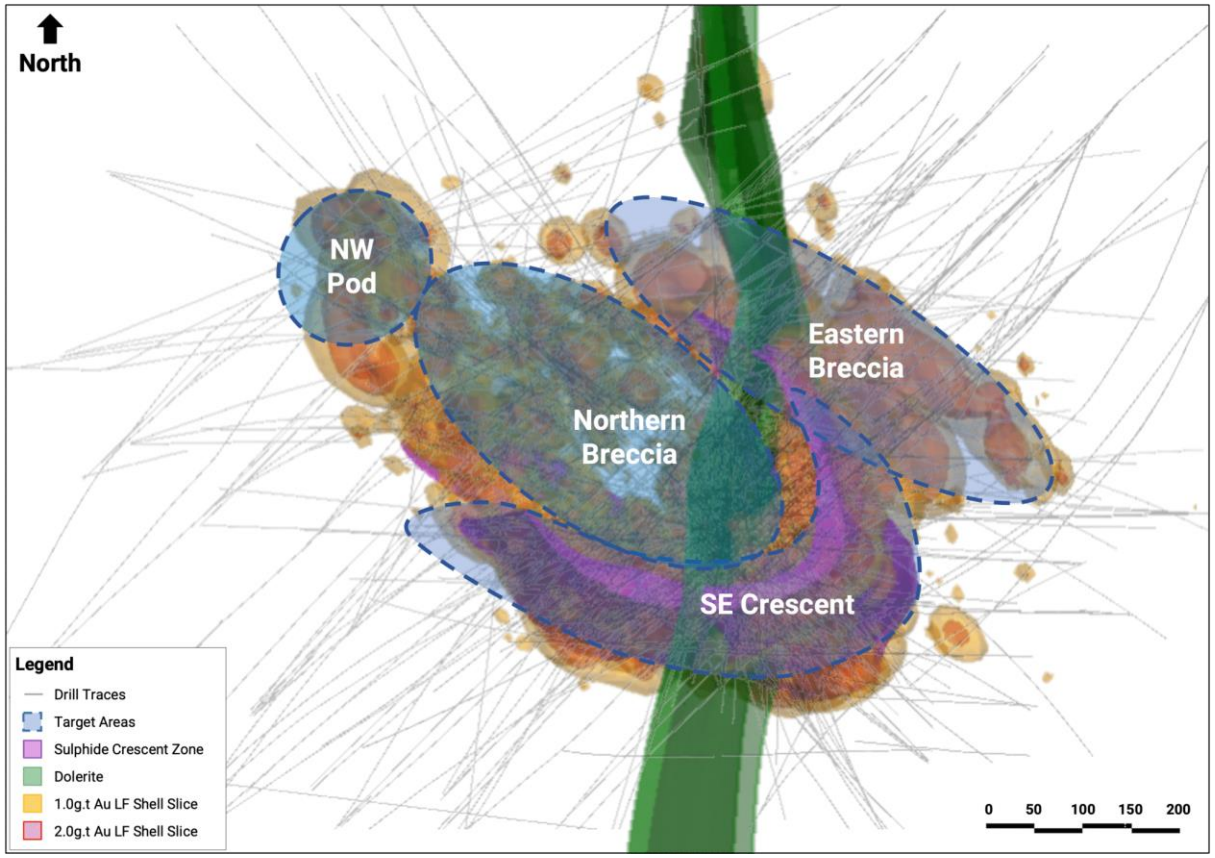
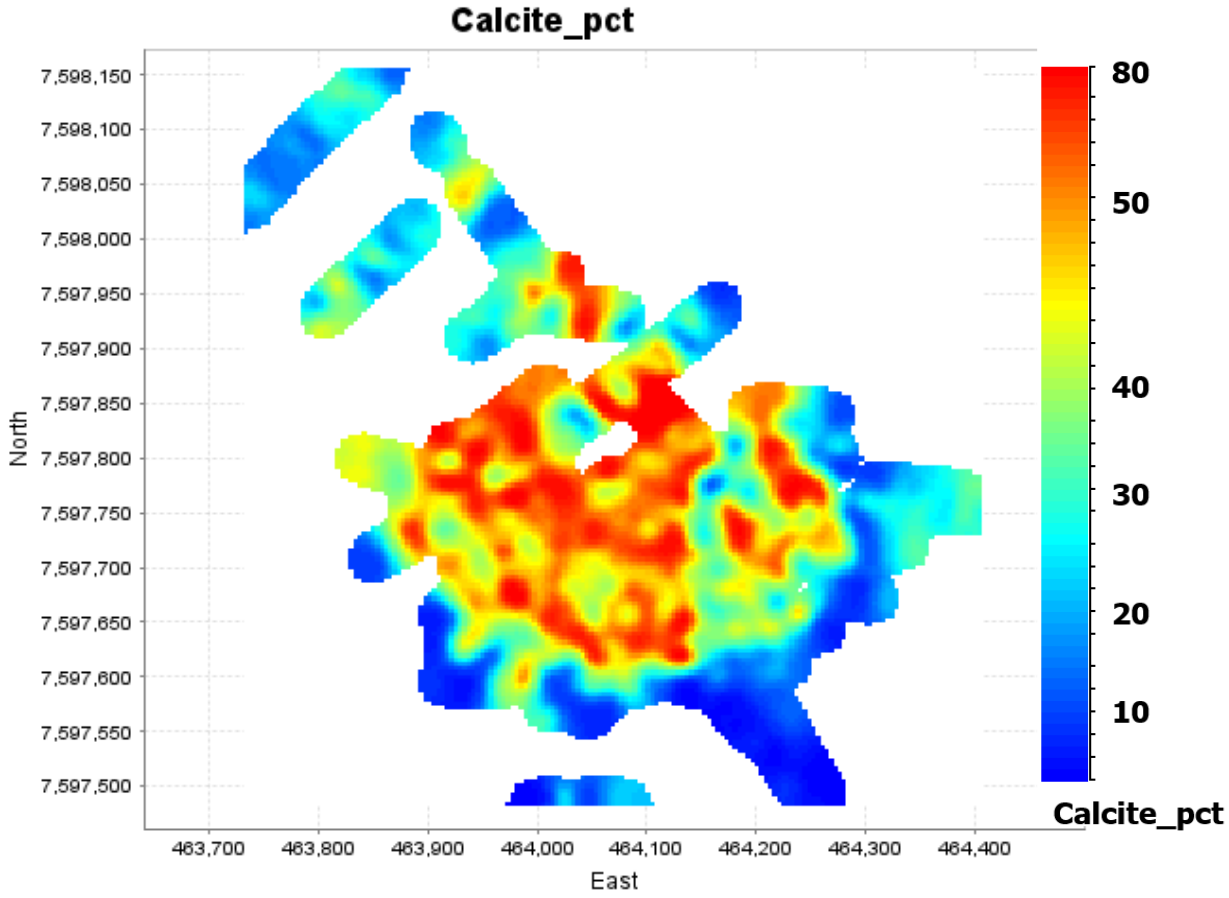
# Comet Case Study; Havieron

This is a case study showing quantitative mineralogy of the Havieron Deposit using 4 acid digest ICP assay data recently released to open file.



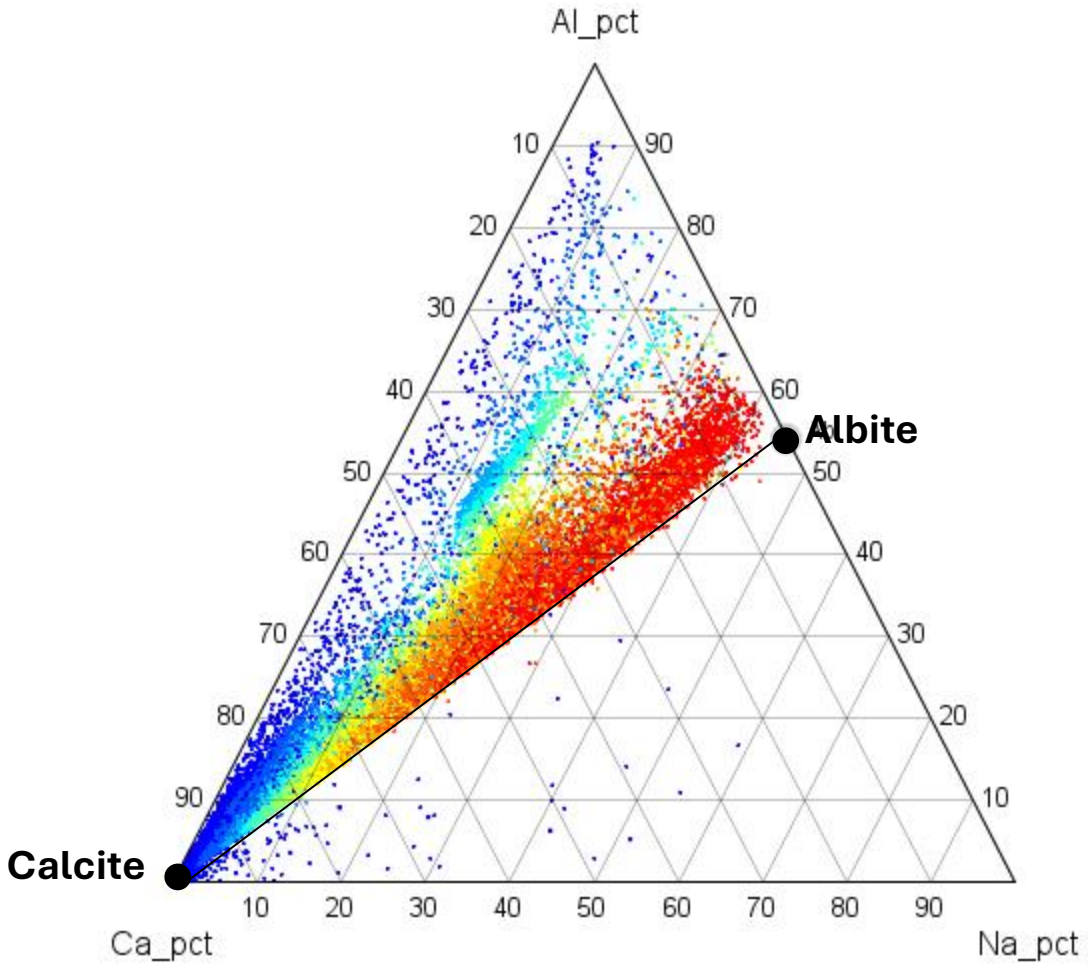
Havieron is a recently discovered, Neoproterozoic breccia pipe system located in the Patterson Province of Western Australia. Greatland announced a resource of of 7 Moz Au and 275 kt Cu, mostly within a portion of the breccia referred to as the Cresent Zone (https://www.greatland.com.au/assets/havieron/). The breccia is centered on a mafic intrusion within laminated clastic sediments of the Malu formation (host rocks to Telfer). The mafic intrusion is entirely brecciated. The mafic clasts, along with clasts of the wall rock are cemented within a calcite matrix. Coarse Ca-Mg amphibole has grown out from the clast margins into the calcite matrix. Au-Cu mineralization is associated with pyrrhotite, especially along the Crescent Zone around the southern margin of the breccia column. Sediments around the margin of the breccia are intensely albitised.

The mineralogy of the system includes calcite-amphibole-albite-biotite-chlorite-quartz-pyrrhotite-chalcopyrite.

The solid solution compositions of the amphibole and biotite can be estimated reasonably well from plots of the major element analyses.

Analyses from open file data were loaded into the Comet software and converted to estimated bulk mineralogy.

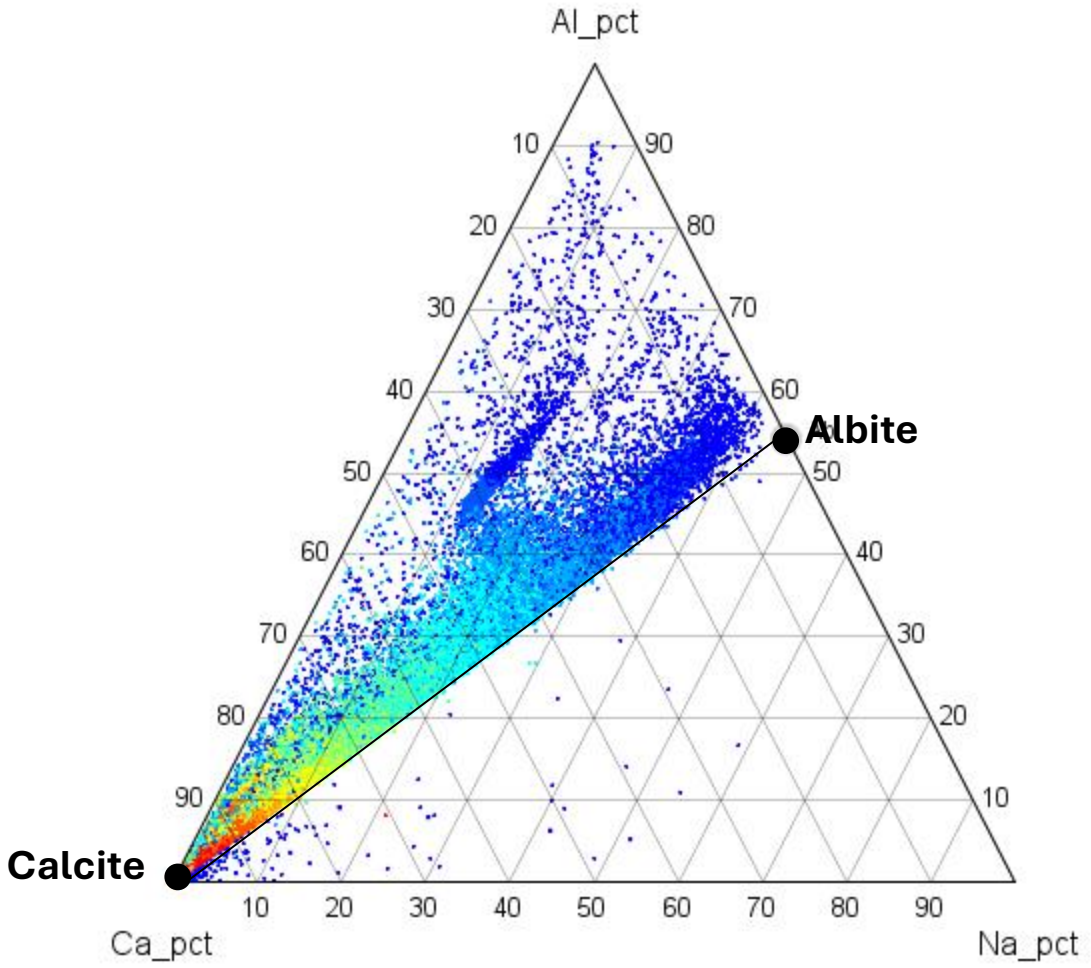
# Albite




**Albite_pct 10 Equal Bins**

- Albite_pct to 5.7
- Albite_pct to 11.72
- Albite_pct to 15.19
- Albite_pct to 17.77
- Albite_pct to 21.35
- Albite_pct to 25.17
- Albite_pct to 29.52
- Albite_pct to 35.19
- Albite_pct to 43.56
- Albite_pct to 84.17

# Calcite



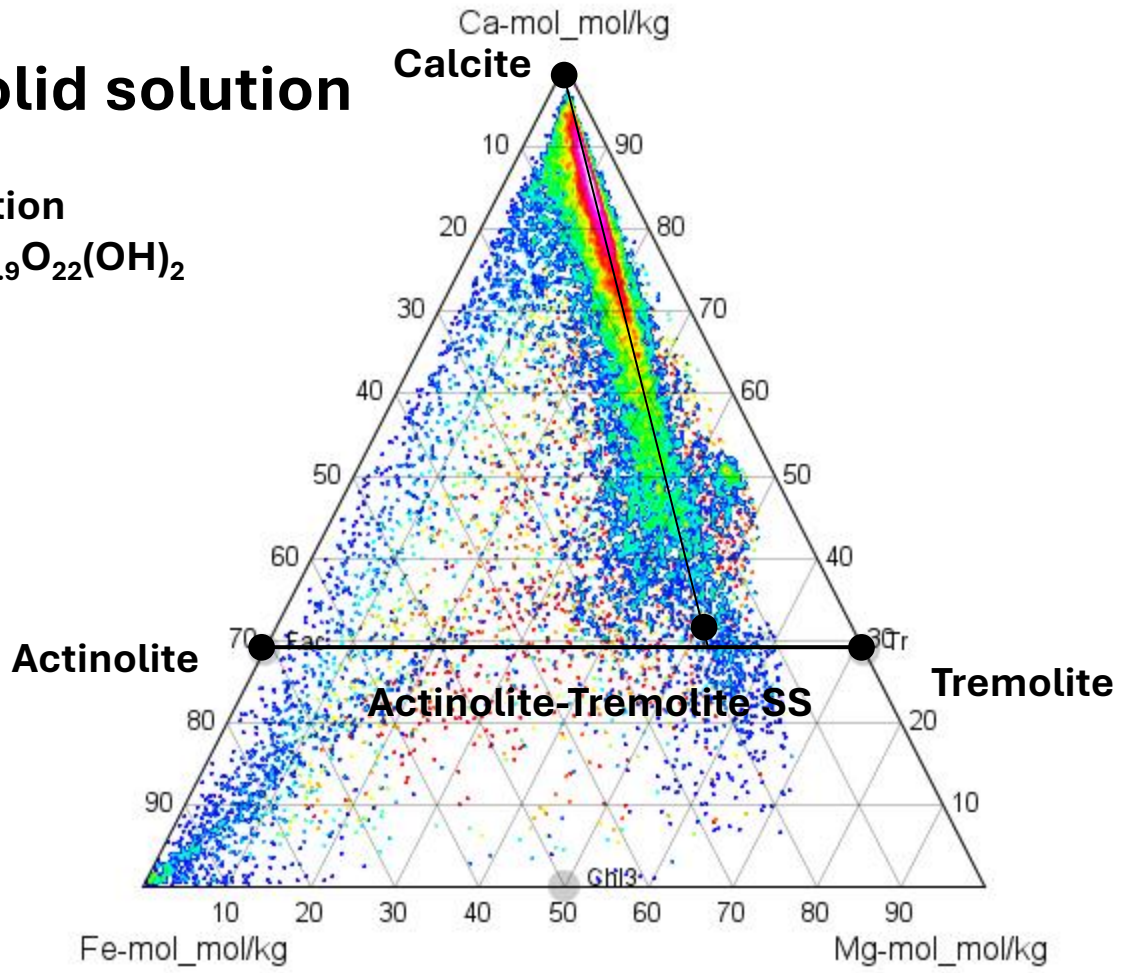

**Calcite_pct 10 Equal Bins**

- Calcite_pct to 2.88
- Calcite_pct to 6.41
- Calcite_pct to 12.78
- Calcite_pct to 21.16
- Calcite_pct to 31.57
- Calcite_pct to 40.92
- Calcite_pct to 48.82
- Calcite_pct to 56.59
- Calcite_pct to 66.14
- Calcite_pct to 97.28

# Actinolite_solid solution

**Estimated composition**

$Ca_2Al_{0.2}Fe_{1.4}Mg_{3.5}Si_{7.9}O_{22}(OH)_2$



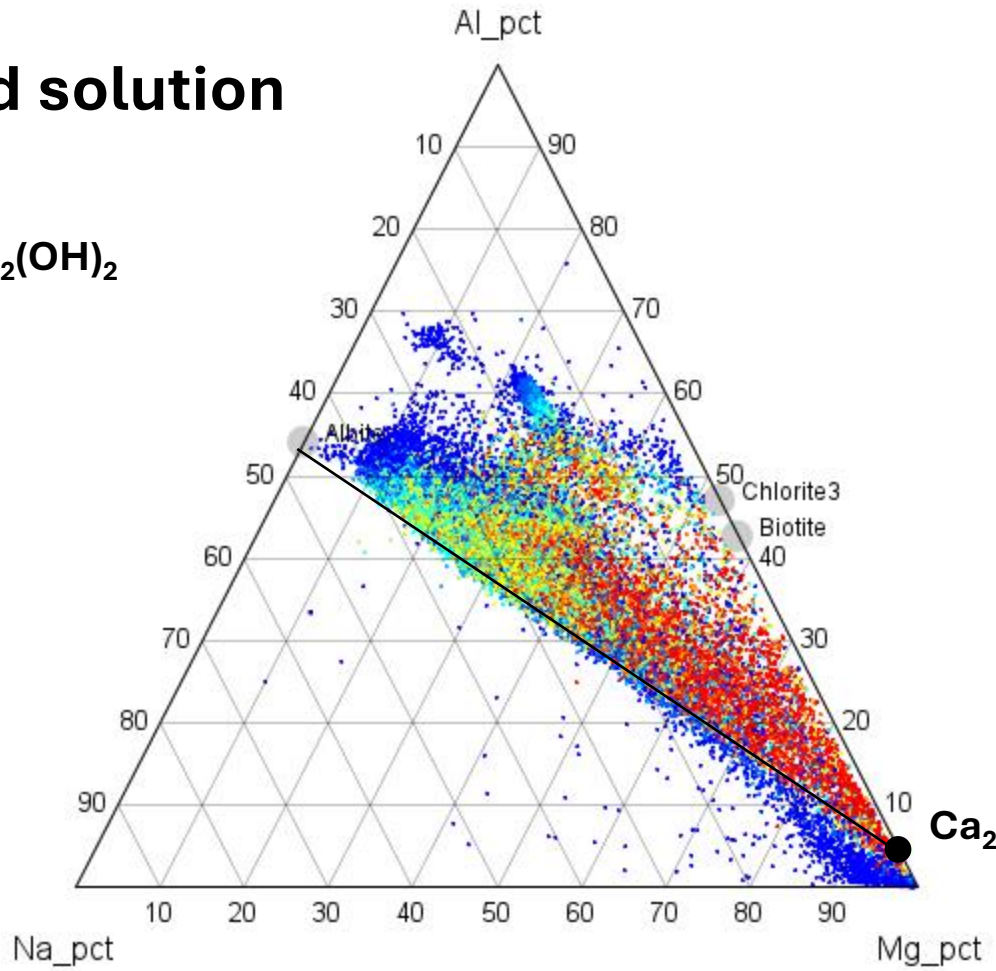

**Actinolite_SS_pct 10 Equal Bins**

- Actinolite_SS_pct to 5.94
- Actinolite_SS_pct to 9.45
- Actinolite_SS_pct to 11.76
- Actinolite_SS_pct to 13.73
- Actinolite_SS_pct to 15.52
- Actinolite_SS_pct to 17.33
- Actinolite_SS_pct to 19.43
- Actinolite_SS_pct to 22.14
- Actinolite_SS_pct to 26.78
- Actinolite_SS_pct to 80.3

# Actinolite_solid solution

**Estimated composition**

$Ca_2Al_{0.2}Fe_{1.4}Mg_{3.5}Si_{7.9}O_{22}(OH)_2$

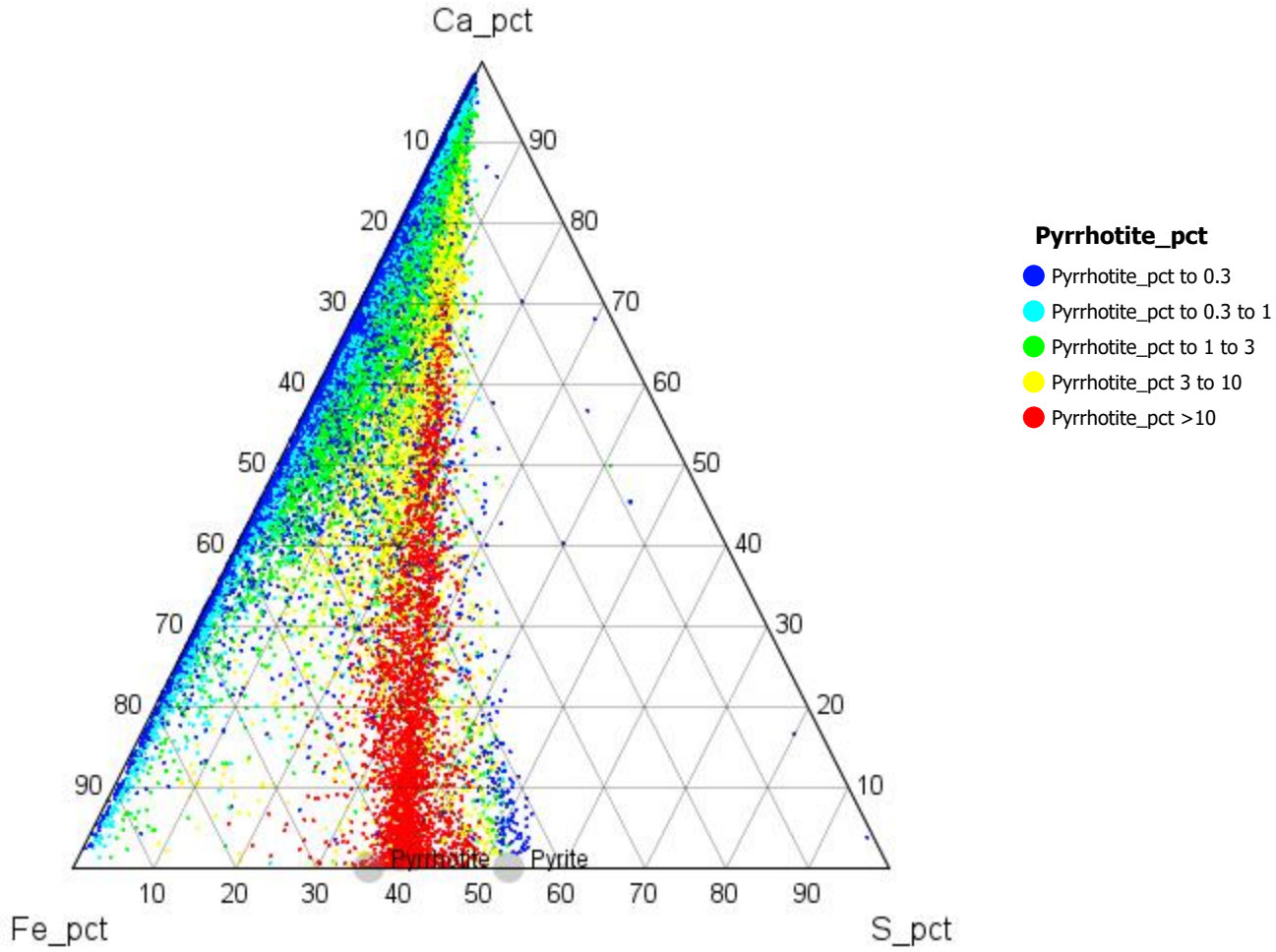



**Actinolite_SS_pct 10 Equal Bins**

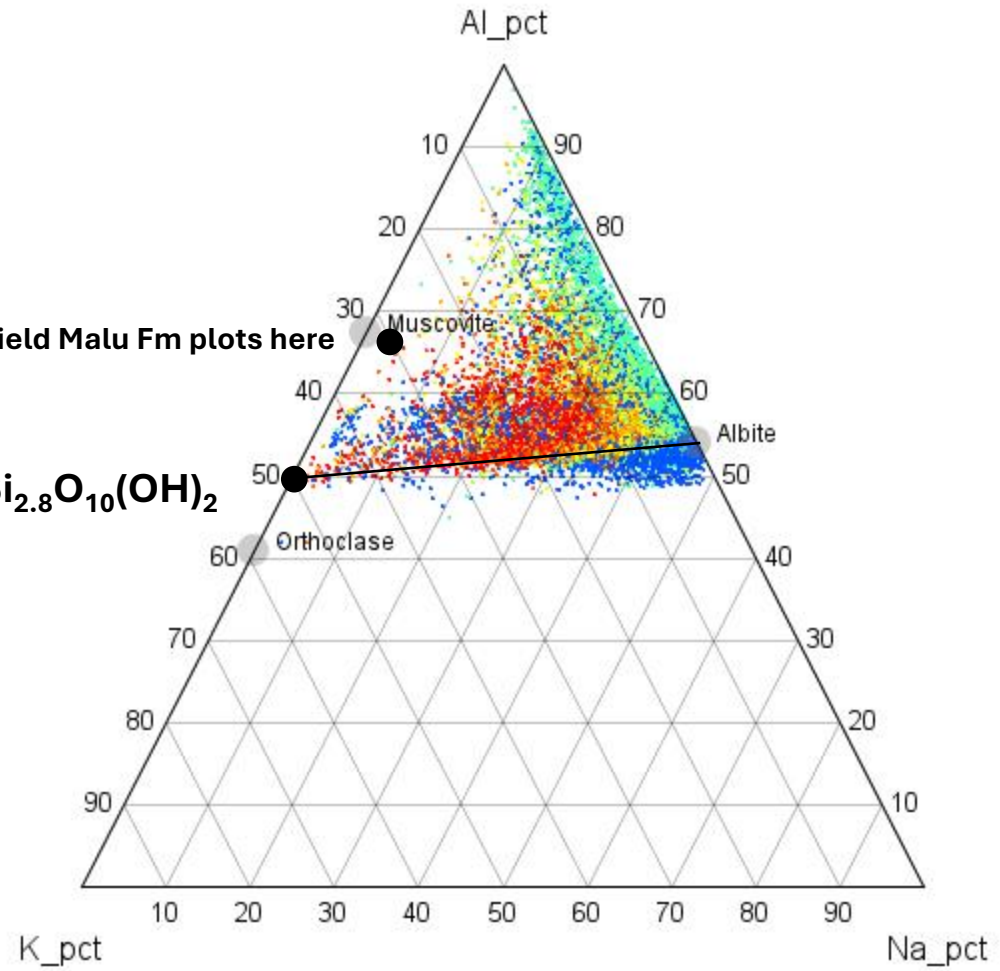
- Actinolite_SS_pct to 5.94
- Actinolite_SS_pct to 9.45
- Actinolite_SS_pct to 11.76
- Actinolite_SS_pct to 13.73
- Actinolite_SS_pct to 15.52
- Actinolite_SS_pct to 17.33
- Actinolite_SS_pct to 19.43
- Actinolite_SS_pct to 22.14
- Actinolite_SS_pct to 26.78
- Actinolite_SS_pct to 80.3

$Ca_2Al_{0.2}Fe_{1.4}Mg_{3.5}Si_{7.9}O_{22}(OH)_2$

# Pyrrhotite


Ca_pct
10
20
30
40
50
60
70
80
90
Fe_pct
10
20
30
40
50
60
70
80
90
S_pct
Pyrrhotite
Pyrite
Pyrrhotite_pct
Pyrrhotite_pct to 0.3
Pyrrhotite_pct to 0.3 to 1
Pyrrhotite_pct to 1 to 3
Pyrrhotite_pct 3 to 10
Pyrrhotite_pct >10

# Biotite



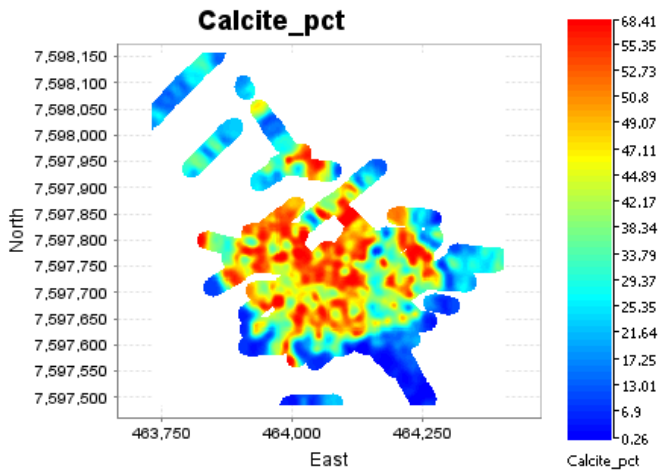

**Far-field Malu Fm plots here**

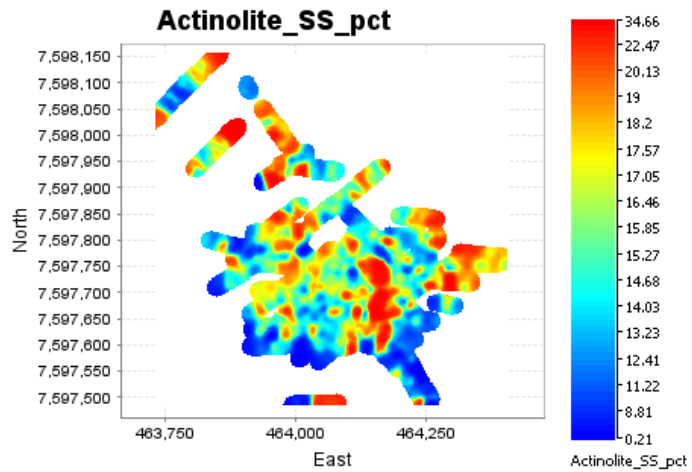
$K_1Al_{1.4}Fe_{0.8}Mg_2Si_{2.8}O_{10}(OH)_2$

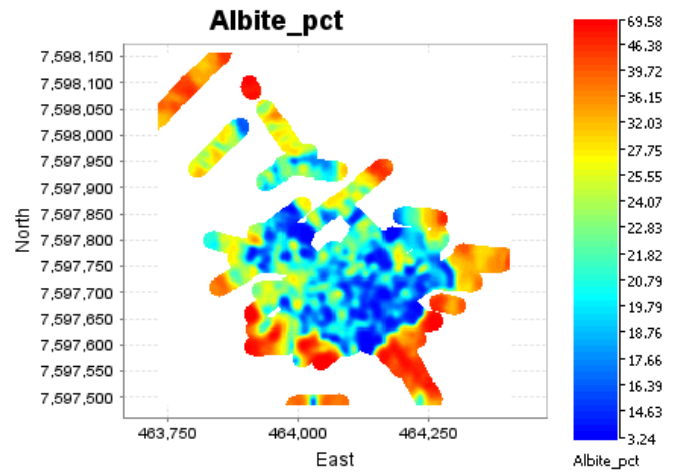
**Total Biotite 10 Equal Bins**

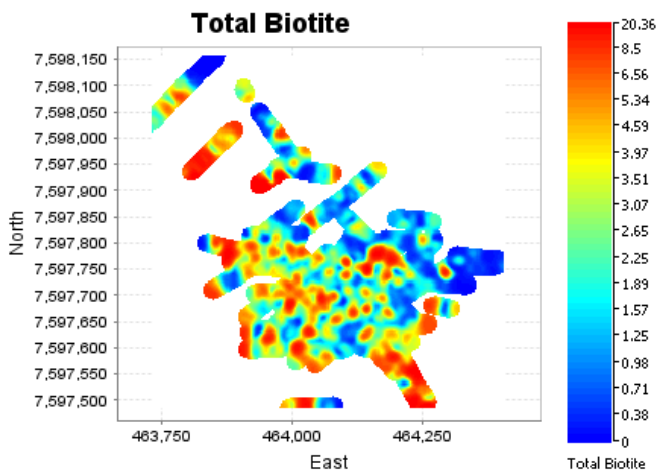
- Total Biotite to 0
- Total Biotite to 0.09
- Total Biotite to 0.85
- Total Biotite to 1.94
- Total Biotite to 3.9
- Total Biotite to 7.92
- Total Biotite to 14.38
- Total Biotite to 60.15

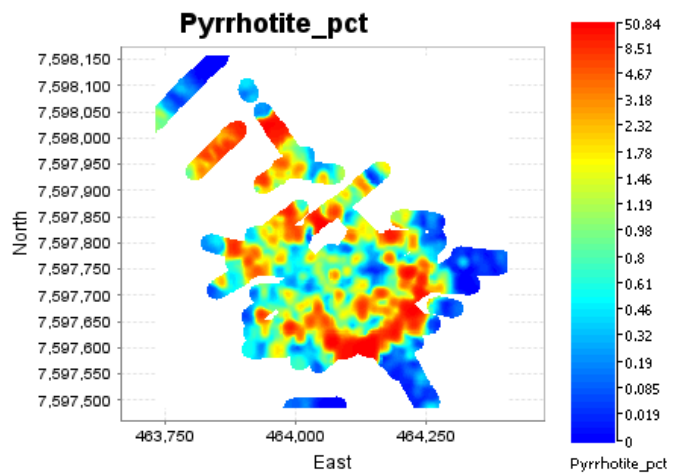
# Mineralogy; Level plan

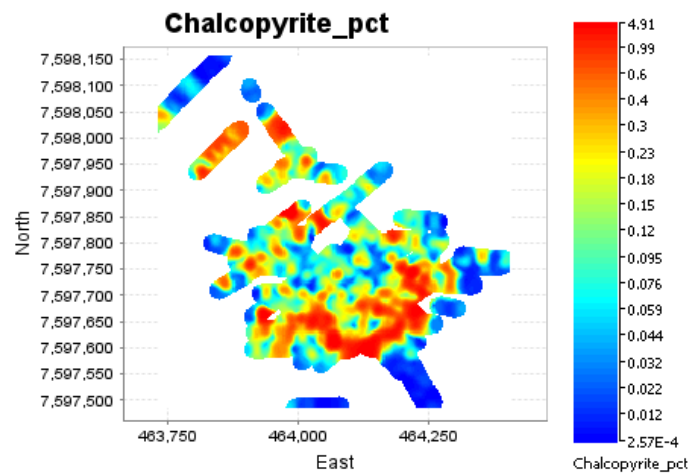


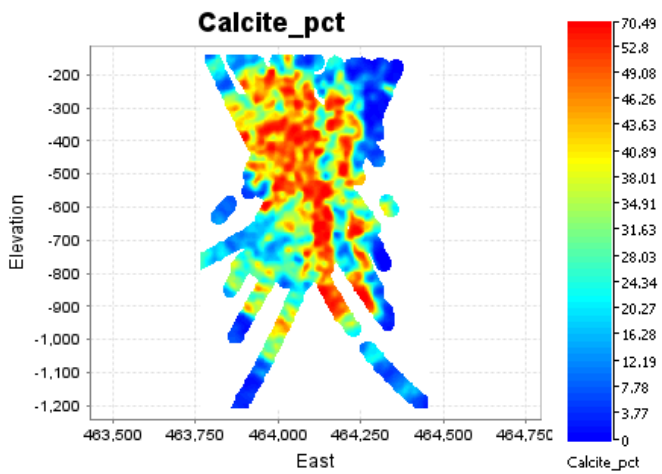



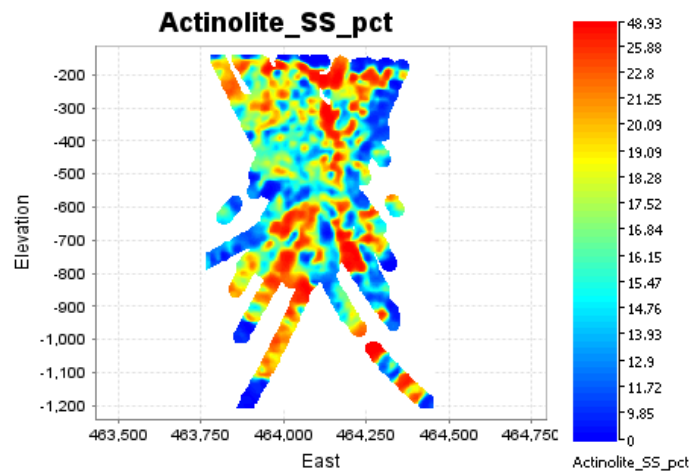



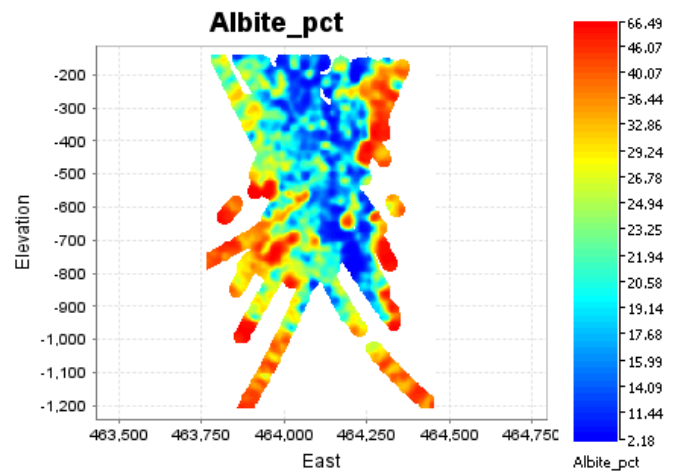



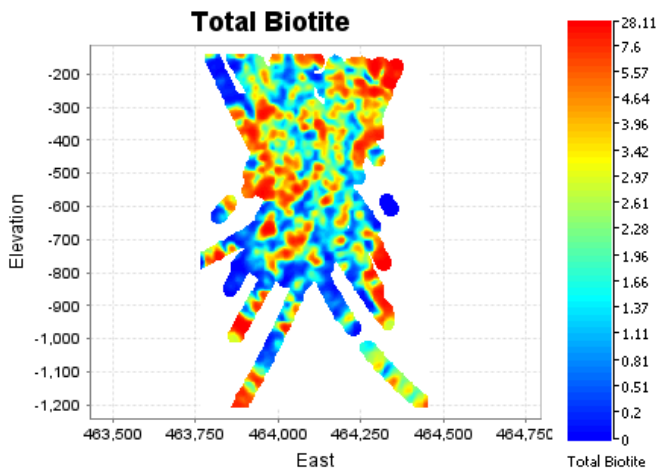



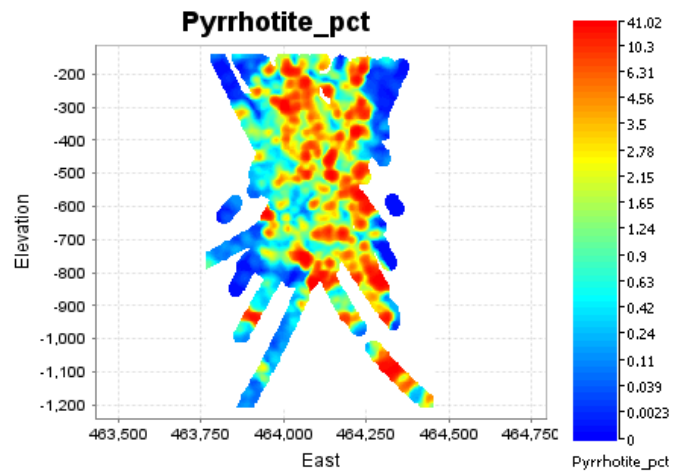
# Mineralogy; Cross Section

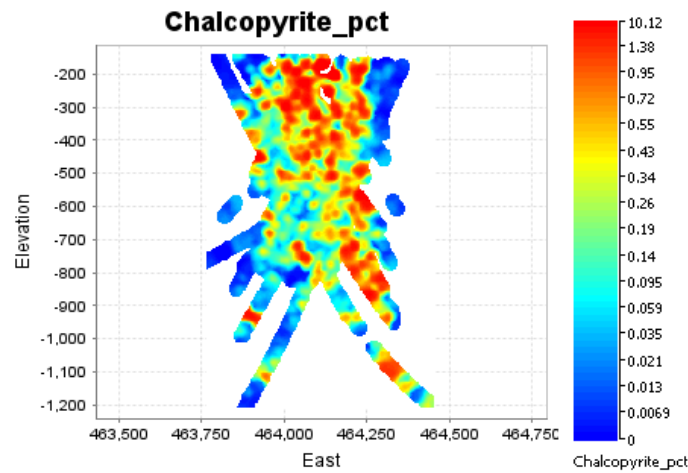


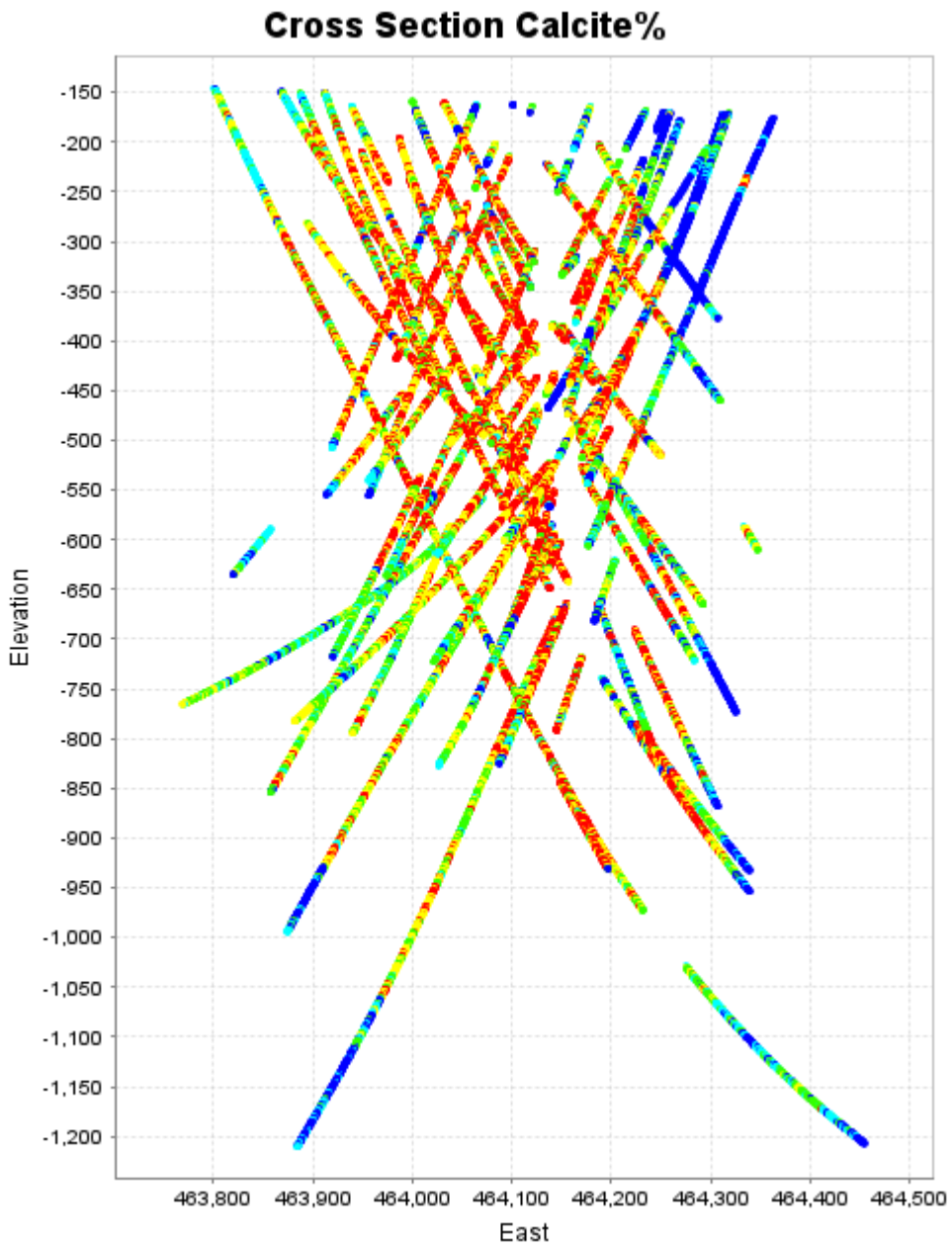



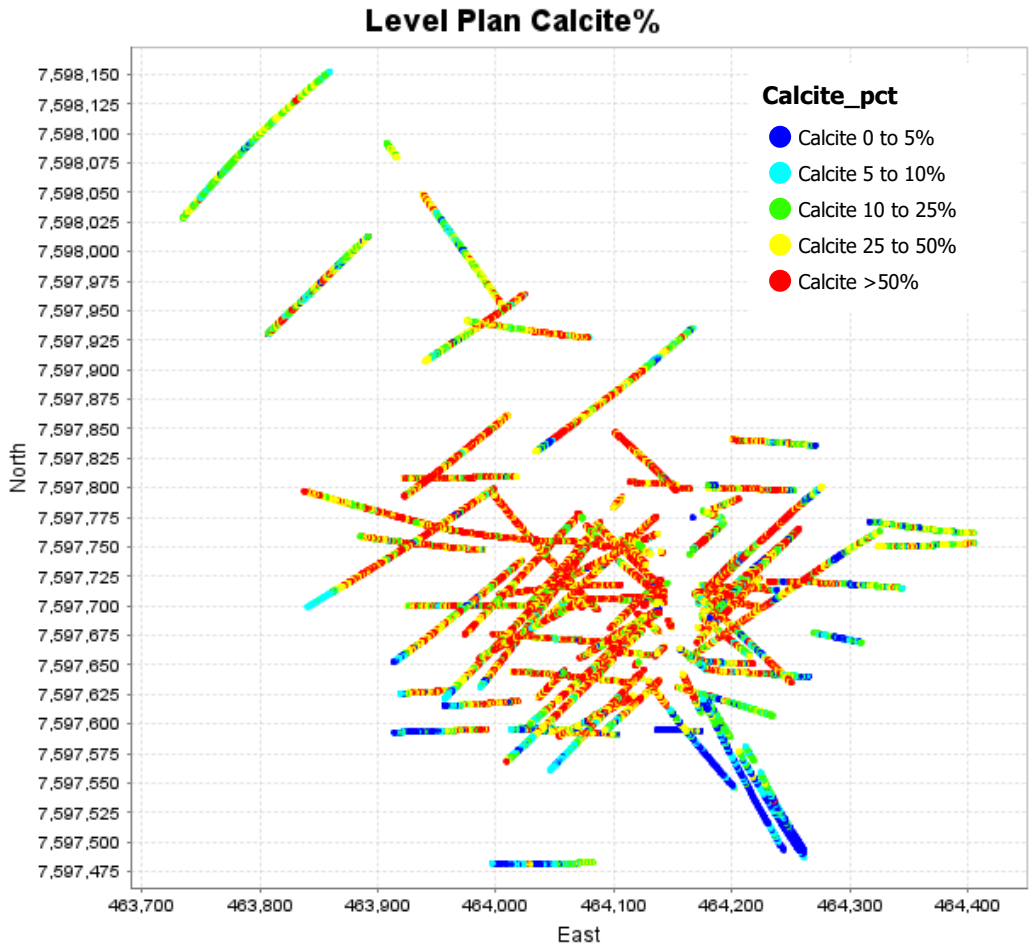



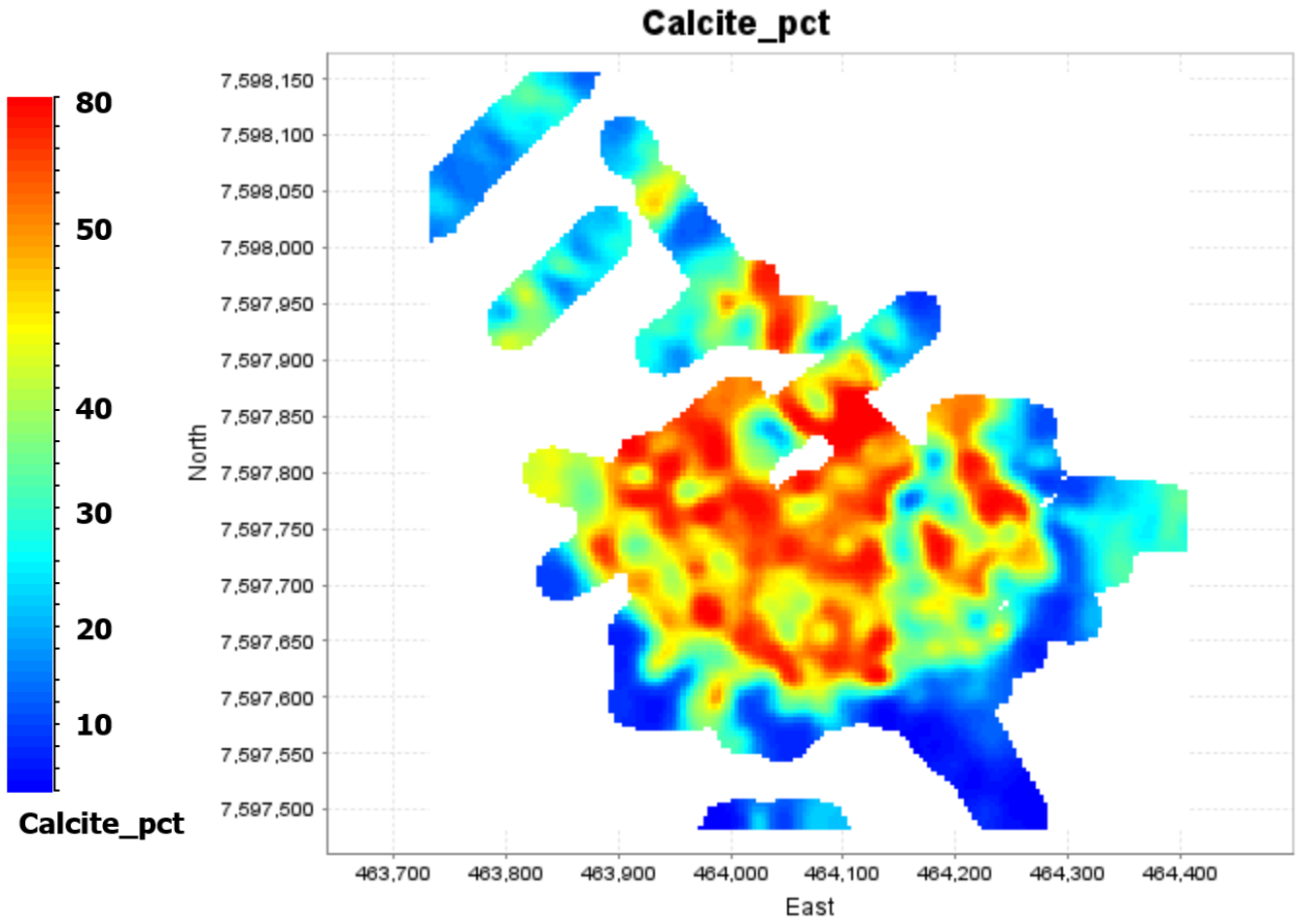




Cross Section Calcite%
-150
-200
-250
-300
-350
-400
-450
-500
-550
-600
-650
-700
-750
-800
-850
-900
-950
-1,000
-1,050
-1,100
-1,150
-1,200
Elevation
463,800
463,900
464,000
464,100
464,200
464,300
464,400
464,500
East


Level Plan Calcite%
Calcite_pct
Calcite 0 to 5%
Calcite 5 to 10%
Calcite 10 to 25%
Calcite 25 to 50%
Calcite >50%
7,598,150
7,598,125
7,598,100
7,598,075
7,598,050
7,598,025
7,598,000
7,597,975
7,597,950
7,597,925
7,597,900
7,597,875
7,597,850
7,597,825
7,597,800
7,597,775
7,597,750
7,597,725
7,597,700
7,597,675
7,597,650
7,597,625
7,597,600
7,597,575
7,597,550
7,597,525
7,597,500
7,597,475
North
463,700
463,800
463,900
464,000
464,100
464,200
464,300
464,400
East


Calcite_pct
80
50
40
30
20
10
Calcite_pct
7,598,150
7,598,100
7,598,050
7,598,000
7,597,950
7,597,900
7,597,850
7,597,800
7,597,750
7,597,700
7,597,650
7,597,600
7,597,550
7,597,500
North
463,700
463,800
463,900
464,000
464,100
464,200
464,300
464,400
East