FLEXIBLE AND MOBILE ECONOMIC PROCESSING TECHNOLOGIES

EU / Latin America dialogue on raw materials

Santiago, Chile

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FAME – FLEXIBLE AND MOBILE ECONOMIC PROCESSING TECHNOLOGIES

- Part of Horizon 2020 Research and Innovation Programme of the European Union
- Budget: €7.5 M
- Project Lifetime: Jan 2015 – Dec 2018
- Coordination and Management: WAI (London) and GKZ (Freiberg)

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FAME PARTNERS

The FAME project involves collaboration between 18 partners from 8 EU member states. Partners include mining companies, junior exploration, SME, research and academia.

FAME

- Develop flexible, modular, environmentally friendly processing technologies.
- Industry Driven R&I Project.
- Brings together industry, scientific research institutes –and academia.
- Raise public awareness and acceptance of mines & mining
- Maintain key mineral processing skills.

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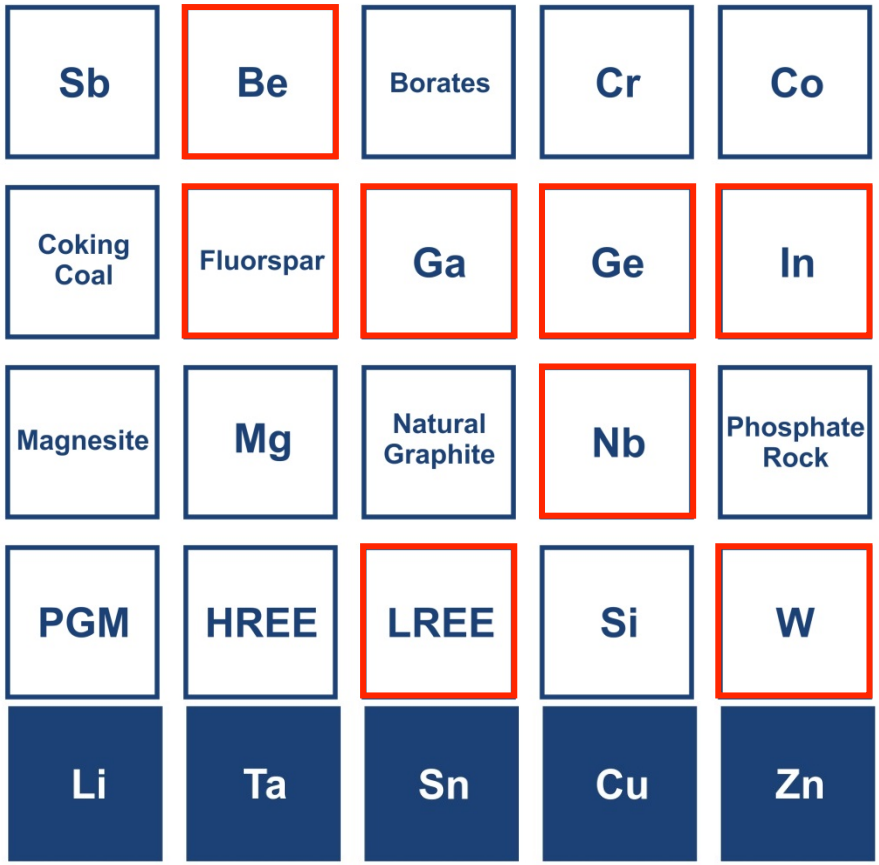
TARGETING SPECIFIC DEPOSIT TYPES: CRM FOCUS



- Which deposit classes in the EU contain significant "Critical Raw Material" Resources?
  - Skarns
  - Greisens
  - Pegmatites
- Complex mineralogy
- Frequently small resources not economically viable using existing large scale process flow designs

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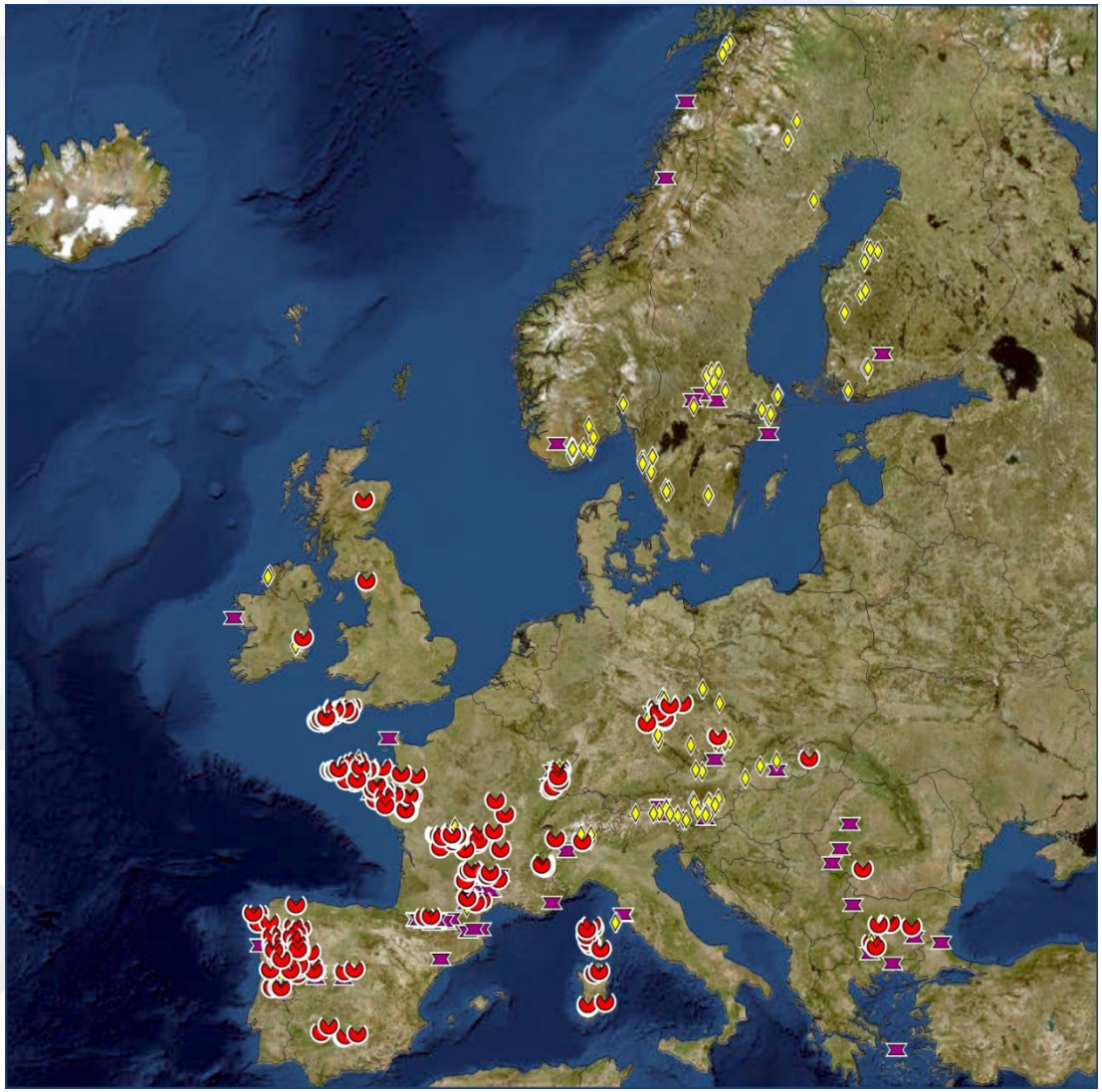
DISTRIBUTION OF THOSE ORE TYPES ACROSS EUROPE

Greisen

Pegmatite

Skarn



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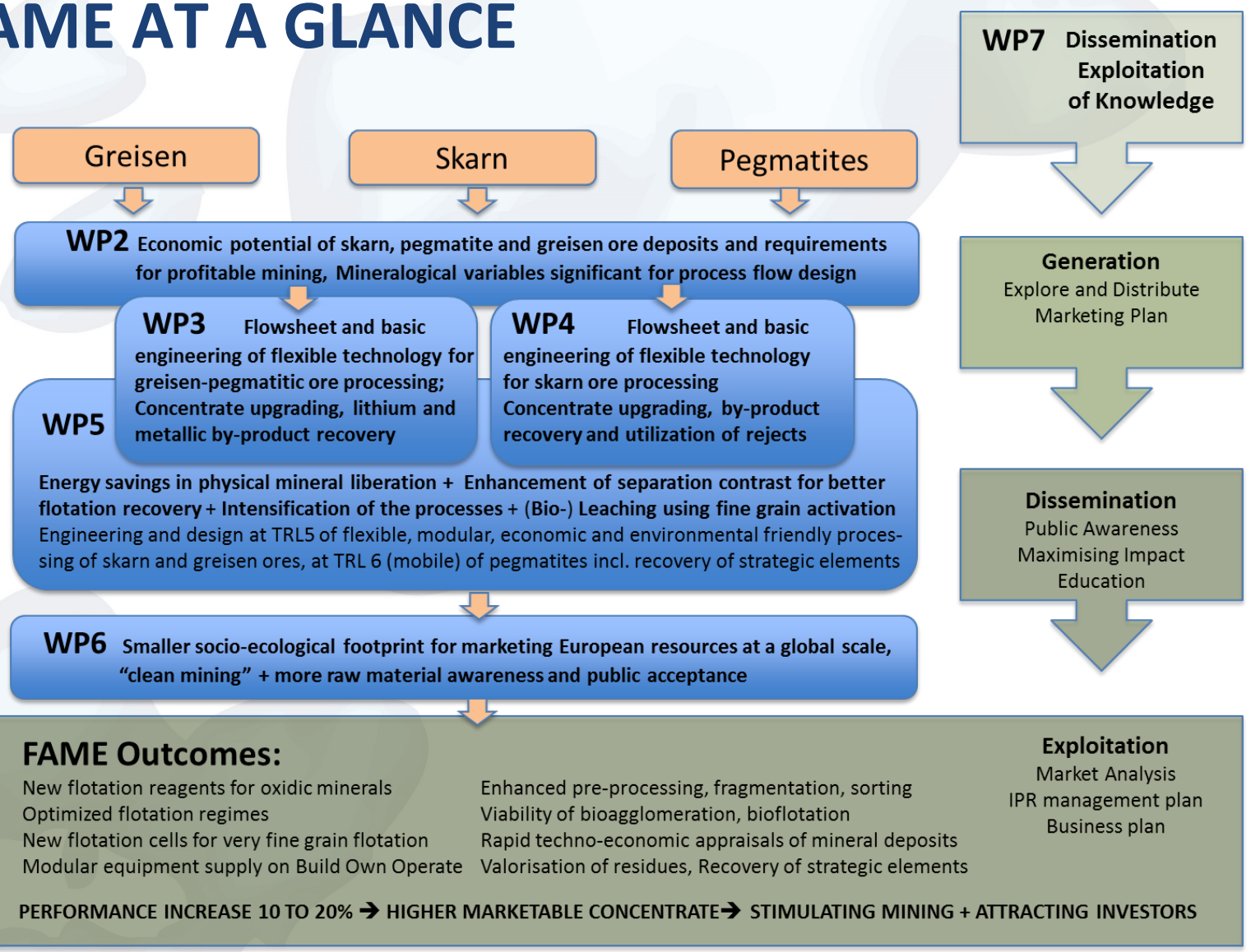
FAME AT A GLANCE



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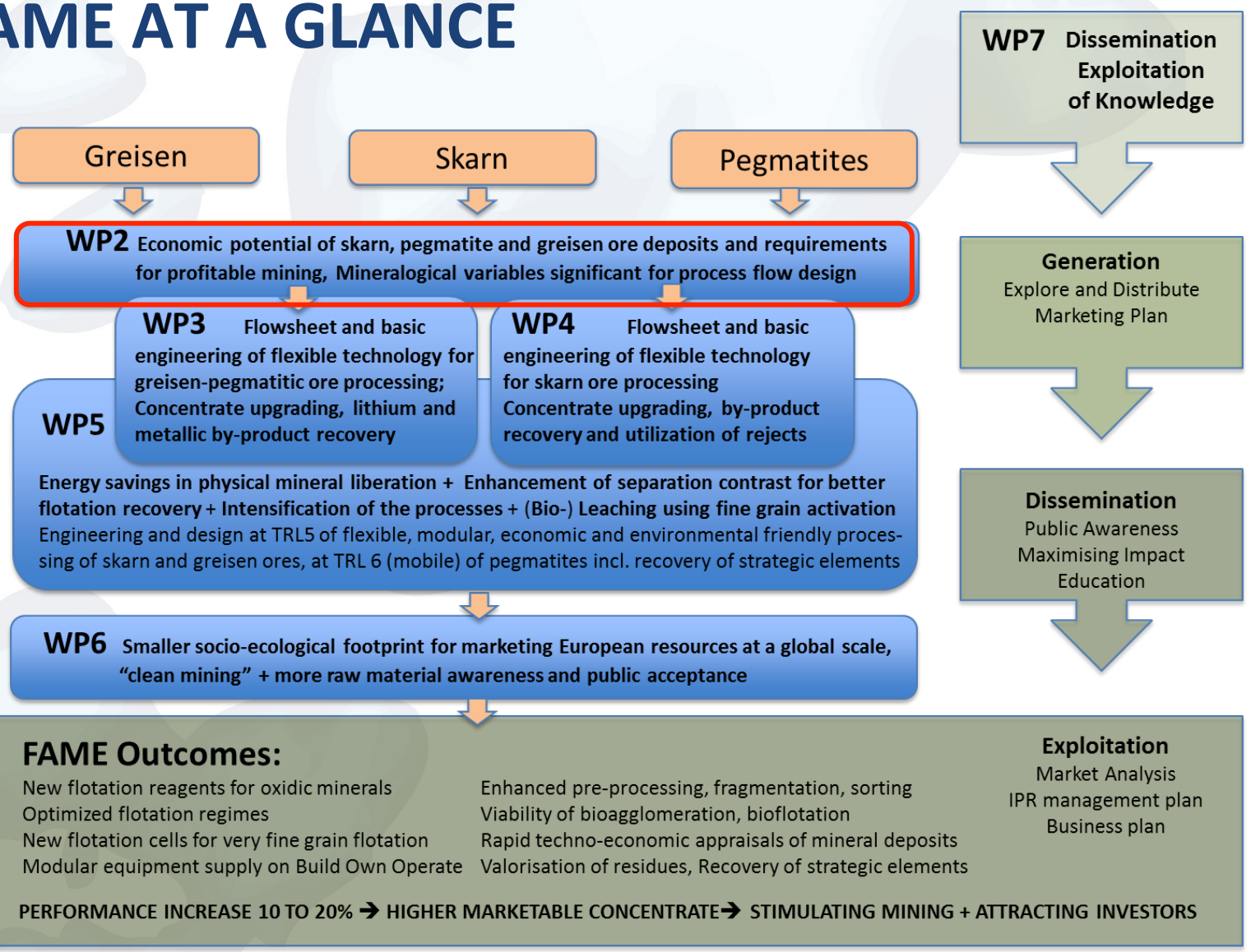

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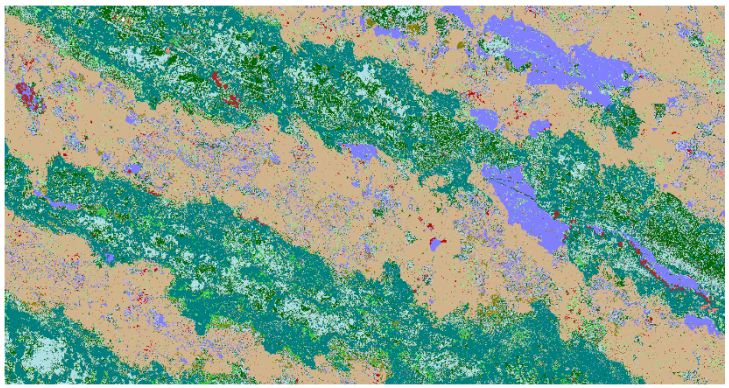
WP2 – DEPOSIT MINERALOGY

- Fully characterise the mineralogical variation within the different ore types:
  - Optical mineralogy
  - QEMSCAN® automated mineralogy
  - Electron microprobe analysis
- Understand the spatial characteristics of that mineralogy
- Provide information to mineral processors in WP3-5 to develop flexible and economically viable work flows enabling mineral separation.

WP2 – QEMSCAN® EXPLAINED

- Zeiss EVO®50 SEM with 4 light element EDS and back scattered electron detector.
- Collection of spatially resolved X-ray spectra and BSE across a thin section.
- Compared to a database of known minerals.
- Produces a false colour image, modal abundance and mineral association data

QEMSCAN® image courtesy of Gavyn Rollinson, CSM



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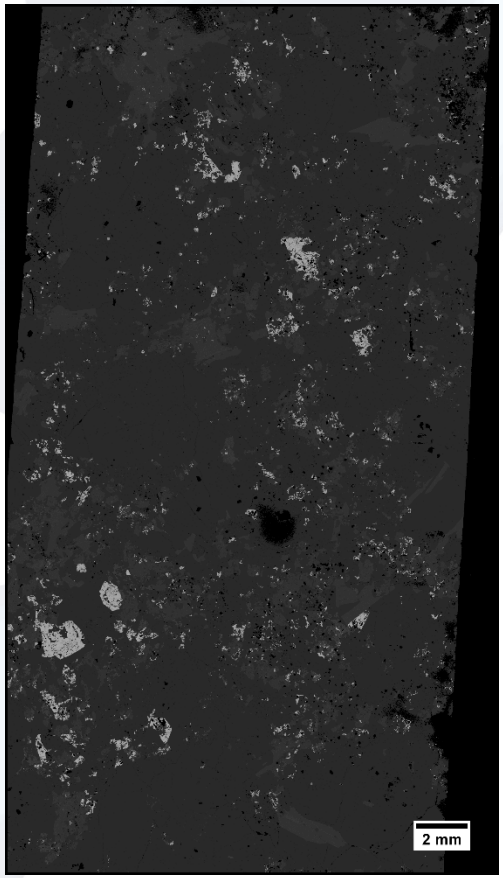
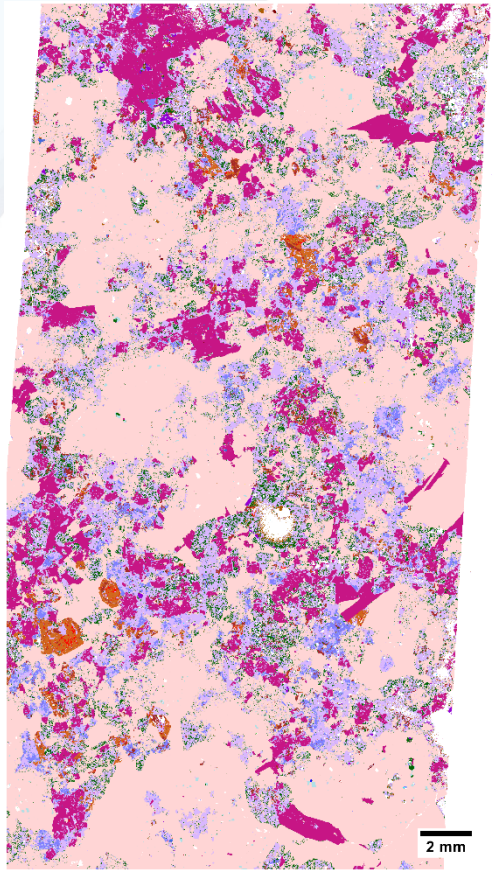
WP2 – GREISEN

- **Primary target: Cassiterite**
- **Subsidiary targets: Li micas, wolframite, scheelite, columbite-tantalite**





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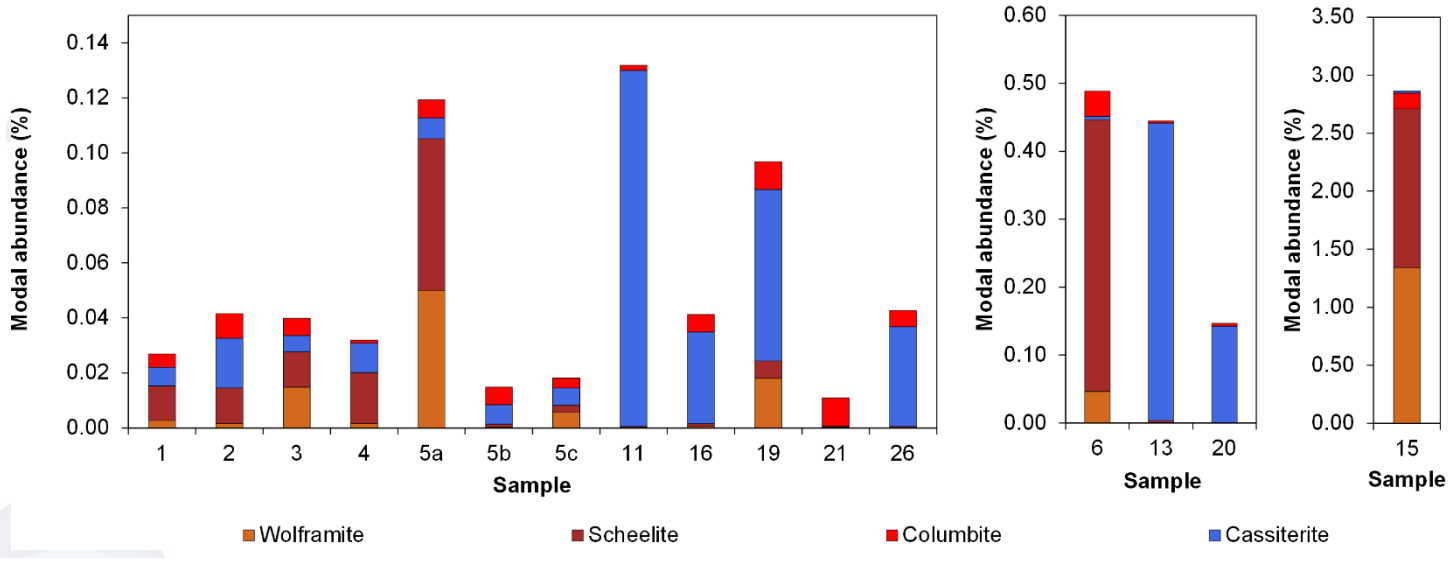
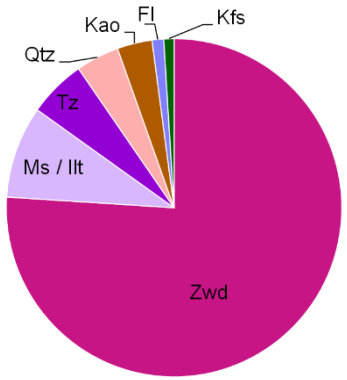
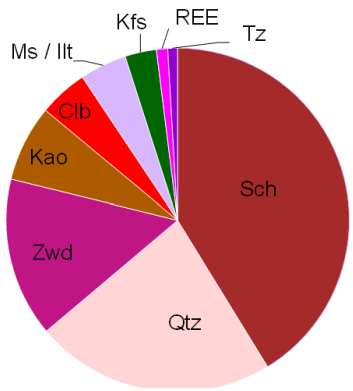
WP2 – GREISEN

- **QEMSCAN® data indicate separation of cassiterite + Li micas from wolframite + scheelite + columbite-tantalite.**





Cassiterite (mean 0.11 vol%, 40 µm) is strongly associated with Li micas.



Wolframite (mean 0.05 vol%, 29 µm) is strongly associated with scheelite

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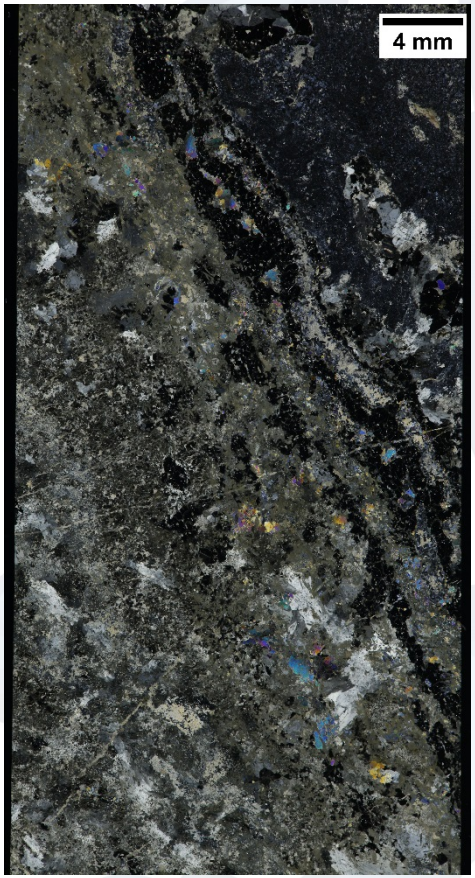
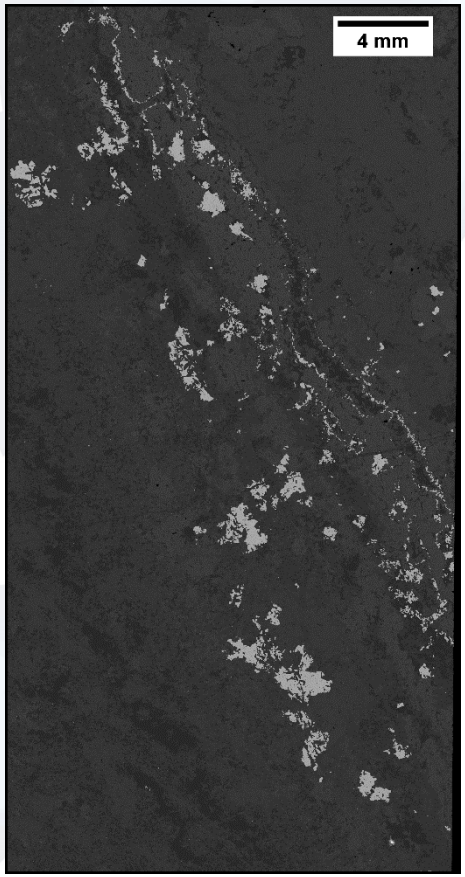
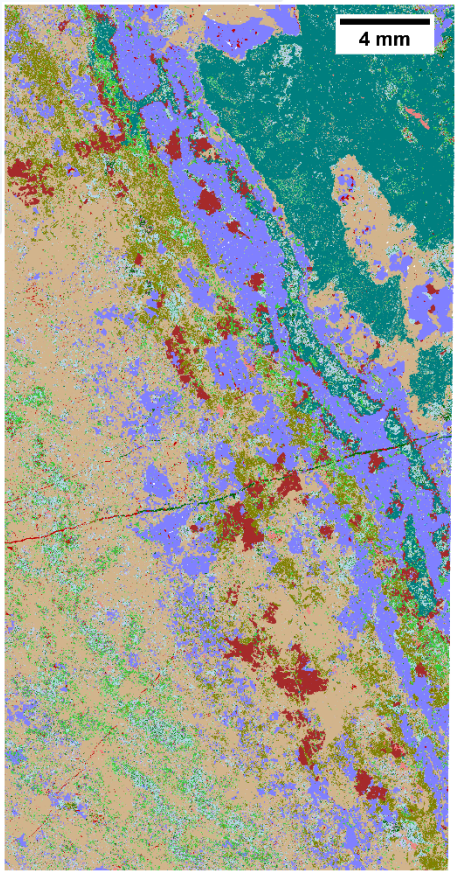
WP2 – SKARN

- Primary target: scheelite
- Subsidiary targets: cassiterite, fluorite







- Background
- Quartz
- K-Feldspar
- Plagioclase feldspar
- Trioctahedral mica
- Illite/Muscovite
- Vesuvianite
- Epidote group
- Hedenbergite/Diopside
- Amphibole (Ca Al poor)
- Amphibole (Ca poor)
- Magnesiochlorite
- Zircon
- Fe oxides
- Malayite
- Cassiterite
- Scheelite
- Titanite
- Calcite
- Fluorite
- Apatite
- REE minerals
- Pyrite
- Arsenopyrite
- Arseniosiderite
- Others

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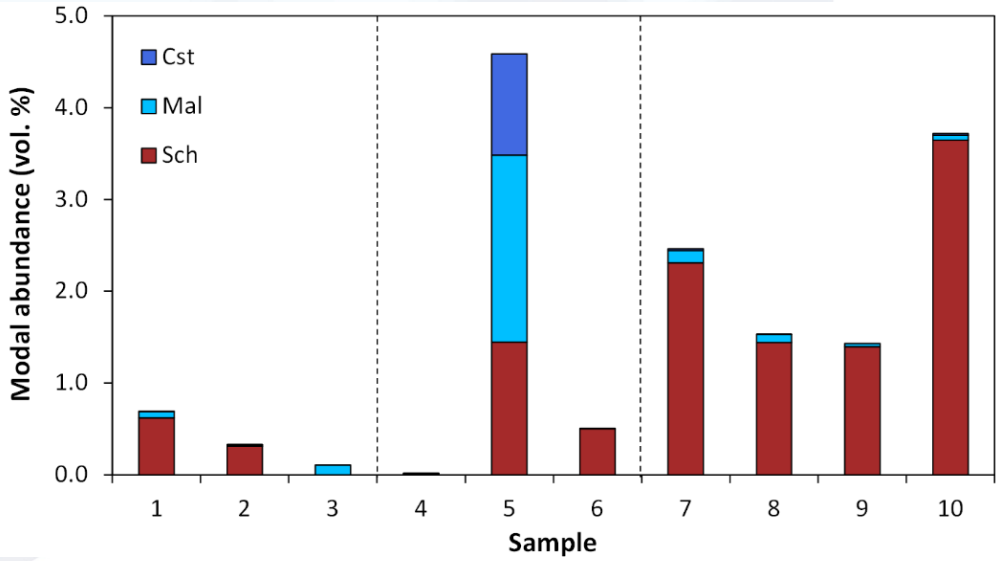
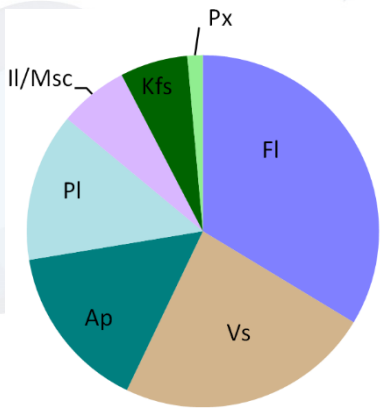
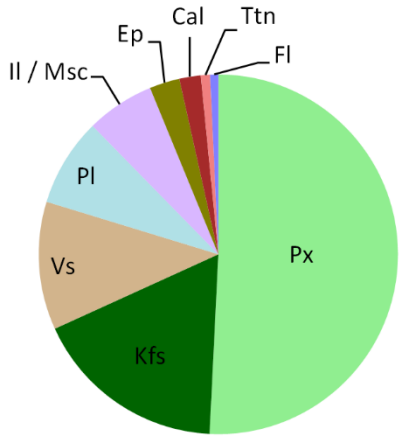
WP2 – SKARN

- QEMSCAN® data indicate enrichment of scheelite in a specific horizon.
- In this horizon, scheelite mean modal abundance 3.2 vol%, mean grainsize 195 µm.





Scheelite is associated with fluorite and vesuvianite.



Malayaite is an additional Sn-bearing mineral and is associated with pyroxene.

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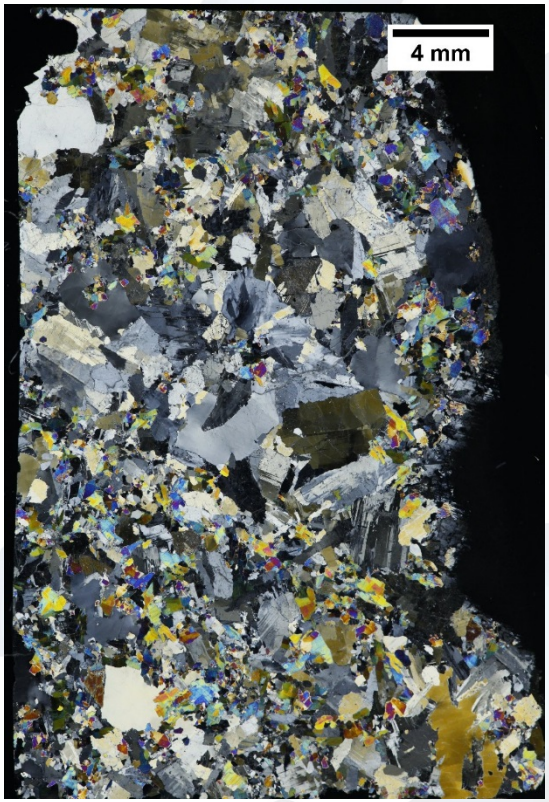
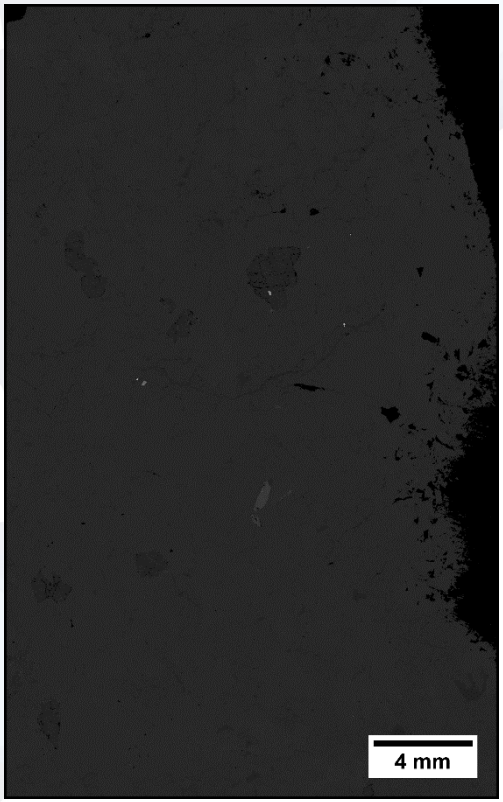
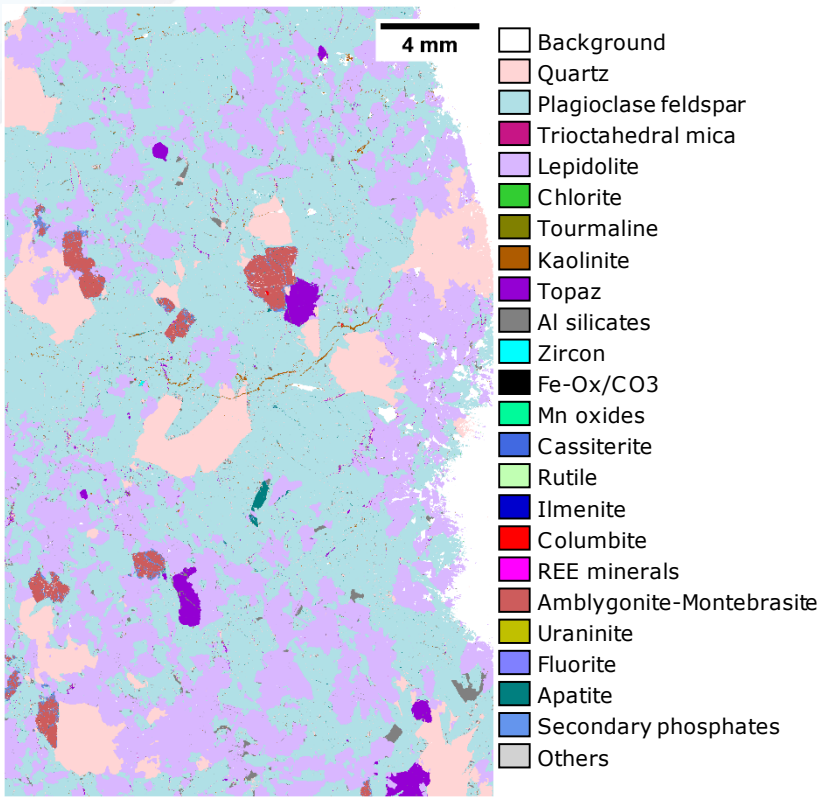
WP2 – PEGMATITE

- **Primary target: lithium mica (lepidolite)**
- **Subsidiary targets: cassiterite, amblygonite-montebrasite, columbite-tantalite.**







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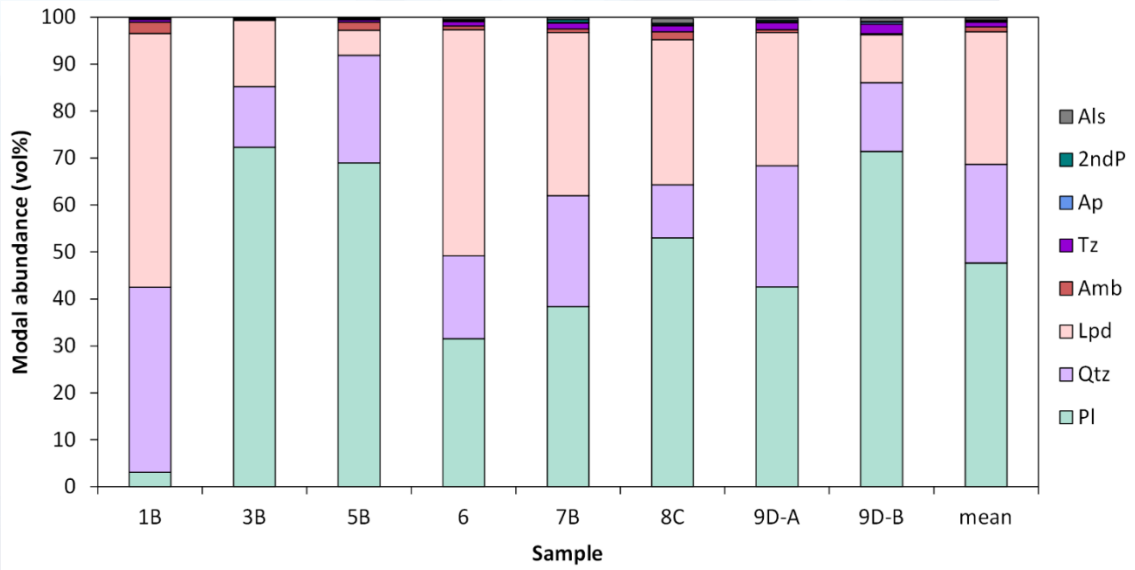
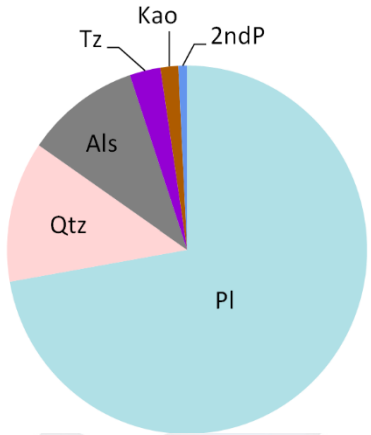
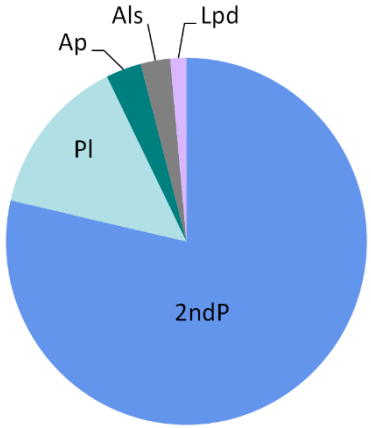
WP2 – PEGMATITE

- QEMSCAN® data indicate lepidolite is abundant (mean 28 vol%, 523 µm), with few inclusions.
- Cassiterite is trace only (<0.01 vol%).





Lepidolite is primarily associated with plagioclase



Amblygonite-montebrasite is frequently altered to secondary phosphates.

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NEXT STEPS

- Mineral characterisation: electron microprobe work to determine mineral chemistry
- Mineral processing test work using mineral characterisation information from WP2.
  - Crushing / grinding followed by mineral liberation analysis using QEMSCAN®.
  - Flotation – new techniques (e.g. ultrasound assisted) and novel regents
  - Gravity separation

FAME CONCLUSIONS

- Started January 2015
- QEMSCAN® and optical microscopy have been used to clarify:
  - Mineralogy (modal abundance vol. % & wt. %)
  - Grainsize and mineral association of primary and subsidiary target minerals
  - Grainsize and mineral association of trace minerals
- WP3-5 are utilising mineral characterisation to inform processing and test work has begun.
- Aims to optimise processing to maximise recovery of primary target minerals & critical raw materials within the EU.

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