

# Cleveland Mine Historical Drill Core Evaluation

## Mineralogical Investigation

Dr Will Goodall and Mr Alastair Cropp

MinAssist Pty Ltd

[enquiries@minassist.com.au](mailto:enquiries@minassist.com.au)

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Client: Rockwell Minerals Ltd





# Battery Lens

Battery material not expected to present metallurgical problems. Relatively simple bulk mineralogy and coarse mean cassiterite grain size. All Sn as cassiterite, with no stannite found.

Fluorite and clay components may require consideration in flotation.

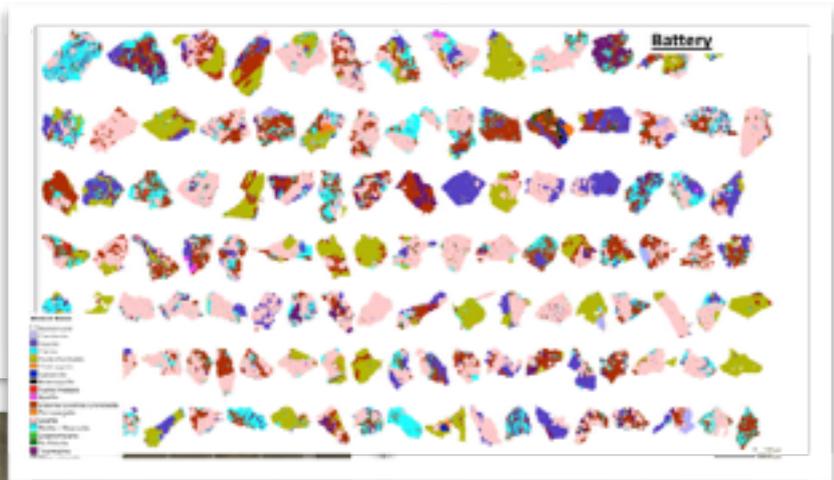
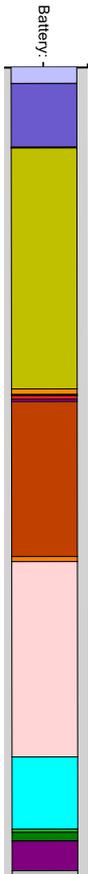


Figure 3. QEMSCAN particle images (CL1775)

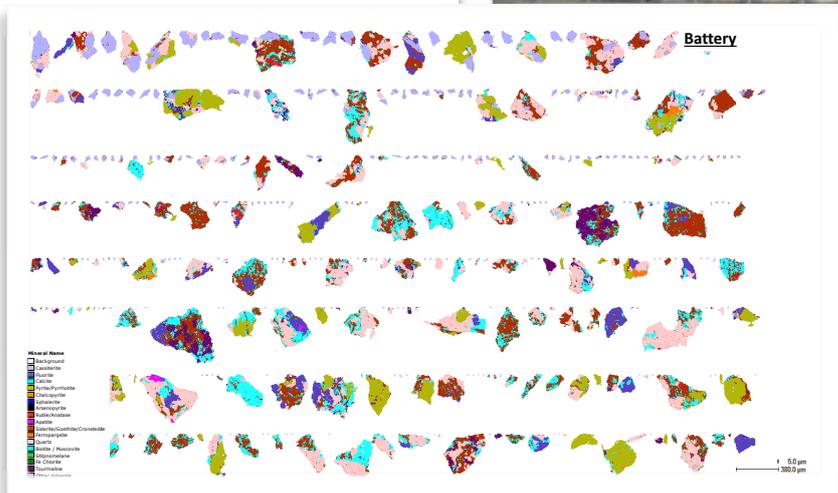
Table 1. Mineral mass by

Mineral	Mass%
Cassiterite	2%
Pyrite/pyrrhotite	30%
Quartz	24%
Siderite/goethite	19%
Biotite/muscovite	9%
Fluorite	8%
Tourmaline	4%



- Minerals
- Cassiterite
  - Fluorite
  - Calcite
  - Pyrite/Pyrrhotite
  - Chalcocopyrite
  - Sphalerite
  - Arsenopyrite
  - Rutile/Anatase
  - Apatite
  - Siderite/Goethite/Cronstedite
  - Ferropargasite
  - Quartz
  - Biotite / Muscovite
  - Stipnomelane
  - Fe Chlorite
  - Tourmaline
  - Other minerals

Intersection: CL1775 102.8 - 103.8m  
 1.22% Sn and 0.2% Cu (XRF)



Mean cassiterite grain size: **36.5µm**

Major mineral associations identified as Biotite/muscovite, quartz, siderite/goethite/cronstedite and pyrite/pyrrhotite.

**Grain size with recoverable range for both flotation and gravity concentration**

Figure 5. QEMSCAN particle images -



Hall's Lode A material not expected to present metallurgical difficulties. Relatively simple bulk mineralogy and coarse mean cassiterite grain size. All Sn as cassiterite, with no stannite found.

Higher proportion of sulphide minerals will present greater load for the sulphide flotation circuit. Clay component may require additional monitoring in flotation reagent selection and operating conditions

# Hall's Lode A

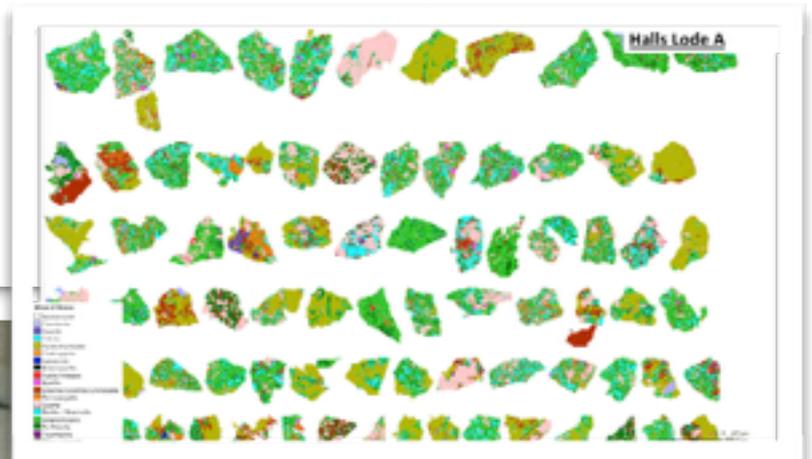


Figure 6. QEMSCAN particle images (CL1392)

- Minerals
- Cassiterite
  - Fluorite
  - Calcite
  - Pyrite/Pyrrhotite
  - Chalcopyrite
  - Sphalerite
  - Arsenopyrite
  - Rutile/Anatase
  - Apatite
  - Siderite/Goethite/Cronstedite
  - Ferropargasite
  - Quartz
  - Biotite / Muscovite
  - Stilpnomelane
  - Fe Chlorite
  - Tourmaline
  - Other minerals

Intersection: C1392 34.93 - 35.97m

1.84% Sn and 0.84% Cu (XRF)

Table 2. Mineral mass by

Mineral	Mass%
Cassiterite	3.5%
Pyrite/pyrrhotite	33%
Quartz	12%
Stilpnomelane	20%
Siderite/goethite	7%
Biotite/muscovite	7%
Fluorite	0.4%
Tourmaline	0%
Chlorite	8%

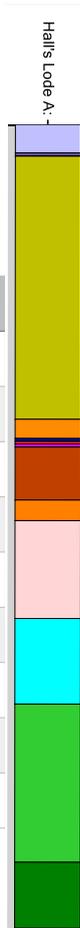


Figure 7. Mineral mass distribution (CL1392)

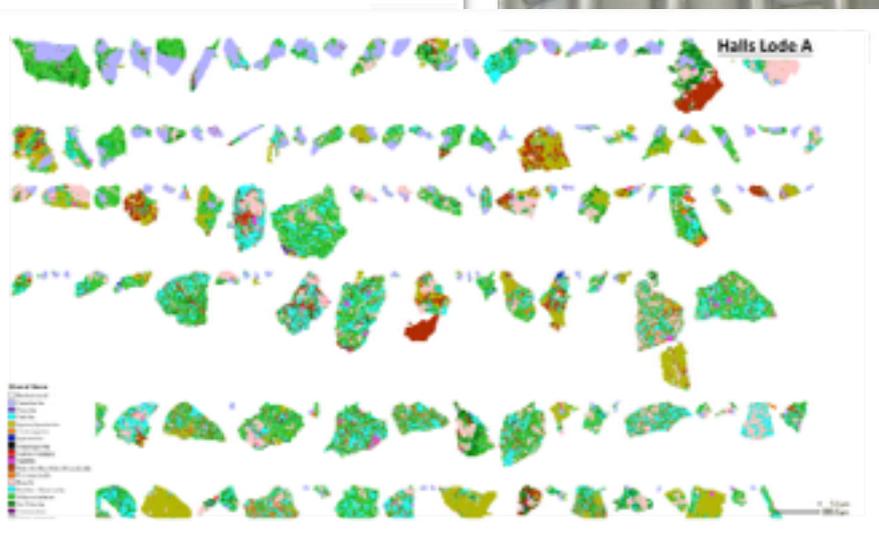


Figure 8. QEMSCAN particle images - cassiterite bearing particles (CL1392)

Mean cassiterite grain size: **23.8µm**

Major mineral associations identified as Biotite/muscovite, Fe chlorite and Stilpnomelane

**Grain size with recoverable range for both flotation and gravity concentration**

Hall's Lode B requires further investigation on additional fresh representative samples.

The association of cassiterite with phyllosilicates (stilpnomelane) and amphiboles (ferrospargsite), along with minor fluorite may require optimisation of flowsheet and operating conditions for this lode

## Hall's Lode B

Table 3. Mineral mass by

Mineral	Mass%
Cassiterite	0.9%
Pyrite/pyrrhotite	8%
Quartz	15%
Stilpnomelane	17%
Siderite/goethite	1%
Biotite/muscovite	2%
Fluorite	5%
Ferrospargsite	38%
Fe Chlorite	11%

Figure 10. Mineral mass distribution (CL2011)

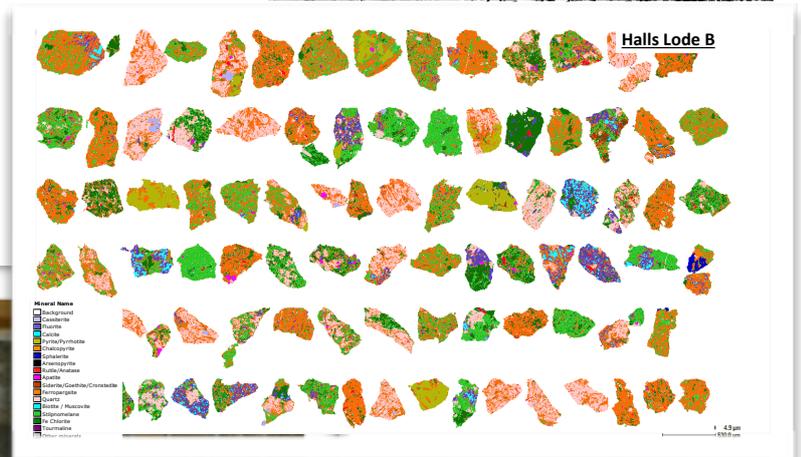


Figure 9. QEMSCAN particle images (CL2011)



Intersection: CL2011 17.7 - 18.9m

0.62% Sn and 0.1% Cu (XRF)

Mean cassiterite grain size: **30.1µm**

Major mineral associations identified as Fe chlorite, stilpnomelane, ferrospargsite and quartz.

**Grain size with recoverable range for both flotation and gravity concentration**

Figure 11. QEMSCAN particle images - cassiterite bearing particles (CL2011)



Hall's Lode C requires further investigation on additional fresh representative samples. Relatively simple bulk mineralogy. All Sn as cassiterite, with no stannite found.

Finer cassiterite grain size and high proportion of clay minerals will need consideration during process development

# Hall's Lode C

Table 4. Mineral mass by QEMSCAN

Mineral	Mass%
Cassiterite	0.4%
Pyrite/pyrrhotite	0.5%
Quartz	45%
Stilpnomelane	0%
Siderite/goethite	0%
Biotite/muscovite	24%
Fluorite	1.8%
Ferrospargsite	4%
Fe Chlorite	19%

Figure 13. Mineral mass distribution (CL254)

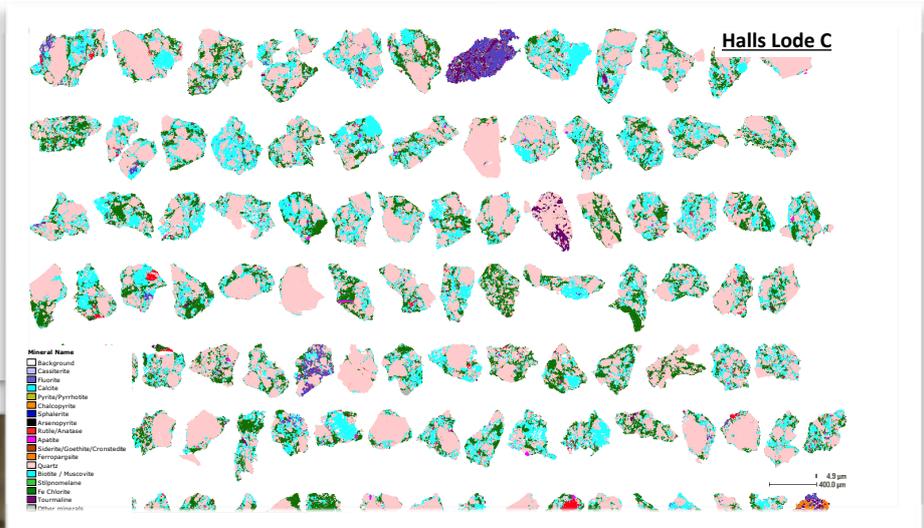


Figure 12. QEMSCAN particle images (CL254)



Intersection: CL254 406.5 - 407.3m

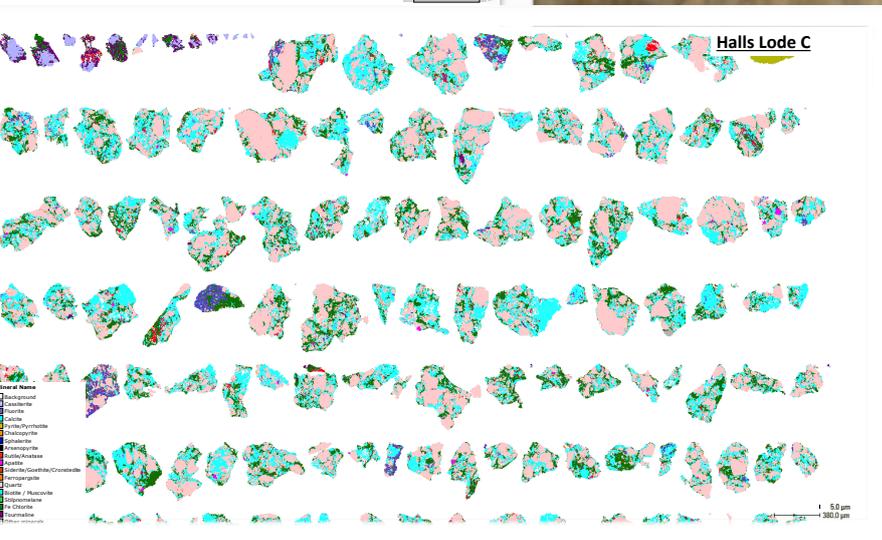
0.23% Sn and 0.23% Cu (XRF)

Mean cassiterite grain size: 13.1 μm

Major mineral associations identified as Biotite/muscovite, quartz and Fe chlorite.

Grain size with recoverable range for flotation.

Figure 14. QEMSCAN particle images - cassiterite bearing particles (CL254)



Khaki Lode requires further investigation on additional fresh representative samples. Relatively simple bulk mineralogy and coarse mean cassiterite grain size. All Sn as cassiterite, with no stannite found.

Mineralogy does not appear complex, however, association with siderite, fluorite and clay may require optimisation of flowsheet and operating conditions for this lode

# Khaki

Table 5. Mineral mass by

Mineral	Mass%
Cassiterite	2.1%
Pyrite/pyrrhotite	23%
Quartz	28%
Stilpnomelane	1%
Siderite/goethite	17%
Biotite/muscovite	8%
Fluorite	8%
Ferrospargsite	1%
Fe Chlorite	1%

Figure 16. Mineral mass distribution (CL1324)

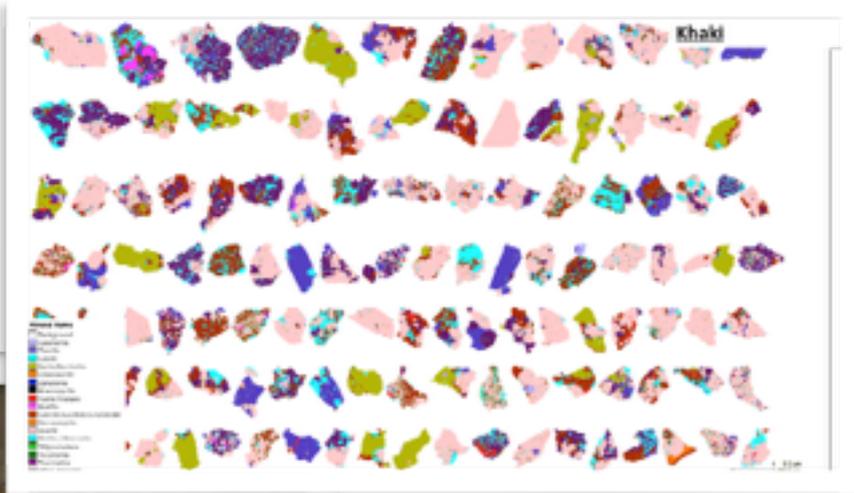


Figure 15. QEMSCAN particle images (CL1324)

- Minerals
- Cassiterite
  - Fluorite
  - Calcite
  - Pyrite/Pyrrhotite
  - Chalcopyrite
  - Sphalerite
  - Arsenopyrite
  - Rutile/Anatase
  - Apatite
  - Siderite/Goethite/Cronstedite
  - Ferrospargsite
  - Quartz
  - Biotite / Muscovite
  - Stilpnomelane
  - Fe Chlorite
  - Tourmaline
  - Other minerals

Intersection: CL1324  
69-70m

1.29% Sn and 0.25% Cu  
(XRF)

Mean cassiterite grain size: **35.3µm**

Major mineral associations identified as Biotite/muscovite, quartz and siderite/goethite/cronstedite.

**Grain size with recoverable range for flotation and gravity recovery**

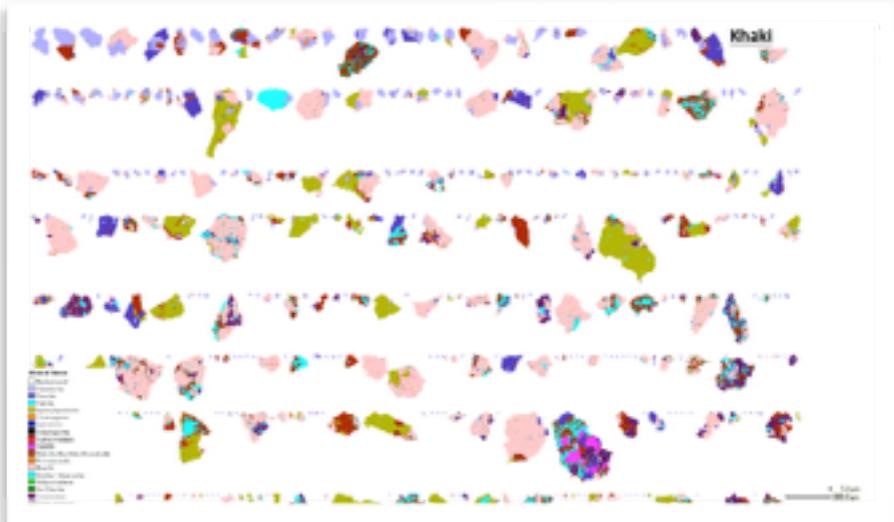
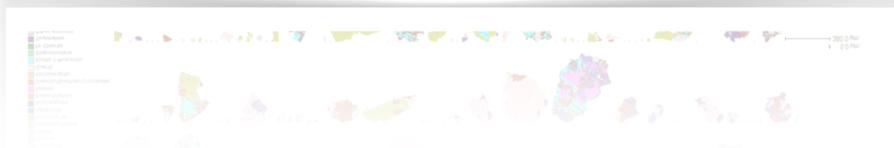


Figure 17. QEMSCAN particle images - cassiterite bearing particles (CL1324)



The Foley Zone represents a tungsten exploration target for extension of the Cleveland mineralisation. Relatively simple bulk mineralogy

Previous analysis showed that tungsten is mainly present with coarse wolframite

## Exploration Target Foley Zone Tungsten Porphyry

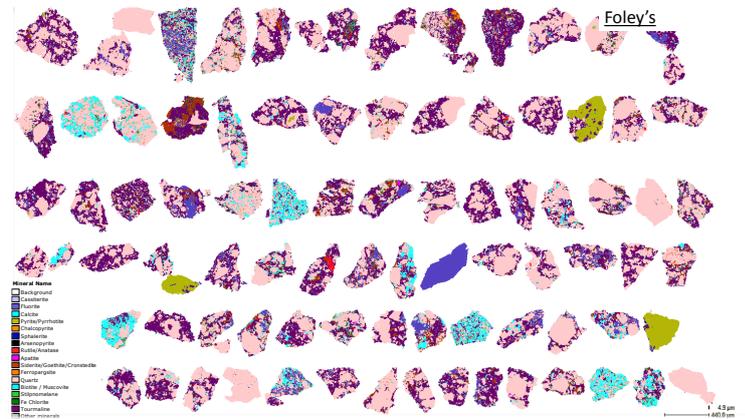


Table 6. Mineral mass by

Mineral	Mass%
Cassiterite	0.1%
Pyrite/pyrrhotite	3%
Quartz	50%
Tourmaline	22%
Siderite/goethite	3%
Biotite/muscovite	10%
Fluorite	4%
Ferropargasite	3%
Fe Chlorite	1%

Figure 19. Mineral mass distribution (CL1786)



Figure 18. QEMSCAN particle images (CL1786)



Intersection: CL1786  
222.5-225m

0.055% WO<sub>3</sub>, 0.02% Sn  
and 0.02% Cu (XRF)

No grains of wolframite discovered by QEMSCAN due to low concentrations and known coarse blade texture of the wolframite.. Poor reconciliation with original reported assay for WO<sub>3</sub> (0.3% WO<sub>3</sub>) was achieved suggesting poor sampling. It is recommended that additional sampling would be required with a greater number of particles investigated to achieve adequate results.

## Recommendations

- I. Mineralogy between lenses at the Cleveland Mine is variable and will require more detailed characterisation for development of ore domain definitions to assess opportunity for ore sorting and process optimisation per lode. It is recommended that a practical starting point for ore domain definition could be by geologically defined lenses.
- II. Screened fractions of each sample should be analysed to determine grain size distribution of cassiterite in greater detail. This will allow more detailed investigation of locking/liberation characteristics and distribution of deleterious minerals. To obtain statistically representative results a wider range of drill intersections should be investigated.
  - A. Improve grain size estimates and grain size distribution calculations, particularly on finer grains, including using smaller pixel spacing on the finer size fractions
  - B. Undertake locking/liberation and mineral association analysis for tin and tungsten bearing minerals by size fraction
  - C. Refine the Species Identification Protocol (SIP) and mineral identification in QEMSCAN, particularly of phyllosilicates, amphibole and cronstedite.
  - D. Undertake specific searches for tin and  $WO_3$  - bearing phases, particularly those samples with low concentrations or where these phases are thought to be coarse grained, such as in the Foley Zone
- III. Further development of mineral lists to provide better characterisation of clay minerals will be important for determination of their effect on flotation processes.
- IV. Additional sampling of Foley Zone intersections with further QEMSCAN analysis to increase particle statistics should be considered. The poor reconciliation between original assays and assays for these samples may suggest a coarse-grain effect for wolframite.

## Process development implications

The quality of samples available made in depth analysis of the variation in mineralogy between lenses at the Cleveland Mine difficult at this early stage. A focus was placed on determination of bulk mineralogy and mean cassiterite grain size to highlight variability between lenses and identify key parameters that should be examined further during process development.

The main outcome was that the mean cassiterite grain size was variable between lenses but generally remained within the practical range of recovery by both flotation and gravity processes. Only Hall's Lode C exhibited a mean cassiterite grain size below what may be practical for gravity recovery, although this remained within the floatable size range. This result was from a single non-representative grab sample. To obtain statistically representative results a wider range of drill intersections analysed at several screen fractions would be required.

The mineralogy between lenses was shown to be variable and the opportunity for ore sorting and process optimisation on a lode by lode basis should be a primary consideration during process development, which should take into consideration minerals such as phyllosilicates, amphibole and siderite on a lode-specific basis.



# Cleveland Historical Drill Core Mineralogy Report

## Introduction

This report summarizes the mineralogy of 6 historic drill core samples collected from underground at the Cleveland Sn, Cu and Ti mine in North West Tasmania, Australia. The drill core samples are over 40 years old, so some oxidation of sulfide minerals is to be expected.

The samples were sent to ALS Mineralogy, Perth, where they were crushed, assayed using XRF, and mineralogical analysis undertaken using XRD and QEMSCAN. The samples and reference numbers are listed in Table 1.

Table 1. Sample location names and corresponding reference numbers.

Ore	QEMSCAN Sample #
Battery	C-1775
Halls Lode A	C-1392
Halls Lode B	C-2011
Halls Lode C	C-254
Khaki	C-1324
Foleys	C-1786

## Assay Reconciliation

The assay reconciliation between the QEMSCAN calculated assay and that measured by XRF compare favorably for Cu, Sn and SiO<sub>2</sub>, and less so for Fe; particularly for Battery and Khaki. This is most likely due to QEMSCAN sample statistics as the compositions look reasonable, although further investigation of the Fe-oxide / hydroxide phases is recommended for future work.

Table 2. Assay reconciliation between the QEMSCAN calculated assay and XRF assay

Assay Reconciliation		QEMSCAN XRF		QEMSCAN XRF		QEMSCAN XRF		QEMSCAN XRF	
Ore Code		Cu		Fe		SiO <sub>2</sub>		Sn	
Battery:		0.2	0.2	29.3	22.5	35.6	30.46	1.5	1.22
Foley's:		0.1	0.02	5.4	6.1	29.4	27.41	0.0	0.02
Hall's Lode A:		0.8	0.84	32.9	32.5	43.1	41.02	2.3	1.84
Hall's Lode B:		0.1	0.1	21.3	22	65.5	64.87	0.6	0.62
Hall's Lode C:		0.3	0.23	6.5	7.11	40.4	36.38	0.2	0.23
Khaki:		0.2	0.15	24.2	18.8	65.1	66.61	1.6	1.29

## Mineralogy

The following mineralogy is based on QEMSCAN results. Pyrite/Pyrrhotite have been grouped together here as the drill core was collected over 40 years ago and oxidation / alteration is expected. Further investigation will be carried out on fresh samples. Siderite/Goethite/Cronstedite, and Biotite/Muscovite are grouped together as separation of these phases and development of the mineral list is beyond the scope of this project.

Figure 1 presents a graph by weight % of the minerals present in each of the 6 samples, whilst Table 3 shows the same data in tabular format. Given the drill core was collected over 50 years ago and has been exposed at surface since, some alteration can be expected such as oxidation of sulfides.

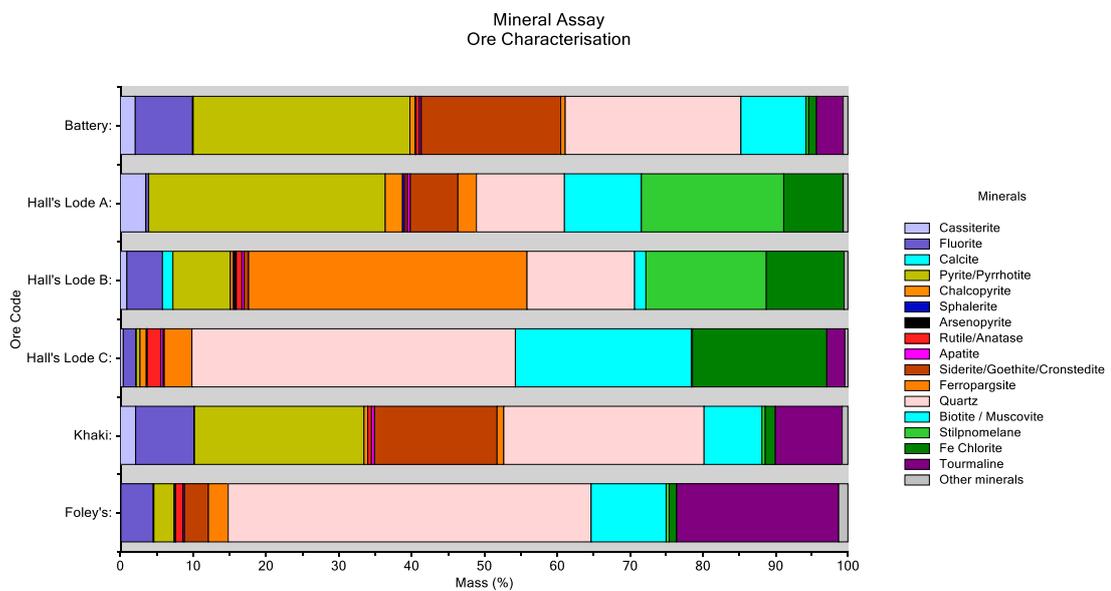


Figure 1. Graph showing wt.% of minerals in the 6 samples (QEMSCAN).

**Table 3. Table showing wt.% of minerals in the 6 samples (QEMSCAN).**

Mass (%)	Ore Code						
	Foley's:	Khaki:	Hall's Lode C:	Hall's Lode B:	Hall's Lode A:	Battery:	
<b>Minerals</b>	<b>Cassiterite</b>	0.10	2.12	0.42	0.91	3.51	2.07
	<b>Fluorite</b>	4.43	8.00	1.76	4.89	0.38	7.87
	<b>Calcite</b>	0.10	0.08	0.03	1.43	0.01	0.09
	<b>Pyrite/Pyrrhotite</b>	2.74	23.29	0.51	7.90	32.52	29.78
	<b>Chalcopyrite</b>	0.20	0.51	0.86	0.40	2.37	0.69
	<b>Sphalerite</b>	0.02	0.01	0.13	0.20	0.36	0.09
	<b>Arsenopyrite</b>	0.02	0.00	0.00	0.21	0.00	0.05
	<b>Rutile/Anatase</b>	1.01	0.51	1.86	0.77	0.32	0.47
	<b>Apatite</b>	0.21	0.42	0.34	0.31	0.38	0.26
	<b>Siderite/Goethite/Cronstedite</b>	3.28	16.85	0.14	0.61	6.55	19.16
	<b>Ferropargsite</b>	2.72	0.92	3.80	38.27	2.54	0.63
	<b>Quartz</b>	49.88	27.53	44.45	14.78	12.09	24.14
	<b>Biotite / Muscovite</b>	10.31	7.95	24.17	1.56	10.58	8.94
	<b>Stilpnomelane</b>	0.43	0.46	0.17	16.55	19.55	0.37
	<b>Fe Chlorite</b>	1.01	1.39	18.46	10.70	8.16	1.07
	<b>Tourmaline</b>	22.27	9.19	2.49	0.00	0.04	3.67
	<b>Other minerals</b>	1.26	0.78	0.41	0.51	0.63	0.64

## Tin

All the tin is found in cassiterite and none in stannite (Figure 3), and the estimated average cassiterite grain size for each sample is presented in Table 4. Figure 4 presents the cassiterite grain size distribution for each sample. These data are calculated from QEMSCAN analysis and are therefore an estimate of the size distribution. Grain size estimates provide a comparison of the grain size distributions between each sample and are useful for examining trends, however 2 limitations should be considered for these data:

1. Given the pixel spacing for the QEMSCAN analysis was set at 5µm, any estimate of size below around 20µm cannot be relied upon, other than to say the grain section was below 20 µm in size.
2. These samples were from crushed and un-sized drill core: more accurate grain and particle size distribution data can be gathered from the analysis of sized fractions.
3. Sample statistics. Whilst good sample statistics in terms of the number of cassiterite grains found were encountered for some samples (notably Halls Lode A and Battery), some samples such as Foley's yielded only a few grains (Figure 2). Any estimation of grain size, P80 or association therefore should be viewed with these statistics in mind, and further work on additional intercepts at several screen fractions would be required before this could be meaningfully achieved.

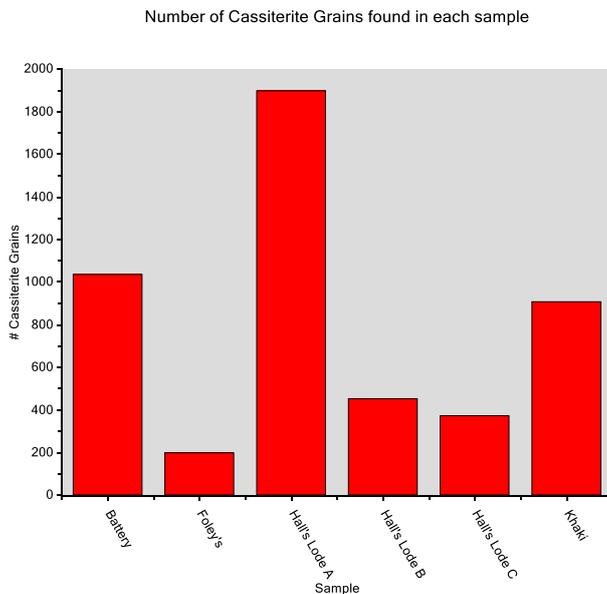


Figure 2. Number of cassiterite grains found by QEMSCAN in each sample.

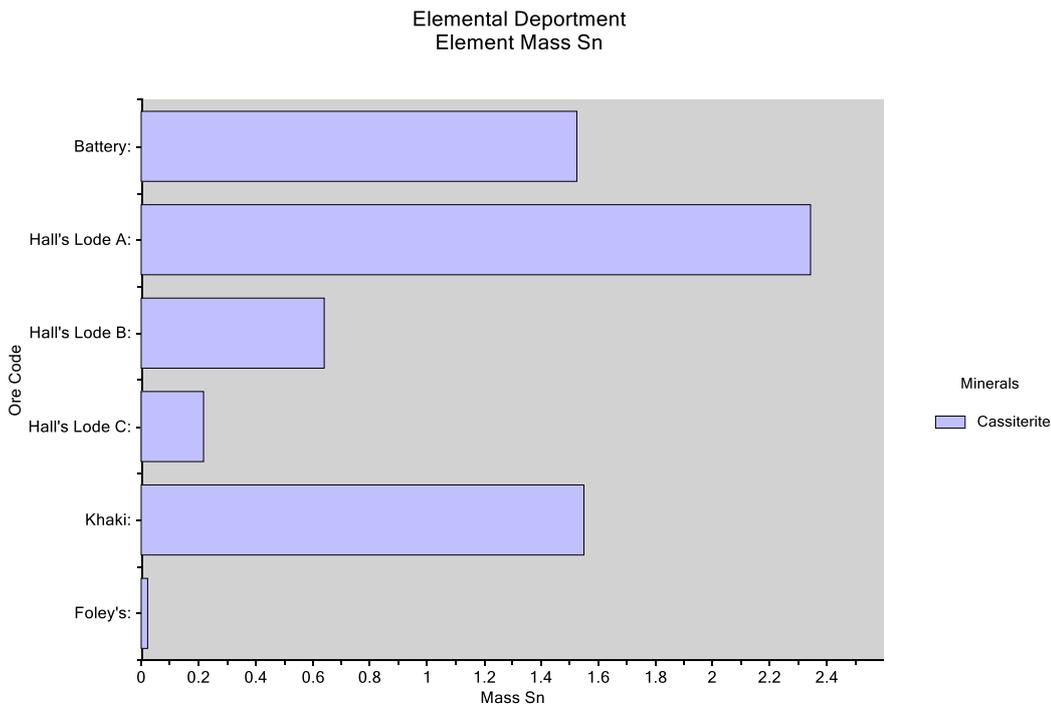


Figure 3. Tin distribution shows all the tin is in cassiterite (QEMSCAN)

Table 4. Average calculated cassiterite grain size for each sample (QEMSCAN)

Estimated Average Grain Size (um)		Cassiterite
Ore Code	Foley's:	8.5
	Khaki:	35.3
	Hall's Lode C:	13.1
	Hall's Lode B:	30.1
	Hall's Lode A:	23.8
	Battery:	36.5

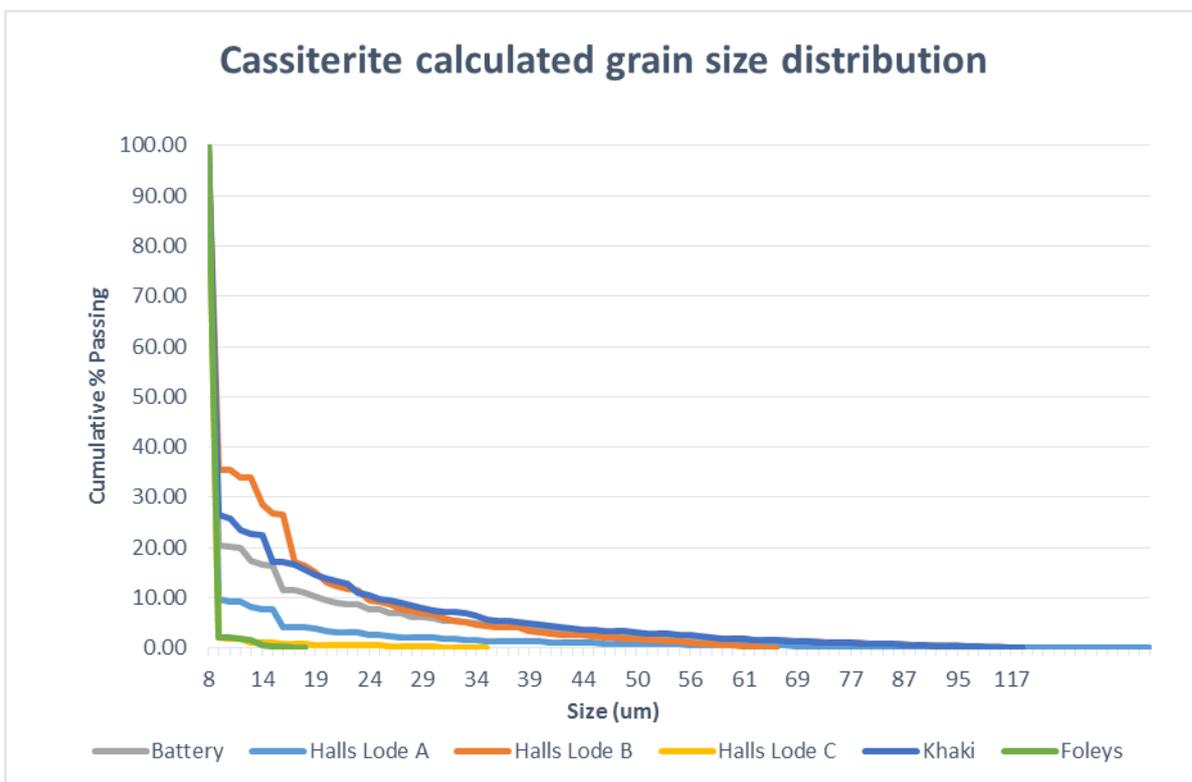


Figure 4. Cassiterite grains size distribution by sample, based on calculations from QEMSCAN data

## Tungsten

The XRF assay indicates that the Foley’s drill core contains the highest proportion of tungsten at 550ppm. As no tungsten-bearing minerals were found in the QEMSCAN analysis despite the

assayed WO<sub>3</sub> content, due to the reported coarse-grained wolframite present, it is recommended that a follow-up study be undertaken to specifically search for these minerals.

Table 5. Tungsten XRF assay results

XRF	W(ppm)
Battery RESI	120
Halls Lode A RESI	130
Halls Lode B RESI	110
Halls Lode C RESI	30
Khaki RESI	150
Foleys RESI	550

## Other elements / minerals

Fluorine reports almost entirely to fluorite, with a minor component in muscovite; although in Halls Lode C muscovite contains 19% of the fluorine (Figure 5).

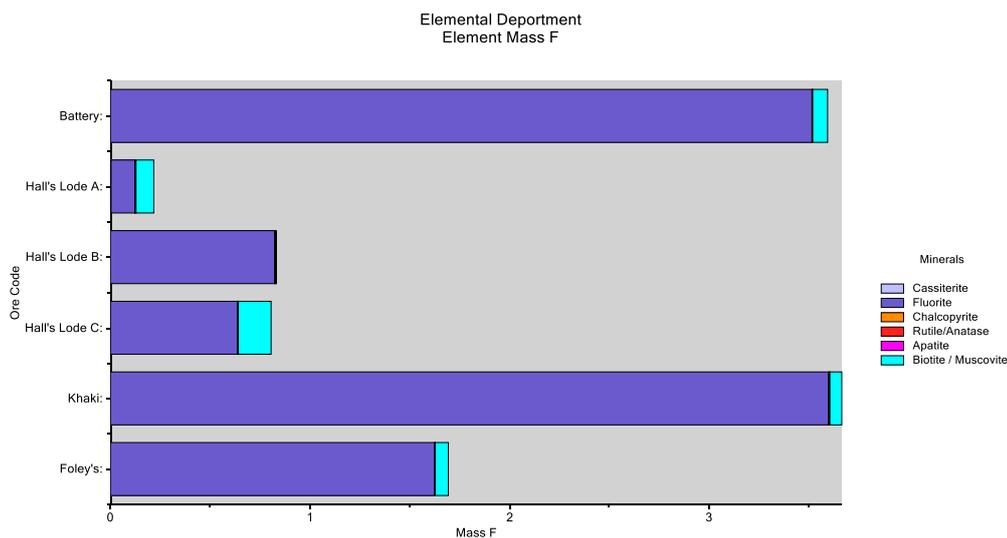
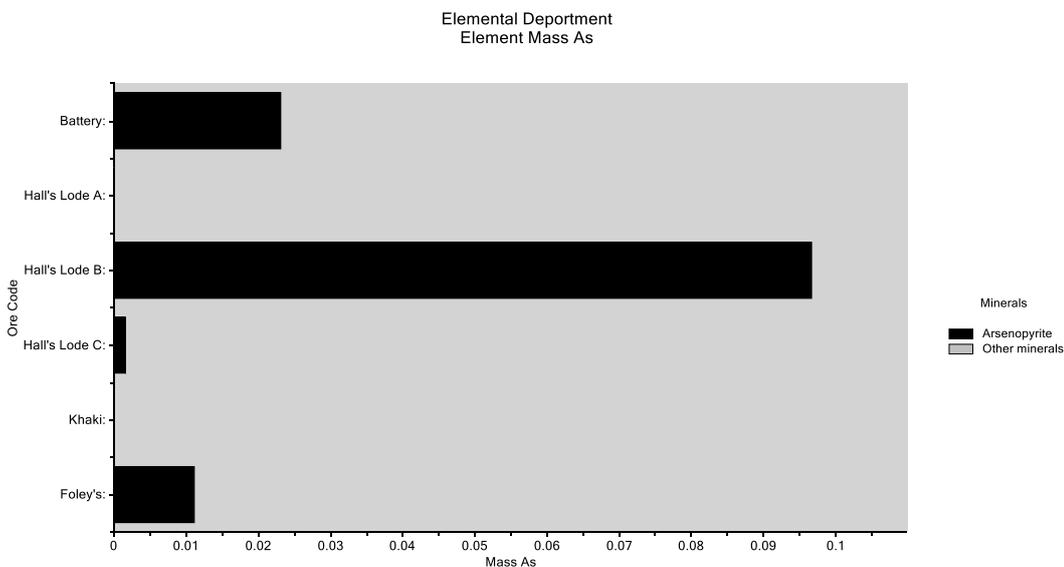


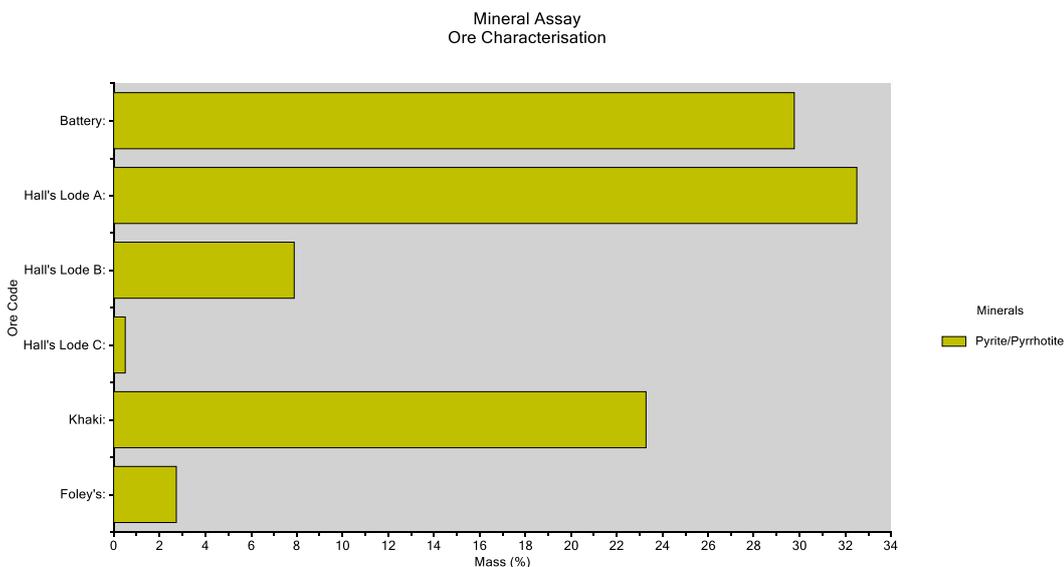
Figure 5. Fluorine department (QEMSCAN)

Trace quantities of arsenic are found in Halls Lode B, Battery and Foleys, exclusively in arsenopyrite (Figure 6).



**Figure 6. Arsenic distribution (QEMSCAN)**

Pyrite / Pyrrhotite are found in all samples, most notably Battery (30%), Halls Lode A (32.6%) and Khaki (23.5%), although it must be borne in mind that these drill cores have been exposed at surface for over 50 years so some sulfide oxidation is to be expected. Fresh drill core would be needed to more accurately examine sulfide mineralogy (Figure 7).



**Figure 7. Modal proportions (mass %) pyrite / pyrrhotite in each sample (QEMSCAN)**

Phyllosilicates such as biotite, muscovite, chlorite and stilpnomelane are present in all samples, and most significantly in the Halls Lode samples (A to C) in quantities exceeding 30% (Figure 8). These should be considered when examining flotation potential.

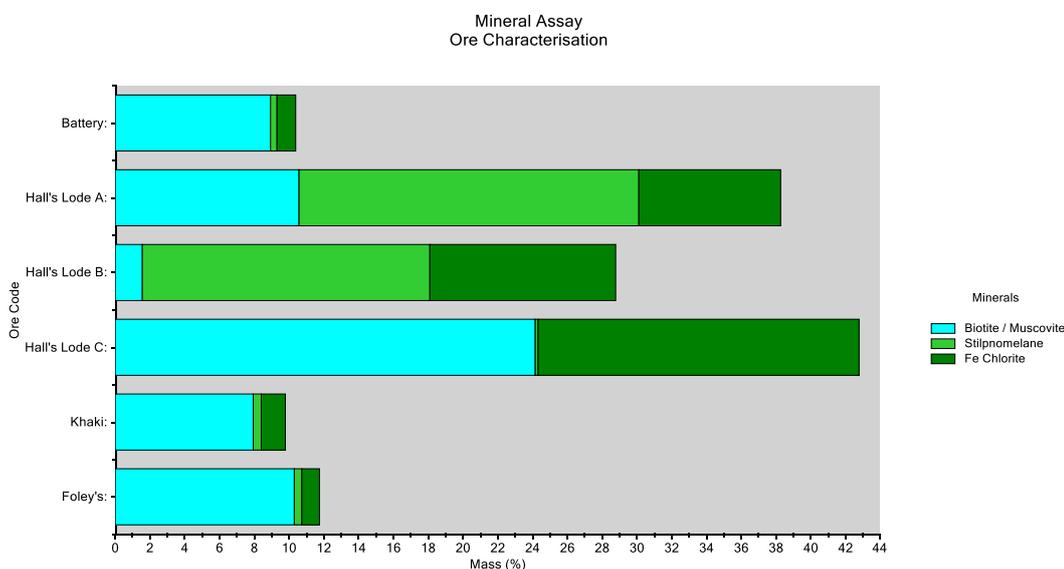


Figure 8. Phyllosilicates in all 6 samples (QEMSCAN)

## Sample Summary

### Battery

Battery comprises primarily pyrite/pyrrhotite (30%), quartz (24%), siderite/goethite (15%) and mica (9%). The tin (1.5% assay) is all in cassiterite which has an average grain size of 32µm, and a P80 roughly estimated at around 10µm. The cassiterite is largely associated with siderite/goethite, muscovite/biotite, and quartz, with minor association with fluorine.

### Halls Lode A

Halls Lode A is largely made up of pyrite/pyrrhotite (33%), stilpnomelane (20%), quartz (12%), biotite/muscovite (11%) and Fe-chlorite (8%). The tin (assay at 2.8%, which is the highest of the six samples) is all in cassiterite with an average grain size of 24µm, and is finely grained (P80 estimated at below 10µm). Cassiterite is largely associated with muscovite/biotite, stilpnomelane and chlorite.



## Halls Lode B

Halls Lode B is comprised ferropargsite (38%), stilpnomelane (17%), quartz (15%) and Fe-chlorite (11%). The tin (assay at 0.6%) is entirely in cassiterite, with an estimated average grain size of 30µm and an estimated P80 of around 15µm. Cassiterite is largely associated with ferropargsite, stilpnomelane and Fe-chlorite, with minor association with fluorine.

## Halls Lode C

Halls Lode C contains quartz (44%), biotite/muscovite (24%) and Fe-chlorite (18%). The tin (assay at 0.2%) is entirely in cassiterite, with an estimated average grain size 13µm and a P80 below 10µm. The cassiterite is largely associated with biotite/muscovite and quartz, with minor association with fluorine.

## Khaki

Khaki is largely composed of quartz (28%), pyrite/pyrrhotite (23%), siderite/goethite/cronstedite (17%), tourmaline (9%), fluorite (8%), and muscovite/biotite (8%). The tin (assay at 1.6%) is entirely in cassiterite, with an estimated average grain size of 35µm and a P80 of around 15µm. The cassiterite is largely associated with siderite/goethite/cronstedite, biotite/muscovite and quartz, with some association with fluorite.

## Foley's

Foley's is comprised of quartz (50%), tourmaline (22%) and biotite/muscovite (10%). The assay indicated tin was below the detection limit, and whilst 2 grains of cassiterite were found by QEMSCAN these are not considered enough to draw any conclusions on the size or association of the cassiterite. Further investigation of both wolframite and cassiterite in additional Foley's samples is recommended.



A Better Understanding of Your Minerals

# Appendix A: Selected QEMSCAN Particle Maps arranged by area

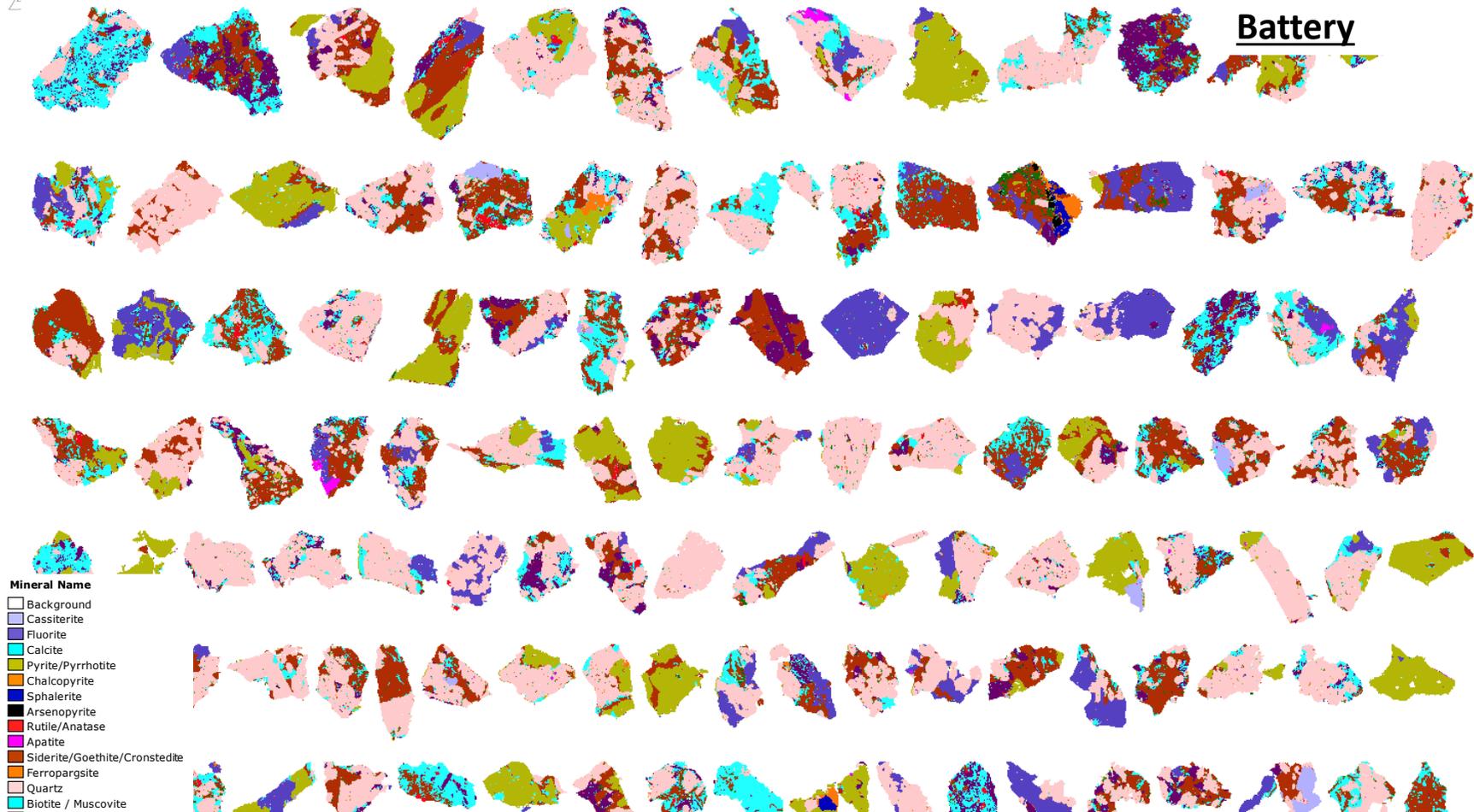
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# Battery

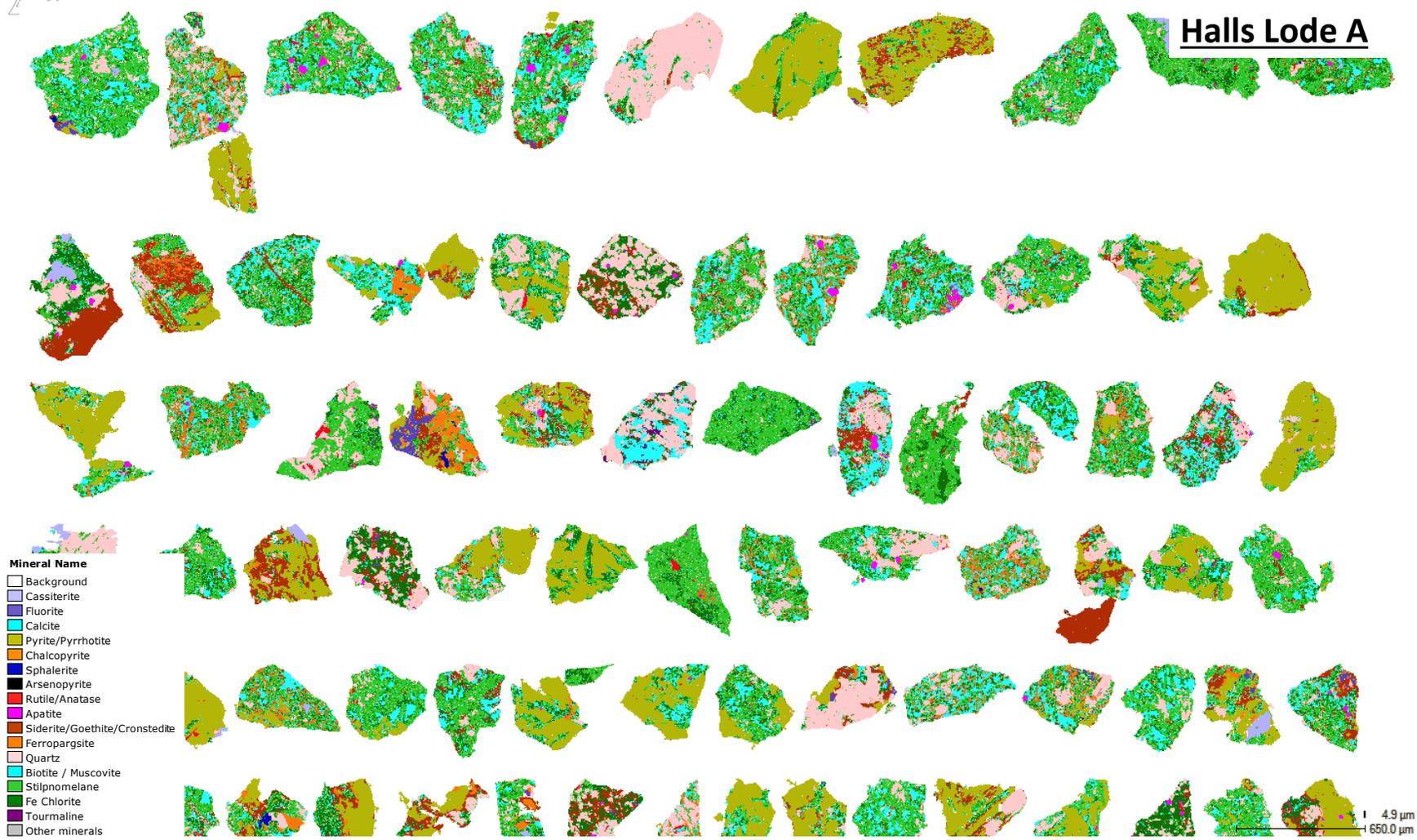




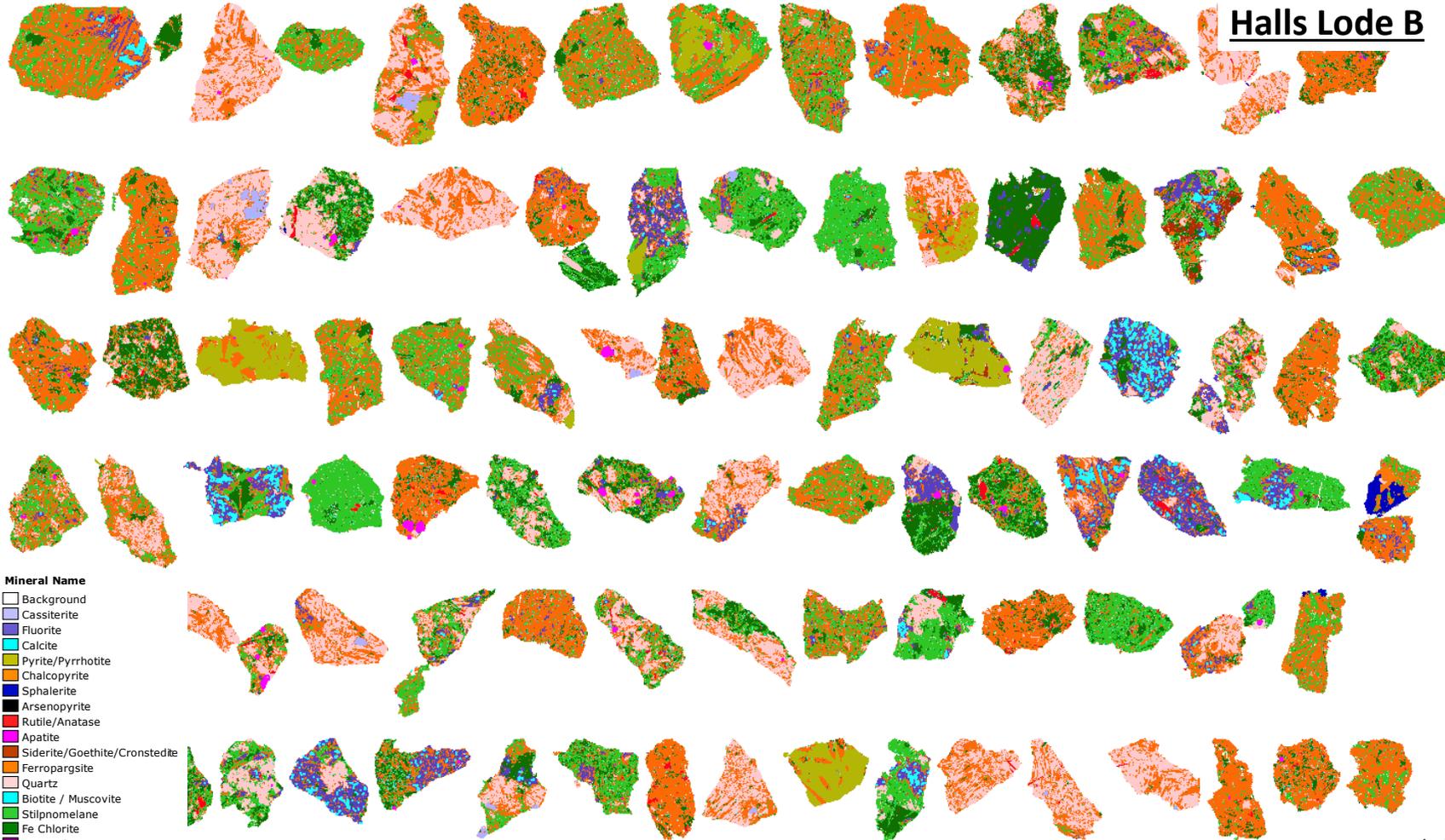
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# Halls Lode A



**Halls Lode B**



- Mineral Name**
- Background
  - Cassiterite
  - Fluorite
  - Calcite
  - Pyrite/Pyrrhotite
  - Chalcopyrite
  - Sphalerite
  - Arsenopyrite
  - Rutile/Anatase
  - Apatite
  - Siderite/Goethite/Cronstedite
  - Ferropargosite
  - Quartz
  - Biotite / Muscovite
  - Stilpnomelane
  - Fe Chlorite
  - Tourmaline
  - Other minerals

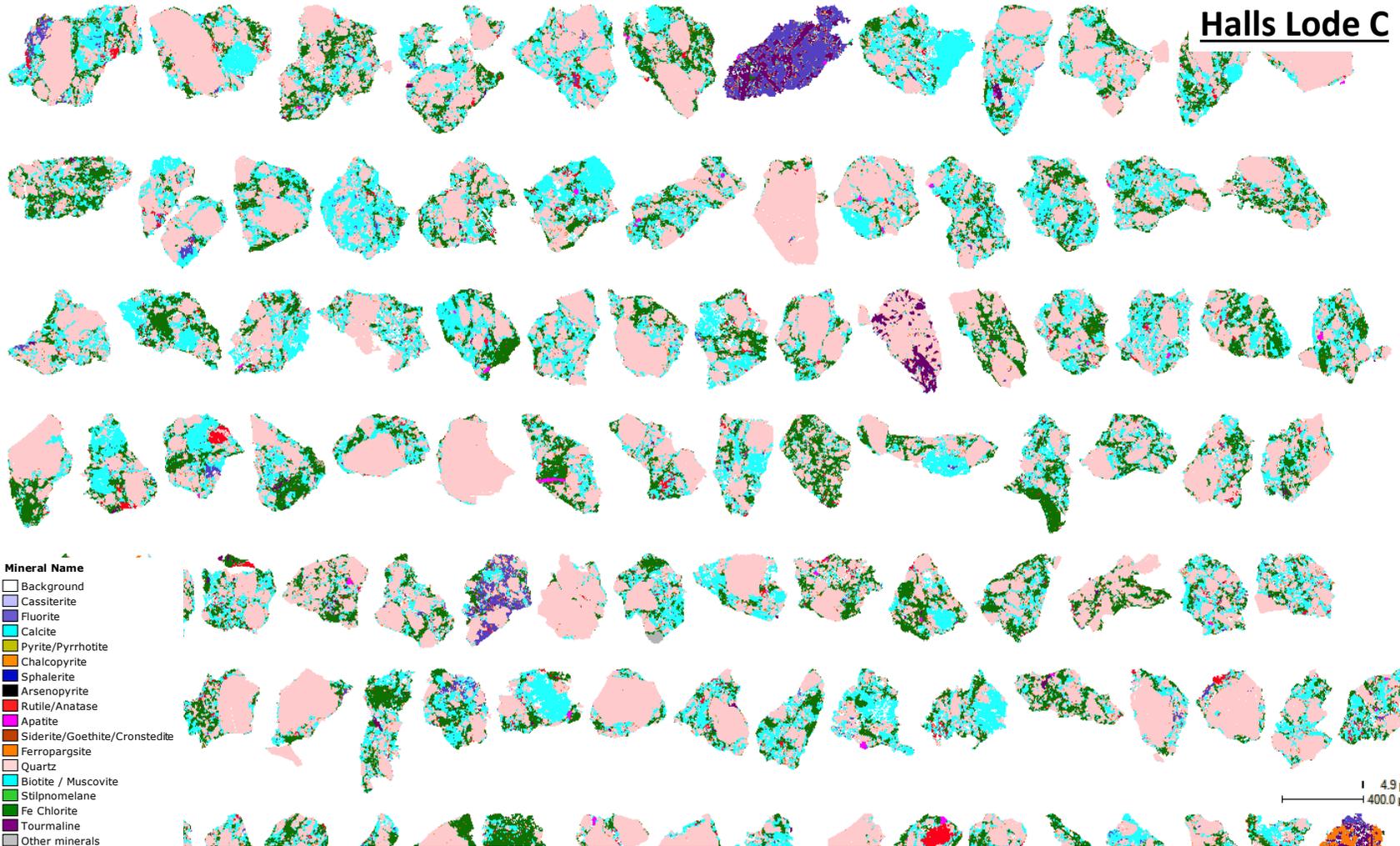
4.9 μm  
530.0 μm



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## Halls Lode C

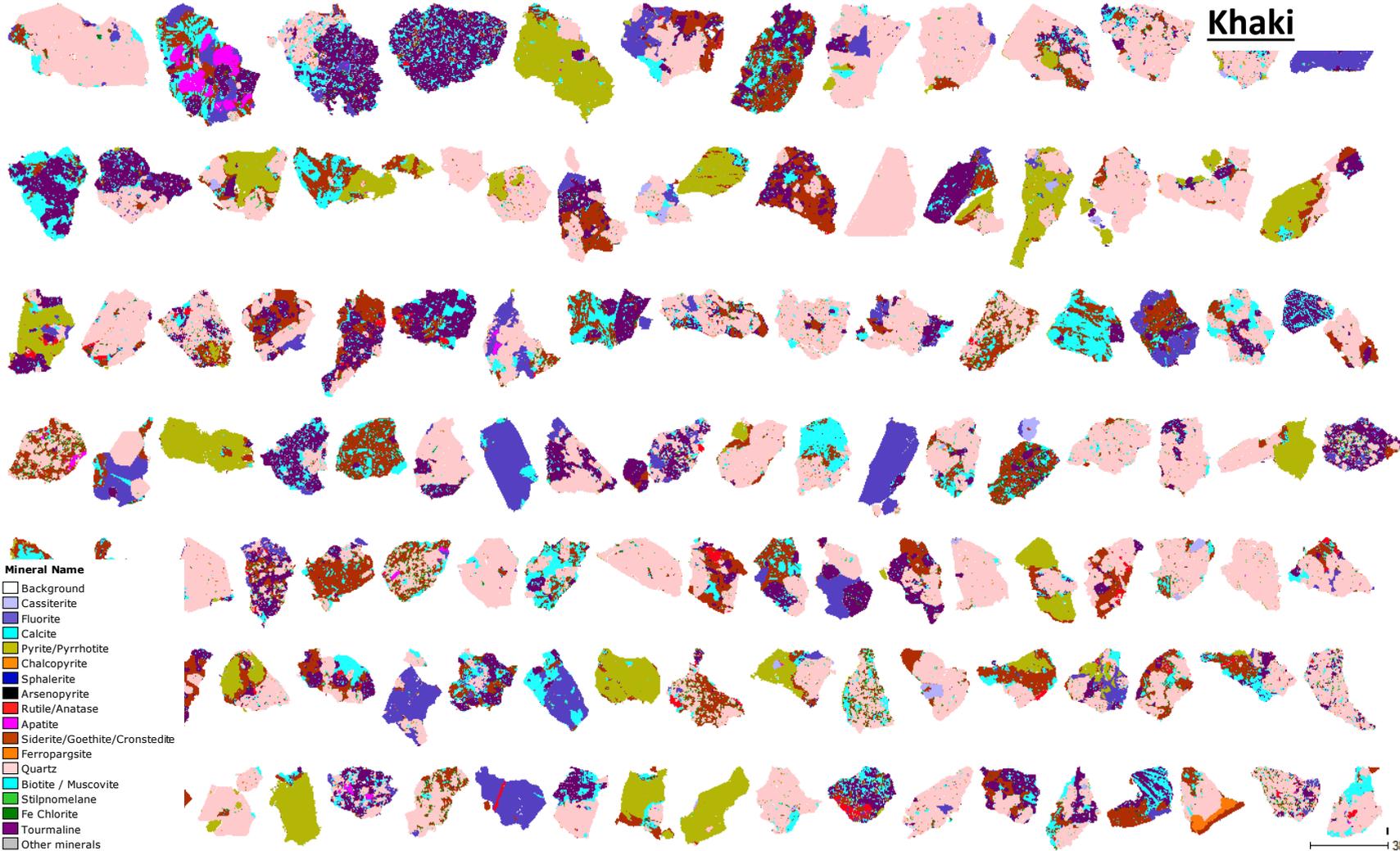




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# Khaki



**Mineral Name**

- Background
- Cassiterite
- Fluorite
- Calcite
- Pyrite/Pyrrhotite
- Chalcopyrite
- Sphalerite
- Arsenopyrite
- Rutile/Anatase
- Apatite
- Siderite/Goethite/Cronstedite
- Ferropargasite
- Quartz
- Biotite / Muscovite
- Stilpnomelane
- Fe Chlorite
- Tourmaline
- Other minerals

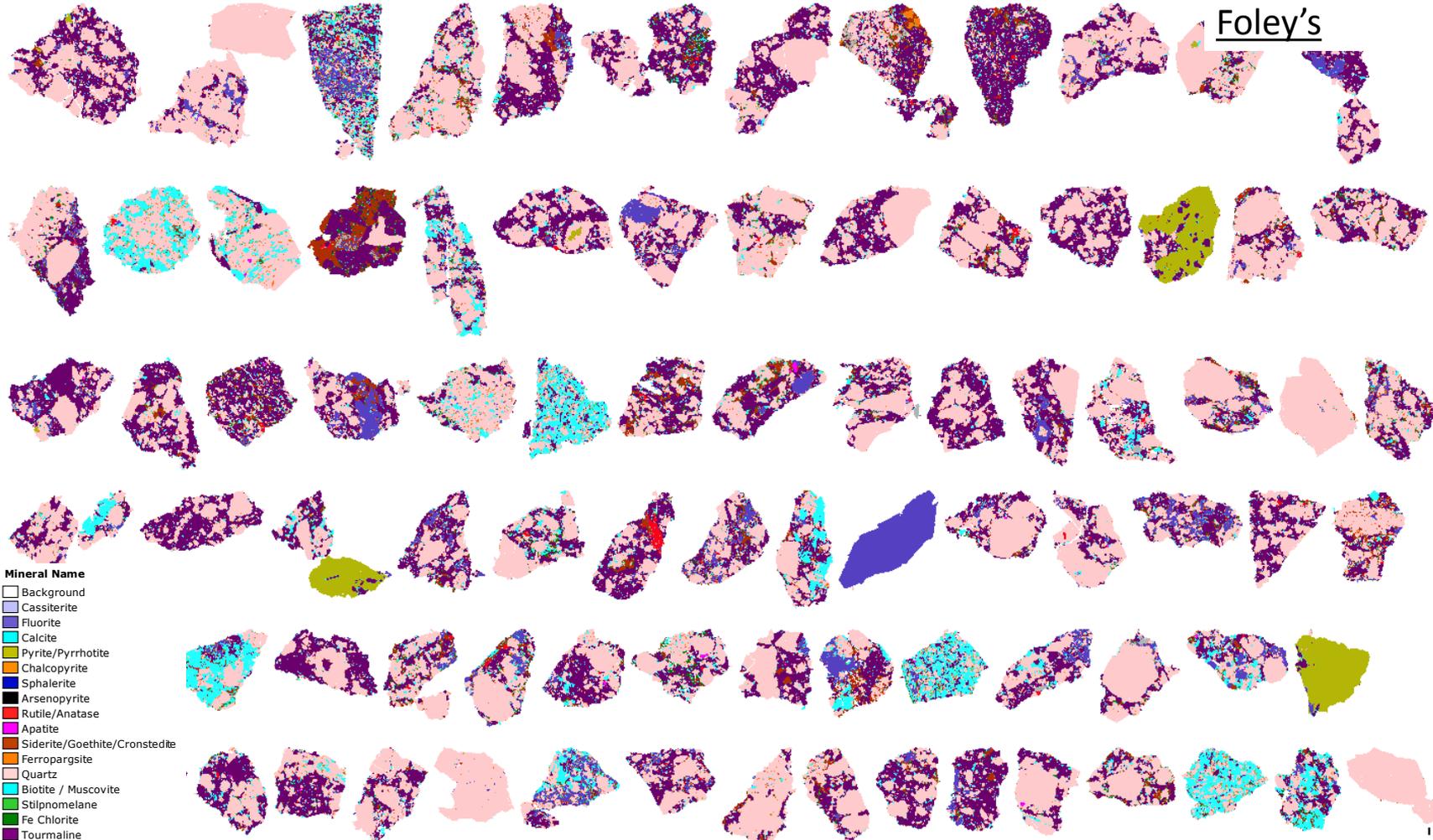
5.0 μm  
380.0 μm



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Foley's



- Mineral Name**
- Background
  - Cassiterite
  - Fluorite
  - Calcite
  - Pyrite/Pyrrhotite
  - Chalcopyrite
  - Sphalerite
  - Arsenopyrite
  - Rutile/Anatase
  - Apatite
  - Siderite/Goethite/Cronstedtite
  - Ferropargasite
  - Quartz
  - Biotite / Muscovite
  - Stilpnomelane
  - Fe Chlorite
  - Tourmaline
  - Other minerals

4.9 μm  
440.0 μm



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## Appendix B: QEMSCAN Particle Maps of Cassiterite Grains in each sample

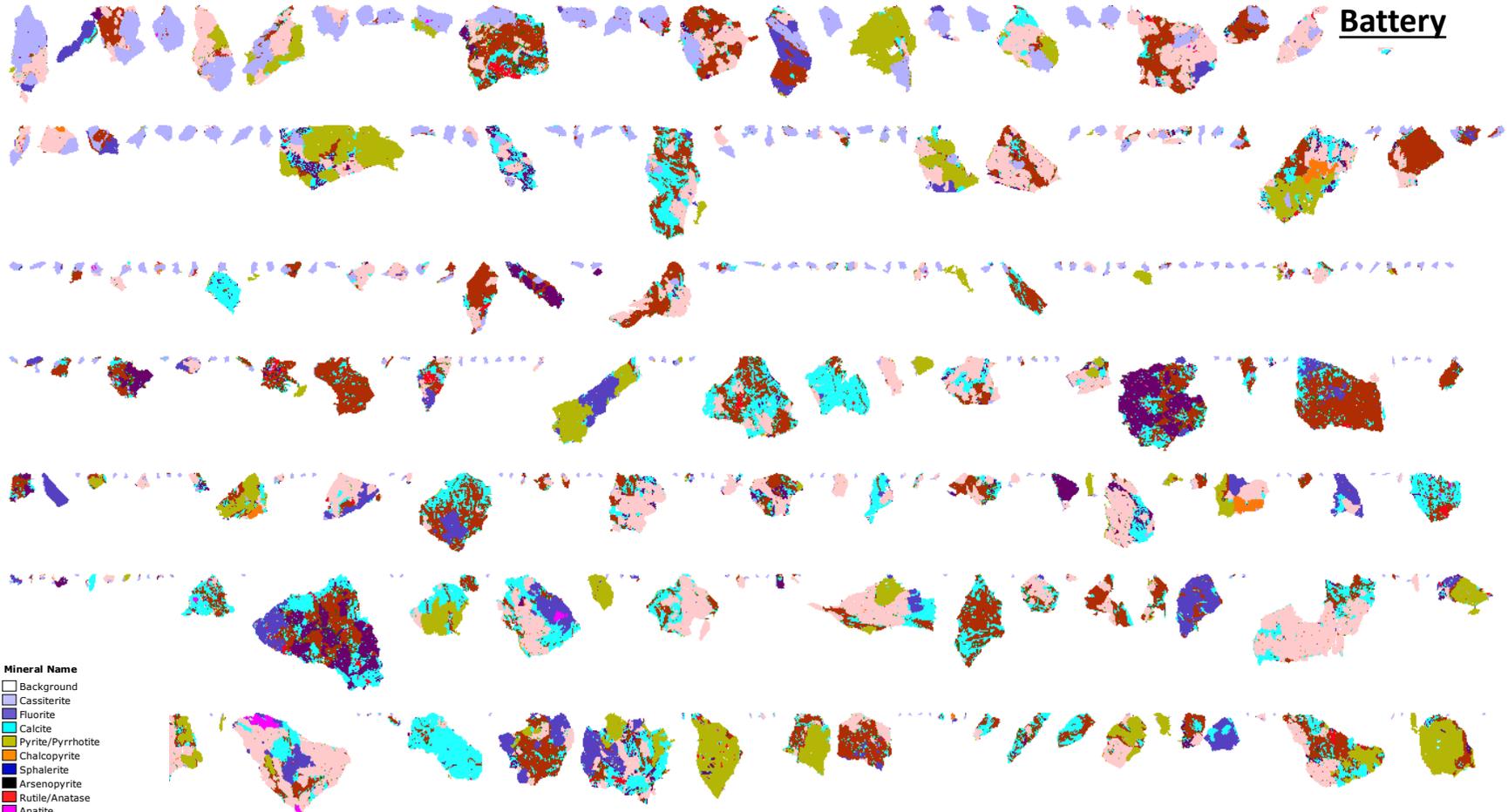
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## Battery



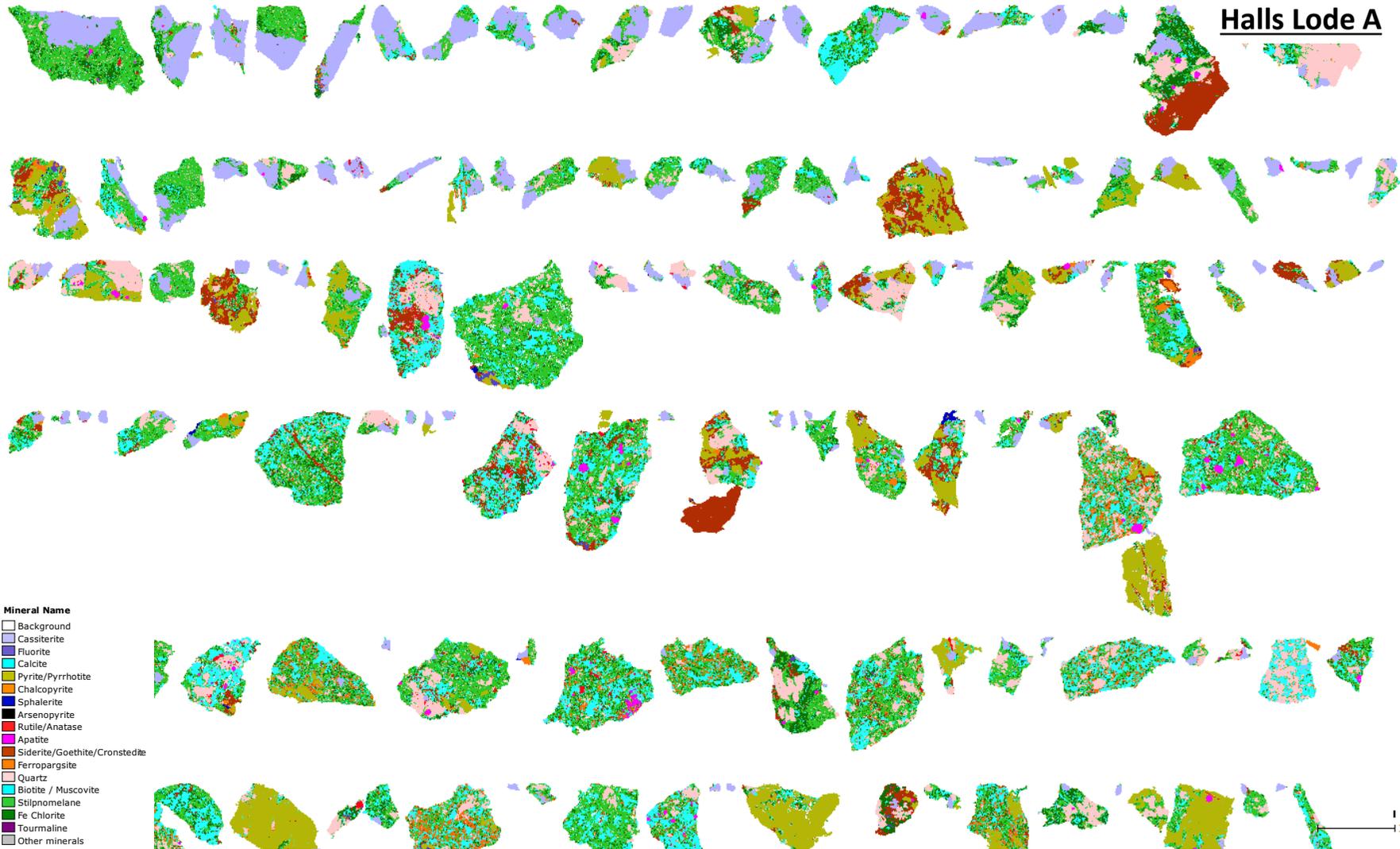
- Mineral Name**
- Background
  - Cassiterite
  - Fluorite
  - Calcite
  - Pyrite/Pyrrhotite
  - Chalcopyrite
  - Sphalerite
  - Arsenopyrite
  - Rutile/Anatase
  - Apatite
  - Siderite/Goethite/Concealerite



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### Halls Lode A



- Mineral Name**
- Background
  - Cassiterite
  - Fluorite
  - Calcite
  - Pyrite/Pyrrhotite
  - Chalcopyrite
  - Sphalerite
  - Arsenopyrite
  - Rutile/Anatase
  - Apatite
  - Siderite/Goethite/Cronstedite
  - Ferropargsite
  - Quartz
  - Biotite / Muscovite
  - Stilpnomelane
  - Fe Chlorite
  - Tourmaline
  - Other minerals

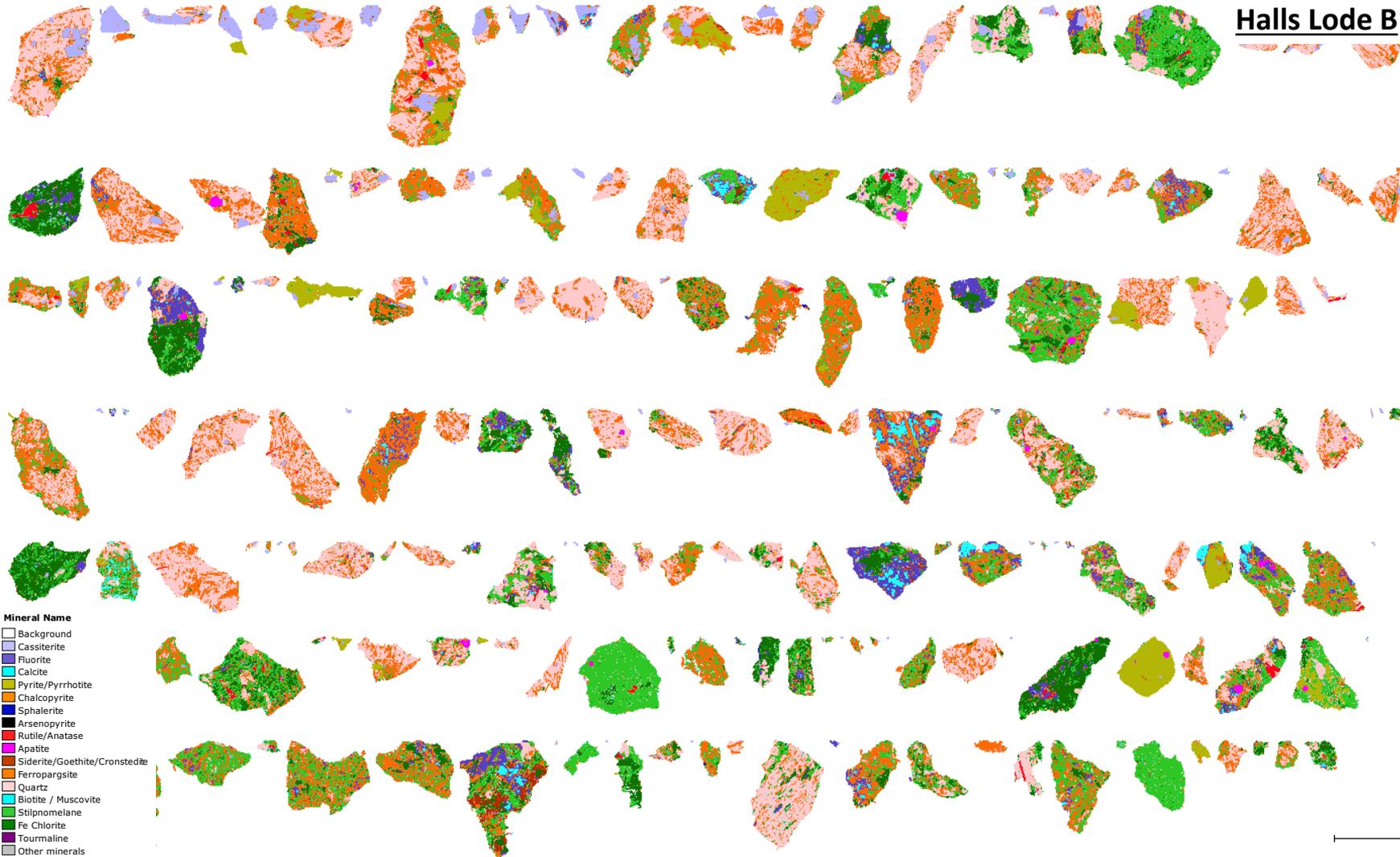
5.0 μm  
380.0 μm



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### Halls Lode B



- Mineral Name**
- Background
  - Cassiterite
  - Fluorite
  - Calcite
  - Pyrite/Pyrrhotite
  - Chalcopyrite
  - Sphalerite
  - Arsenopyrite
  - Rutile/Anatase
  - Apatite
  - Siderite/Goethite/Cronstedite
  - Ferropargosite
  - Quartz
  - Biotite / Muscovite
  - Stilpnomelane
  - Fe Chlorite
  - Tourmaline
  - Other minerals

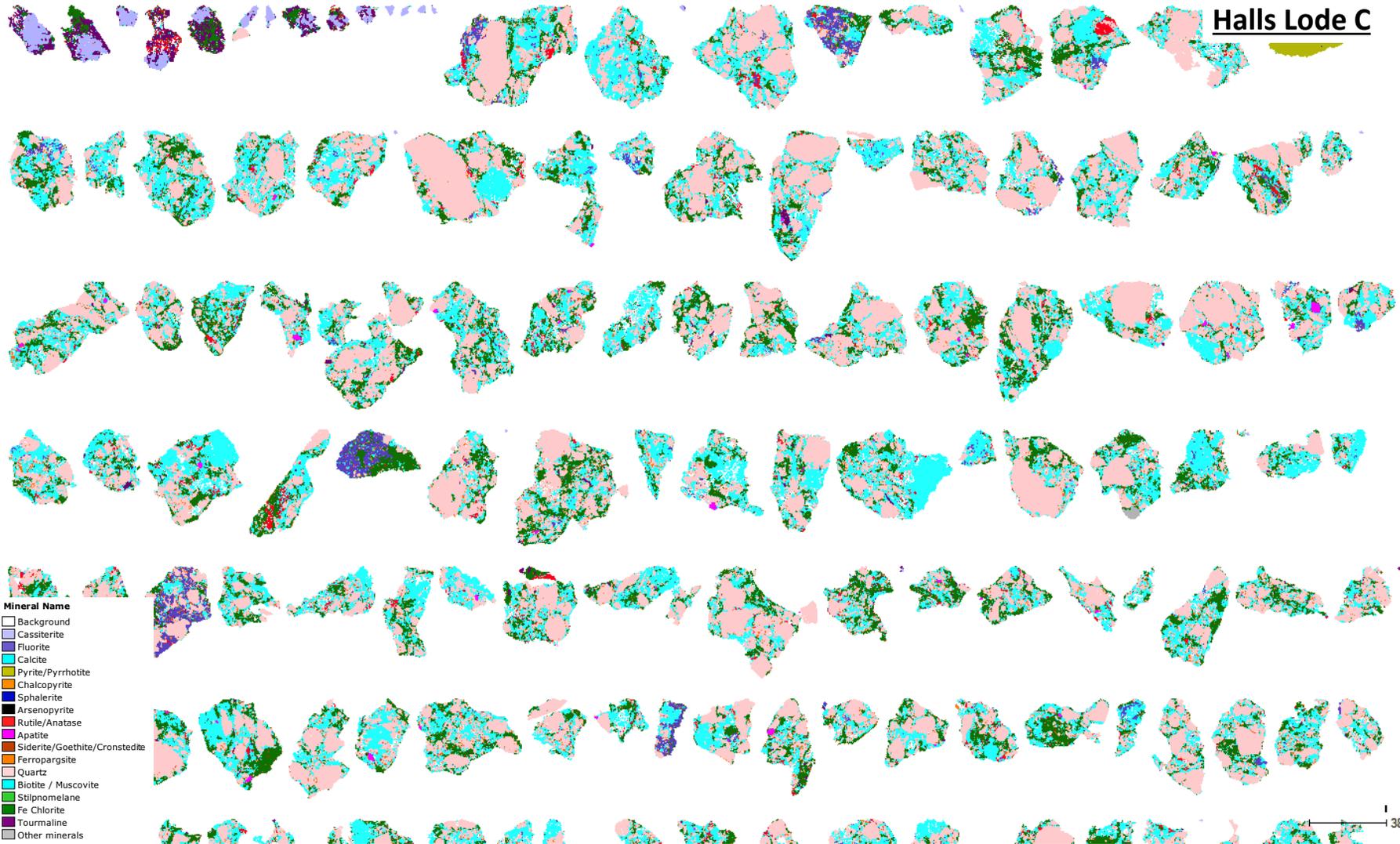
5.0  $\mu$ m  
380.0  $\mu$ m



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ABN: 51 118 344 602

### Halls Lode C



- Mineral Name**
- Background
  - Cassiterite
  - Fluorite
  - Calcite
  - Pyrite/Pyrrhotite
  - Chalcopyrite
  - Sphalerite
  - Arsenopyrite
  - Rutile/Anatase
  - Apatite
  - Siderite/Goethite/Cronstedtite
  - Ferropargosite
  - Quartz
  - Biotite / Muscovite
  - Stilpnomelane
  - Fe Chlorite
  - Tourmaline
  - Other minerals

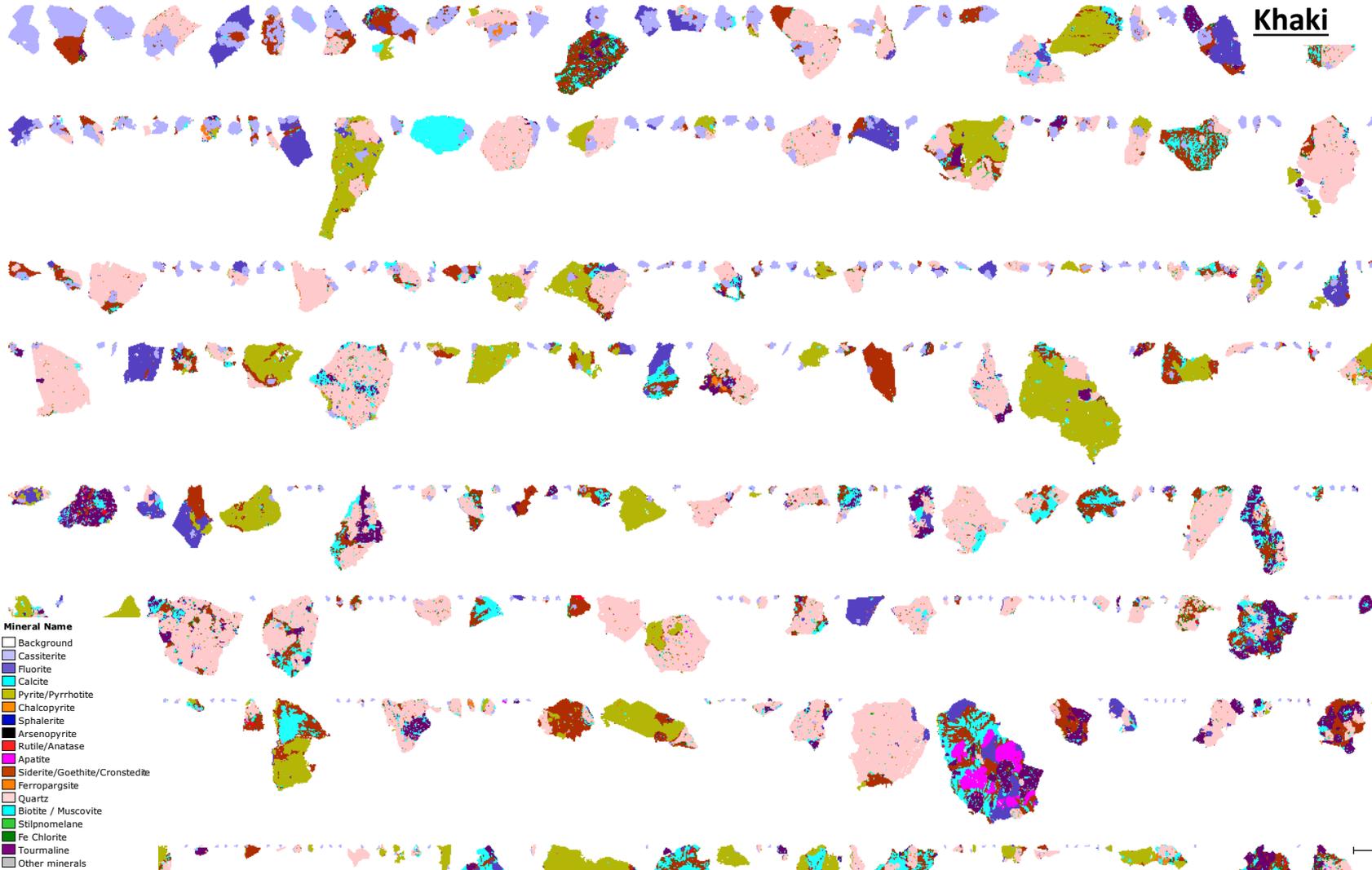
5.0 μm  
380.0 μm



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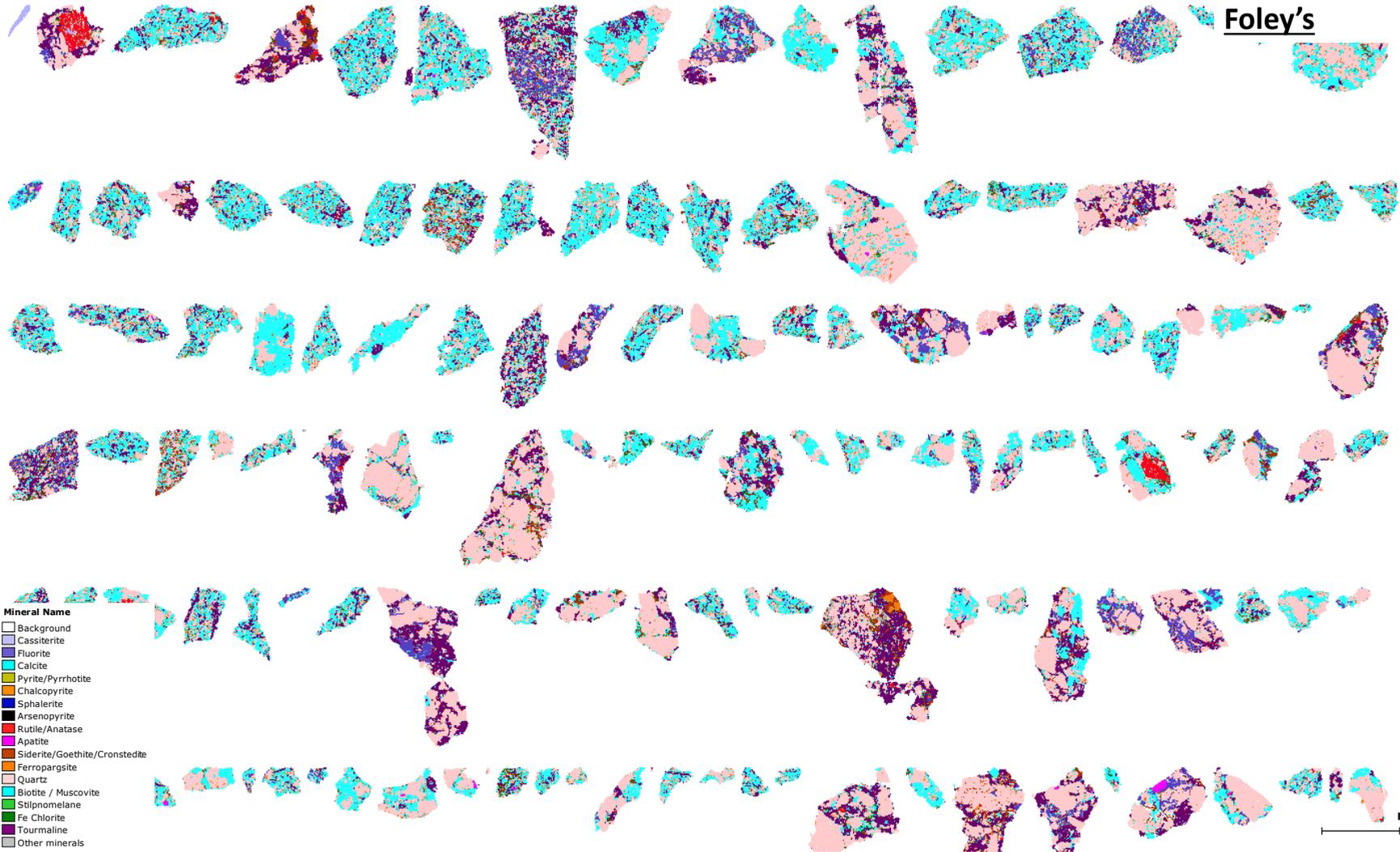
### Khaki





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# Appendix C: Mineral Association Data

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## Appendix D: XRD Data

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XRD Relative Abundance of Minerals					
Battery	Halls Lode A	Halls Lode B	Halls Lode C	Khaki	Foleys
Quartz	Sepiolite (probably stilpnomelane)	Ferropargasite Sepiolite (probably stilpnomelane)	Quartz	Quartz	Quartz
Siderite	Muscovite		Chlinochlore (Fe Chlorite)	Siderite	Schorl (Tourmaline)
Flourite	Quartz	Stilpnomelane	Muscovite	Flourite	Flourite
Pyrrhotite	Pyrrhotite	Quartz	Dravite (Tourmaline)	Pyrrhotite	Muscovite
Clinochlore (Fe Chlorite)	Pyrite	Chlinochlore (Fe Chlorite)	Sapiolite	Dravite (Tourmaline)	Siderite
Pyrite	Cronstedite	Flourite	Cassiterite	Pyrite	Chlinochlore (Fe Chlorite)
Muscovite	Cassiterite			Chlinochlore (Fe Chlorite)	Pyrite
Dravite (Tourmaline)	Goethite			Muscovite	Biotite
Galena	Sphalerite			Cassiterite	Amphibole
Schorl (Tourmaline)	Amphibole				
Amphibole	Chalcopyrite				
Stannite	Calcite (probably chalcopyrite)				
Cassiterite	Killalaite				

Figure 9. Relative abundance of minerals in each same as identified by XRD. No modal proportions available. Comments in brackets indicate potential peak overlaps, or mineral name used in QEMSCAN data.