

# Mineral Resources Tasmania

## Laboratory Report

LJN2018-147.9

## MINERALOGICAL ANALYSES

### SHEPHARD & MURPHY MINE



An unpublished Mineral Resources Tasmania Report for:

**M Latham**

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## SUMMARY

*This sample contains brown bismutite, with quartz and minor waylandite.*

## INTRODUCTION

One mineral sample was collected and submitted for mineralogical identification. Details are shown in Table 1. As it appeared to contain unusual minerals it was selected for a detailed mineralogical study by SEM-EDS (Scanning electron microscopy- Energy dispersive X-ray spectroscopy).

**Table 1: Sample Details**

Reg. No	Location	Description
G409152	Shephard & Murphy Mine	Bismutite

## SAMPLE DESCRIPTIONS

Under the stereomicroscope the sample contains coarsely crystalline milky white quartz veins with very fine grained pale brown bismutite (Fig. 1).



*Fig. 1: Sample G409152, showing brown bismutite on white quartz. FOV: about 60 mm.*

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Fig. 2 BSE Image, Sample G409152, showing balls of waylandite on bismutite. FOV: about 0.5 mm.

## SEM/EDAX ANALYSES

The sample was analysed by SEM-EDS, with analytical conditions shown in Appendix 1, and results given in Appendix 2 and shown in Fig. 2.

Analyses of the amorphous creamy mineral with quartz showed it to be mostly Bi with O and C, consistent with bismutite. There are small botryoids to about 20 microns on its surface that have a composition about:  $(\text{Bi}_{0.8}, \text{Ba}_{0.1}, \text{Pb}_{0.1}, \text{Ca}_{0.2}) (\text{Al}_3 \text{Fe}_{0.1}) (\text{PO}_4)_2$ . This is consistent with waylandite:  $\text{BiAl}_3(\text{PO}_4)_2(\text{OH})_6$ , not reported in Tasmania to date.

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**MINERALOGIST/PETROLOGIST**

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## Appendix 1: 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 & forescatter 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 <sup>3</sup>
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 2: Laboratory Report –SEM Analyses (relative atomic proportions based on cation totals)

Project Path	Spectrum Label	Al	Si	P	Cl	Ca	Fe	Ba	Pb	Bi	
2018-12-20/G409152 S&M/Site 3	Spectrum 288	3.0	0.2	1.7	0.1	0.2	0.0	0.0	0.1	0.8	waylandite
2018-12-20/G409152 S&M/Site 3	Spectrum 289	2.9	1.2	1.8	0.0	0.2	0.1	0.1	0.1	0.8	waylandite
2018-12-20/G409152 S&M/Site 3	Spectrum 290	3.0	0.6	1.8	0.1	0.2	0.1	0.1	0.1	0.8	waylandite
2018-12-20/G409152 S&M/Site 3	Spectrum 291	3.1	0.2	1.7	0.0	0.2	0.1	0.0	0.1	0.7	waylandite
2018-12-20/G409152 S&M/Site 4	Spectrum 292	1.3	1.0	0.0	0.0	0.0	0.2	0.0	0.0	3.5	?mix
2018-12-20/G409152 S&M/Site 4	Spectrum 293	0.9	0.7	0.0	0.0	0.0	0.2	0.0	0.0	4.2	?mix
2018-12-20/G409152 S&M/Site 4	Spectrum 294	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	bismutite
2018-12-20/G409152 S&M/Site 4	Spectrum 295	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	bismutite