Influence of Size-Fraction Partitioning of Sulphide and Carbonate Minerals in Blasted Rock on ARD Potential Classification, Copper Mountain Mine

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What We'll Cover

- Reason for the study.
- Background on Copper Mountain.
- Study design and methods.
- Interim findings.
- Implications for other sites.

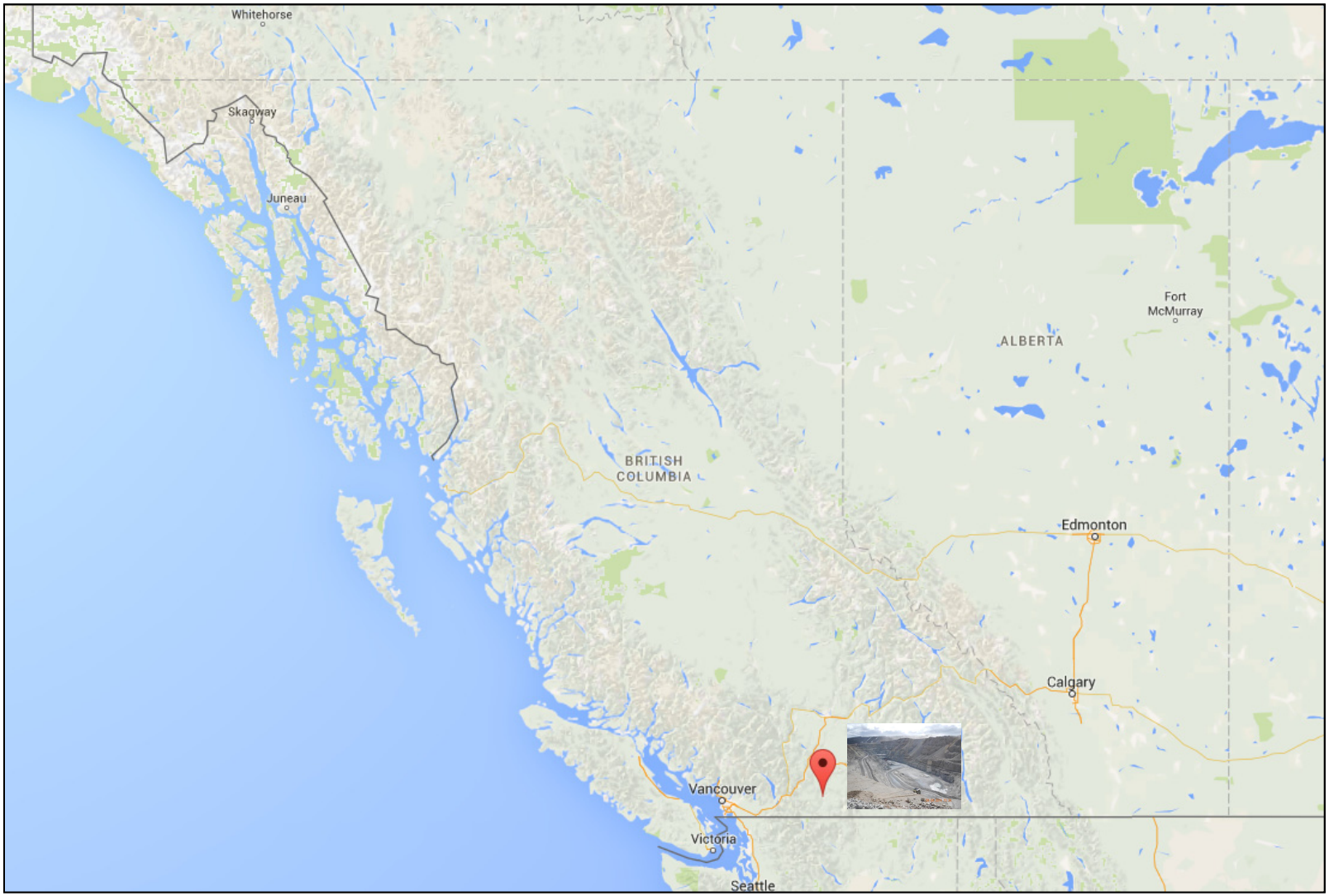
Reason for the Study

- CMM is currently segregating rock and low grade ore based on ARD potential.
  - Basis is analysis of blast hole samples.

- Results from operational testing of placed PAG rock very commonly returns non-PAG.

- The mine is possibly segregating unnecessarily and incurring costs for current and future management.

Located in Southwestern BC



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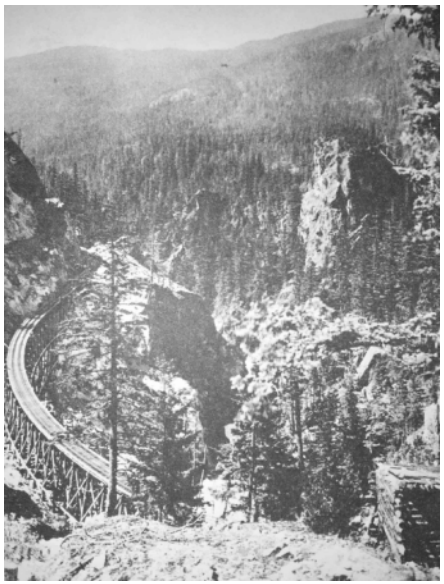
Geology and Mining History

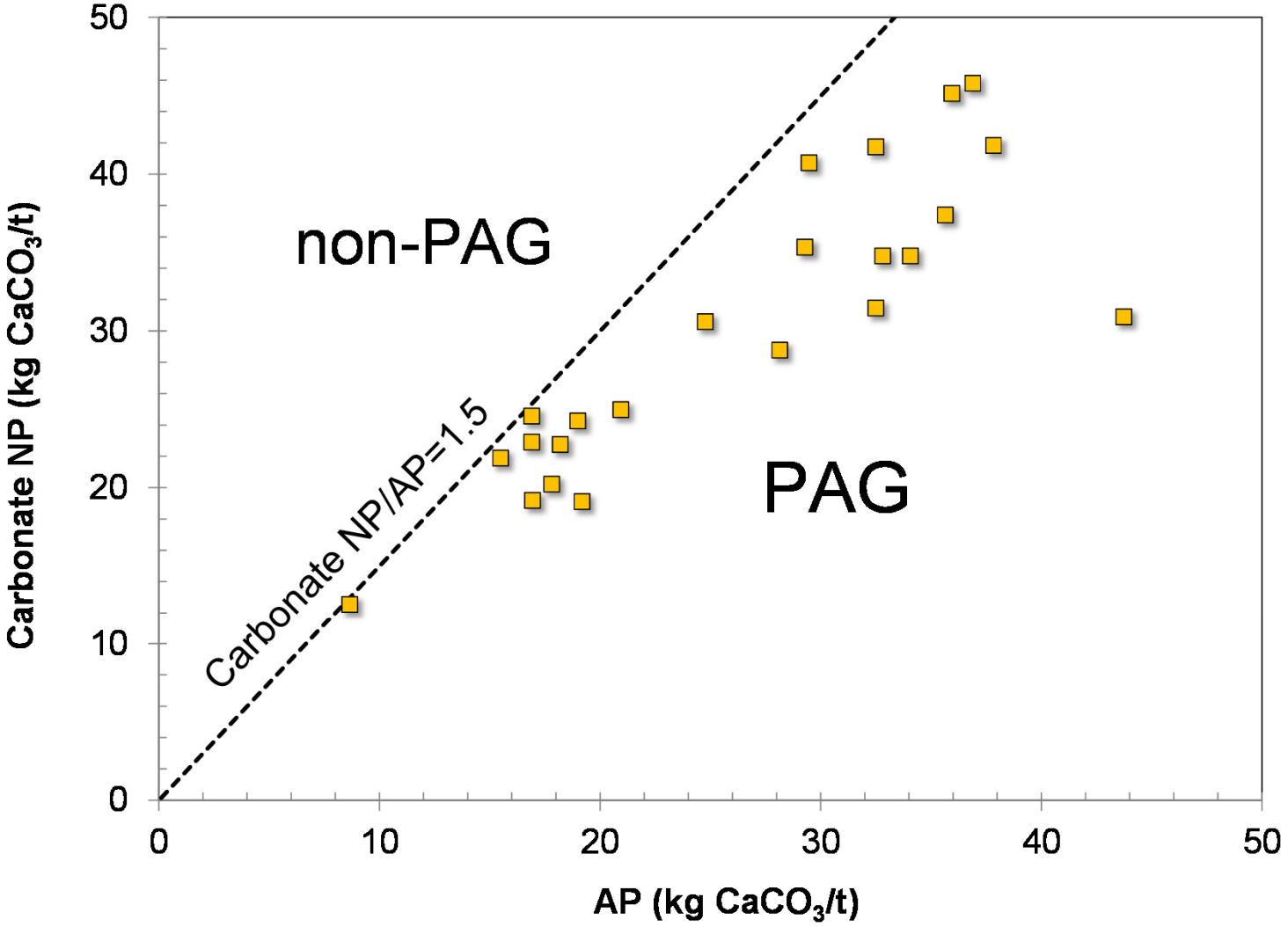
- Porphyry deposit containing copper sulphide mineralization.
- Hosted by plutonic rocks intruded into volcanic rocks.
- Historical mining spanning more than a century.
  - Underground until late 1950s.
  - Open pit mining began in 1980s.



Waste Management

- Low grade ore and waste segregated for ARD potential using blast hole cuttings.
  - PAG defined as Carbonate NP/AP≤1.5
- Samples are tested post-placement.
  - Two size fractions (-2 mm and +2 mm)

Typical Blast Hole Results for PAG Rock



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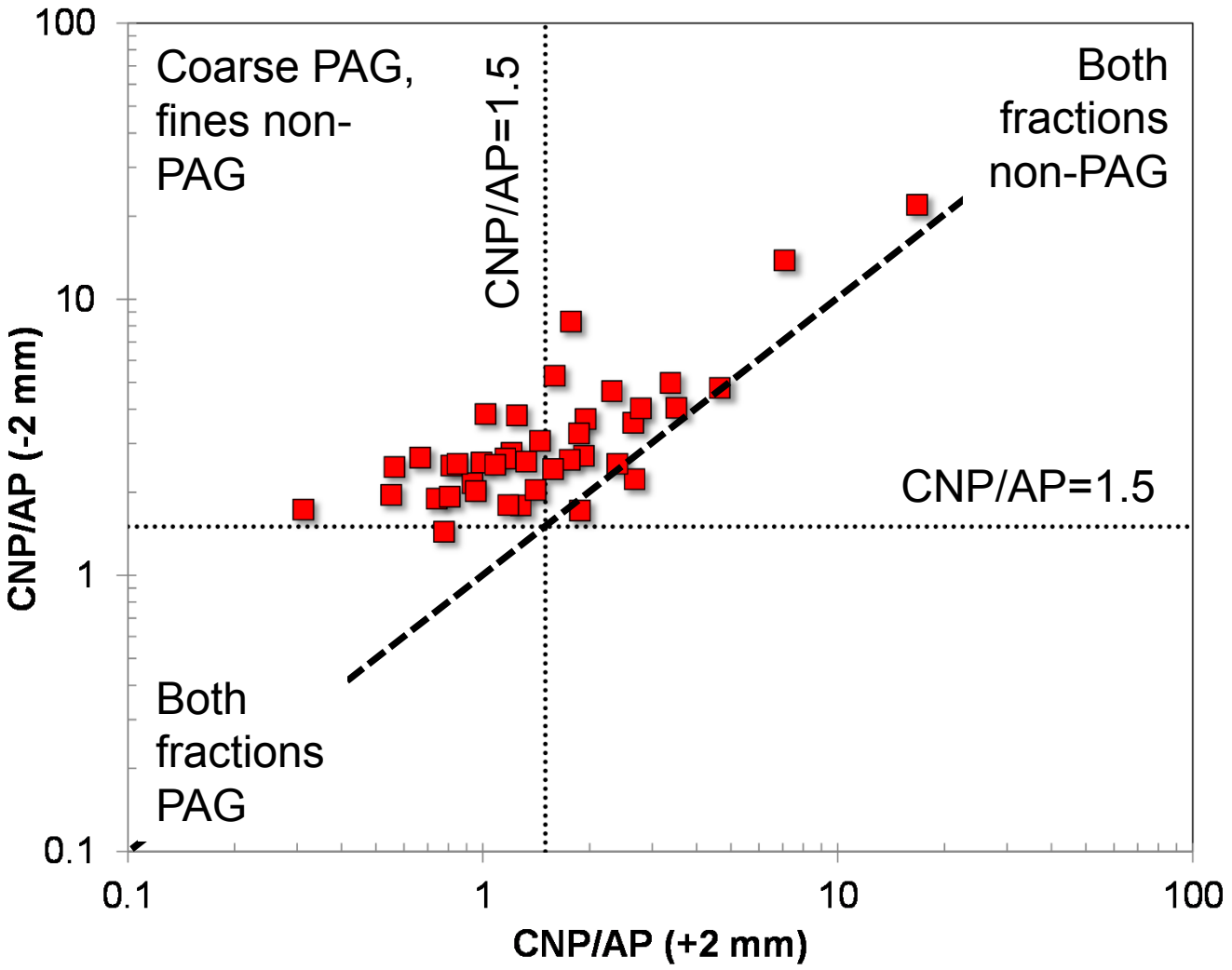
Results of Placed PAG Rock – Two Fractions



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Observations from Operational Testing

- CNP/AP>1.5 in -2 mm for PAG rock.
- CNP/AP is typically greater in fine fraction compared to coarse fraction.
- Volcanic component blasts coarse and is very competent.

Site Observations

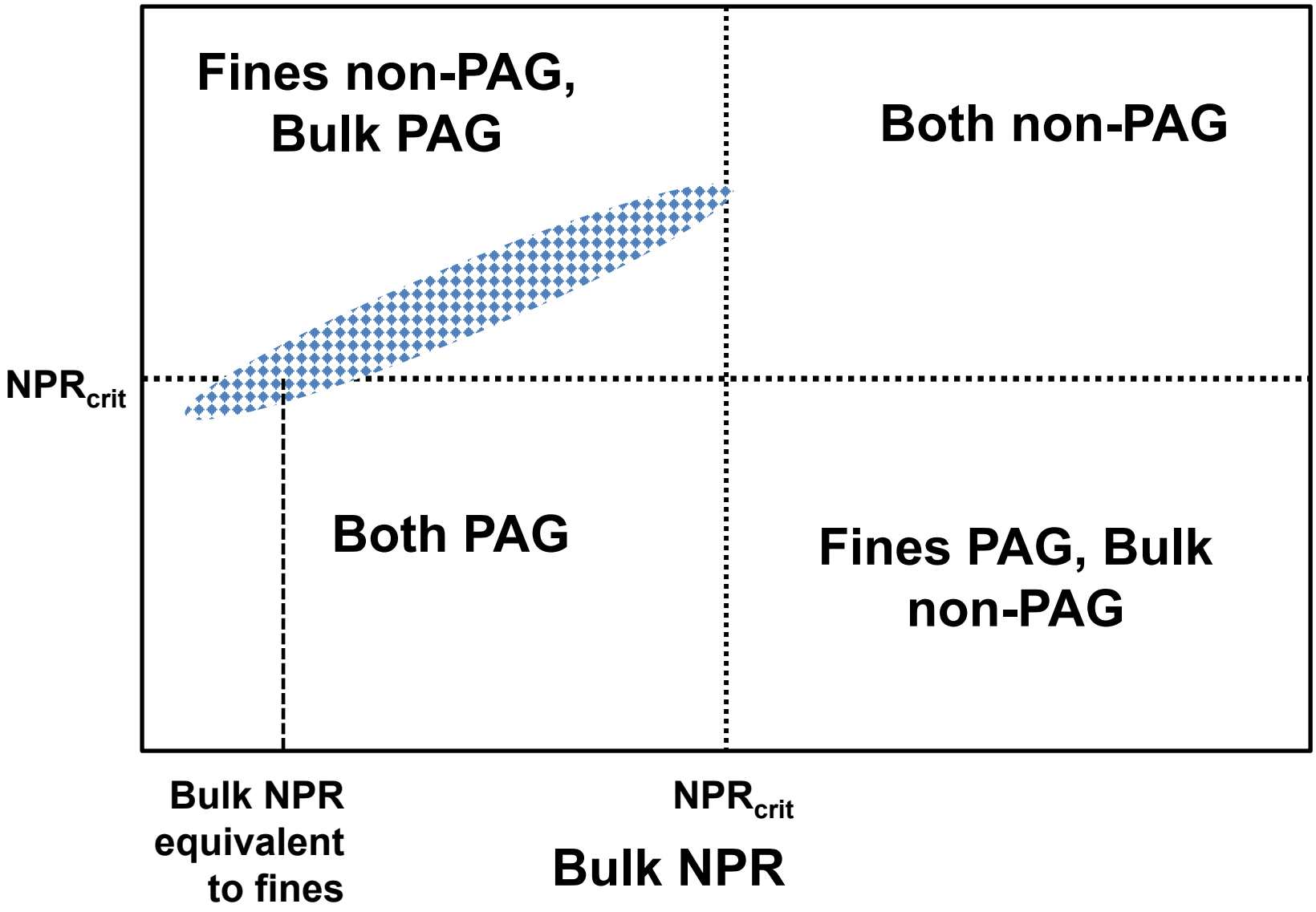
- After long history of mining at Copper Mountain, drainage from old features is non-acidic.
- Products of carbonate-controlled weathering are common.

Conceptual Model and Objective

- Waste rock reactivity is determined by the composition of fines. Bulk rock characteristics may not reflect the characteristics of fines.

- Determine the relationship between ARD potential of bulk rock and ARD potential of fines.

Project Design – Base Case



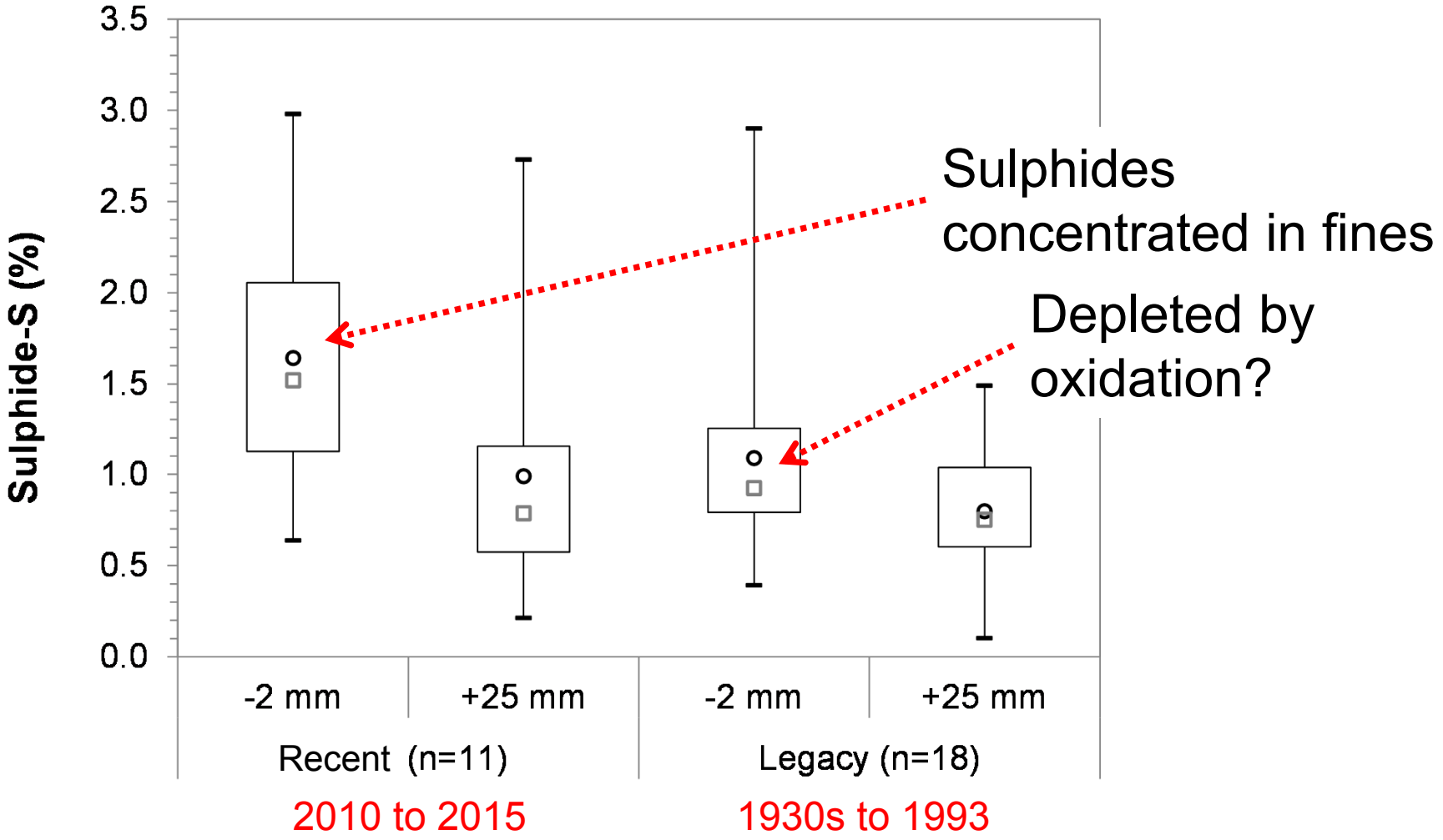
Variables Considered

- Definition of “fines”
  - Which size fraction largely determines geochemical performance?
- Rock type
  - Does mineral partitioning by size fraction differ in hornfelsed volcanic vs intrusive rock?
- Aging effects
  - Does physical and chemical weathering result in mineral partitioning by size fraction that differs from fresh rock?

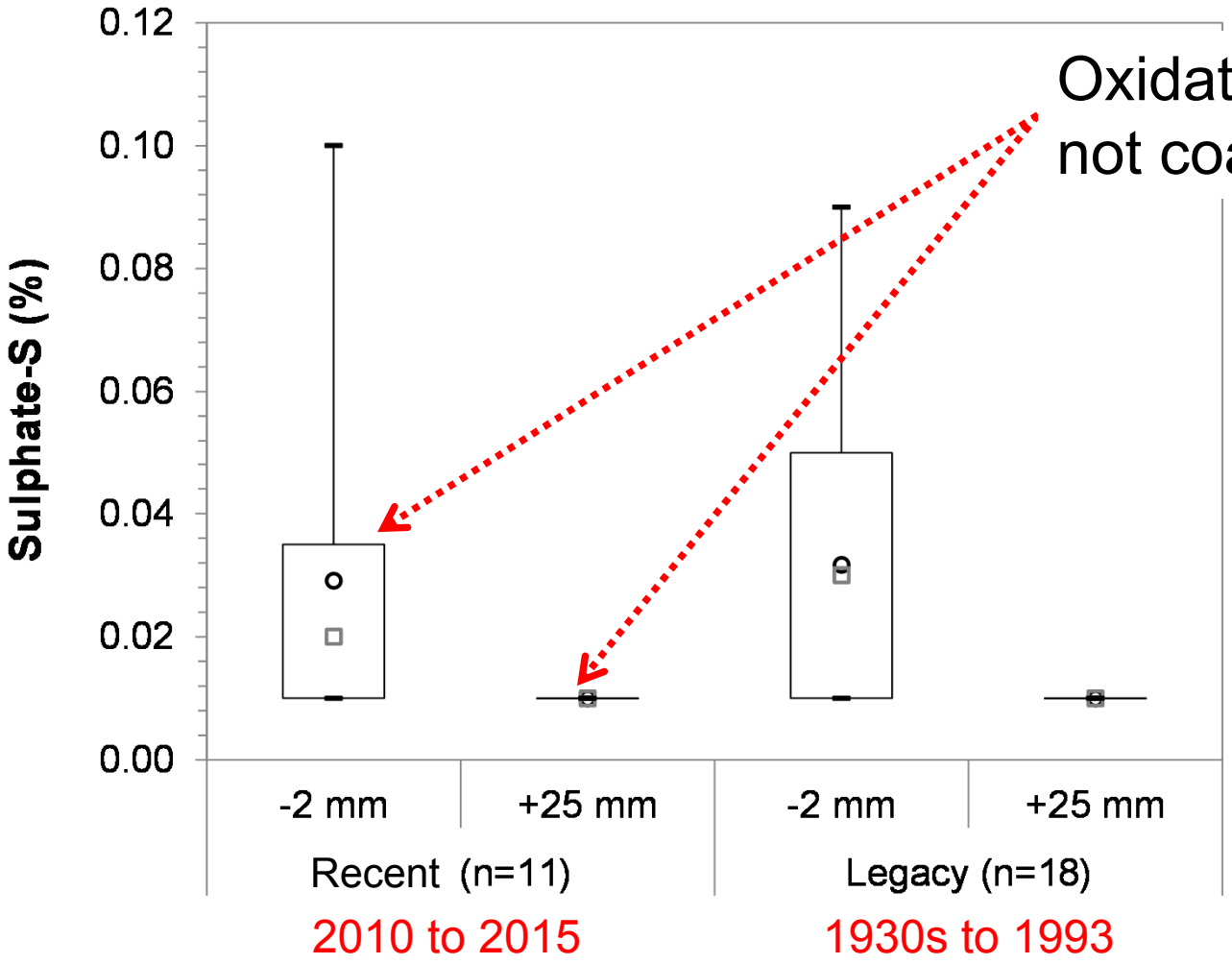
Design

- Collect bulk samples – two rock types, several ages.
- Sieve to particle size fractions using sieves at 2, 6.25, and 25 mm.
- Analysis of size fractions for sulphur, carbonate.
- Optical mineralogy, QEMSCAN to evaluate mineral liberation and weathering effects.

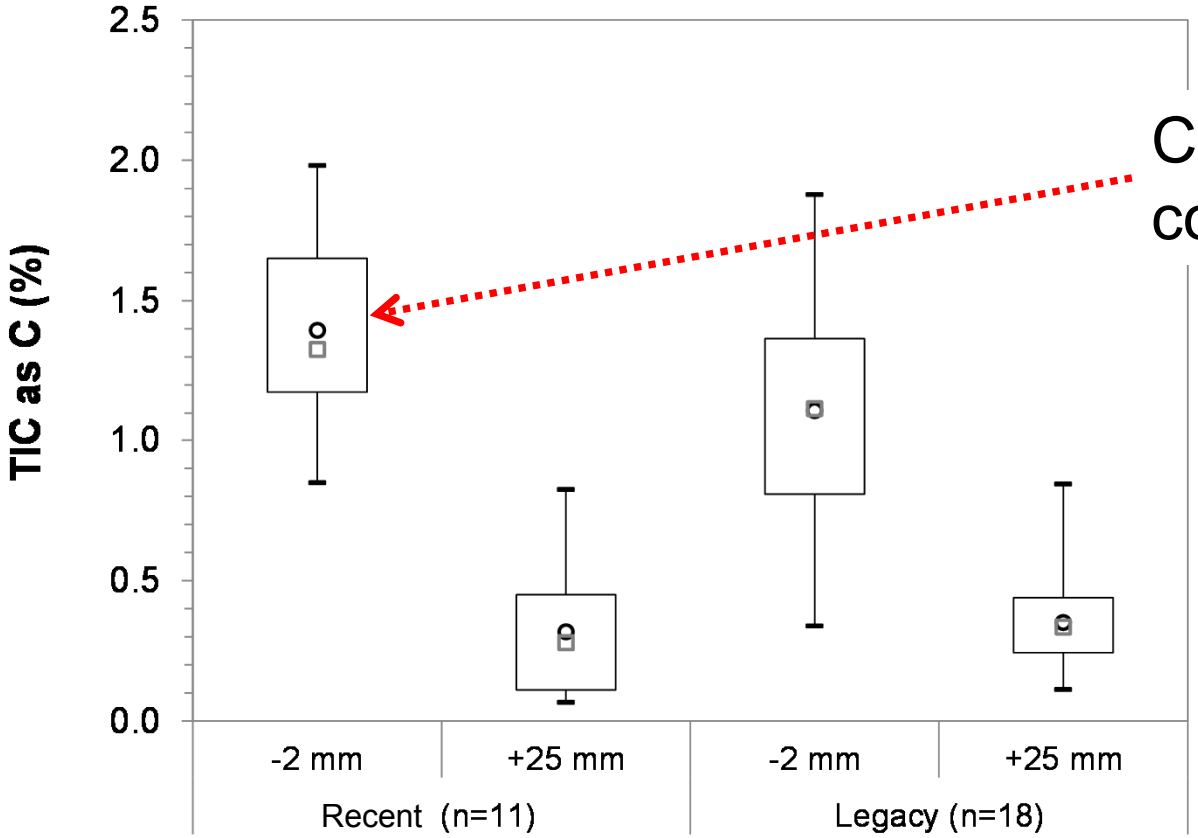
Findings - Sulphide in Volcanics



Findings - Sulphate in Volcanics



Findings – Carbonate in Volcanics



Carbonates very concentrated in fines

2010 to 2015

1930s to 1993

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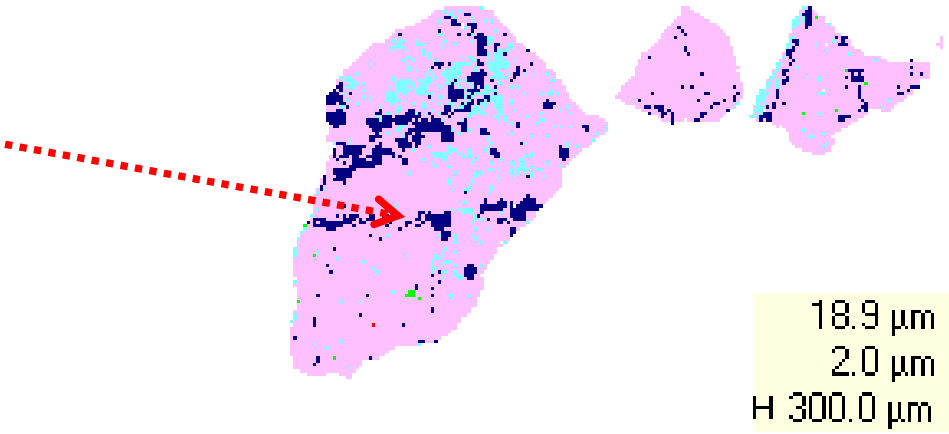
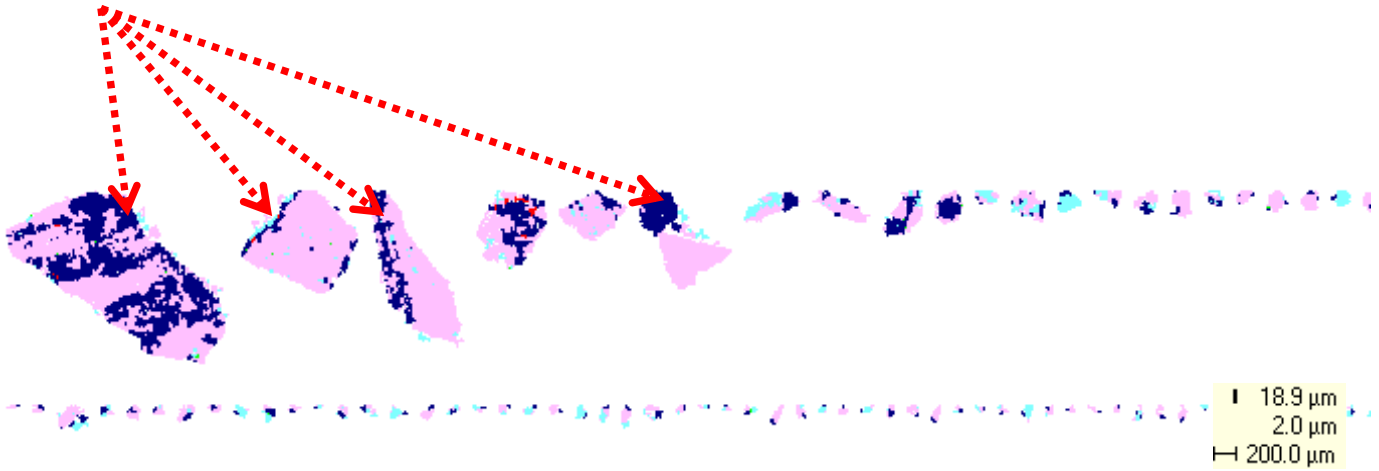
Findings – QEMSCAN Mineral Exposure

-2 + 6 mm: sheltered sulphides (dark blue)



-2 mm: Exposed sulphides



Interim Findings

- Results confirm mineral enrichment in fine fraction.
- Rock type is important – stronger enrichment for volcanics.
- Age is possibly important.
  - CNP/AP higher for older samples from intrusives, not volcanics.
- Sulphides in coarse particles (>2 mm) sheltered from oxidation.

Implications

- Fine size fractions can have different characteristics than bulk.
  - Site characteristics will determine how this affects ML/ARD potential
- Style of mineralization (vein vs disseminated, coarse vs fine mineral grains) is probably critical.

Thank you for listening

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