EVALUATION OF CAVE-TO-MILL OPPORTUNITIES AT THE NEW AFTON MINE

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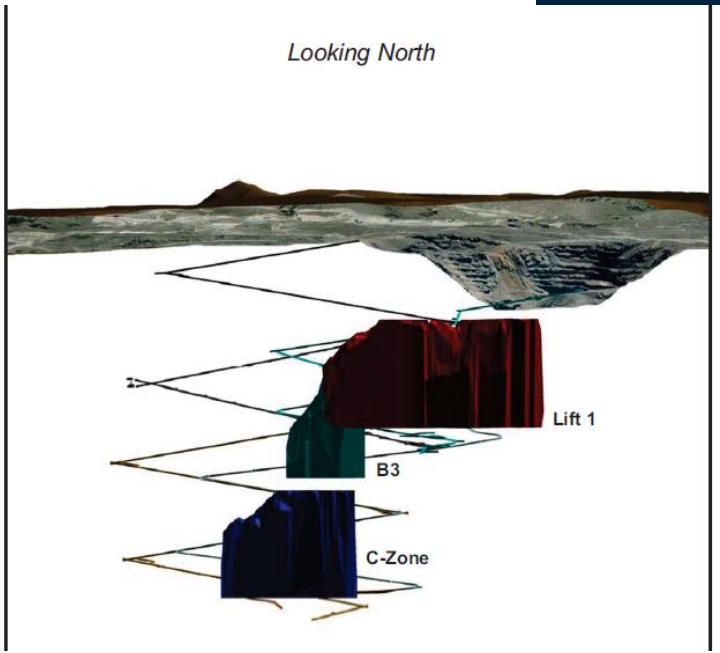
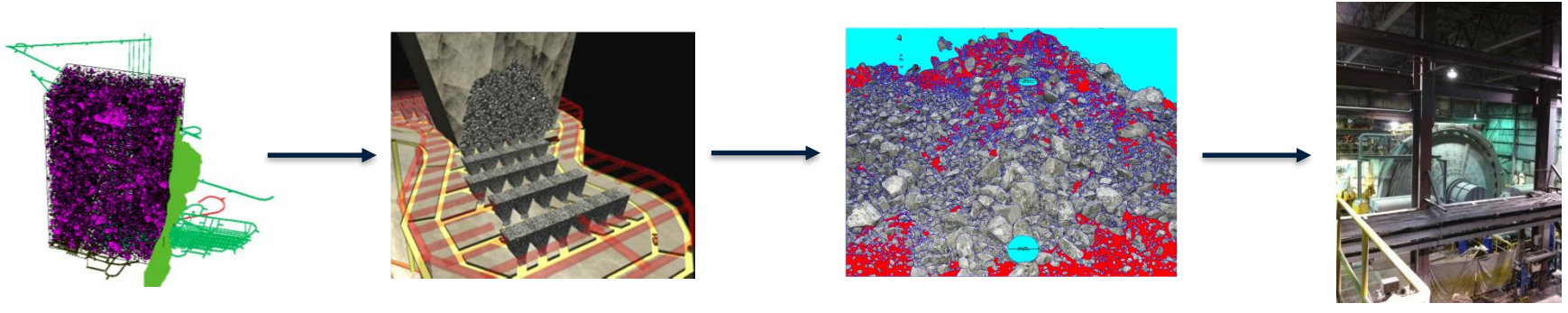


INTRODUCTION

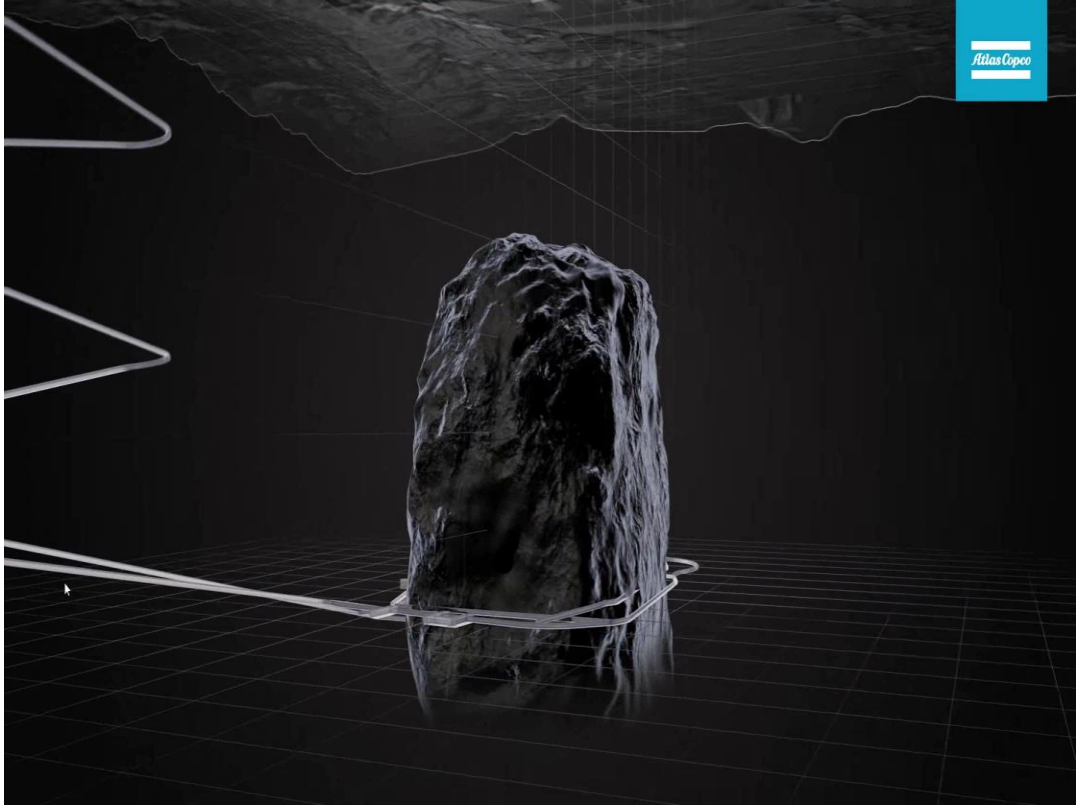
Cave-to-Mill defines ore block models with respect to both mine and mill performance

Study carried out at New Afton on mine and mill integration. Focus areas included:

- Fragmentation
- Sensor-based Sorting



BLOCK CAVING

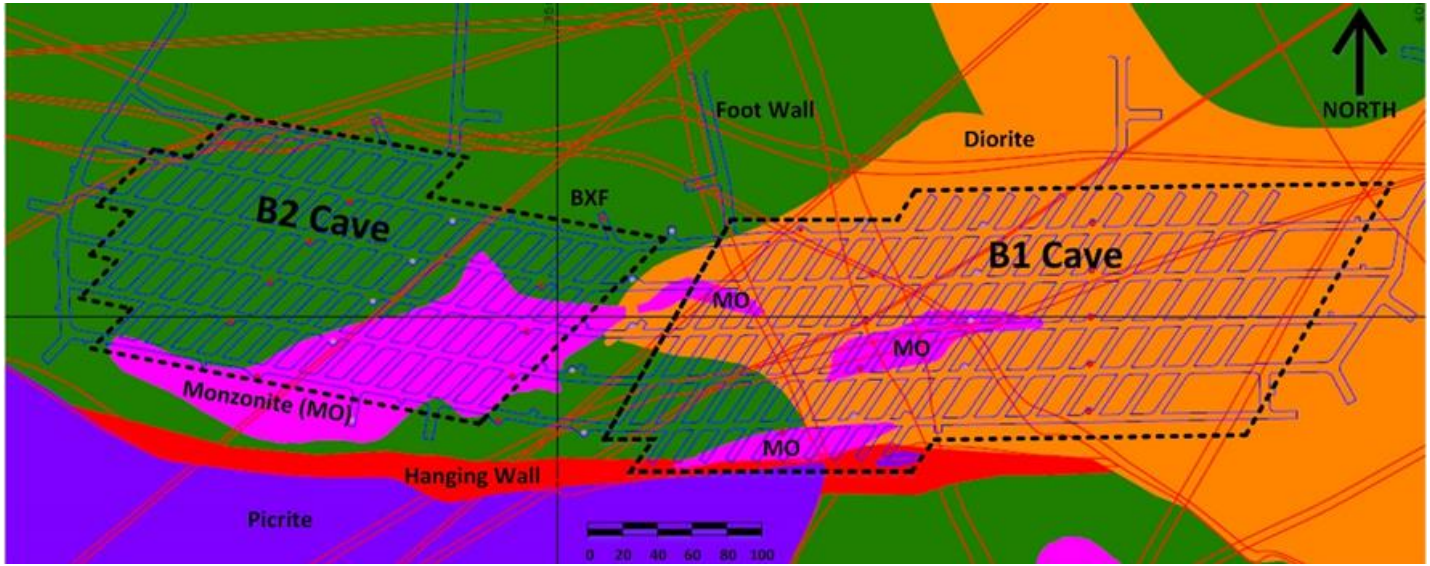


- Increasingly proposed
- **Lowest cost** underground mining method
- **Not selective**
- Ore is fragmented by **gravity** (not blasted)
- Uncertainty in extent of **dilution** and **mixing**

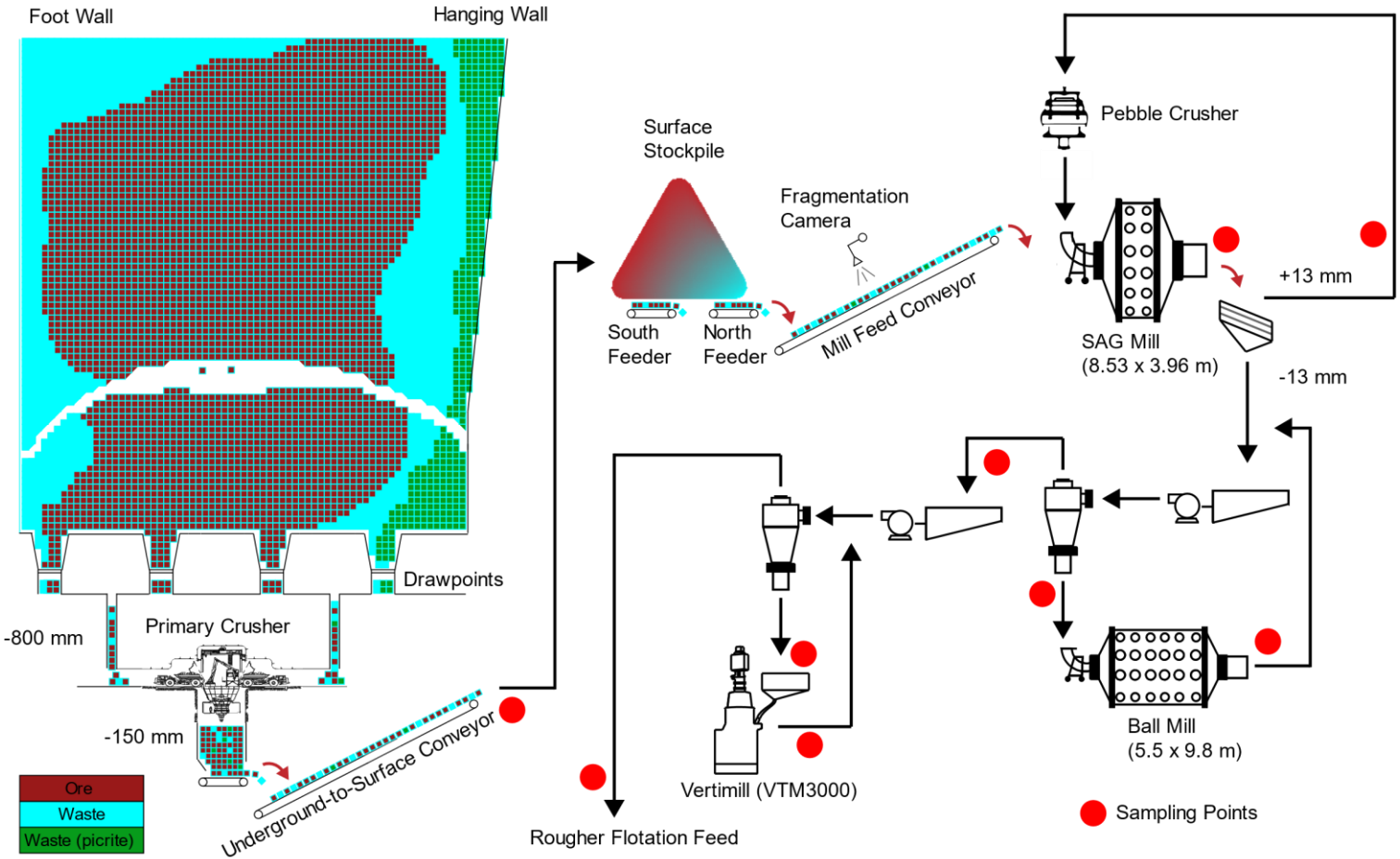
CAVING PROJECTS AND OPERATIONS

NEW AFTON BLOCK CAVING OPERATION

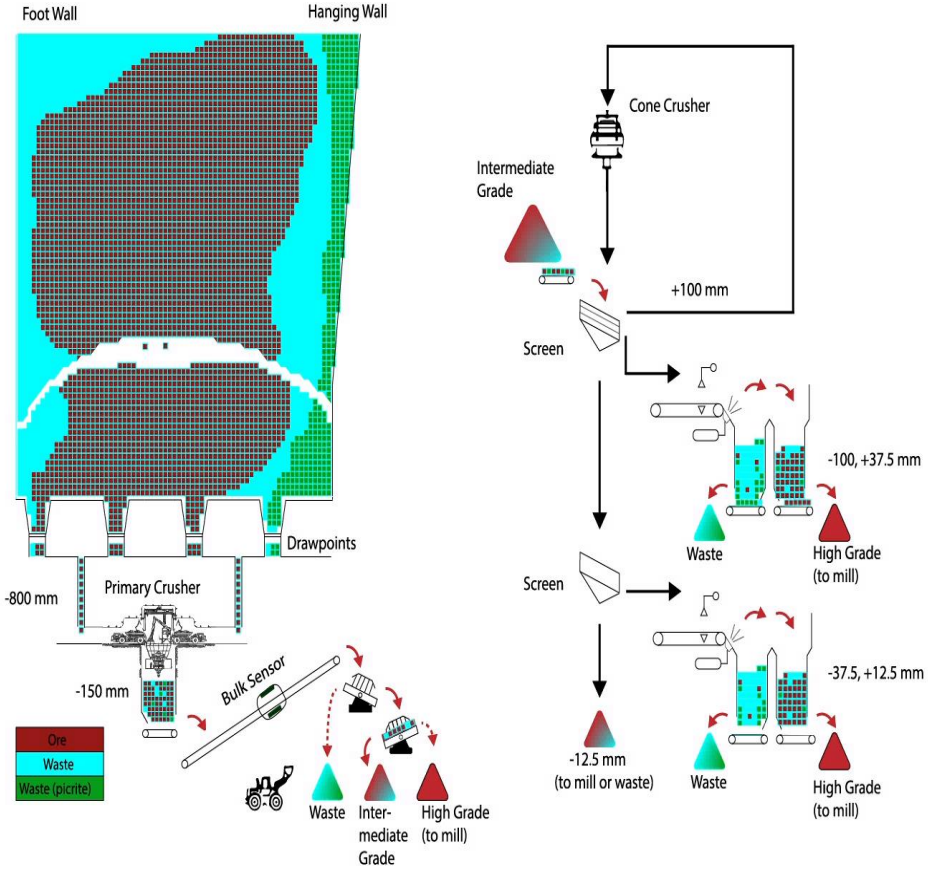
- 17,500 tpd copper-gold operation in British Columbia
- Existing caves are approximately 600 meters below surface
- Consists of East and West Cave
- Combined mining footprint: 800 x 150 metres



NEW AFTON BLOCK CAVING OPERATION



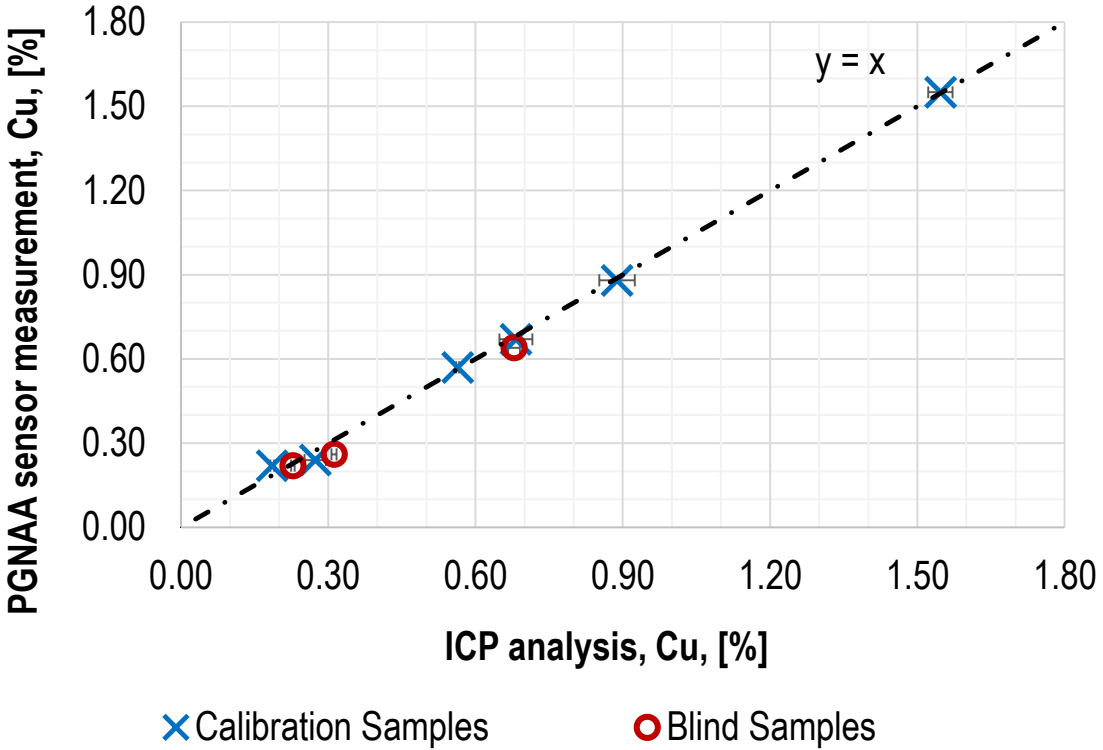
BULK AND PARTICLE SORTING CONCEPT



BULK SENSING – PROMPT GAMMA NEUTRON ACTIVATION ANALYSIS (PGNAA)

Scantech (2017)

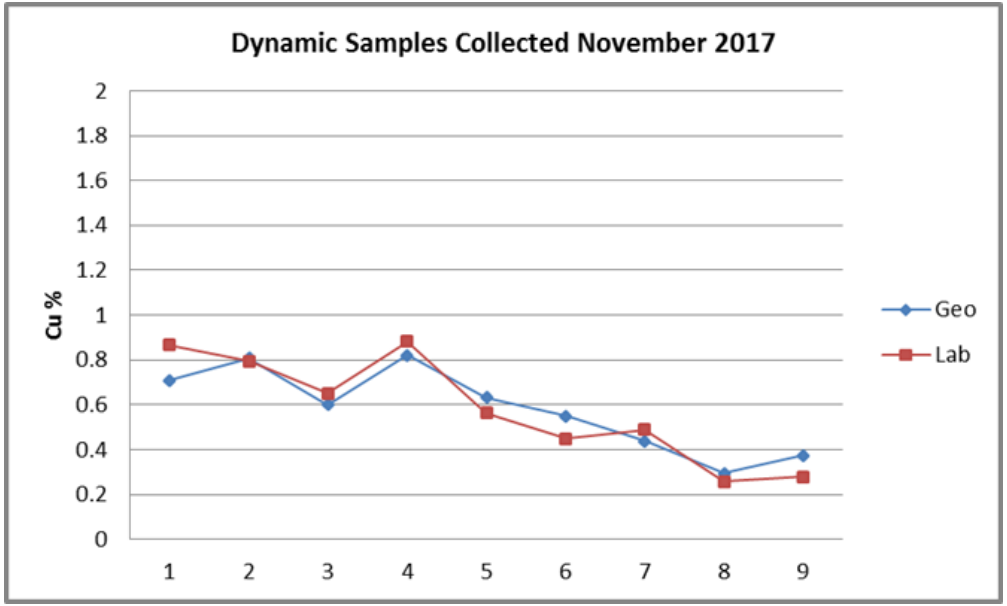
www.scantech.com.au



9 samples of ~200 kg used for test work

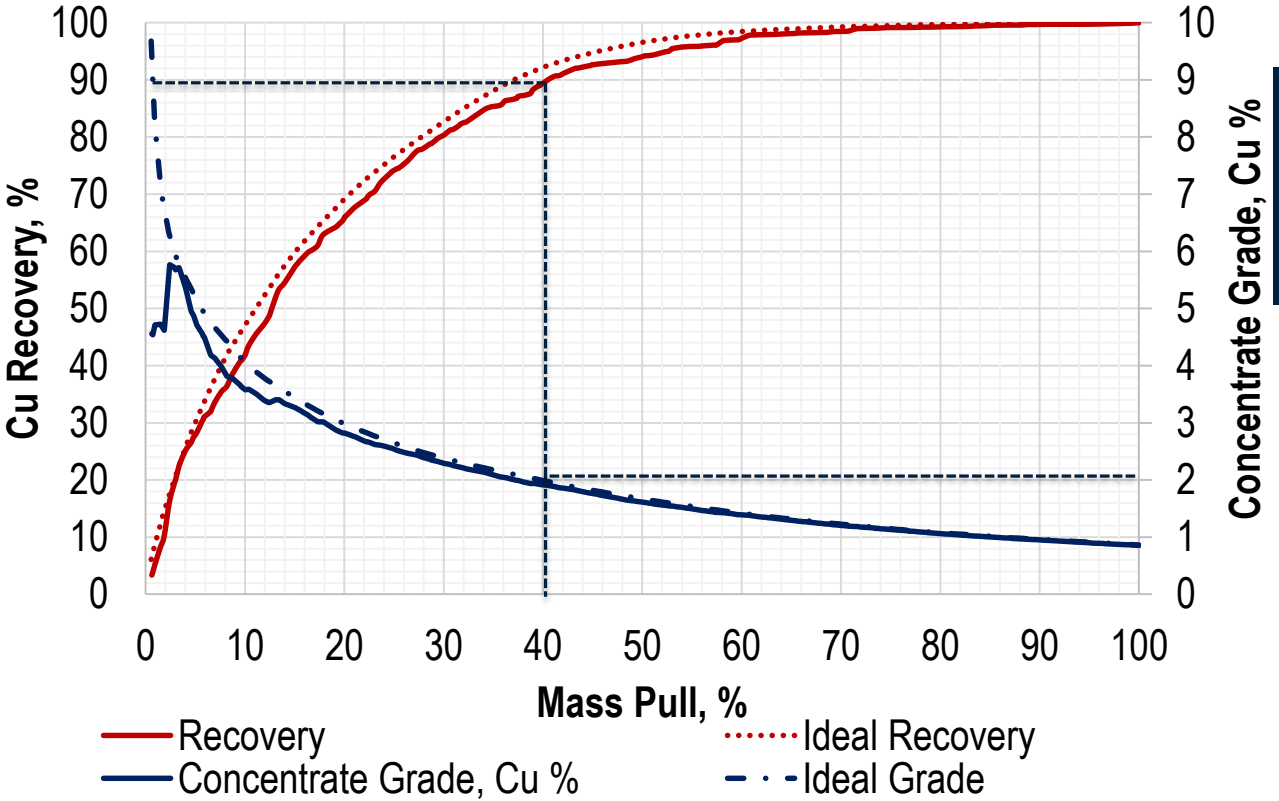
BULK SENSING – PROMPT GAMMA NEUTRON ACTIVATION ANALYSIS (PGNAA)

Scantech unit installed on the underground to surface conveyor in late 2017. New Afton site carried out a preliminary comparison of copper grades from sensor measurements and sampling/assaying:



New Afton (Ryan Favali, 2017)

PARTICLE SORTING ANALYSIS

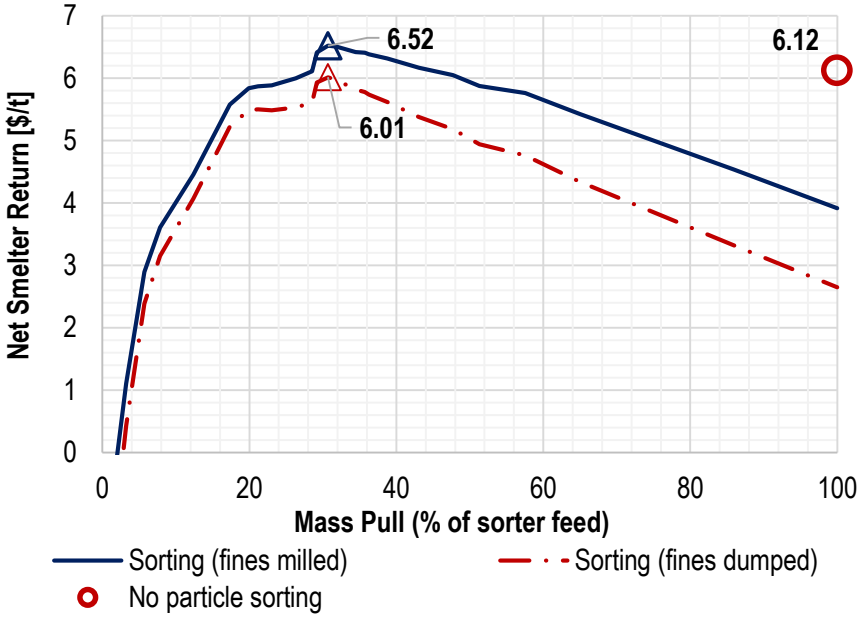


Similar sorting capability demonstrated by dynamic sorting tests

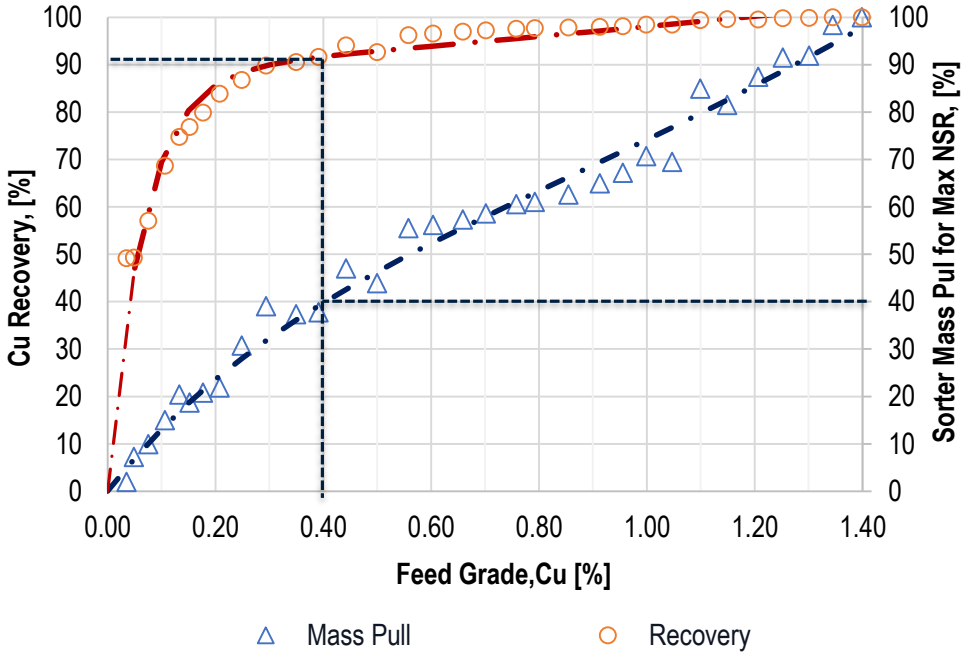
COST & PROCESS ASSUMPTIONS

Process	Units	Value
Cu price	$/lb	2.90
Au price	$/oz	1,290
Silver price	$/oz	17
Loading (screening plant cost)	$/t	0.65
Milling cost	$/t of mill feed	9
Waste disposal cost	$/t	2.48
Screening, crushing & sorting cost	$/per tonne of screen feed	0.80
Percentage passing 12.5 mm	%	34
Mechanical sorting efficiency, eff_{sort}	%	95
Grade of -12.5 mm material (fines dilution)	% of head grade	75

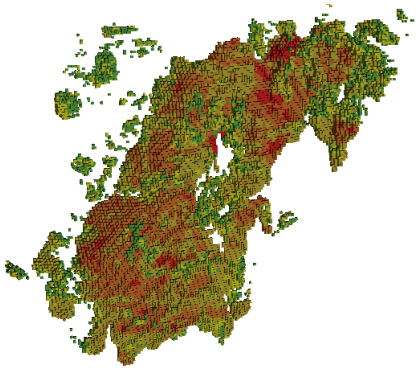
PARTICLE SORTING MODELS



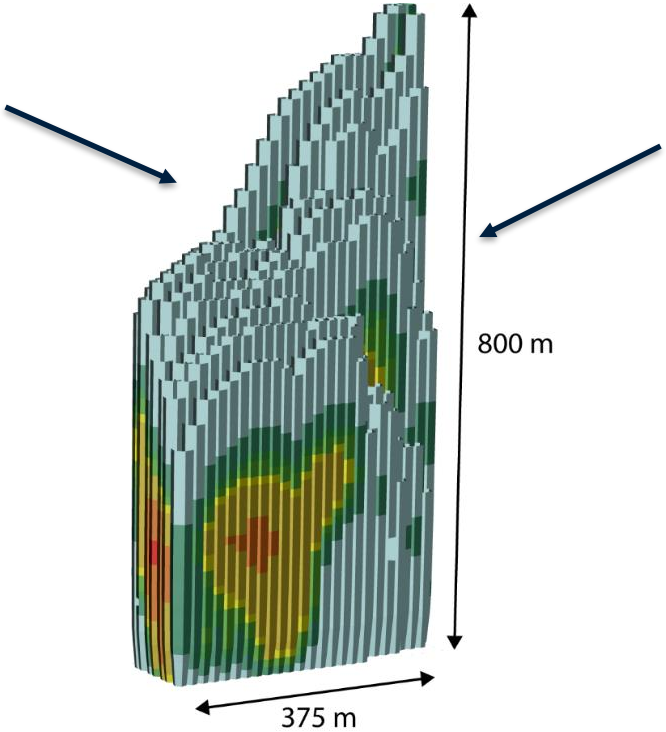
Based on a head grade of 0.22% copper

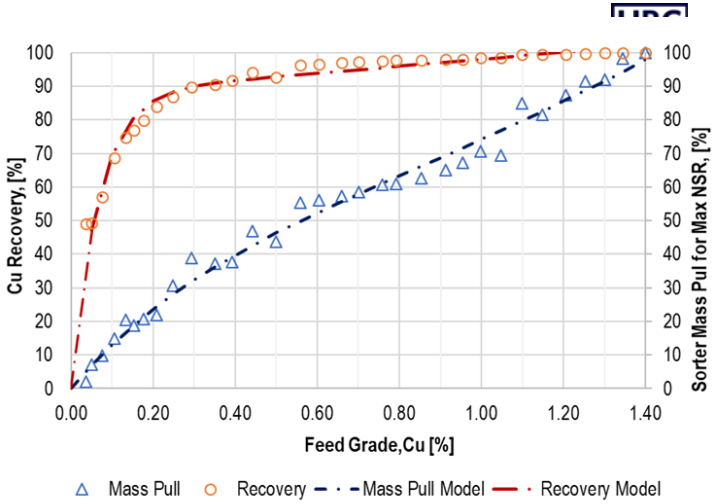


CAVE DESIGN WITH SORTING MODELS



Grade block model

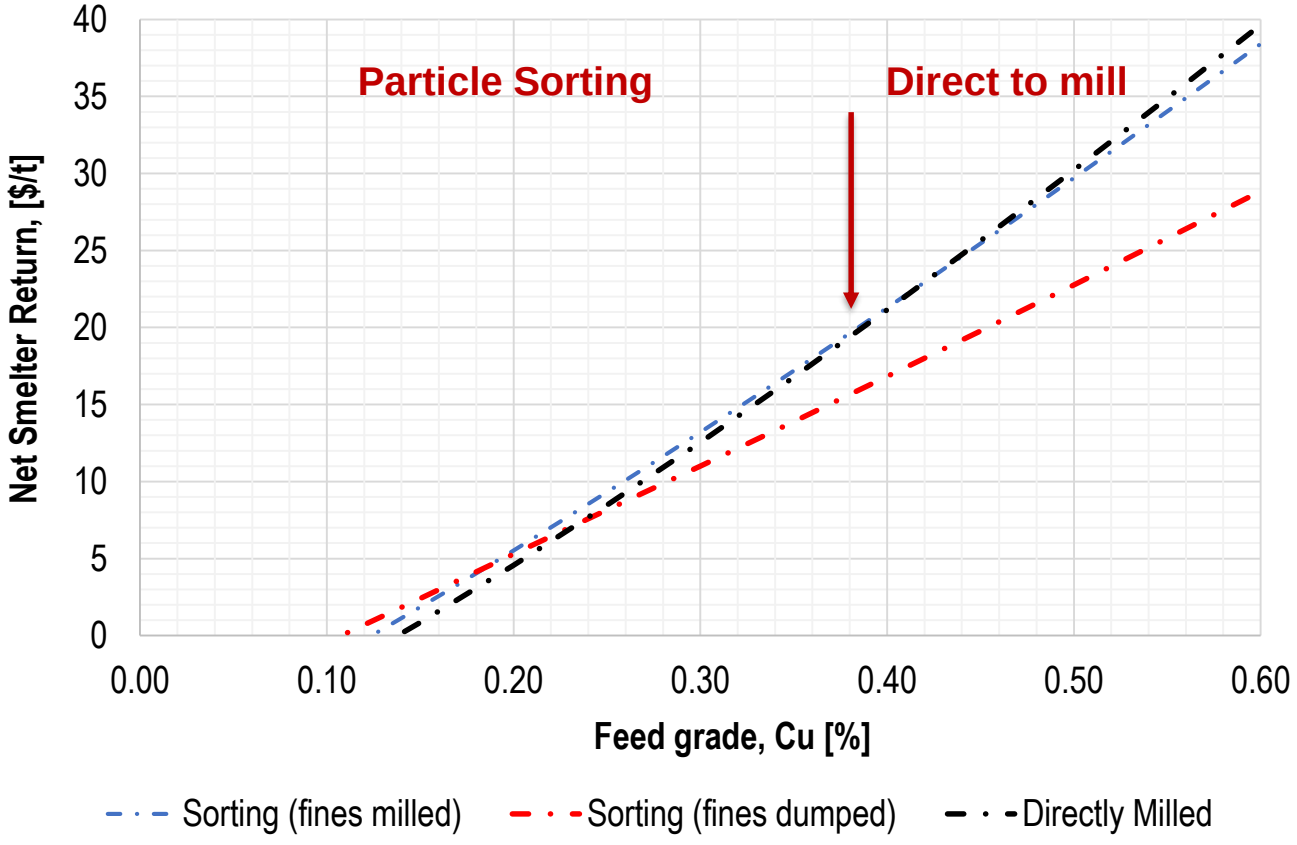




Sorting performance linked to grade

Slice file example for a theoretical cave mine. Hot (red) colours represent higher $NSR/tonne value

VALUE COMPARISON



CONCLUSIONS

- New Afton ore is amenable to bulk (PGNAA) and particle (XRF) sensor-based sorting technologies
- Bulk and particle sorting adds selectivity to the mining method and reduces the impact of unplanned dilution
- Combination of bulk and particle sorting reduces particle sorting capital costs
- Greater value opportunity exists for caving projects
- Method can now be used to determine the size of the economic cave footprint (reserve) when sensor-based sorting is implemented

ACKNOWLEDGEMENTS

- New Gold and New Afton Mine
- ALS Metallurgy (Kamloops)
- MotionMetrics
- Scantech
- MineSense
- Munkhtsolmon Munkhchuluun, Yubo Liu & Elberel Erdenebat

INITIATIVE TO ESTABLISH AN
INTERNATIONAL CAVING RESEARCH NETWORK

QUESTIONS?