3OH)(OH)_6$), Gibbsite, Philipsbornite ($PbFe^{3+}_3AsO_4(AsO_3OH)(OH)_6$), fuchsite, acanthite and chalcocite.

INTRODUCTION

Seven mineral samples were collected from the Adelaide mine, Dundas, with details listed in Table 1 below. They were submitted for mineralogical analyses, to aid in their identification. Tests included XRD and SEM for mineralogy and pXRF for chemistry.

Table 1: Sample details.

Registration Number	Location	Tests	Sample Description	Job
G407927	Adelaide mine	SEM	Pink gibbsite	LJN2017-115-15
G407942	Adelaide mine	SEM	Grey gibbsite	LJN2017-119-6
G409111	Adelaide mine	PTS Petrology	Sulphide ore	LJN2018-125
G409290	Adelaide mine	SEM, pXRF, XRD	Yellow mineral (bindheimite?)	LJN2019-060
G409291	Adelaide mine	pXRF, XRD	Blue-green mineral (fuchsite?)	LJN2019-060
G409292	Adelaide mine	pXRF, XRD	Brown crocoite	LJN2019-060
G409293	Adelaide mine	SEM, pXRF, XRD	Silver-rich galena	LJN2019-060

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DESCRIPTIONS AND PREPARATION

The samples were prepared, examined and analysed mostly in the Mineral Resources Tasmania (MRT) laboratories, Rosny Park, Tasmania. They were studied by stereomicroscopy and Scanning Electron Microscopy/Energy Dispersive Spectroscopy (SEM/EDS, UTas), and tested by XRD and pXRF.

G407927 Pink gibbsite

This mineral is a pale to medium pink, fine grained, botryoidal mineral commonly forming hollow crusts to about 3 mm thick in pockets in limonitic gossan, probably forming moulds after dundasite (Fig 1). Some is partly altered to grey gibbsite (Fig 2).



Fig. 1. G407927. Pink to grey botryoidal gibbsite (replacing dundasite?) with red crocoite. FOV ~70mm.

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Fig. 2. G407927. Pink to grey botryoidal gibbsite (replacing dundasite?) with red crocoite. FOV ~30mm.

G407942 Grey gibbsite

This mineral is very similar to G407927, but can apparently form on both white and pink gibbsite, probably forming moulds after dundasite (Fig 3). The material appears to be white when first mined, but turns grey in the sunlight (A Wright, pers. comm.).

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Fig. 3. G407942. Grey botryoidal gibbsite on white gibbsite with red crocoite and pink botryoidal gibbsite. FOV ~40mm.

G409111 Silver-rich galena

This mineral is a dark grey to black, silvery in part, massive, and friable to locally well crystalline. It is locally coated by brown to black limonite and manganese oxides, and yellow bindheimite(?). There are no optically visible crystals. The specimen is very similar to G409293 (Fig 12). Polished thin section photomicrographs are shown in Figs 4 -7. They indicate the galena is almost totally altered to a mixture of anglesite and galena, with some very fine grained included sulphides, probably including Acanthite. Other minerals present include pyrite, sphalerite and pyrrhotite.

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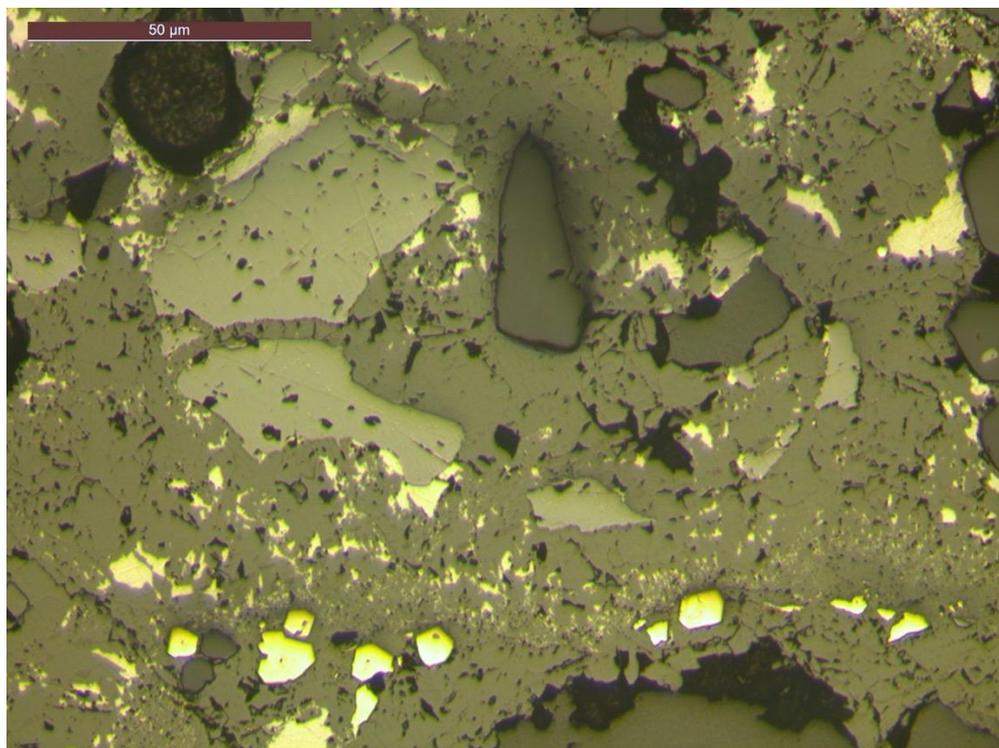


Fig. 4. G409111. Pale grey sphalerite (eg. upper left), pyrite (blocky grains near bottom), chalcopyrite (yellow) and white sulphides (probably residual galena and acanthite), in a mid-grey matrix of cerussite and anglesite. Plane polarised reflected light. FOV ~0.2mm.

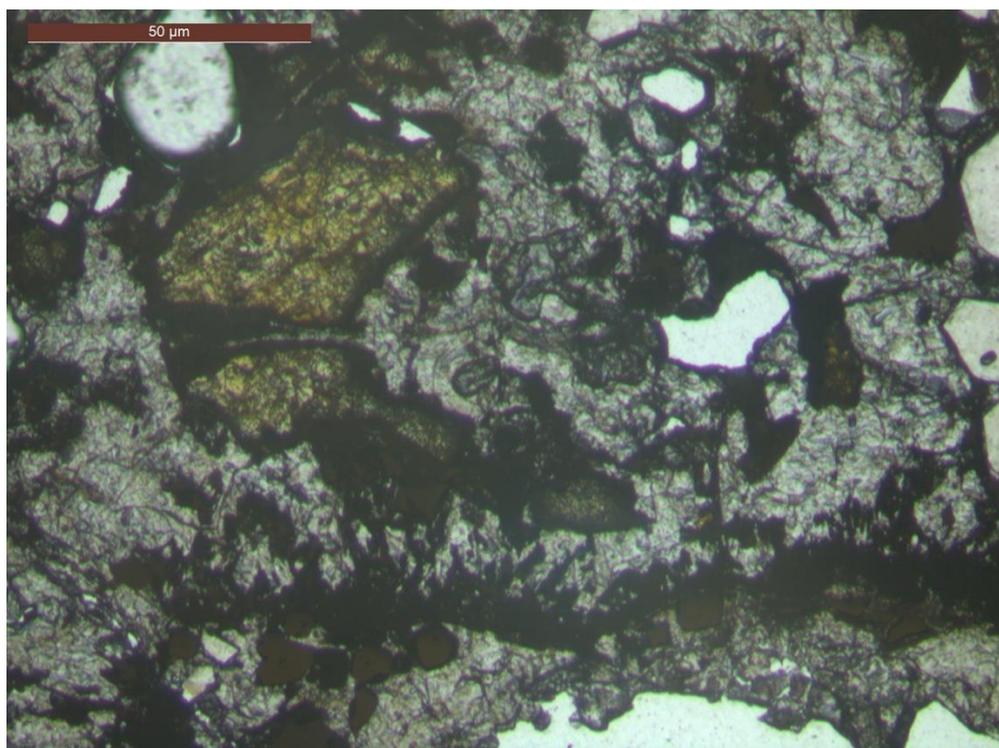


Fig. 5. G409111. Same area as above. Brown sphalerite (eg. upper left), miscellaneous sulphides (black), in a pale-grey matrix of cerussite and anglesite. Plane polarised transmitted light. FOV ~0.2mm.

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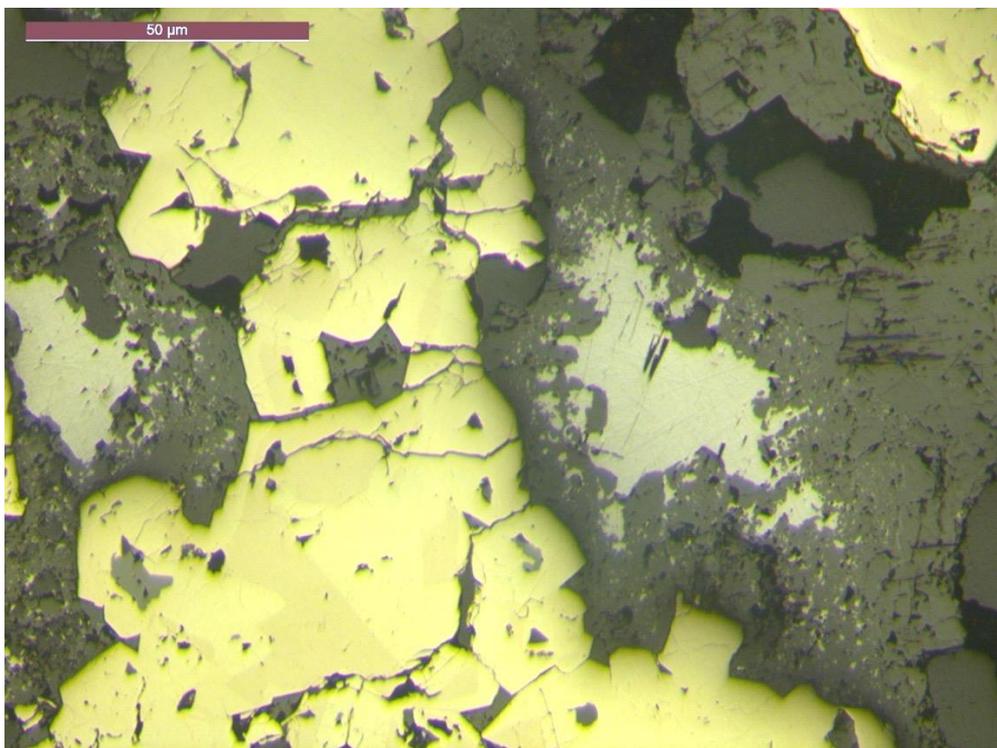


Fig. 6. G409111. Brownish cream pyrrhotite, creamy pyrite and white sulphides (probably residual galena and acanthite), in a mid-grey matrix of cerussite and anglesite. Plane polarised reflected light. FOV ~0.2mm.

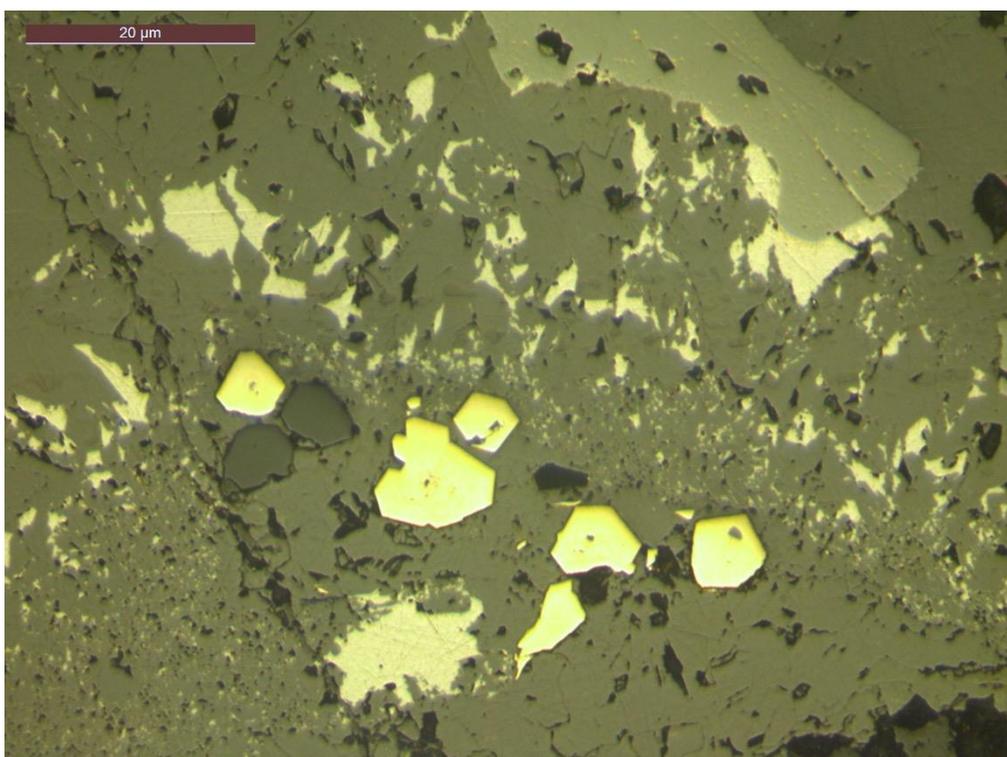


Fig. 7. G409111. Creamy pyrite and white sulphides (probably residual galena and acanthite), in a mid-grey matrix of cerussite and anglesite. Plane polarised reflected light. FOV ~0.1mm.

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G409290 Philipsbornite/Segnitite

This mineral is a pale to lemon yellow, massive, friable mineral in a nodule coated by brown to black limonite and manganese oxides (Fig 2). There are no optically visible crystals.



Fig. 8. G409290. Mass of mostly yellow philipsbornite, surrounded by brown limonite. FOV ~50mm.

G409291 Fuchsite

This mineral is a medium chrome green to greenish white, soft, friable mineral occurring as thin bands in a brown siltstone, with some small black grains of magnetite or chromite. There are no optically visible crystals.

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Fig. 9. G409291. Green fuchsite bands in a cream-brown siltstone matrix. FOV ~120mm.

G409292 Black “crocoite”

This mineral is an aggregate of prismatic crystals to about 25mm long, on a yellow-brown gossanous matrix. The crystals vary from a grey-brown to a dark chocolate brown in colour.



Fig. 10. G409292. Brown crocoite-like crystals on a gossan matrix. FOV ~150mm.

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Fig. 11. G409292. Brown crocoite-like crystals on a gossan matrix. FOV ~100mm.

G409293 Silver-rich galena

This mineral is a dark grey to black, silvery in part, massive, and friable to locally well crystalline (Fig. 12). It is locally coated by brown to black limonite and manganese oxides, and yellow bindheimite(?). There are no optically visible crystals. This specimen is very similar to G409111.

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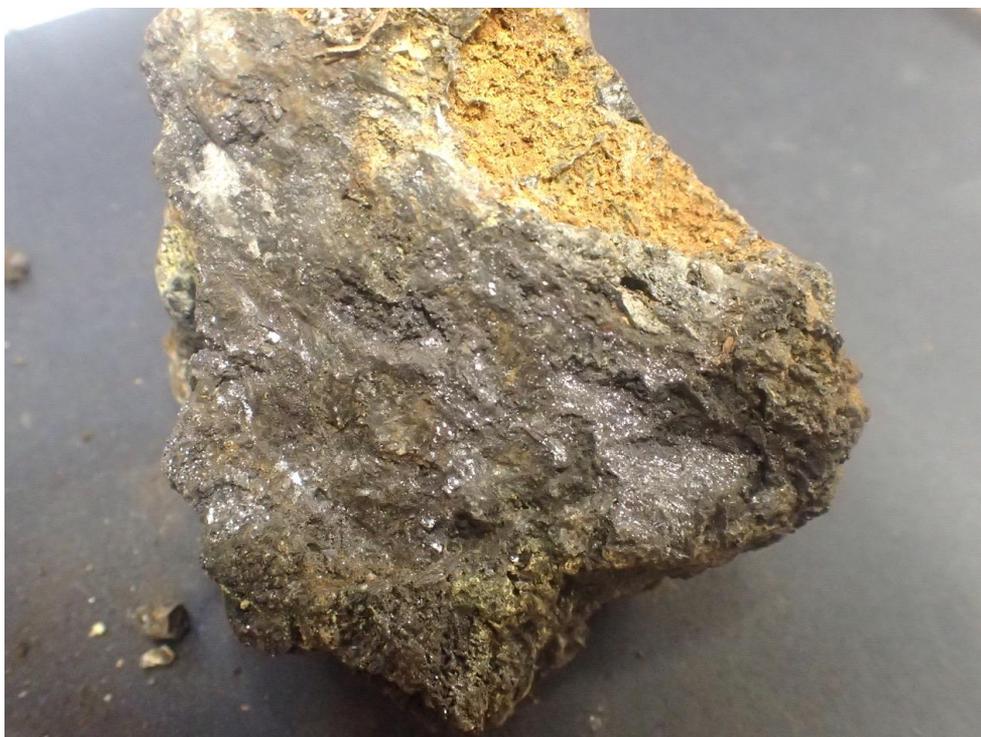


Fig. 12. G409293. Highly altered galena with some limonite-bindheimite gossan matrix. FOV ~80mm.

PXRF

The samples were analysed for major and trace elements using an Olympus Vanta M Series pXRF. The instrument uses a 4-Watt X-ray tube with application optimized anode material (rhodium Rh and tungsten W): 8-50 kV with a large area Silicon Drift Detector. The instrument uses the built-in Olympus Vanta analysis software version 3.12.34.

The results are shown in Tables 2 -7.

Results for G409290 (Philipsbornite/segnite, Table 2) indicate high amounts of Pb, Sb, As, Ca, S, Fe, Si, Al and Mg. These suggest a mixture of philipsbornite, segnitite, anglesite, gibbsite, quartz, dolomite and bindheimite, but may be affected by the high Pb content overwhelming the calibrations.

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Table 2: pXRF summary, G409290 (philipsbornite).

Sample	G409290	G409290
Units	wt.%	wt.%
Mg	6.2	10.2
Al	5.0	9.5
Si	1.3	1.6
S	8.6	8.6
Ca	1.1	0.0
Mn	0.6	0.4
Fe	6.4	4.3
As	14.6	19.1
Sb	6.6	0.7
Pb	25.6	28.0

Results for G409291 (Fuchsite, Table 3) indicate high amounts of Pb, Fe, Mn, Cr, Ti, K, S, Si and Mg. These suggest a mixture of a Cr-Ti-Fe-Al mica (fuchsite) and Pb-rich ferromanganese gossan.

Table 3: pXRF summary, G409291 (Fuchsite)

Sample	G409291	G409291	G409291	G409291	G409291	G409291 soft
Units	wt.%	wt.%	wt.%	wt.%	wt.%	wt.%
Al	13.7	12.8	14.2	4.3	4.3	1.9
Si	18.6	16.4	18.5	4.2	4.2	1.8
S	0.1	0.3	0.1	0.9	0.9	1.0
K	4.8	2.8	5.0	0.9	0.9	0.3
Ti	0.6	1.3	0.7	0.1	0.1	0.1
Cr	1.6	2.4	1.8	0.2	0.2	0.1
Mn	0.0	0.1	0.0	2.7	2.7	2.5
Fe	0.8	1.7	0.7	12.2	12.2	14.5
Pb	0.0	0.2	0.0	2.6	2.6	2.9

Results for G409292 (Brown crocoite, Table 4) indicate high amounts of Pb, Fe, Mn, S, Si and Al. These suggest a mixture of a limonite, anglesite, Pb-Mn oxides and gibbsite.

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Table 4: pXRF summary, G409292 (Brown Crocoite)

Sample	G409292	G409292
Units	wt.%	wt.%
Al	1.6	1.6
Si	0.6	0.8
S	0.5	0.7
Mn	0.2	0.9
Fe	45.5	43.9
Pb	0.6	1.3

Results for G409293 (Fuchsite, Table 3) indicate high amounts of Pb, Sb, Sn, Cd, Ag, As, Zn, Cu, Fe, Mn, Cr, Ti, K, S, Si and Al. These suggest a mixture of a Galena and other minerals but may be affected by the high Pb content, overwhelming the calibrations.

Table 5: pXRF summary, G409293 (Galena)

G409293	Ave. wt.%
Al	0.31
Si	1.52
S	19.47
K	0.12
Ca	0.29
Ti	0.58
Cr	0.12
Mn	3.12
Fe	2.64
Cu	0.65
Zn	0.49
As	2.71
Ag	0.59
Cd	0.64
Sn	0.71
Sb	0.55
Pb	56.53

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XRD

The samples were prepared, examined and analysed in the MRT laboratories, Rosny Park, Tasmania. They were run on an automated Philips X-Ray diffractometer system: PW 1729 generator, PW 1050 goniometer and PW 1710 microprocessor with nickel-filtered copper radiation at 35kV/25mA, a graphite monochromator (PW1752), sample spinner and a proportional detector (sealed gas filled PW1711). Our typical step-size is 0.02 degrees, and the standard scanning speed is 0.02 degrees/second. The PW1710 system is presently driven by the CSIRO XRD software: "VisualXRD" , "PW1710 for Windows" and "XPLOT for Windows". Interpretation and quantification is largely manual, using a series of prepared standards of the more common minerals to enable some semi-quantitative analysis. Quartz, if present, is used as an internal standard; and if not present, it is often added to the sample for a supplementary scan. Our semi-quantitative results are calculated using single-peak calibration factors derived from scans of known mixtures of minerals.

SCANNING ELECTRON MICROSCOPY (SEM)

The samples were subsampled, with selected grains mounted on carbon tape on Al stubs and analysed by SEM-EDS, CSL, University of Tasmania, with analytical conditions shown in Appendix 3. The formula normalisation is dependent on the mineralogy. The results are given in Appendix 4 and discussed below.

G407927

The Pink gibbsite, as expected, consists mostly of Al and O, but there were many other minor to trace elements. Sporadic high Si may be due to some intermixed halloysite or kaolinite. Interestingly, some analyses gave high Ag (correlating well with S, 2:1; Fig. 14) indicating it is most likely due to fine inclusions of acanthite

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(Ag₂S). Sb is significant in most analyses and correlates with Pb (Fig. 15), suggesting it is due to very fine intermixed bindheimite. Most analyses give between 0.1 – 1.1 at.% Cr and 0.1 – 1.3 at.% Pb (Fig. 15); the high variability suggests these elements may be due to extremely fine inclusions of crocoite, although there is not a good correlation, so dundasite and other minerals may be involved. One analysis gave very high Cr and high Pb, possibly indicative of some intermixed grimaldiite plus a Pb mineral.

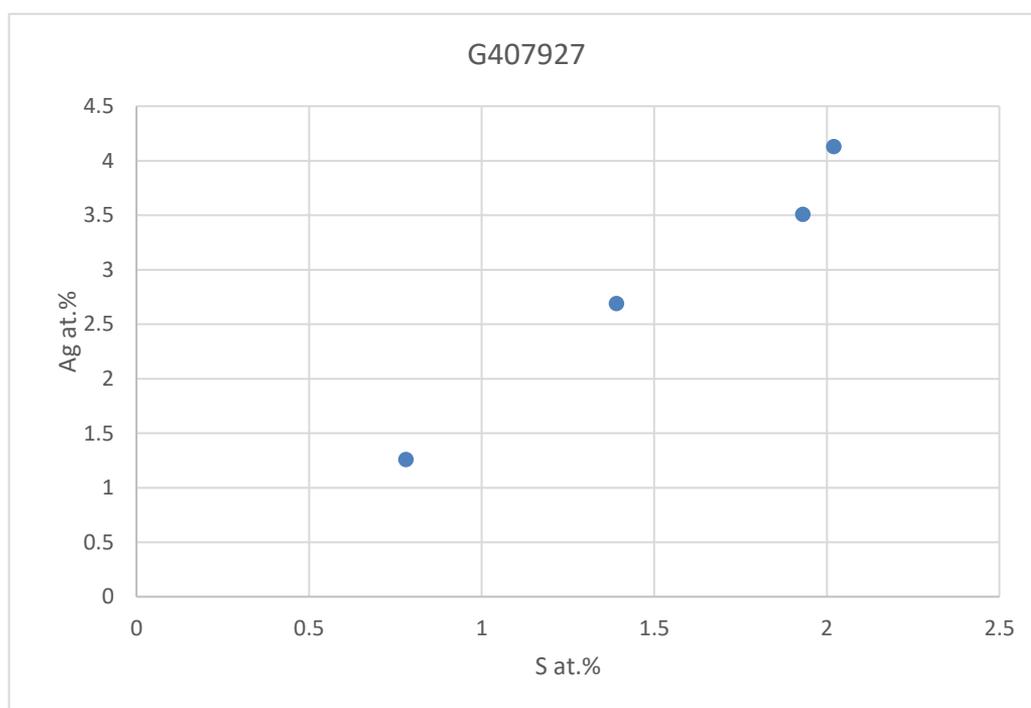


Fig. 13. G407927 EDS analyses showing a good Ag-S correlation.

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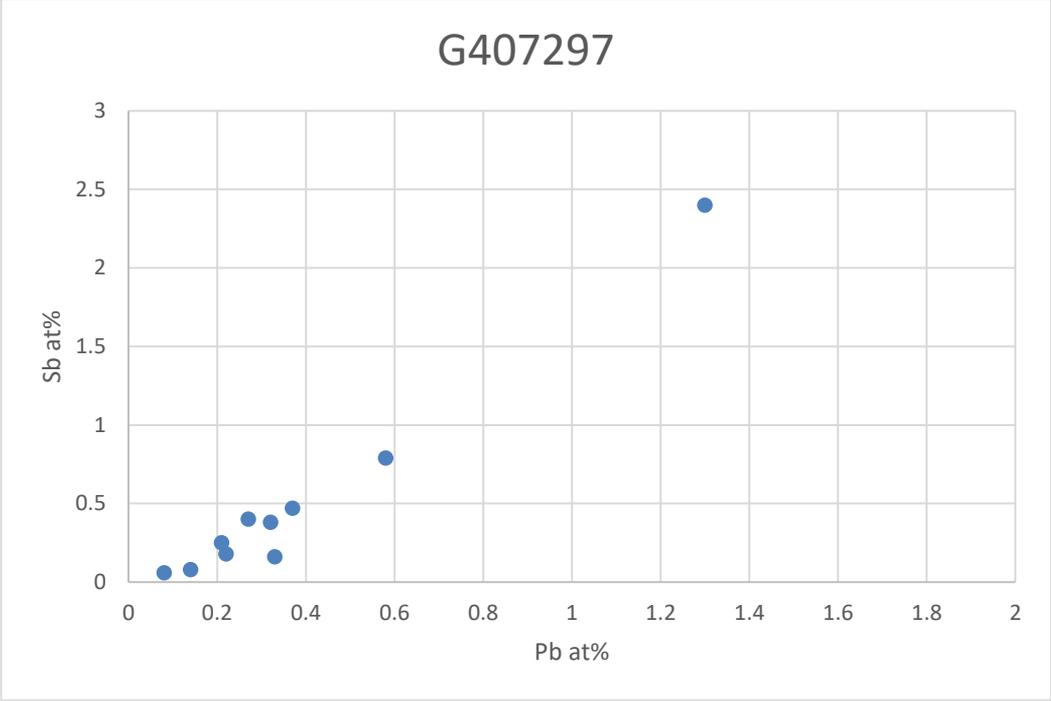


Fig. 14. G407927 EDS analyses showing a good Sb-Pb correlation.

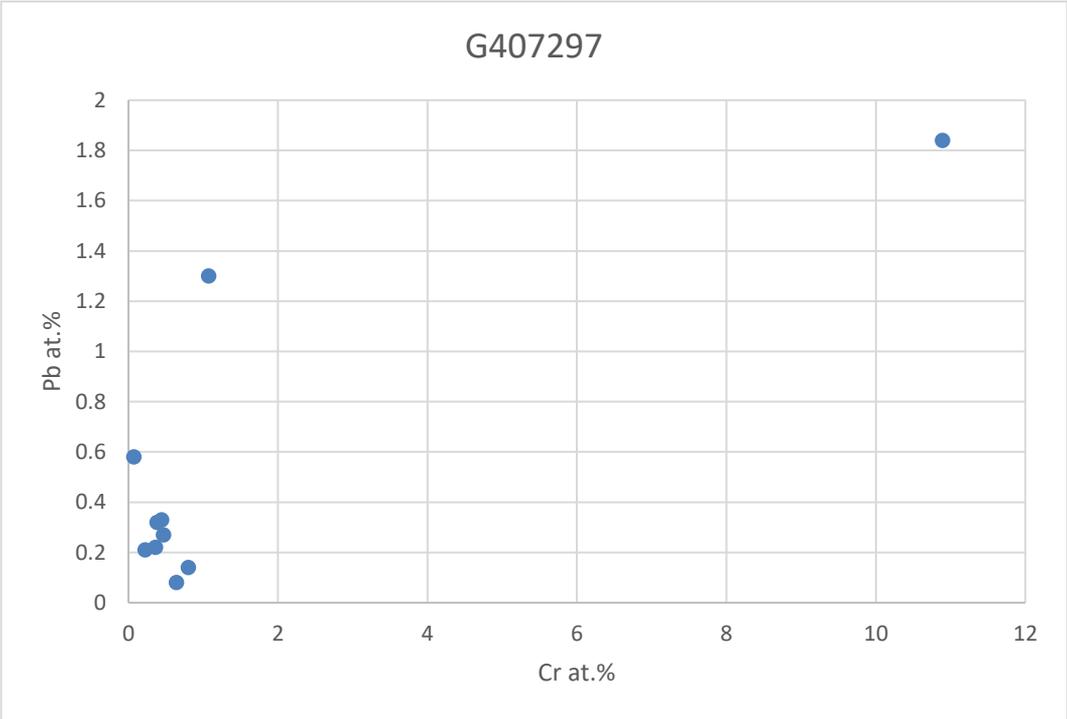


Fig. 15. G407927 EDS analyses showing no Cr-Pb correlation.

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G407942

The grey gibbsite, as expected, consists mostly of Al and O, but there was also significant Pb (0.2 + 0.4wt.%) and Fe (0 – 0.9 wt.%) in most analyses. UV light may possibly affect these elements and darken the gibbsite?

G409290

G409290 contains a mixture of Segnitite, Gibbsite, Philipsbornite, Goethite, Bindheimite, Halloysite 7Å and Fe-Mn oxides. The halloysite contains significant K, suggesting some admixed mica. The goethite is impure, containing significant Pb, Al, Si, Mn and sometimes Zn, As, Cr and other elements. The Fe-Mn oxides are mostly Fe-dominant, with significant Al, Si, and Pb; it probably includes coronadite-group minerals. The bindheimite analysed is impure with very high Fe and abundant Al, Si, Cr, As; it is probably mostly goethite. The philipsbornite is mostly high in Al, Pb and As as expected, but many analyses are high in Fe, Pb, S and Cr. Some of the analyses high in Fe, As and Pb may represent segnitite but the analyses are poor.

G409293

G409293 contains a mixture of Acanthite, Cerussite, Anglesite, Galena, Goethite and Sphalerite. The Acanthite is relatively pure with some minor Pb, Cu and Fe. Cerussite is also relatively pure, some Ag values may be due to fine Acanthite inclusions. "Bindheimite" is relatively pure with some Fe, Si, Ag. There is another associated phase that appears to be an unidentified Fe-Sb-Pb-O mineral, though it could be a mixture of bindheimite and limonite. It is also Sn-rich. Also identified were anglesite, limonite (very impure) and an Ag-Cu sulphide, probably an Ag-rich chalcocite?

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CONCLUSIONS

The pink gibbsite in G407927 contains many unusual, non-intrinsic elements, including Pb, Sb, Cr, As, S, Fe and Si. Some of these elements are present in admixed acanthite (Ag_2S) and bindheimite $\text{Pb}_2\text{Sb}_2\text{O}_6(\text{O},\text{OH})$ plus possibly some intermixed halloysite, dundasite $\text{PbAl}_2(\text{CO}_3)_2(\text{OH})_4\cdot\text{H}_2\text{O}$, and grimaldiite ($\text{CrO}(\text{OH})$).

The grey gibbsite in G407942 contains significant Pb (0.1 - 0.4wt.%) and Fe (0 – 0.9 wt.%) in most analyses; its form is uncertain. UV light may possibly affect these elements and darken the gibbsite?

G409111 is a sulphide sample containing galena which is almost totally altered to a mixture of anglesite and galena, with some very fine grained included sulphides, probably including Acanthite. Other minerals present include pyrite, sphalerite and pyrrhotite.

G409290 contains a mixture of Segnitite ($\text{PbFe}^{3+}_3\text{AsO}_4(\text{AsO}_3\text{OH})(\text{OH})_6$), Gibbsite, Philipsbornite ($\text{PbFe}^{3+}_3\text{AsO}_4(\text{AsO}_3\text{OH})(\text{OH})_6$), Goethite, Bindheimite, Halloysite 7Å and Fe-Mn oxides.

G409291 contains a mixture of Quartz, Mica (Diocahedral: muscovite and/or fuchsite?), Chromite, Goethite and Lepidocrocite ($\text{FeO}(\text{OH})$). The blue-green mineral is probably fuchsitic (chromian) muscovite.

The “brown crocoite” in G409292 contains a mixture of Goethite, Gibbsite, Quartz, Halloysite 7Å and Hematite.

The silver-rich galena in G409293 contains a mixture of Cerussite, Anglesite, Galena, Goethite, Acanthite, Chalcocite, Semseyite? ($\text{Pb}_9\text{Sb}_8\text{S}_{21}$) and Sphalerite.

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MINERALOGIST/PETROLOGIST

T Coyte
SENIOR TECHNICAL OFFICER

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This and other data collected in MRT laboratories may enter the MRT databases but every attempt will be made to ensure it remains closed file and not be available externally, unless at your request.

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Appendix 1: Laboratory Report – XRD Analyses

Client: Adelaide mining Co
Sample Sources: Adelaide mine
MRT Job Number: LJN2019-060
Analysis: Approximate Mineralogy
Method: X-Ray Diffraction
Results: (approx wt %):

Analysis Results – G409290

General information

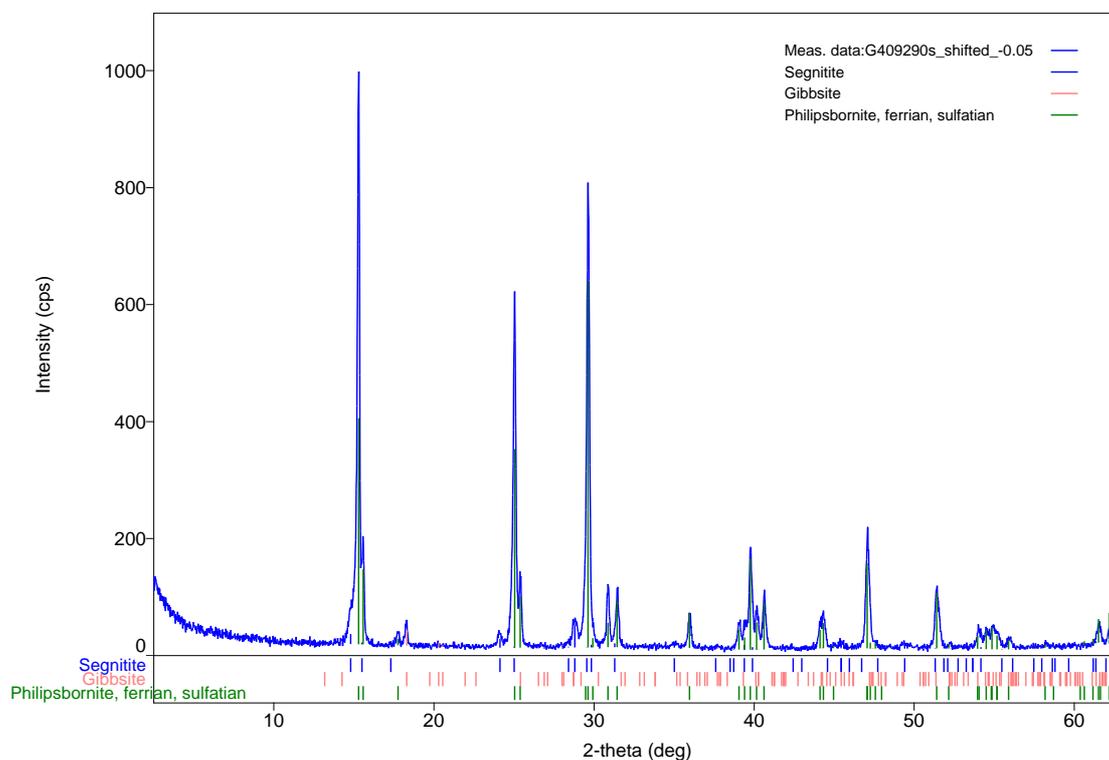
Analysis date	2019/06/11	XRD	Philips
Job Number	LJN2019-057	Measurement date	2019/06/03
File name	G409290s.raw	Operator:	T.Coyte
Comment:	Selective sample of yellow material run on glass disk		

Qualitative analysis results

Phase name	Formula
Segnitite	$\text{PbFe}_3(\text{AsO}_4)_2(\text{OH})_5(\text{H}_2\text{O})$
Gibbsite	$\text{Al}(\text{OH})_3$
Philipsbornite, ferrian, sulfatian	$\text{Pb}(\text{Al}_{2.56}\text{Fe}_{0.44})((\text{AsO}_4)_{1.65}(\text{SO}_4)_{0.35})(\text{OH})_6$

Peak overlap may interfere with identifications and quantitative calculations.
Amorphous minerals and minerals present in trace amounts may not be detected.

Phase data pattern



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Analysis Results – G409291

General information

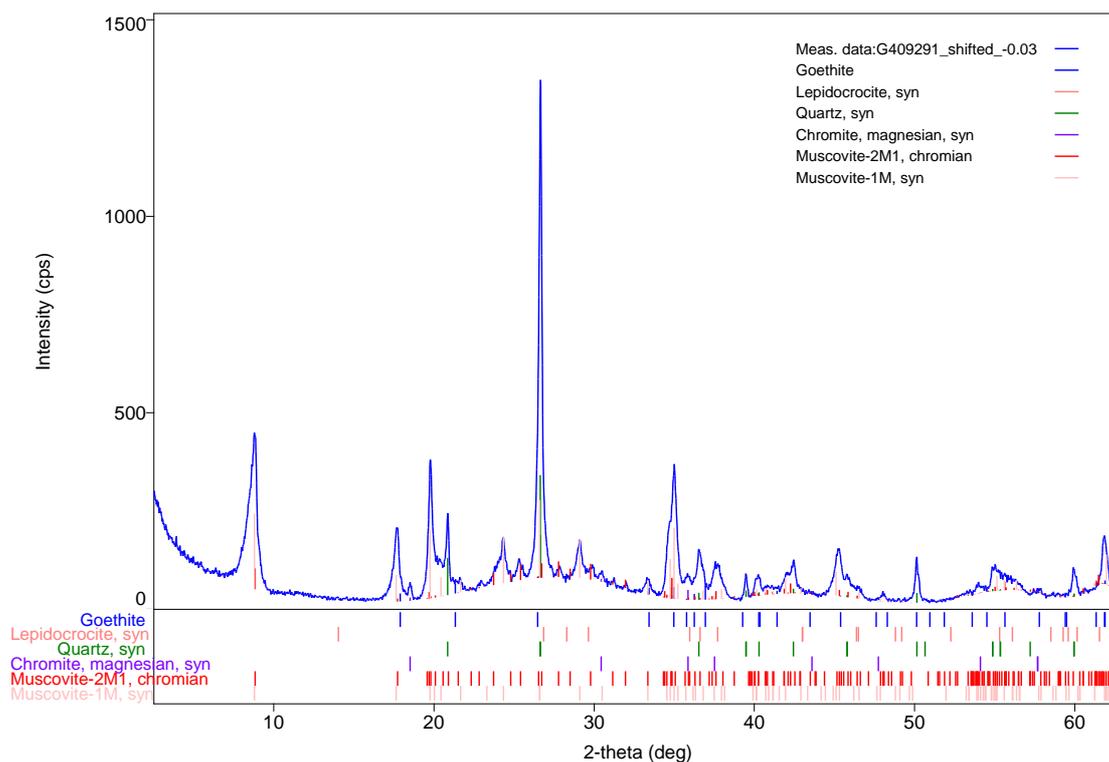
Analysis date 2019/06/11
Sample name LJN2019-060 Measurement date 31/5/2019
File name G409291.raw Operator Tcoyte
Comment XRD Philips, Original RIR method used, 3 supplementary runs focused on picking individual minerals

Semi-Quantitative analysis results

Phase name	Content (%)	Formula
Mica (Dioctahedrel)	79(10)	$K_{0.65}Al_{2.0}[Al_{0.65}Si_{3.35}O_{10}](OH)_2$
Quartz	17(3)	SiO_2
Chromite	3(2)	$(Mg,Fe)Cr_2O_4$
Goethite	<1(1)	$\alpha-Fe^{3+}O(OH)$
Lepidocrocite	<1(1)	$\gamma-Fe^{3+}O(OH)$

Peak overlap may interfere with identifications and quantitative calculations.
Amorphous minerals and minerals present in trace amounts may not be detected

Phase data pattern



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Analysis Results – G409292

General information

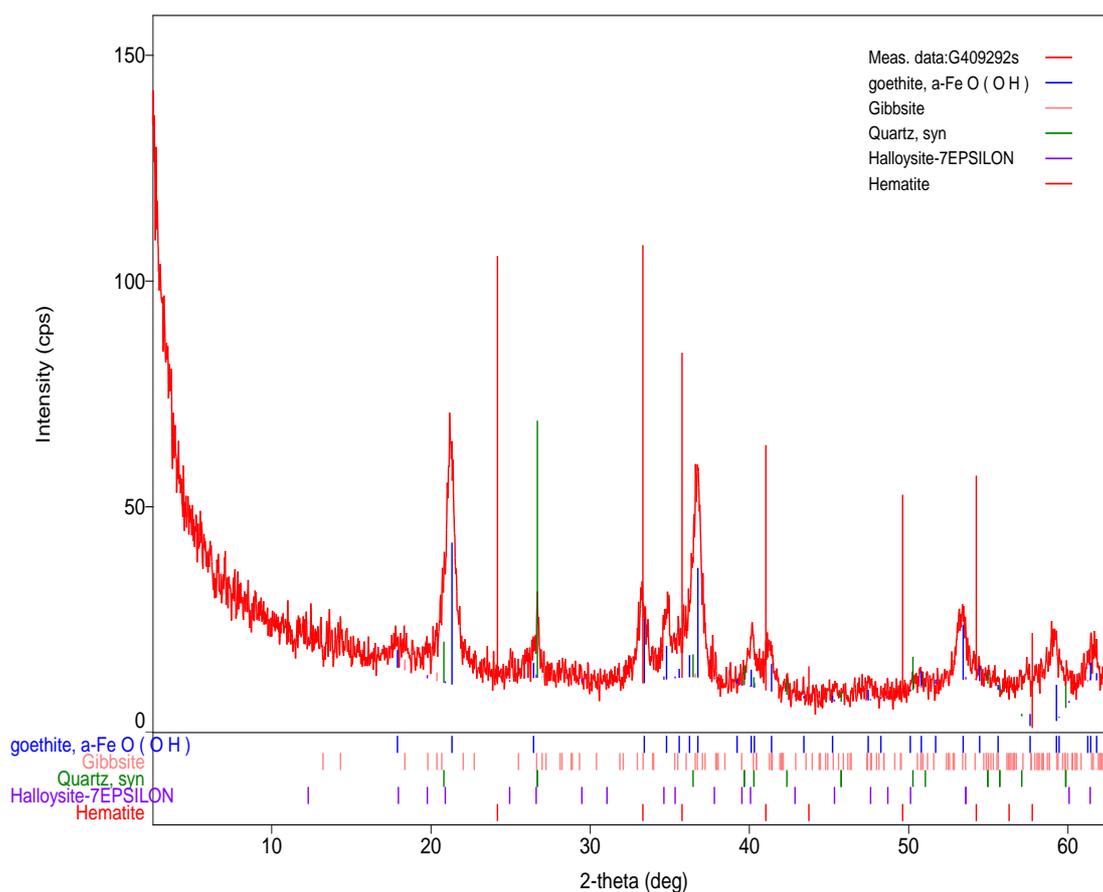
Analysis date	2019/06/11	XRD	Philips
Job Number	LJN2019-060	Measurement date	2019/06/17
File name	G409292.raw	Operator:	T.Coyte
Comment:	Selective sample of needle-like crystals on glass disk, for phase ID		

Semi-Quantitative analysis results

Phase name	Formula
Goethite	$\alpha\text{-Fe}^{3+}\text{O(OH)}$
Gibbsite	Al(OH)_3
Quartz	SiO_2
Halloysite 7Å	$\text{Al}_2(\text{Si}_2\text{O}_5)(\text{OH})_4$
Hematite	Fe_2O_3

Peak overlap may interfere with identifications and quantitative calculations.
Amorphous minerals and minerals present in trace amounts may not be detected

Phase data pattern



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Analysis Results – G409293

General information

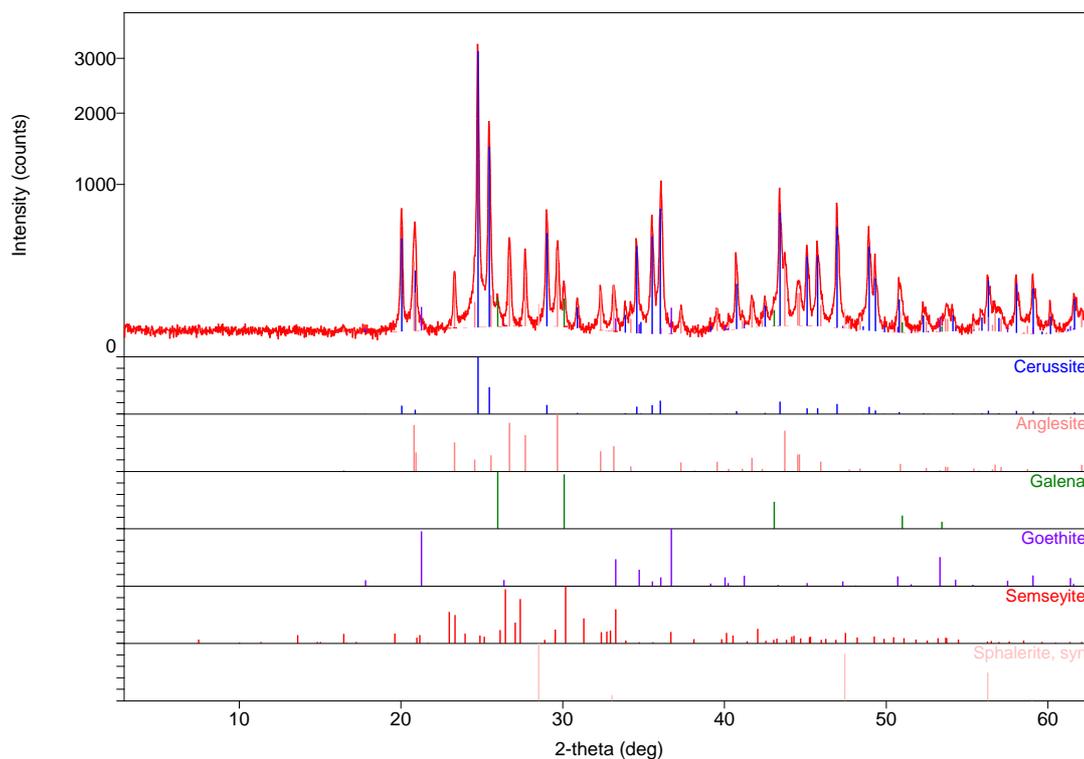
Analysis date 2019/08/23 XRD Rigaku Miniflex 600
Job Number LJN2019-060
Sample ID G409293 Operator: T.Coyte
Comment: Representative sample not possible without crushing whole sample. Clear Cerussite Crystals confirmed with selective sampling, Black powder on top of rock contained trace Sphalerite. Yellow mineral only contain Cerussite, Anglesite and Galena.

Analysis Results

Phase name	Formula
Cerussite	Pb(CO ₃)
Anglesite	Pb(SO ₄)
Galena	PbS
Goethite	FeO(OH)
Semseyite	Pb ₉ Sb ₈ S ₂₁
Sphalerite, syn	ZnS

Peak overlap may interfere with identifications and quantitative calculations.
Amorphous minerals and minerals present in trace amounts may not be detected.

Phase data pattern



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Appendix 2: Laboratory Report - pXRF analyses

Client: R. Bottrill

Sample Sources: Adelaide mine

MRT Job Number: LJN2019-060

Analysis: Approximate Chemistry

Method: Portable X-Ray Fluorescence

Results (ppm):

Note: Yellow highlights indicate high concentration

Sample ID	G409290	G409290
Date	14/5/19	14/5/19
Units	PPM	PPM
Mg Concentration	62413	102481
Mg Error1s	3724	2178
Al Concentration	50489	94514
Al Error1s	921	828
Si Concentration	12528	15529
Si Error1s	246	185
P Concentration	0	0
P Error1s	247	111
S Concentration	85942	86341
S Error1s	786	441
K Concentration	0	0
K Error1s	467	194
Ca Concentration	10745	0
Ca Error1s	127	177
Ti Concentration	2809	2835
Ti Error1s	226	143
V Concentration	302	334
V Error1s	30	21
Cr Concentration	3528	3235
Cr Error1s	111	80
Mn Concentration	5875	4280
Mn Error1s	133	85
Fe Concentration	63759	42922
Fe Error1s	634	279
Co Concentration	0	0
Co Error1s	18	13
Ni Concentration	647	852
Ni Error1s	26	22
Cu Concentration	949	1029
Cu Error1s	29	22
Zn Concentration	470	413
Zn Error1s	23	17
As Concentration	146217	190638

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Sample ID	G409290	G409290
Date	14/5/19	14/5/19
Units	PPM	PPM
As Error1s	1321	946
Se Concentration	500	628
Se Error1s	27	23
Rb Concentration	0	0
Rb Error1s	1	1
Sr Concentration	0	0
Sr Error1s	1	1
Y Concentration	0	0
Y Error1s	4	4
Zr Concentration	0	0
Zr Error1s	1	1
Nb Concentration	638	696
Nb Error1s	12	10
Mo Concentration	543	592
Mo Error1s	13	10
Ag Concentration	335	1350
Ag Error1s	46	45
Cd Concentration	2445	7367
Cd Error1s	71	83
Sn Concentration	1121	2752
Sn Error1s	82	74
Sb Concentration	65576	6912
Sb Error1s	654	113
W Concentration	177	135
W Error1s	53	43
Hg Concentration	0	0
Hg Error1s	13	12
Pb Concentration	256237	279510
Pb Error1s	2301	1384
Bi Concentration	0	0
Bi Error1s	10	9
Th Concentration	307	311
Th Error1s	25	19
U Concentration	0	0
U Error1s	3	2
LE Concentration	225449	154347
LE Error1s	6185	3521

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Sample ID	G409291	G409291	G409291	G409291	G409291	G409291 soft
Date	14/5/19	14/5/19	14/5/19	14/5/19	14/5/19	14/5/19
Units	PPM	PPM	PPM	PPM	PPM	PPM
Mg Concentration	0	0	0	0	0	0
Mg Error1s	2614	3023	2594	6198	6198	4898
Al Concentration	136595	128086	141565	42622	42622	19474
Al Error1s	798	800	810	678	678	385
Si Concentration	185548	164175	184817	41622	41622	17725
Si Error1s	713	695	710	390	390	190
P Concentration	0	0	0	0	0	0
P Error1s	53	62	54	132	132	110
S Concentration	595	3368	834	8610	8610	10232
S Error1s	24	36	25	79	79	83
K Concentration	48386	28285	49681	8988	8988	3070
K Error1s	182	124	186	80	80	35
Ca Concentration	0	0	0	0	0	74
Ca Error1s	160	192	161	258	258	13
Ti Concentration	6430	13154	7383	583	583	560
Ti Error1s	143	185	152	74	74	67
V Concentration	172	181	130	39	39	48
V Error1s	15	16	15	9	9	8
Cr Concentration	15869	24400	17771	1530	1530	1083
Cr Error1s	122	157	131	34	34	27
Mn Concentration	278	707	430	26591	26591	25023
Mn Error1s	41	50	44	216	216	203
Fe Concentration	7689	16796	6561	121919	121919	145133
Fe Error1s	62	103	58	854	854	1026
Co Concentration	0	0	0	0	0	0
Co Error1s	17	23	16	46	46	44
Ni Concentration	59	82	58	138	138	107
Ni Error1s	5	5	5	10	10	9
Cu Concentration	20	27	16	430	430	480
Cu Error1s	3	4	3	13	13	13
Zn Concentration	161	2123	155	1063	1063	1427
Zn Error1s	5	17	4	17	17	20
As Concentration	43	1080	23	2074	2074	2199
As Error1s	3	11	3	46	46	47
Se Concentration	0	4	0	0	0	0
Se Error1s	1	1	1	2	2	2
Rb Concentration	281	285	297	117	117	91
Rb Error1s	3	3	3	3	3	3
Sr Concentration	7	11	7	0	0	0

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Sample ID	G409291	G409291	G409291	G409291	G409291	G409291 soft
Date	14/5/19	14/5/19	14/5/19	14/5/19	14/5/19	14/5/19
Units	PPM	PPM	PPM	PPM	PPM	PPM
Sr Error1s	1	1	1	1	1	1
Y Concentration	4	0	6	0	0	0
Y Error1s	1	3	1	3	3	3
Zr Concentration	38	55	51	0	0	0
Zr Error1s	1	2	1	1	1	1
Nb Concentration	0	9	0	37	37	31
Nb Error1s	2	1	2	2	2	2
Mo Concentration	5	6	0	49	49	53
Mo Error1s	2	2	3	3	3	3
Ag Concentration	0	0	0	0	0	0
Ag Error1s	12	11	13	6	6	5
Cd Concentration	0	0	0	0	0	0
Cd Error1s	14	13	14	6	6	5
Sn Concentration	44	93	47	658	658	668
Sn Error1s	11	12	11	23	23	23
Sb Concentration	0	461	0	389	389	372
Sb Error1s	27	17	27	28	28	28
W Concentration	0	0	0	0	0	0
W Error1s	9	16	9	9	9	8
Hg Concentration	0	0	0	0	0	0
Hg Error1s	6	8	6	7	7	6
Pb Concentration	236	1831	244	26400	26400	28680
Pb Error1s	4	14	5	191	191	210
Bi Concentration	0	0	0	0	0	0
Bi Error1s	8	8	8	8	8	7
Th Concentration	13	0	0	0	0	0
Th Error1s	4	6	6	3	3	2
U Concentration	0	0	0	0	0	0
U Error1s	5	4	5	3	3	2
LE Concentration	597525	614781	589923	716140	716140	743470
LE Error1s	1393	1470	1409	2004	2004	1817

Mineral Resources Tasmania

Sample ID	G409292	G409292
Date	14/5/19	14/5/19
Units	PPM	PPM
Mg Concentration	0	0
Mg Error1s	45267	22789
Al Concentration	15566	15620
Al Error1s	663	570
Si Concentration	6390	7877
Si Error1s	192	182
P Concentration	0	0
P Error1s	926	488
S Concentration	5248	6933
S Error1s	83	86
K Concentration	0	0
K Error1s	1894	1004
Ca Concentration	1255	1234
Ca Error1s	30	26
Ti Concentration	0	0
Ti Error1s	1514	847
V Concentration	0	0
V Error1s	16	15
Cr Concentration	1249	1270
Cr Error1s	39	37
Mn Concentration	2374	8829
Mn Error1s	68	123
Fe Concentration	455055	439079
Fe Error1s	4608	3915
Co Concentration	0	0
Co Error1s	80	70
Ni Concentration	0	0
Ni Error1s	4	4
Cu Concentration	1858	1767
Cu Error1s	55	47
Zn Concentration	2012	2366
Zn Error1s	49	47
As Concentration	1567	1916
As Error1s	51	63
Se Concentration	0	0
Se Error1s	1	1
Rb Concentration	0	0
Rb Error1s	1	1
Sr Concentration	0	0
Sr Error1s	1	1
Y Concentration	0	0
Y Error1s	1	1
Zr Concentration	0	0
Zr Error1s	1	1
Nb Concentration	17	0
Nb Error1s	5	1
Mo Concentration	71	57
Mo Error1s	7	6
Ag Concentration	0	0
Ag Error1s	4	4

Mineral Resources Tasmania

Sample ID	G409292	G409292
Date	14/5/19	14/5/19
Units	PPM	PPM
Cd Concentration	0	0
Cd Error1s	5	4
Sn Concentration	120	107
Sn Error1s	40	34
Sb Concentration	1533	1260
Sb Error1s	61	52
W Concentration	0	0
W Error1s	7	6
Hg Concentration	0	0
Hg Error1s	4	4
Pb Concentration	5596	13447
Pb Error1s	85	147
Bi Concentration	0	0
Bi Error1s	4	4
Th Concentration	0	0
Th Error1s	2	2
U Concentration	0	0
U Error1s	2	2
LE Concentration	500089	498237
LE Error1s	5058	4469

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Sample ID	G409293						
Date	28/5/19	28/5/19	28/5/19	28/5/19	28/5/19	28/5/19	28/5/19
Units	PPM						
Mg Concentration	0	0	0	0	0	0	0
Mg Error1s	7358	7014	14632	11294	5763	3046	6351
Al Concentration	0	0	1695	0	15236	2158	2757
Al Error1s	1105	1068	518	1510	437	358	355
Si Concentration	14296	16860	11055	10842	21528	14463	17491
Si Error1s	202	208	243	246	203	202	191
P Concentration	391	342	0	0	345	130	476
P Error1s	55	52	340	269	44	41	45
S Concentration	251418	239089	152731	145241	215783	133516	225235
S Error1s	469	476	1296	1549	453	851	625
K Concentration	0	649	4518	0	0	0	3150
K Error1s	308	128	179	495	258	132	113
Ca Concentration	0	5857	11314	0	2405	0	818
Ca Error1s	239	103	163	360	79	117	79
Ti Concentration	5922	6893	6326	4674	6099	4052	6361
Ti Error1s	256	272	325	278	245	197	240
V Concentration	646	615	578	452	558	366	649
V Error1s	43	42	50	44	37	32	39
Cr Concentration	1233	945	828	1217	2133	1261	1041
Cr Error1s	89	80	93	98	93	78	76
Mn Concentration	3079	2333	4081	47713	15451	142270	3472
Mn Error1s	106	93	139	635	193	1002	101
Fe Concentration	14563	9250	18893	41983	59674	27717	13042
Fe Error1s	172	137	269	544	308	300	152
Co Concentration	0	0	0	0	0	0	0
Co Error1s	6	5	8	12	10	9	5
Ni Concentration	417	366	324	345	391	310	353
Ni Error1s	25	24	28	28	23	22	22
Cu Concentration	4051	6031	18550	2227	7496	971	5936
Cu Error1s	58	69	205	55	72	30	64
Zn Concentration	4027	11111	11232	1558	1133	1468	3445
Zn Error1s	52	81	132	44	31	34	45
As Concentration	32302	30454	27248	26012	23282	20946	29282
As Error1s	339	331	433	448	297	309	307
Se Concentration	291	279	190	212	215	103	354
Se Error1s	44	42	47	45	37	34	39
Rb Concentration	0	0	0	0	0	0	0
Rb Error1s	1	1	1	2	1	1	1
Sr Concentration	0	0	0	0	0	0	0
Sr Error1s	1	1	1	1	1	1	1
Y Concentration	0	0	0	0	0	0	0
Y Error1s	4	4	5	5	4	4	4

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Sample ID	G409293						
Date	28/5/19	28/5/19	28/5/19	28/5/19	28/5/19	28/5/19	28/5/19
Units	PPM						
Zr Concentration	0	0	0	0	0	0	0
Zr Error1s	1	1	1	1	1	1	1
Nb Concentration	2783	2749	2363	2272	2524	2037	2668
Nb Error1s	19	18	28	31	16	20	17
Mo Concentration	1563	1525	1326	1253	1369	1120	1460
Mo Error1s	18	17	23	24	15	15	15
Ag Concentration	959	2879	21039	1461	1934	0	13285
Ag Error1s	76	81	243	83	65	2	118
Cd Concentration	7316	7747	3886	3635	8233	5165	8986
Cd Error1s	120	116	121	114	104	92	115
Sn Concentration	7007	7524	8224	4175	7850	4969	9623
Sn Error1s	146	146	193	144	129	110	151
Sb Concentration	2912	8588	14990	2620	3814	1492	4274
Sb Error1s	147	177	274	156	130	105	141
W Concentration	347	0	0	399	394	334	380
W Error1s	78	12	14	79	62	61	69
Hg Concentration	0	0	0	0	0	0	0
Hg Error1s	10	10	12	12	9	9	9
Pb Concentration	620017	608978	553892	534061	565782	484910	589617
Pb Error1s	941	1018	4601	5621	1046	3021	1524
Bi Concentration	0	0	0	0	0	0	0
Bi Error1s	11	11	13	13	10	10	10
Th Concentration	957	879	821	766	795	721	864
Th Error1s	37	34	44	43	29	32	31
U Concentration	0	0	0	0	0	0	0
U Error1s	2	2	3	3	2	2	2
LE Concentration	23502	28056	123896	166885	35576	149520	54983
LE Error1s	1249	1413	7208	8726	1535	5226	2307

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Appendix 3: Laboratory Report –SEM analytical conditions

Hitachi SU-70 analytical field emission SEM

- Installed February 2011
- Schottky thermal field emission source
- ultra-high resolution (1.0 nm @ 15kV, 1.6 nm @ 1kV for SE imaging)
- high vacuum operation only (i.e. no variable pressure in chamber)
- Hitachi in-chamber and in-lens scintillation detectors, Super ExB filter, beam deceleration
- Hitachi in-chamber 5-segment solid state BSE detector, retractable
- in-column Faraday cup with picoammeter for beam current measurement
- anticontamination cold plate, liquid nitrogen cooled
- 5 axis motorised fully eucentric stage, XYZ range 110x110x40mm
- Oxford AZtec EDS/EBSD system with
 - X-Max 80 SDD EDS, MnKa 125 eV resolution, elements B-U, large area hyperspectral mapping, standardless and standards-based quantification, feature analysis
 - HKL NordlysNano EBSD camera & foreshatter detector system, HKL & Channel 5 software packages, Synergy EDS/EBSD integration, HKL, ICSD & American Mineralogist phase databases
- NEW June 2017: Gatan ChromaCL2 colour cathodoluminescence imaging system with integrated BSE detector, Digital Micrograph 3 software, automated mosaic acquisition, simultaneous acquisition of SE, iBSE and colour CL images.

Label:	am 179
Element List Type:	Current Spectrum
Processing Option:	All Elements
Specimen Coating:	On
Beam Calibration Element Coating:	Off
Coating Element:	Carbon
Coating Thickness:	20 nm
Coating Density:	2.25 g/cm ³
Automatic Line Selection:	Disabled
Normalization:	Enabled
Thresholding:	Sigma level = 1
Detector Window Correction:	Enabled
Deconvolution Elements:	None
Selected Standards:	Minerals_15kV_2017-10-20 [User]
Pulse Pile Up Correction:	Succeeded
Detector file:	X-Max 3
Efficiency:	File based

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Appendix 4: Laboratory Report - EDS analyses

Client: A Wright

Sample Sources: Adelaide mine, Dundas

MRT Job Number: LJN2015-148

Analysis: Mineral chemistry

Method: SEM/EDS

Analyst: R. Bottrill

Date:

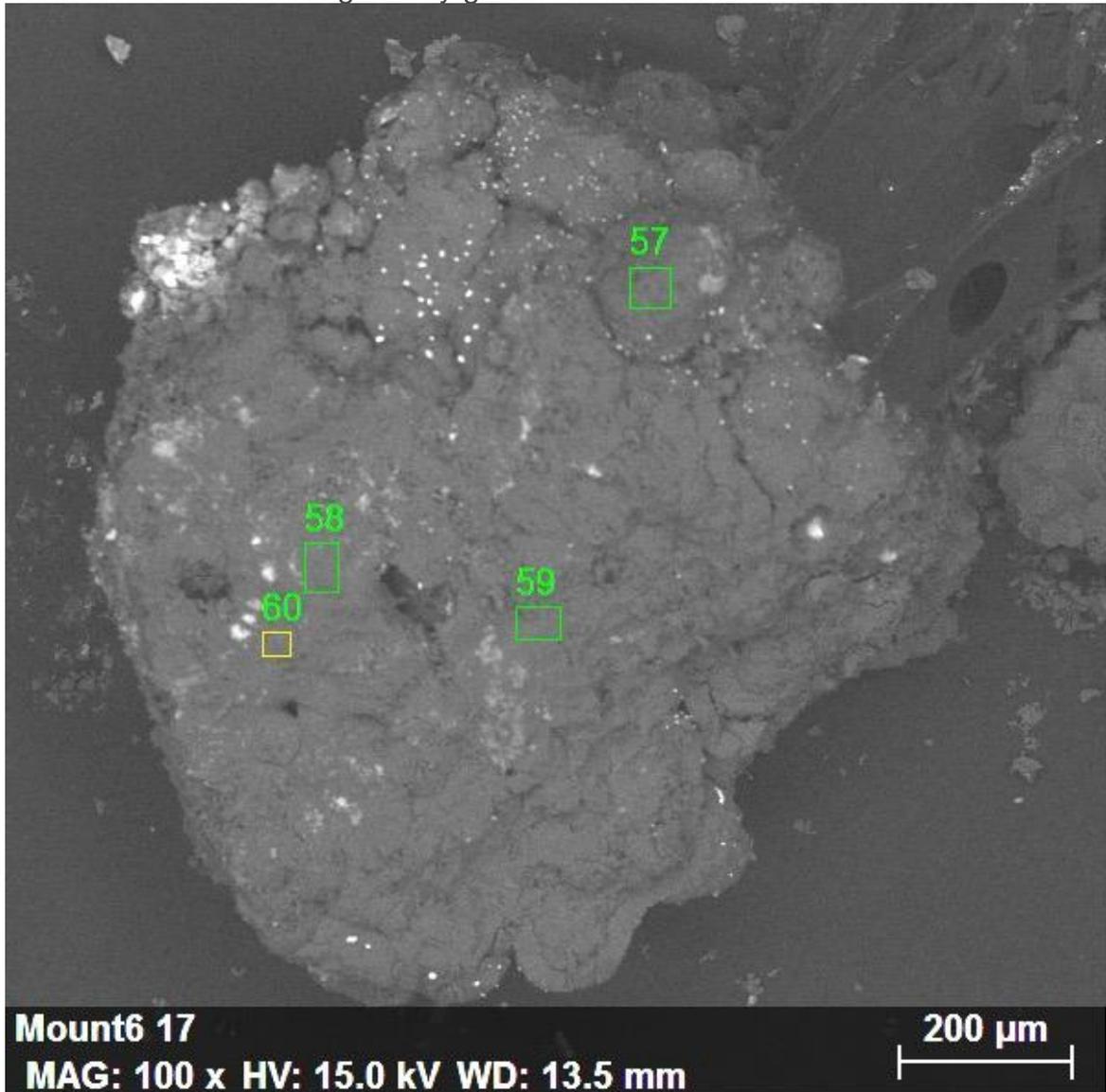
Table- SEM/EDS analyses, Results (at.%): Sample G407927

Label	O	Al	Si	P	S	Cr	Mn	Fe	Ag	Sn	Sb	Pb	Total
Gibb- 528	73.3	25.57			0.1	0.64		0.25			0.06	0.08	100
Gibb- 529	74.88	24.1				0.8					0.08	0.14	100
Gibb- 530	72.04	15.24				10.89						1.84	100
Gibb- 531	79.01	20.54				0.41					0.05		100
Gibb- 532	77.2	22.15				0.45		0.16			0.04		100
Gibb- 533	70.3	29.34	0.17			0.2							100
Gibb- 534	79.55	20.08				0.33					0.03		100
Gibb- 535	76.19	22.55				0.62	0.06	0.49			0.08		100
Gibb- 536	76.08	22.24				0.47			0.42	0.13	0.4	0.27	100
Gibb- 537	66.55	33.23			0.22								100
Gibb- 538	73.64	21.52			1.39	0.36			2.69		0.18	0.22	100
Gibb- 539	75.94	17.32	0.14		1.93	0.38			3.51	0.08	0.38	0.32	100
Gibb- 540	79.47	17.55	0.14		0.78	0.22			1.26	0.14	0.25	0.21	100
Gibb- 541	74.47	25.46				0.07							100
Gibb- 542	78.17	21.83											100
Gibb- 543	76.3	21.84	0.22			0.07				0.2	0.79	0.58	100
Gibb- 544	77.78	21.14	0.15							0.1	0.47	0.37	100
Gibb- 545	70.61	23.95	0.31	0.13		1.07				0.23	2.4	1.3	100
Gibb- 546	75.6	17.32			2.02	0.44			4.13		0.16	0.33	100

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Image: Grey gibbsite

G407942



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Table - SEM/EDS analyses, Gibbsite. G407942
Date:2017-09-06,HV:15.0kV

57						
EI	AN	Series	unn. C	norm. C	Atom. C	Error (1 Sigma)
			[wt.%]	[wt.%]	[at.%]	[wt.%]
O	8	K-series	40.11	55.62	68.16	4.68
Al	13	K-series	31.47	43.65	31.71	1.49
Pb	82	M-series	0.36	0.5	0.05	0.05
Fe	26	K-series	0.17	0.23	0.08	0.04
58						
O	8	K-series	41.96	57.17	69.74	4.86
Al	13	K-series	30.24	41.2	29.8	1.43
Fe	26	K-series	0.89	1.21	0.42	0.07
Pb	82	M-series	0.3	0.42	0.04	0.05
59						
EI	AN	Series	unn. C	norm. C	Atom. C	Error (1 Sigma)
			[wt.%]	[wt.%]	[at.%]	[wt.%]
O	8	K-series	34.94	57.76	70.06	4.05
Al	13	K-series	24.99	41.31	29.71	1.19
Fe	26	K-series	0.33	0.54	0.19	0.05
Pb	82	M-series	0.24	0.39	0.04	0.04
60						
EI	AN	Series	unn. C	norm. C	Atom. C	Error (1 Sigma)
			[wt.%]	[wt.%]	[at.%]	[wt.%]
O	8	K-series	34.69	56.91	69.18	4.03
Al	13	K-series	26.04	42.72	30.79	1.23
Pb	82	M-series	0.23	0.38	0.04	0.04

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Table 3: EDS analyses, RSB-2019-08-07/G409290-Adelaide
At.%, normalised to 100%

Acanthite

Spectrum Label	O	Si	S	Mn	Fe	Cu	Zn	As	Ag	Sn	Sb	Pb	Total	Project Path
Spectrum 173	33.2	0.0	17.7		0.3	0.0	0.9		47.2			0.7	100	Site 4
Spectrum 159	7.4	0.0	26.5		0.0	0.0	0.0		65.3			0.8	100	Site 3
Spectrum 164	28.9	0.0	15.6		0.0	0.7	0.0		53.9			0.8	100	Site 3
Spectrum 170	47.6	0.4	17.3		0.4	0.0	0.0		33.3			1.0	100	Site 4
Spectrum 181	33.8	0.5	22.0		0.5	0.0	0.0		41.8			1.4	100	Site 4
Spectrum 146	37.1	0.0	11.2	0.3	0.4	0.0	0.0		49.1			1.8	100	Site 3
Spectrum 172	25.2	0.7	25.3		0.7	0.8	0.0		45.4			2.0	100	Site 4
Spectrum 148	12.6	0.0	25.5		0.0	0.6	0.0		61.3			0.0	100	Site 3

Bindheimite + Limonite

Spectrum Label	O	Al	Si	S	Cr	Mn	Fe	Cu	Zn	As	Ag	Sn	Sb	Pb	Total	Project Path
Spectrum 191	71.6	0.8	1.7	0.3			16.4			0.2	0.0	0.2	3.8	5.1	100	Site 7
Spectrum 194	73.4	0.6	1.4	0.0			12.5			0.0	0.0	0.6	6.0	5.5	100	Site 7
Spectrum 193-cer	73.1	0.7	1.4	0.5			12.4			0.0	0.0	2.3	3.9	5.6	100	Site 7
Spectrum 195	72.1	0.7	1.6	0.0	0.0		13.6	0.3	0.0	0.2	0.0	0.3	5.5	5.6	100	Site 7
Spectrum 188	71.1	0.6	1.5	0.0			12.5			0.2	0.0	0.6	6.9	6.6	100	Site 7

Bindheimite

Spectrum Label	O	Al	Si	S	Cr	Mn	Fe	Cu	Zn	As	Ag	Sn	Sb	Pb	Total	Project Path
Spectrum 187	88.3	0.0	0.0	0.0			1.1			0.0	0.0	0.0	4.0	6.6	100	Site 5
Spectrum 142	71.4	0.0	0.8	0.0			2.6			0.0	1.5	1.7	12.3	9.7	100	Site 2
Spectrum 190	72.2	0.0	0.7	0.0			2.9			0.0	0.3	0.0	10.6	13.4	100	Site 7
Spectrum 192	67.5	0.0	1.0	0.0			2.7			0.0	0.0	0.0	14.3	14.6	100	Site 7
Spectrum 177	76.3	0.0	0.0	0.0			1.4			0.0	1.2	0.0	4.4	16.6	100	Site 4

Cerussite

Spectrum Label	O	S	Cr	Mn	Fe	Cu	Zn	As	Ag	Sb	Pb	Total	Project Path
Spectrum 198	80.2	0.0			0.0				0.0	0.0	19.8	100	Site 8
Spectrum 185	75.4	0.0			0.5				0.0	0.0	24.1	100	Site 5
Spectrum 186	75.9	0.0			0.0				0.0	0.0	24.1	100	Site 5
Spectrum 167	74.2	0.0			0.0				1.0	0.0	24.9	100	Site 4
Spectrum 182-	72.4	0.0			0.0				1.5	0.8	25.3	100	Site 5
Spectrum 138	73.8	0.0			0.0				0.0	0.0	26.2	100	Site 2
Spectrum 197-	72.5	0.0			0.0				0.0	0.0	27.5	100	Site 8
Spectrum 184	69.6	0.0			0.0				0.0	0.0	30.4	100	Site 5
Spectrum 161	68.7	0.0			0.8				0.0	0.0	30.5	100	Site 3
Spectrum 183	65.4	0.0			0.0				0.0	0.0	34.6	100	Site 5
Spectrum 199	63.7	0.0			0.0				0.0	0.0	36.3	100	Site 8
Spectrum 200	61.0	0.0			0.0				0.0	0.0	39.0	100	Site 8
Spectrum 196	58.3	0.0			0.0				0.0	0.0	41.7	100	Site 8

Anglesite

Spectrum Label	O	Al	Si	S	Cr	Mn	Fe	Cu	Zn	Ag	Sb	Pb	Total
Spectrum 140	62.2			18.4		0.0	0.0	0.0	0.0	0.0	0.0	19.5	100
Spectrum 139	56.5	0.4	1.0	17.4		0.0	1.8	0.0	0.0	0.0	1.1	21.8	100

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Chalcocite

Spectrum Label	O	S	Cr	Mn	Fe	Cu	Zn	As	Ag	Sn	Sb	Pb	Total
Spectrum 155	11.9	46.5		0.0	0.3	39.6	0.0		1.7		0.0	0.0	100
Spectrum 150	10.5	46.2		0.0	0.0	39.9	0.0		2.7		0.0	0.7	100
Spectrum 154	31.3	31.9		0.0	0.9	28.2	0.0		1.3		3.3	3.2	100

Limonite

Spectrum Label	O	S	Cr	Mn	Fe	Cu	Zn	As	Ag	Sn	Sb	Pb	Total
Spectrum 151	74.9	0.5		0.3	21.7		0.4		0.2		0.2	0.5	100
Spectrum 158	67.0	0.5		0.3	29.3		0.5		0.1		0.3	0.7	100
Spectrum 143	70.6	0.5		0.4	23.9		0.5	0.1	0.0		0.1	0.8	100

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EDS analyses, RSB-2019-08-07/G409290-Adelaide

At.%, normalised to 100%

Philipsbornite

Spectrum Label	O	Al	Si	S	Cr	Mn	Fe	As	Sb	Pb	Total	Project Path
Spectrum 89	65.0	15.6		1.0	0.5	0.3	1.1	9.2	0.0	7.5	100	Site 4
Spectrum 130	72.7	9.9	0.3	0.7	0.4		4.1	6.7	1.1	4.1	100	Site 11
Spectrum 136	73.4	10.1	0.4	0.6	0.3		4.8	5.9	1.1	3.5	100	Site 11
Spectrum 128	74.1	8.7	0.4	0.5	0.4		5.8	5.3	1.6	3.3	100	Site 11
Spectrum 135	65.6	12.7	0.5	0.8	0.4		6.4	7.4	1.6	4.6	100	Site 11
Spectrum 115	73.7	8.1		0.8	0.3		5.3	6.8	1.1	4.0	100	Site 8
Spectrum 129	75.9	8.2		0.7	0.2		4.2	6.5	0.7	3.6	100	Site 11
Spectrum 122	75.9	10.7		0.6	0.3		1.9	6.6	0.3	3.6	100	Site 8
Spectrum 120	52.1	11.2		1.4	1.6		15.0	6.8	2.5	9.5	100	Site 8
Spectrum 111	71.4	13.1		1.1	0.2		1.0	8.0	0.0	5.1	100	Site 8
Spectrum 93	73.3	13.4		0.6	0.2		0.2	7.6	0.0	4.7	100	Site 5
Spectrum 91	70.3	14.5		1.1	0.3		0.2	8.1	0.0	5.5	100	Site 5
Spectrum 92	70.1	14.8		0.9	0.3		0.2	8.4	0.0	5.5	100	Site 5
Spectrum 90	64.7	16.8		1.1	0.4		0.2	9.8	0.0	7.0	100	Site 5
Spectrum 113	64.3	17.1		1.2	0.3		0.0	9.6	0.0	7.5	100	Site 8
Spectrum 84	57.6	17.6		1.4	0.7		2.1	10.6	0.0	9.9	100	Site 4

"Bindheimite"+

Spectrum Label	O	Al	Si	S	K	Cr	Mn	Fe	As	Sb	Pb	Total	Project Path
Spectrum 116	36.3	4.2	0.7	0.8		1.4		43.4	2.2	5.5	5.4	100	Site 8
Spectrum 134	72.7	2.7	0.9	0.0		0.4		15.4	2.0	4.2	1.8	100	Site 11
Spectrum 137	70.1	3.3	1.0	0.3		0.5		16.8	2.2	4.0	2.0	100	Site 11
Spectrum 133	71.1	2.8	1.2	0.0		0.4		16.8	1.9	4.1	1.8	100	Site 11
Spectrum 117	39.7	2.3	1.2	0.0		1.0		43.2	1.4	8.6	2.5	100	Site 8
Spectrum 132	70.1	3.3	1.6	0.3		0.4		16.2	2.1	4.2	1.9	100	Site 11
Spectrum 126	66.4	4.5	1.9	0.3		0.5		16.5	3.2	4.8	2.0	100	Site 11

Fe-Mn oxides

Spectrum Label	O	Al	Si	S	Cr	Mn	Fe	Zn	As	Sb	Pb	Total	Project Path
Spectrum 77	61.1	2.8	1.3	0.3	0.0	7.3	25.4	0.0	0.0	0.0	1.8	100	Site 4
Spectrum 78	67.2	2.7	0.7	0.0	0.0	9.4	17.4	0.0	0.0	0.0	2.6	100	Site 4
Spectrum 87	39.5	5.7	1.7	0.0	0.0	10.3	40.1	0.7	0.0	0.0	2.0	100	Site 4
Spectrum 61	71.5	2.0	0.6	0.0	0.0	11.5	10.7	0.0	0.2	0.0	3.5	100	Site 3
Spectrum 82	65.3	2.2	1.2	0.0	0.0	13.0	14.6	0.0	0.1	0.0	3.6	100	Site 4
Spectrum 85	64.1	3.3	2.1	0.0	0.0	13.3	13.6	0.0	0.2	0.0	3.4	100	Site 4
Spectrum 73	63.5	1.9	0.7	0.0	0.0	14.4	15.6	0.0	0.0	0.0	3.9	100	Site 4
Spectrum 70	59.8	2.4	0.5	0.0	0.0	16.1	17.0	0.0	0.1	0.0	4.1	100	Site 4
Spectrum 72	46.8	2.6	0.7	0.0	0.0	18.9	26.5	0.0	0.0	0.2	4.3	100	Site 4
Spectrum 71	33.9	2.2	0.5	0.0	0.0	22.3	37.8	0.0	0.0	0.0	3.4	100	Site 4
Spectrum 74	37.8	2.2	0.8	0.0	0.0	22.9	31.9	0.0	0.0	0.2	4.2	100	Site 4
Spectrum 86	23.0	1.6	0.7	0.0	0.0	24.1	47.5	0.0	0.0	0.0	3.1	100	Site 4
Spectrum 75	33.6	2.1	0.7	0.0	0.0	27.5	31.0	0.0	0.0	0.2	4.9	100	Site 4

Mineral Resources Tasmania

Limonite

Spectrum Label	O	Al	Si	S	K	Cr	Mn	Fe	Zn	As	Sb	Pb	Total	Project Path
Spectrum 67	2.7	0.7	0.6	0.0	0.0	0.0	0.5	93.6	1.7	0.0	0.0	0.3	100	Site 3
Spectrum 109	17.6	0.9	0.8	0.0	0.0	0.0	0.7	78.5	1.3	0.0	0.0	0.2	100	Site 7
Spectrum 65	56.4	1.1	1.6	0.0	0.0	0.0	0.9	38.8	0.8	0.0	0.0	0.5	100	Site 3
Spectrum 99	63.8	3.7	1.4	0.2	0.0	0.0	1.2	28.4	0.3	0.6	0.0	0.5	100	Site 7
Spectrum 60	41.5	1.5	1.5	0.0	0.0	0.2	1.5	52.4	0.8	0.0	0.0	0.6	100	Site 3
Spectrum 64	4.2	0.5	0.2	0.0	0.0	0.0	1.7	93.2	0.0	0.0	0.0	0.2	100	Site 3
Spectrum 83	62.7	2.4	1.1	0.0	0.0	0.0	1.8	31.5	0.0	0.0	0.0	0.6	100	Site 4
Spectrum 97	67.8	3.5	1.7	0.0	0.0	0.0	1.8	24.3	0.0	0.4	0.0	0.6	100	Site 7
Spectrum 68	68.1	2.9	1.6	0.2	0.0	0.0	2.2	24.2	0.0	0.2	0.0	0.6	100	Site 3
Spectrum 100	57.6	3.0	1.5	0.0	0.0	0.0	2.3	35.4	0.0	0.0	0.0	0.3	100	Site 7
Spectrum 80	55.7	2.1	1.4	0.4	0.0	0.0	2.4	37.2	0.0	0.1	0.0	0.8	100	Site 4
Spectrum 105	48.9	1.2	1.5	0.0	0.0	0.3	2.6	44.4	0.0	0.0	0.2	0.9	100	Site 7
Spectrum 88	67.3	2.4	1.6	0.3	0.0	0.1	3.6	23.6	0.0	0.0	0.1	1.1	100	Site 4
Spectrum 76	61.4	2.6	1.1	0.3	0.0	0.1	4.8	28.3	0.0	0.0	0.0	1.4	100	Site 4
Spectrum 62	72.8	4.0	2.8	0.0	0.1	0.0	5.6	12.5	0.0	0.3	0.0	1.8	100	Site 3
Spectrum 79	67.6	3.9	1.1	0.2	0.0	0.1	5.9	19.6	0.0	0.1	0.0	1.5	100	Site 4
Spectrum 63	39.7	2.3	1.2	0.4	0.0	0.0	6.0	48.6	0.5	0.2	0.0	1.3	100	Site 3
Spectrum 66	69.2	2.5	1.3	0.0	0.0	0.0	6.5	18.6	0.0	0.2	0.0	1.8	100	Site 3
Spectrum 102	6.9	0.4	0.6	0.3	0.0	0.0	0.0	90.3	1.4	0.0	0.0	0.2	100	Site 7

Halloysite

Spectrum Label	Al	Si	K	Cr	Mn	Fe	Zn	As	Pb	Total
Spectrum 95	11.0	11.5	1.0	0.1	0.1	2.9	0.0	0.0	0.1	100
Spectrum 81	8.2	10.3	1.8	0.2	0.0	15.1	0.3	0.1	0.1	100
Spectrum 110	12.8	14.0	1.1	0.1	0.0	0.2	0.0	0.0	0.0	100
Spectrum 106	14.2	15.3	1.1	0.1	0.0	0.2	0.0	0.0	0.0	100