

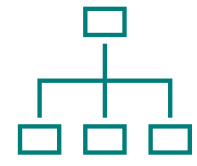


Adapting Our Mines to Meet Future Demands

Colin Pegues
General Manager
Copper Cliff Mine Complex

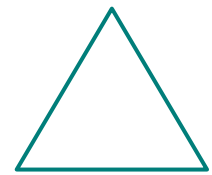
Life Matters Most

Behind every
life, there are
many others.



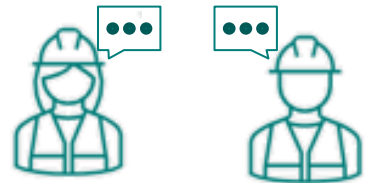
1. HIRA Critical Controls

574 new engineered systems, equipment and passive barriers to strengthen our risk management processes have been defined and are being verified.



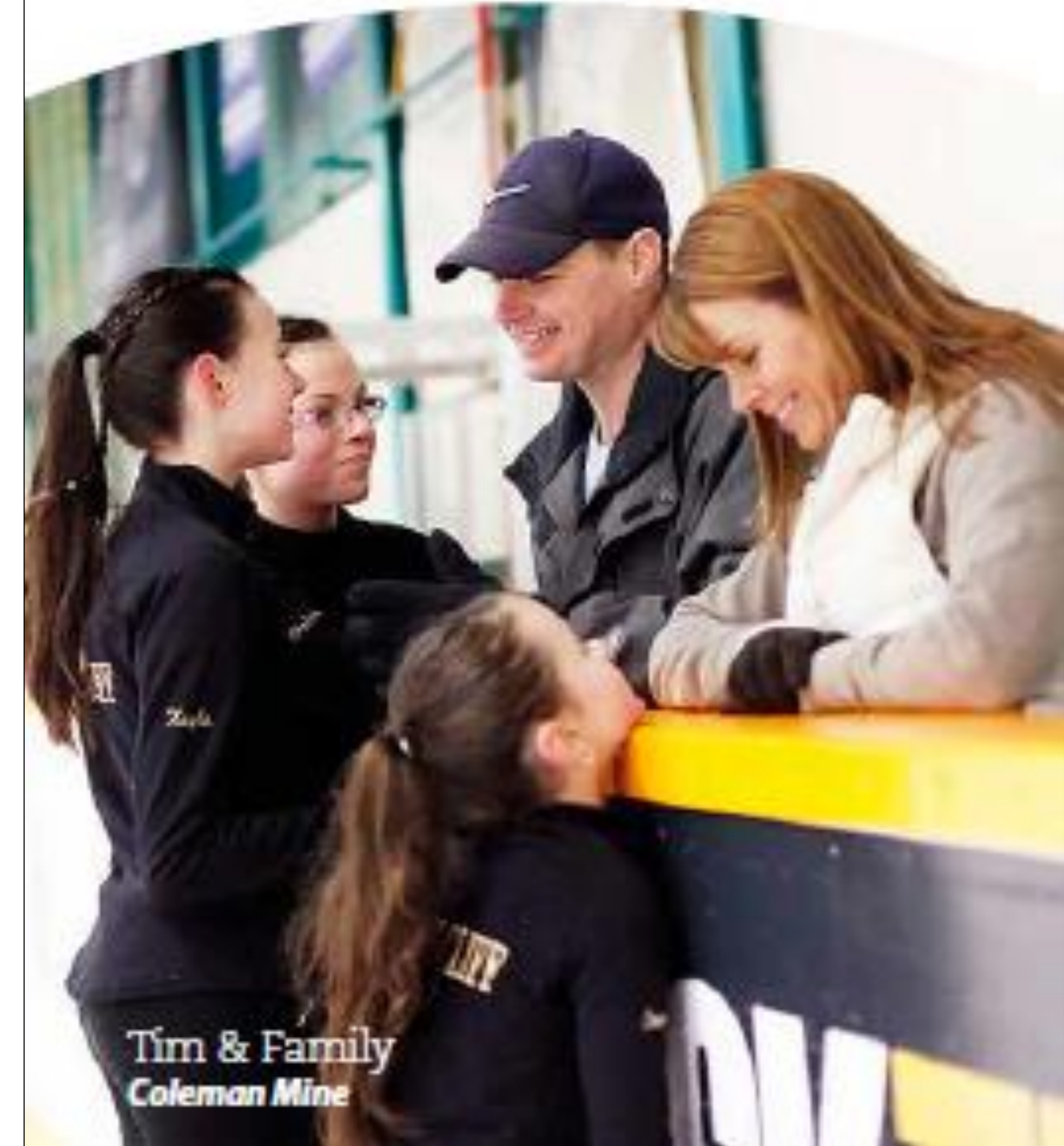
2. Critical Risk Management

>43,500 CRM Verifications since implementation in 2022



3. Leadership in the Field

>34,500 interactions since implementation in 2022



Tim & Family
Coleman Mine

Making Sense of the 21st Century

INFLATION

DECARBONIZATION

Disruptive Technology

SUPPLY CHAIN RESILIENCE

IOT
INTERNET OF THINGS

GREEN ECONOMY

TALENT ACQUISITION

HUMAN MACHINE INTERFACE

SAFETY 4.0

Cost Of Capital

Earned Value

CRITICAL MINERALS

AUTOMATION

E S G

ENVIRONMENT SOCIAL GOVERNANCE

BEV

CYBER SECURITY

Adjusted EBITDA

BUILDING for SUSTAINABILITY

GENs at Work

Black Mass

Vale North Atlantic

Investing in Ontario

Vale is proud to call Ontario home — investing in safe, responsible, and sustainable mining that contributes to a strong Canadian economy.

Employment Legacy :

We are proud to provide stable, well-paying jobs in the communities where we operate, employing a team of dedicated, high-performing people.

Over the last 14 years, total investment:



in labour income over the past 14 years.



Vale directly employed:

4,432
people



Average salary

81.5%
more than the provincial average



\$617M
In total wages

We produce the high-quality products the world needs

Pellets

30-45 kt*



Disc and chip

5-10 kt*

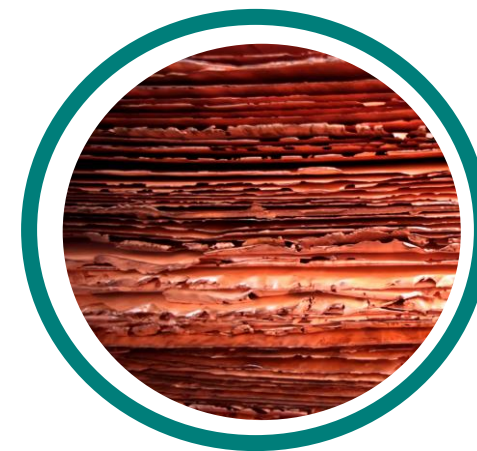


Powders

10-20 kt*



Copper



2023 Production Budget

(finished product)

	Sudbury	North Atlantic
Nickel	60kt	141kt
Copper	79kt	95kt

*Annual production ranges



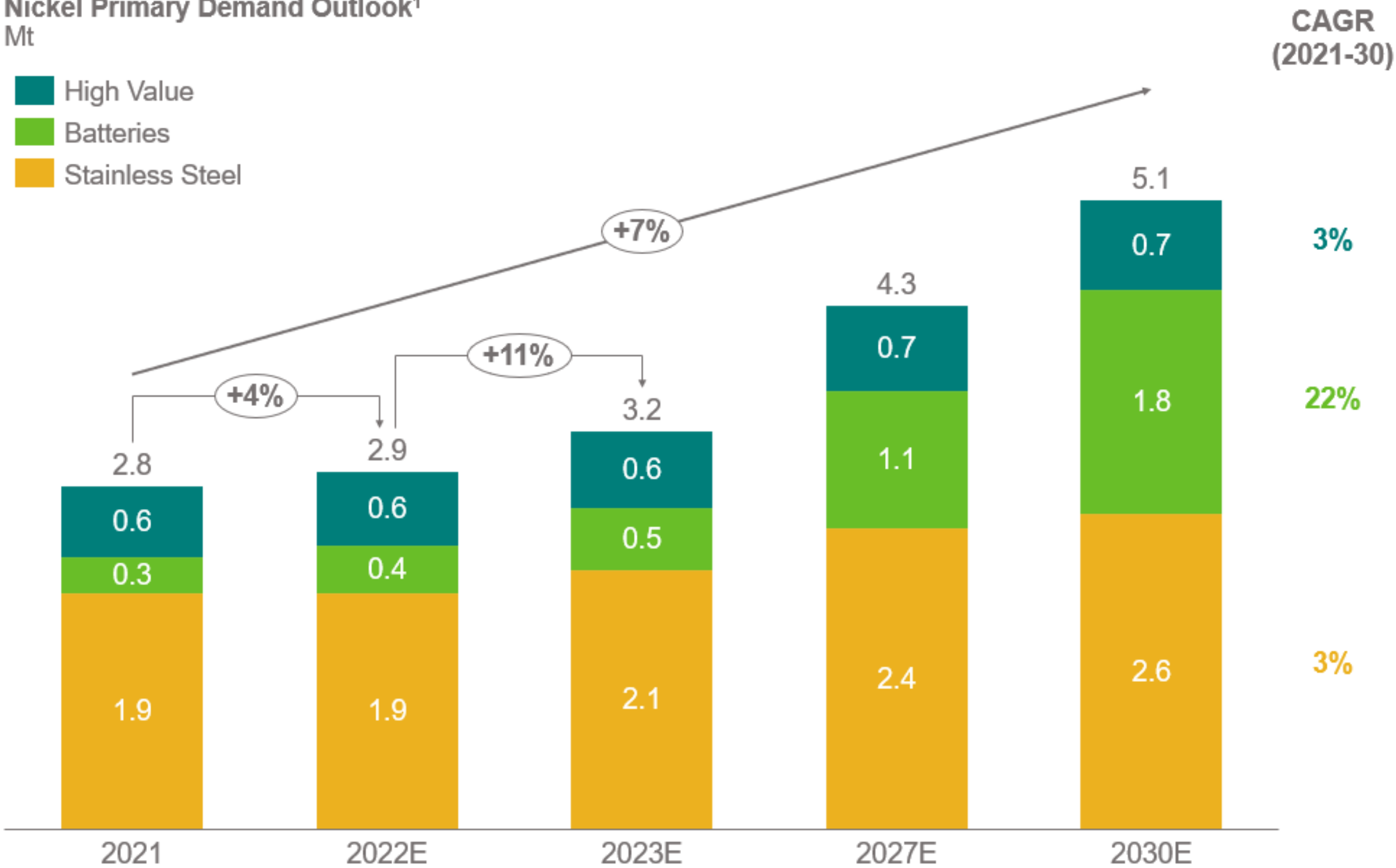
Copper Cliff
Nickel Refinery

The Energy Transition

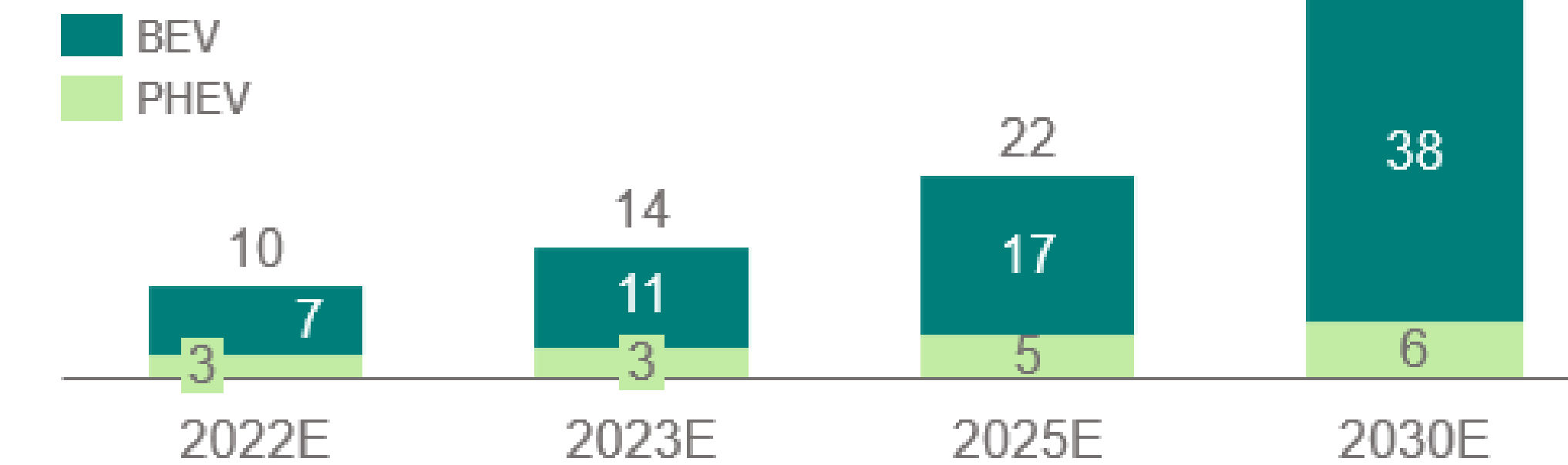
Nickel demand is projected to exceed supply due to increase in EV sales

Nickel Primary Demand Outlook¹
Mt

- High Value
- Batteries
- Stainless Steel



Passenger EV Sales (million cars)



High Value

- Minimal growth expected in the long run with short term growth driven by capacity additions

Batteries

- EV sales set to grow 42% year-over-year in 2023 and at a CAGR of 24% from '21 to '30
- Main drivers of growth is the adoption rate of electric vehicles and the preference towards Ni-rich chemistries

Stainless Steel

- Stainless steel production set to grow 7% year-over-year in 2023 due to pandemic recovery and capacity additions.
- In the long-term urbanization will still play a key role in nickel demand with growth in austenitic stainless steel.



A Ni-rich EV battery requires 40 – 60 kg of nickel vs. 1 – 2 kg for ICE² vehicles

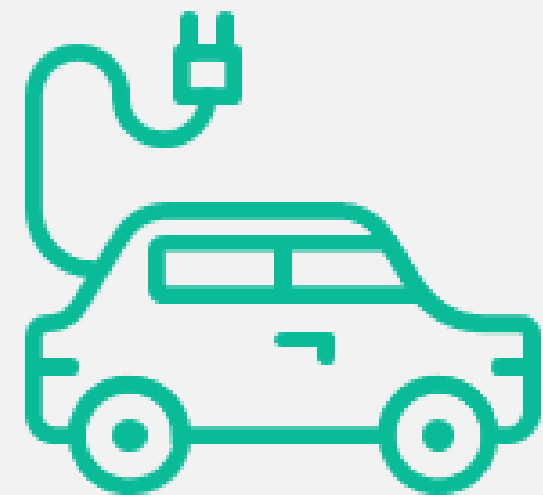
Note 1: Excludes SS scrap consumption, but includes battery recycling
 Note 2: Non-EV includes stationary storage which is primarily LFP battery chemistry
 Source: Vale BM Marketing

Sourcing low-carbon nickel will be critical to fulfill the decarbonization objectives of electric vehicles



60%

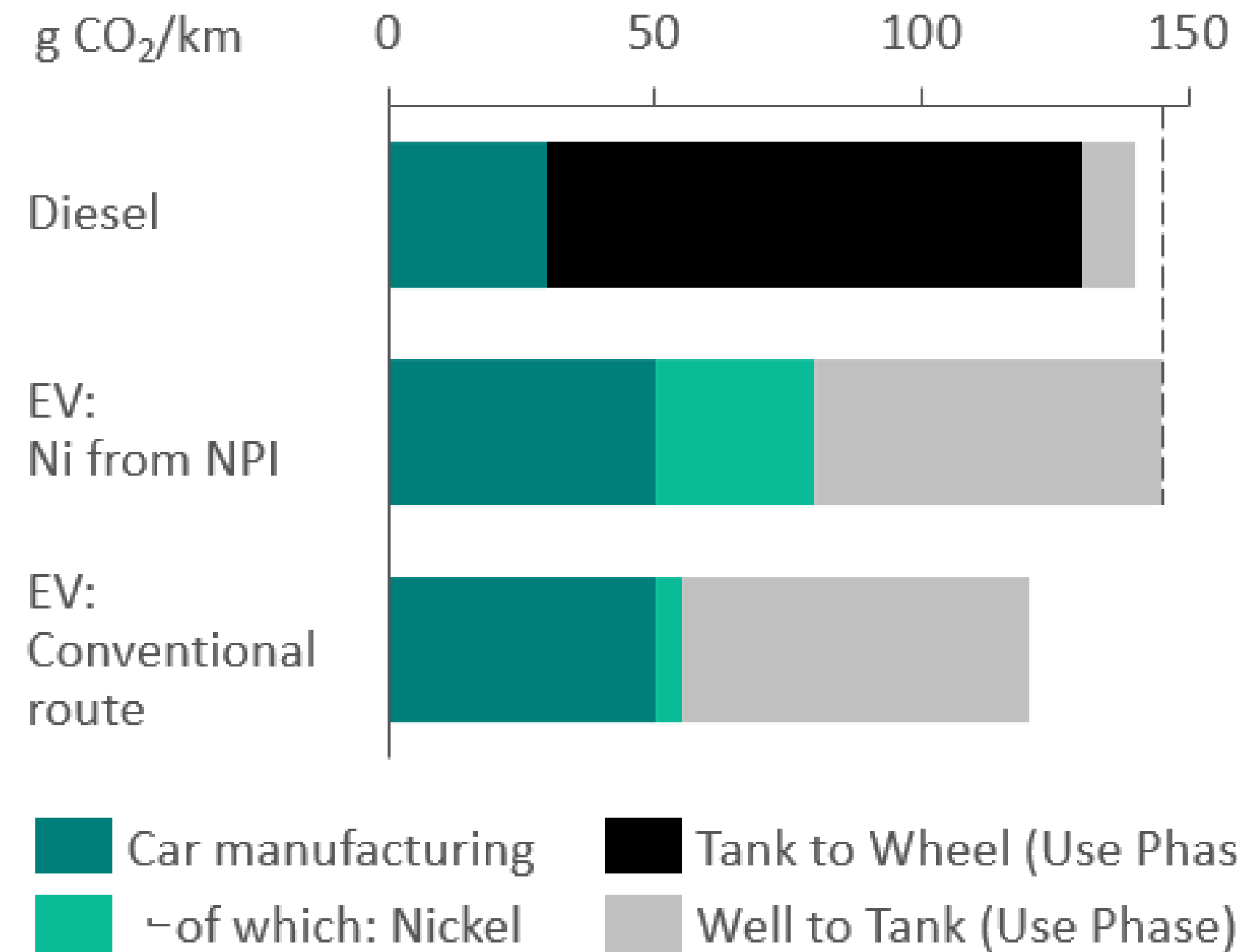
of CO2 emissions on heavy-duty EV manufacturing comes from the battery¹



50%

of CO2 emissions on passenger EV manufacturing comes from the battery¹

Lifetime CO2 emissions for passenger cars²



EV emissions largely impacted by nickel production route

The raw materials are the highest contributor to the carbon footprint of an EV. If battery materials are sourced from poor ESG performers, the value gained from converting to EVs diminishes.

Note 1: Including all upstream emissions from raw material extraction to the OEM, including logistics. ²Estimated assuming 75 kg of Ni in battery and EU-28 grid mix (41% hydrocarbon in 2020).
 Source: McKinsey, Trafigura

Capital Projects

Capital Projects

Victor / Nickel Rim South Ext

Nickel Production ~5ktpa	Copper Production ~20ktpa
Estimated LOM 25yrs	Project Stage DFS ¹
Cluster Ontario	Expected Start-up Date 2028-2029



CCM 3

Nickel Production 5-10ktpa	Copper Production 7-12ktpa
Estimated LOM 21yrs	Project Stage DFS ¹
Cluster Ontario	Expected Start-up Date 2028



Creighton Phase 5

Nickel Production 15-20ktpa	Copper Production 10-16ktpa
Estimated LOM 15yrs	Project Stage DFS ²
Cluster Ontario	Expected Start-up Date 2029-2031



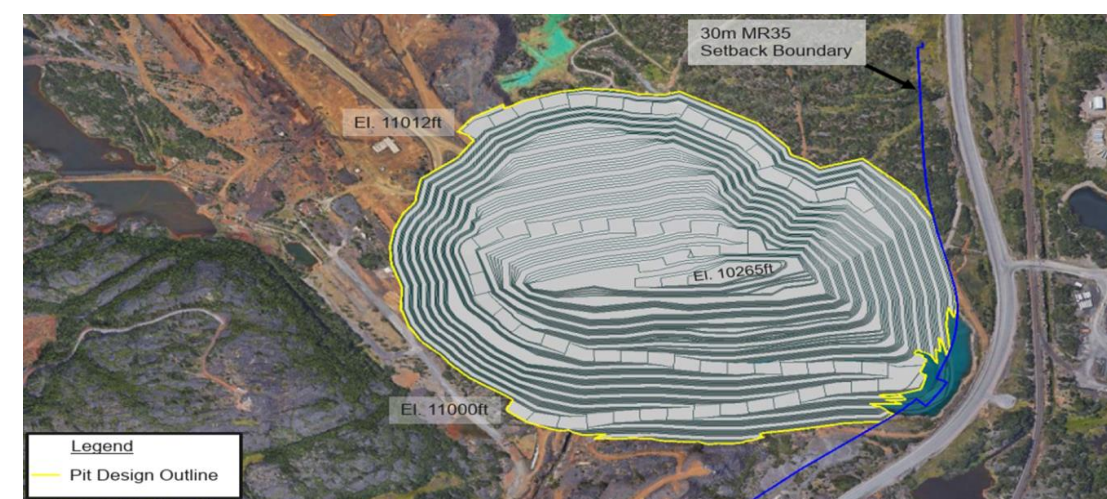
CCM 4

Nickel Production 7-12ktpa	Copper Production 7-12ktpa
Estimated LOM 16yrs	Project Stage PFS ¹
Cluster Ontario	Expected Start-up Date 2031



CCM Pit

Nickel Production 13ktpa	Copper Production 8ktpa
Estimated LOM 7yrs	Project Stage DFS ¹
Cluster Ontario	Expected Start-up Date 2026-2027



Stobie Pit

Nickel Production 4-9ktpa	Copper Production 5-10ktpa
Estimated LOM 3yrs	Project Stage PFS ¹
Cluster Ontario	Expected Start-up Date 2033



Note: Projects are subject to approval. Stages of development, estimated production and expected start-up date are indicative figures and subject to change as the project study progress. ¹ Definitive Feasibility Study. ² Pre-Feasibility Study.

Creighton Phase 5: Going deeper

Scope

- Extend mine from 8590 level to 9760 level via ramp.
- Infrastructure which includes ventilation, workshops and cooling plant
- BEV fleet (with innovative teleremote capabilities)
- 13 trucks, 6 scoops, 6 jumbos, 3 production drills and 40 ancillary units

Schedule:

- Work has begun and project completion expected by 2031
- First production starting in 2028

Annual Production increase

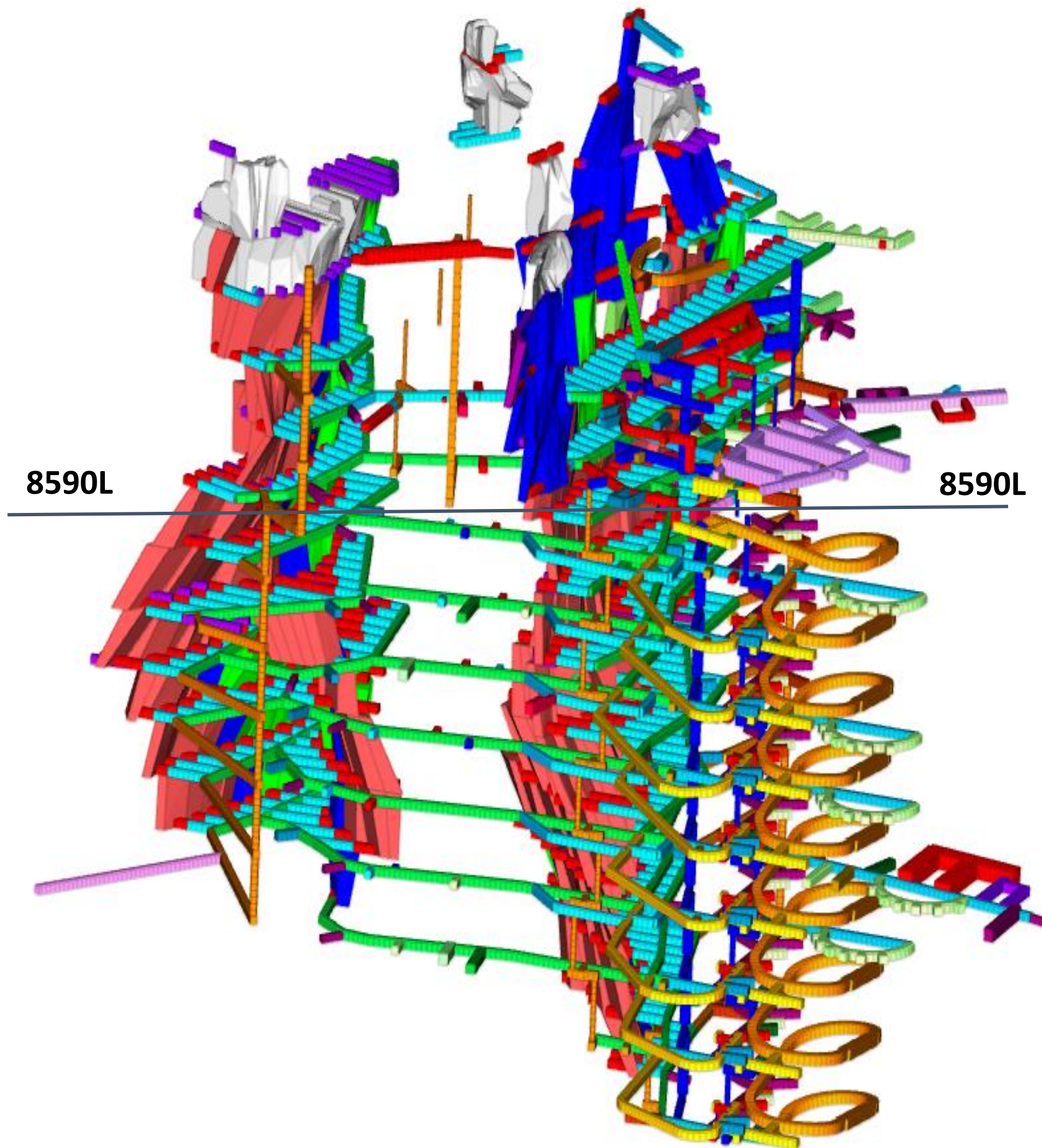
- Nickel: 15 kt to 30 kt
- Copper: 14 kt to 25 kt

Investment

- US\$ 1.1 B in project capex

Benefits

- CO₂ emissions reduced by approx. 30%
- All electric mine improves working conditions
- Additional ~150 full time jobs generated for the local economy, ~150 direct contractors during construction



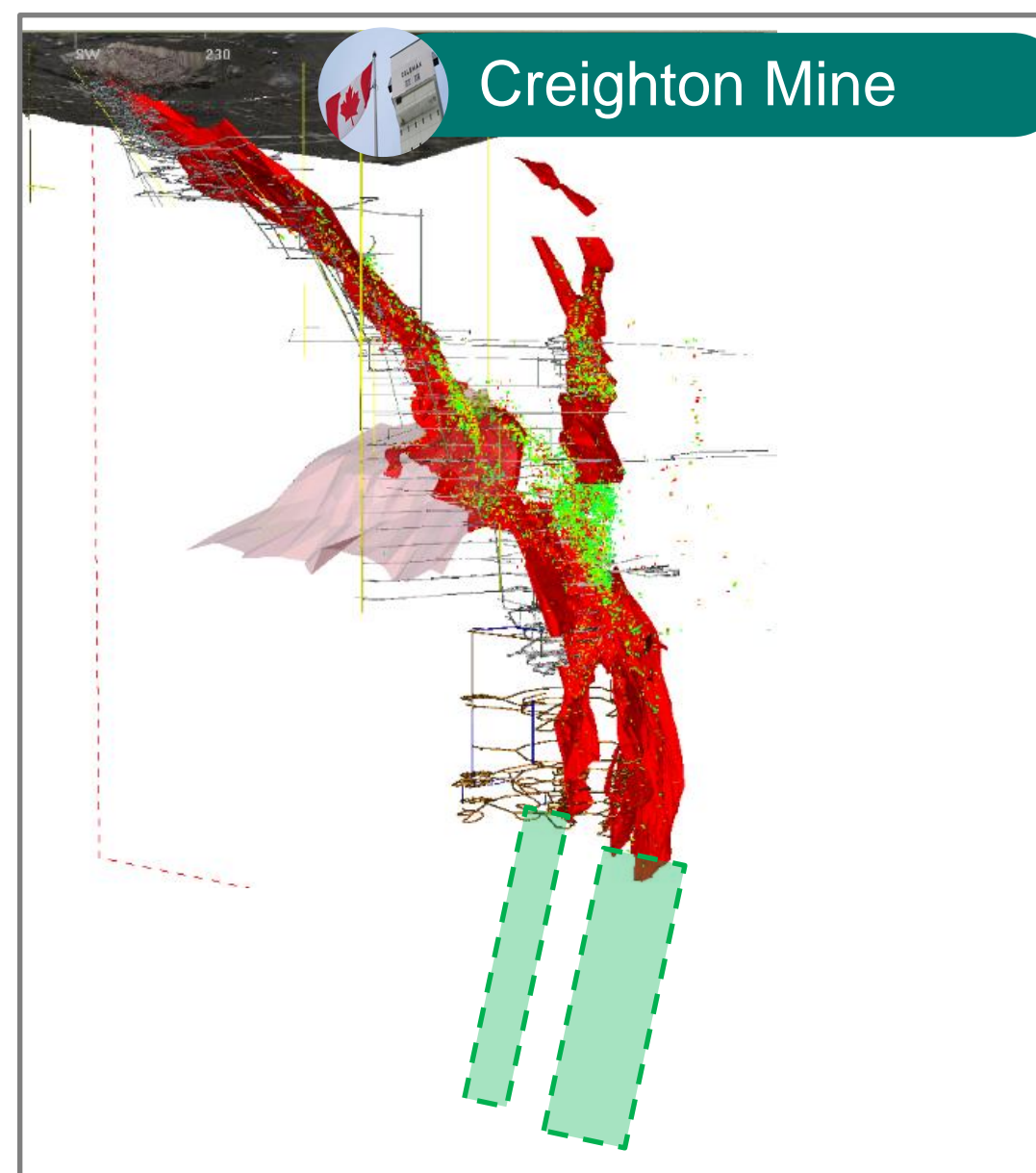
Phase 5 – Below 8590 level

Exploration

- Sudbury presents high-potential for discovery of small to medium size polymetallic deposits above 1000m despite significant historical exploration
- Large areas of unexplored prospective geology above 3000m totaling >50km² have potential to host significant high-value polymetallic deposits (>20kt Ni/a of production)

Our strategy

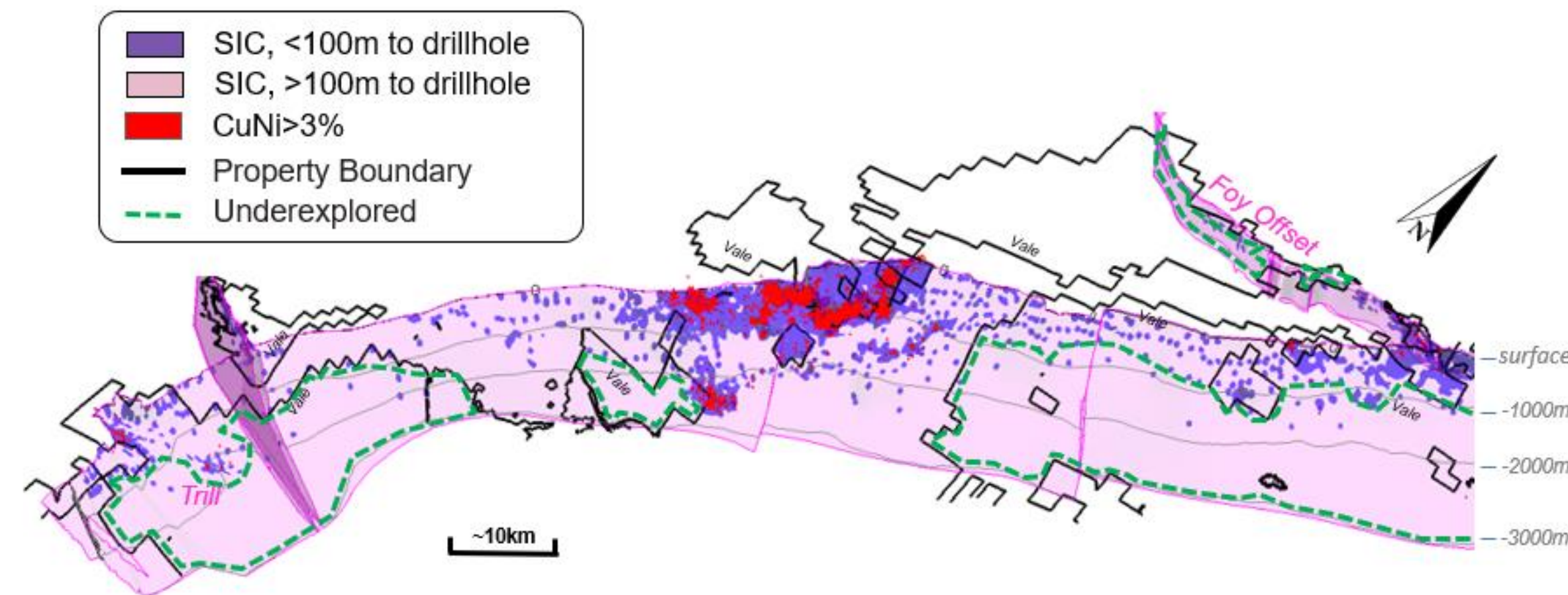
- **Near Mines**



- **< 1000m**

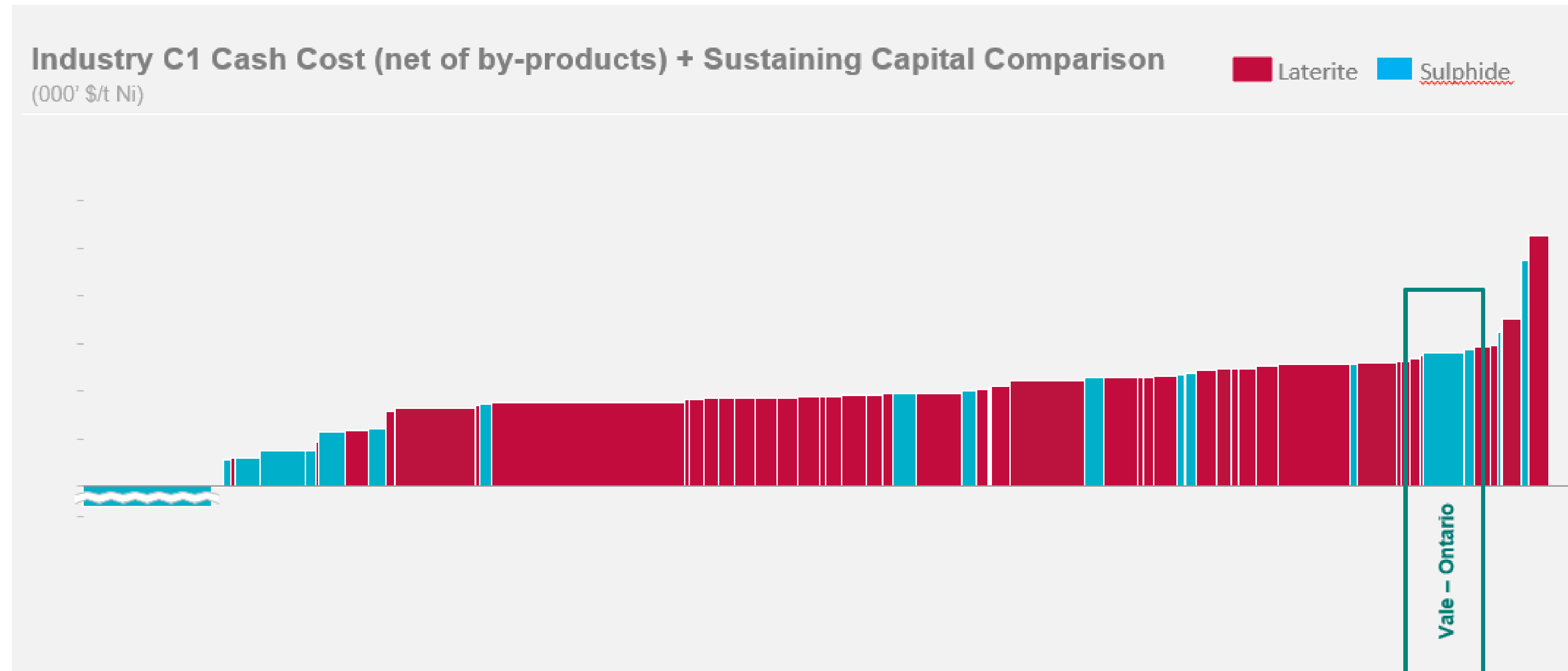
- **< 3000m**

- **Right Cost**



Reducing costs is key to unlocking the full potential of our operations

Our local suppliers and contractors are an integral part of our business. Ensuring we are executing our projects and producing nickel in a cost-effective manner will allow us to generate the cash that we need to fund our ore replacement and growth projects which are critical to our future operations.



- Our mines are getting deeper and further away from the shaft
- Our footprint is wide, and our infrastructure is aging
- Inflation and the cost of doing business is increasing production costs

- Current Unit Cost, including sustaining, is \$24,000 USD / tonne of Nickel, current LME Nickel price range is \$22,000 to \$24,000 USD / tonne of Nickel

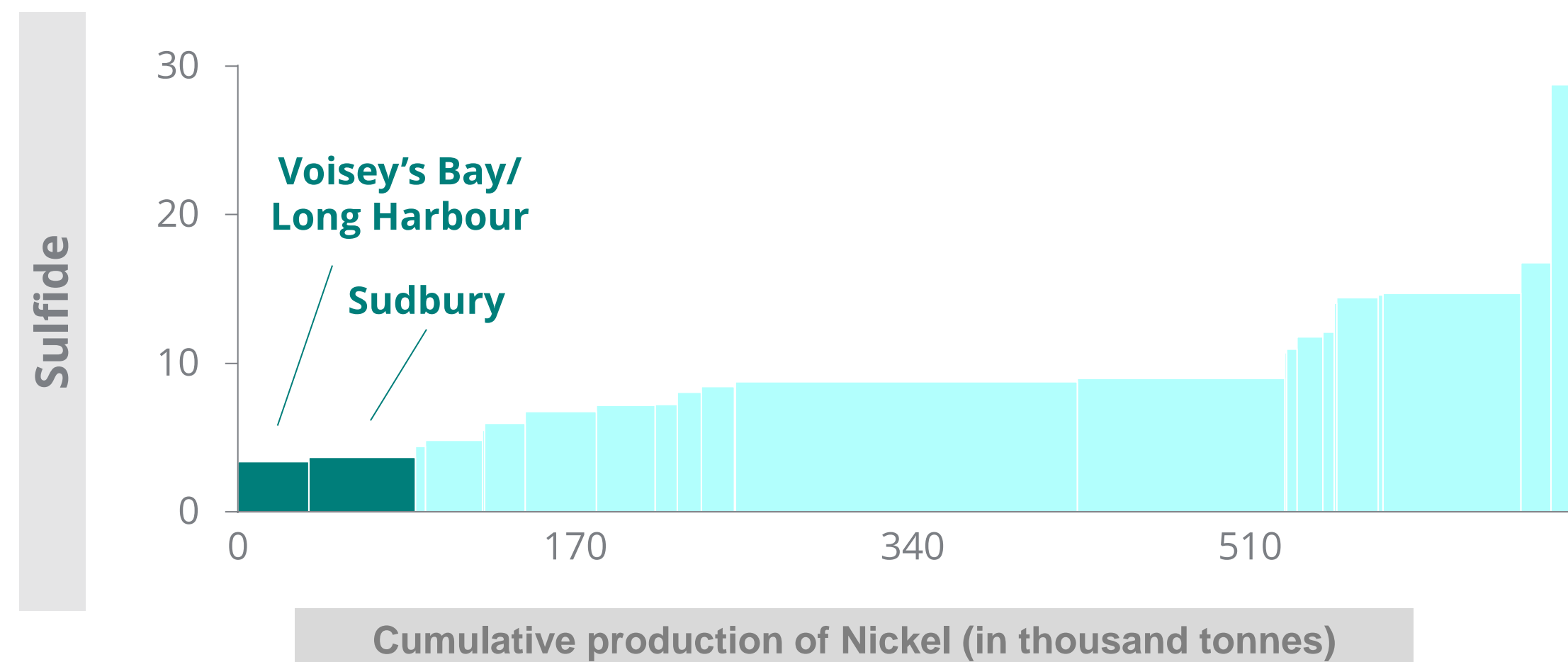
¹ All-in unit cash cost of sales represent the cost to produce 1 tonne of nickel less by-product credit plus sustaining capital investments. Vale UCC and production Base Metals Strategy and Planning.C1 cash cost + sustaining competitors: 2020 Woodmac

A Leader in Responsible Mining

Currently a leader in low-carbon emissions

Nickel Operations (Scope 1 & 2)¹

2020 finished Nickel, Mtonne CO₂/tonne Ni cont.



Our Climate Change Targets

Reduce GHG emissions

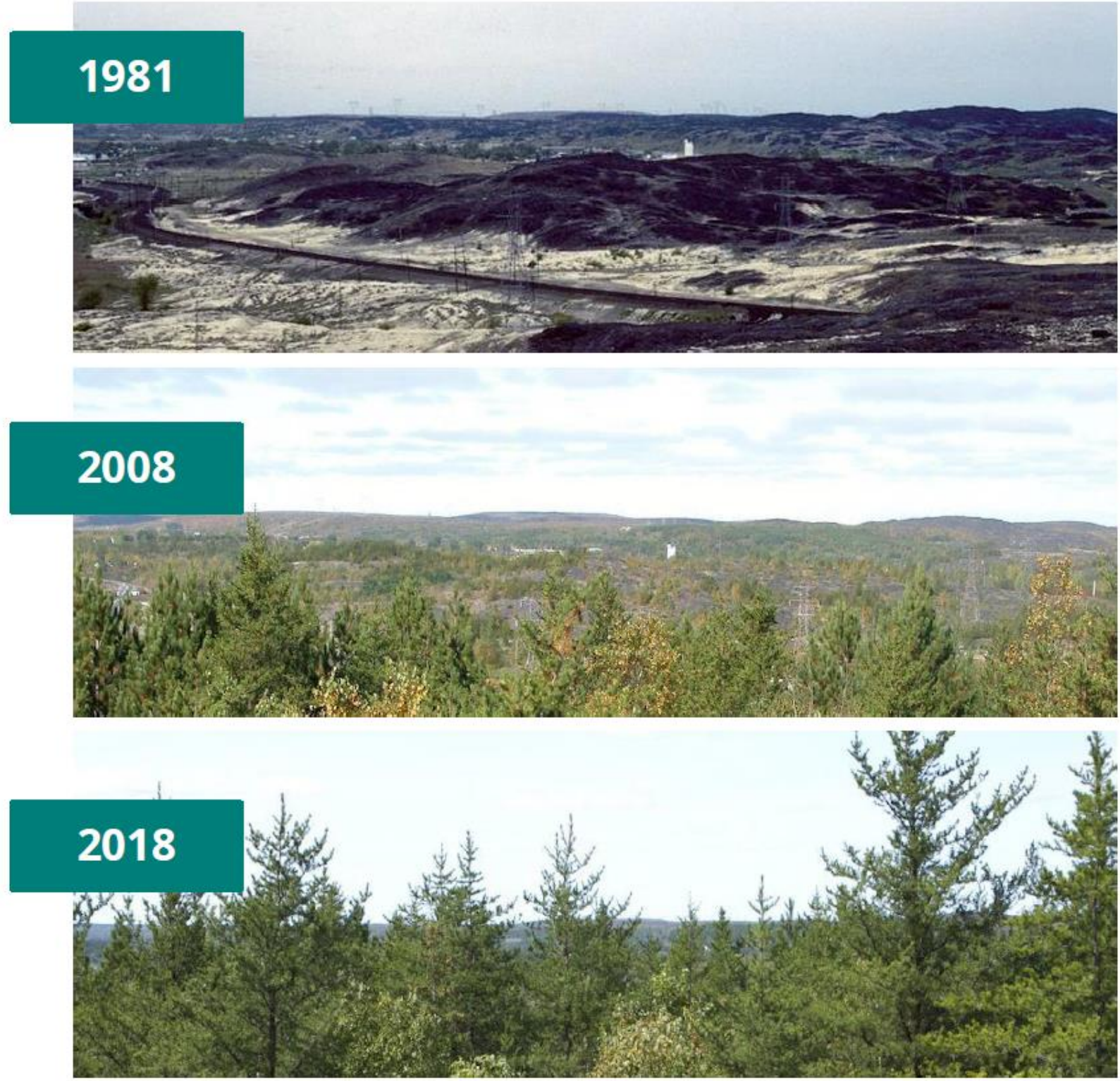
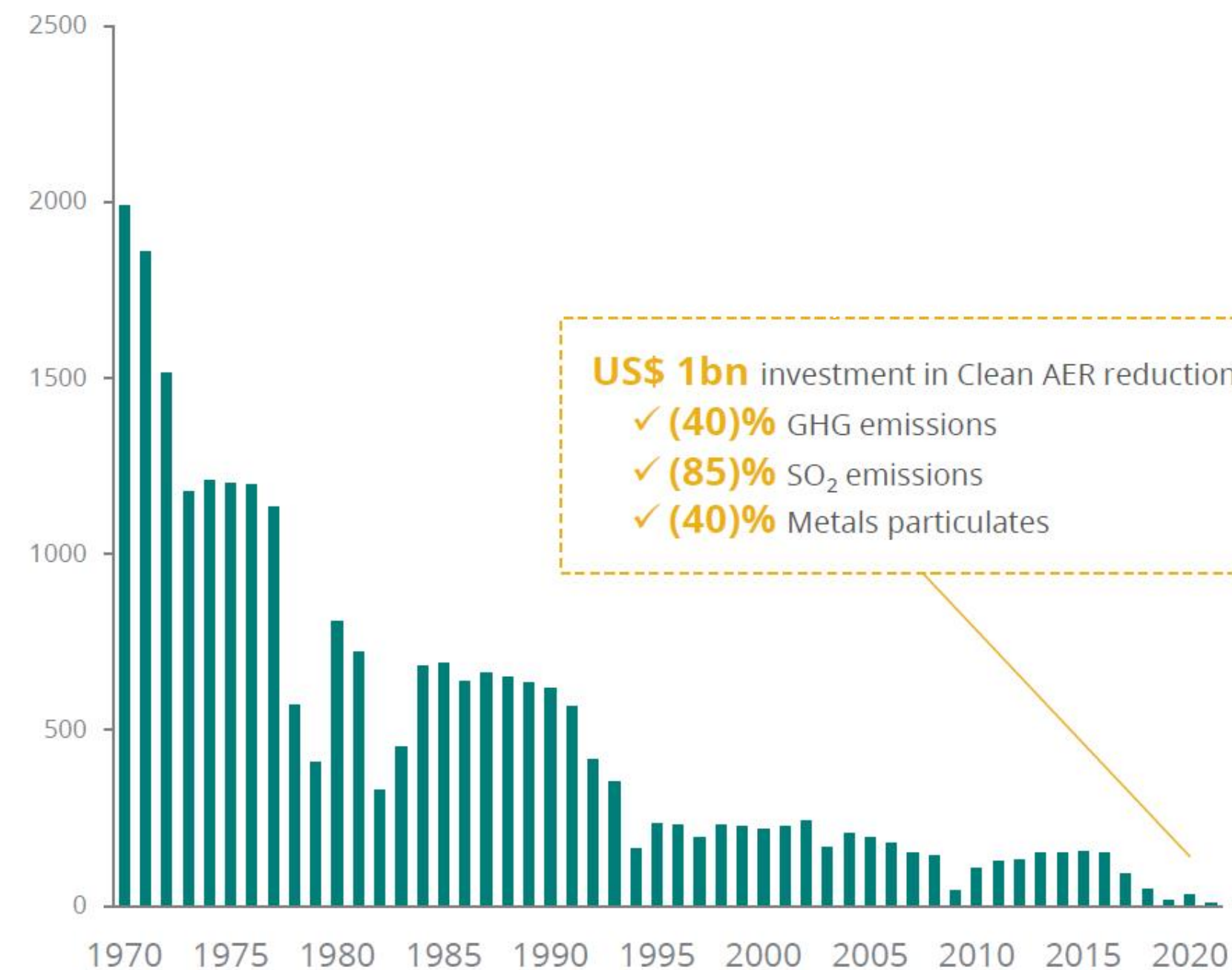
- Scope 1 & 2 by 33% by 2030
- Net zero Scope 1&2 by 2050

Long-term commitment to reduce SO₂ and GHG emissions

As we continue to invest in solutions & technologies to secure our future & reduce our emissions, we are proud of our accomplishments to date.

SO₂ Emission Reductions in Ontario

Tonnes of SO₂



40 battery vehicles U/G in Sudbury



10 million trees planted



AER / decommissioning of superstack = 40% less GHG emissions



Maintaining the momentum to continue to reduce our emissions

Reaching our sustainability targets will require substantial capital investments.

CC Nickel Refinery SO₂ scrubber

- **Cost:** CAD \$186M
- **Timeline:** 2023 – 2026
- **Goal:** Bring SO₂ levels down to 100 micrograms(μg) per m³



Finding new opportunities through Circular Mining (*Waste-to-Value*)

We are seizing opportunities to transform typical waste we have generated to value while reducing legacy environmental footprint.

Black mass (battery recycling)

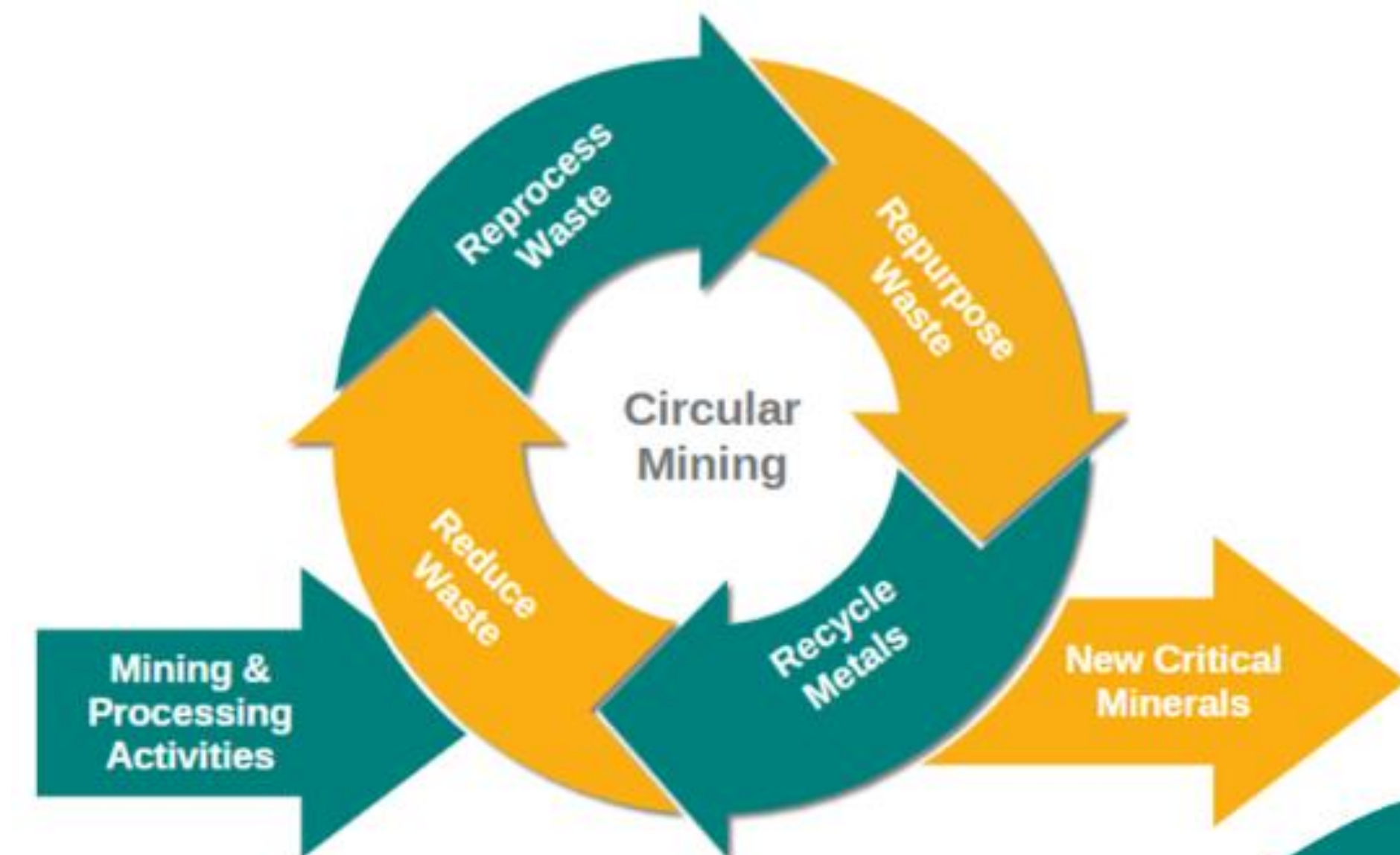


- Trialing the recycling of spent battery material (black mass) to return it to the EV ecosystem.
- Using nickel rich battery materials and integrating the process within our existing flowsheet.

Tailings, Slag and Waste Piles



- Extracting material from Sudbury's tailings, slag and waste piles.
- Vale has the potential to recover metal from our waste to expand our production by decades.



Circular mining (Waste-to-Value)



Investments

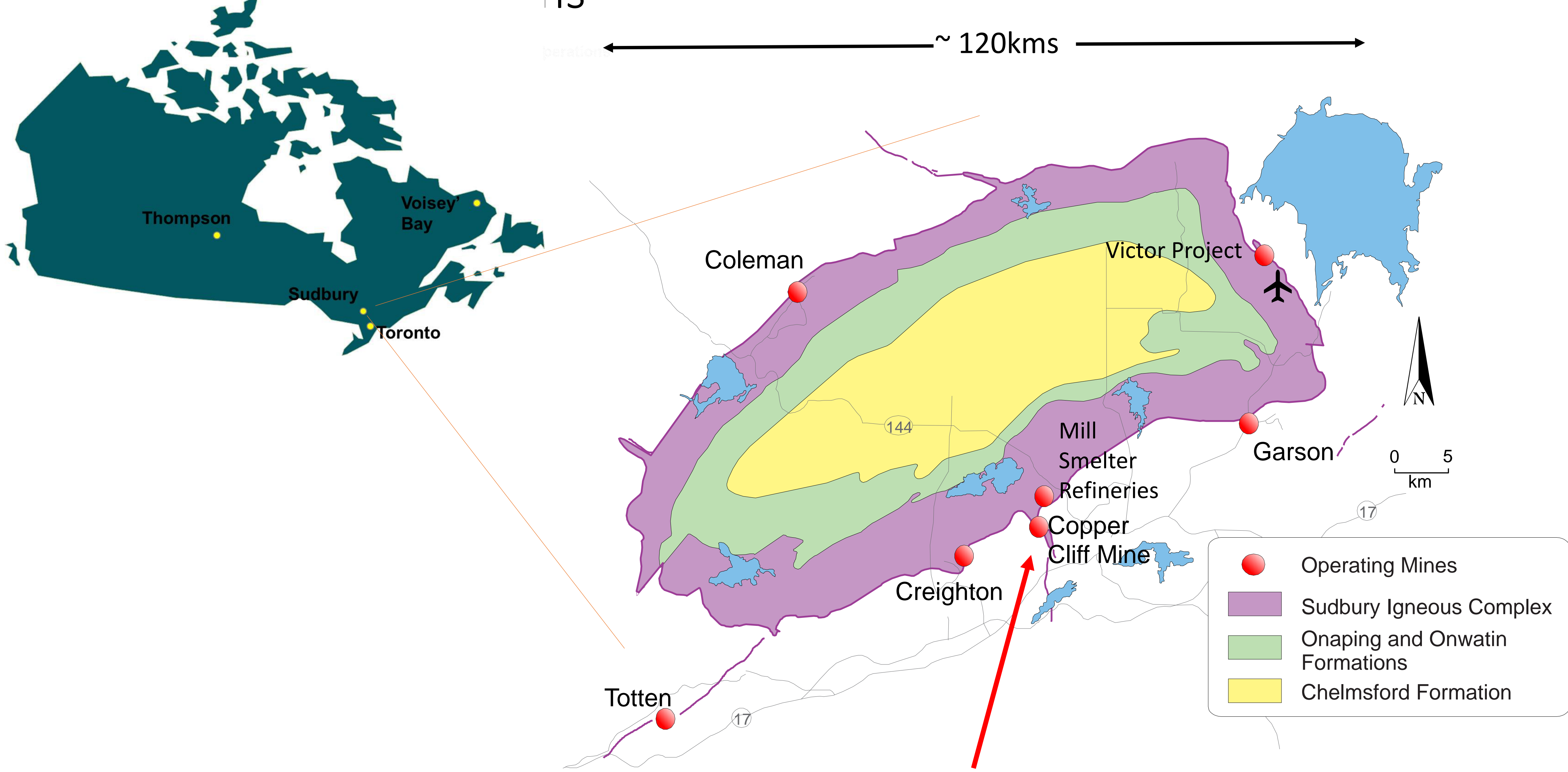


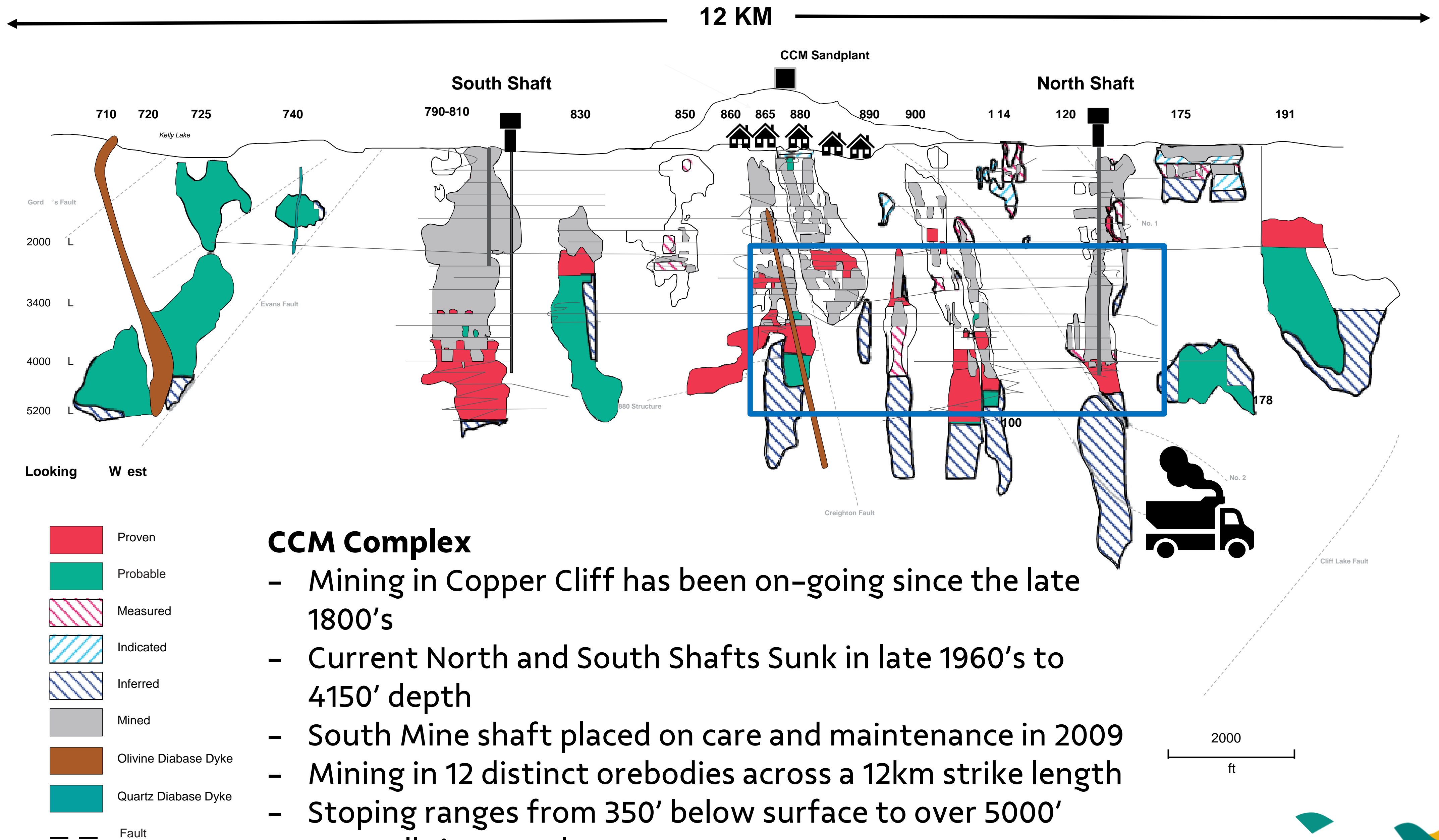
MIRARCO at Laurentian University – C\$875,000 over five years to support a new industrial research chair in biomining and bioremediation

University of Toronto – C\$1.6 million to power sustainable mining solutions and foster Canadian skills and talent.

Copper Cliff Mine Complex

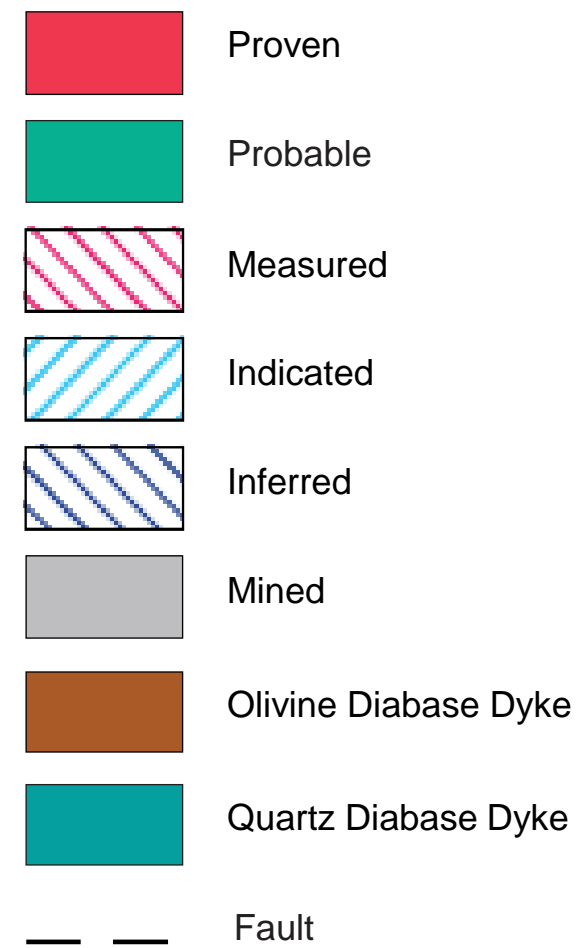
Vale Sudbury Operations

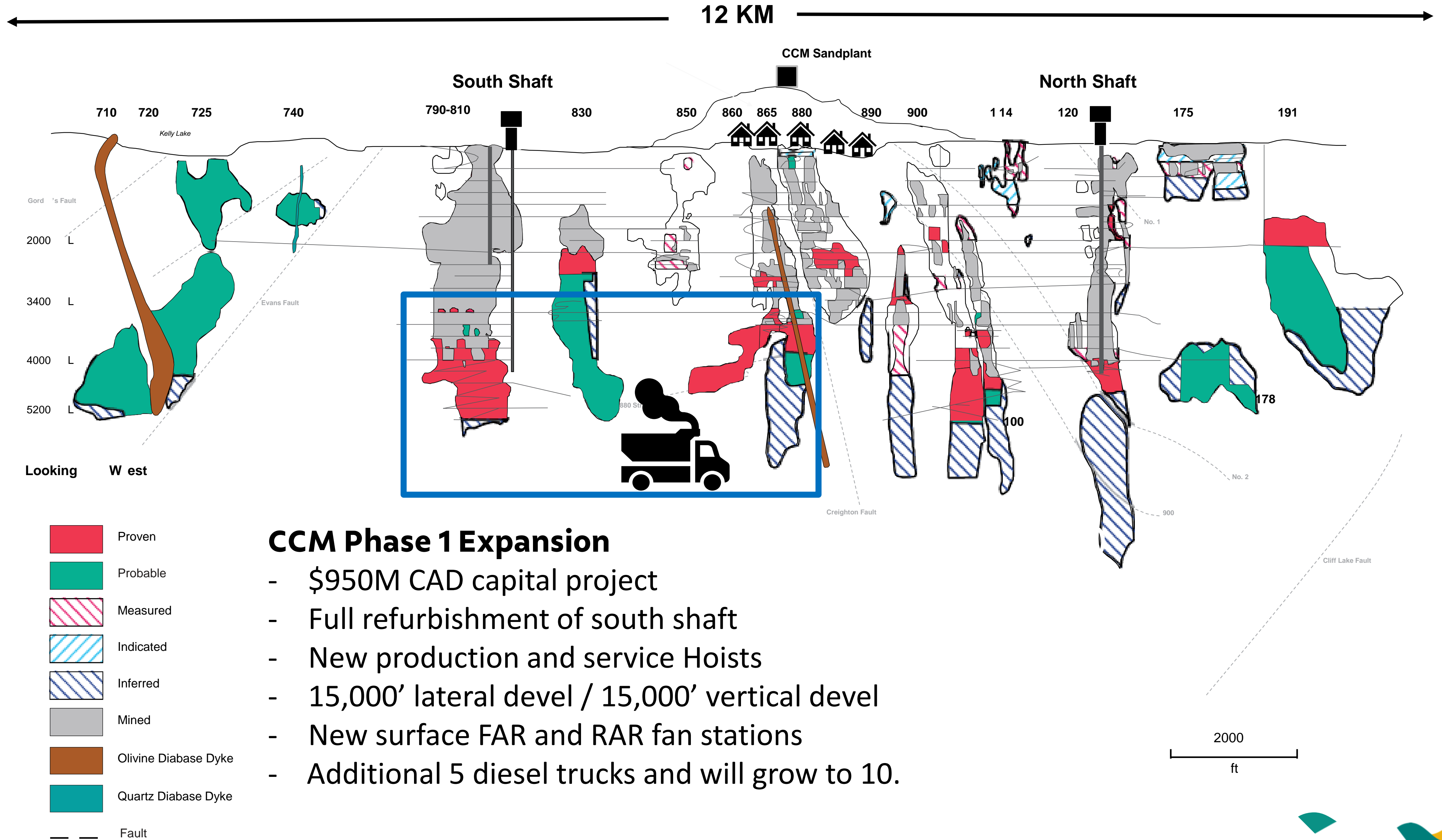




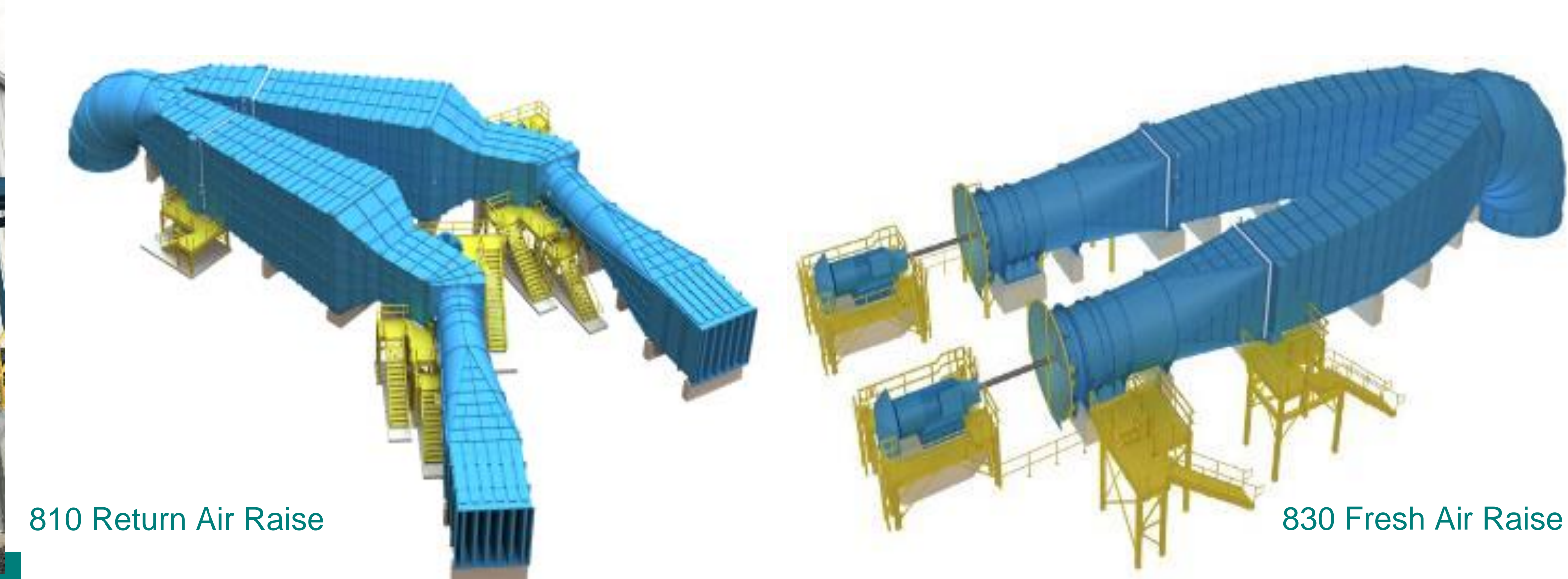
CCM Complex

- Mining in Copper Cliff has been on-going since the late 1800's
- Current North and South Shafts Sunk in late 1960's to 4150' depth
- South Mine shaft placed on care and maintenance in 2009
- Mining in 12 distinct orebodies across a 12km strike length
- Stoping ranges from 350' below surface to over 5000'
- 640 Full time employees





Ventilation Upgrades



810 Return Air Raise

830 Fresh Air Raise

Updates to Ontario Regulations

Update to Elemental Carbon Exposure



NEWS RELEASE

Ontario Introducing New Rules to Keep Miners Safe

Changes will reduce exposure to harmful chemicals and allow robots to detect hazards

April 11, 2023

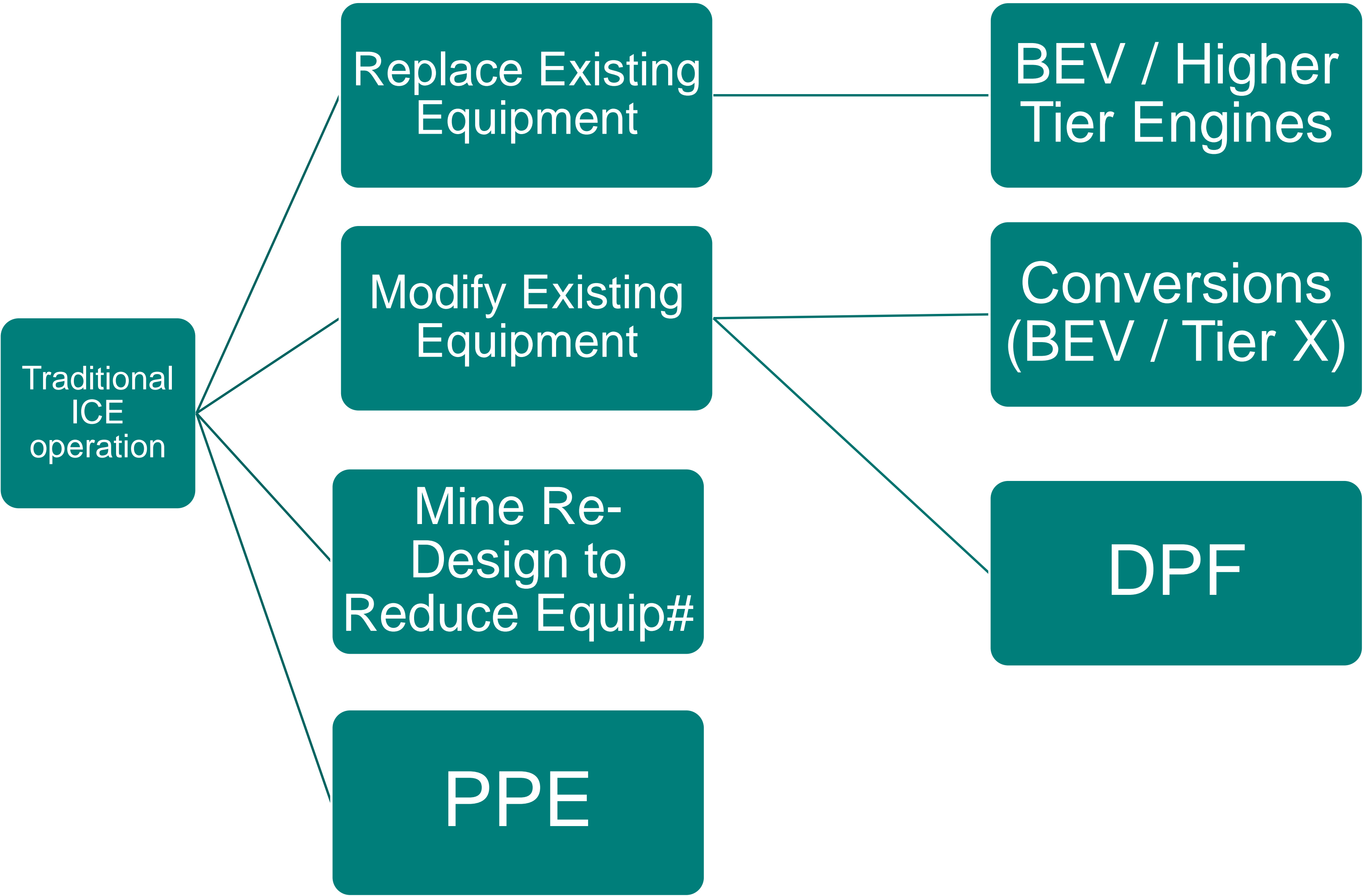
- The regulatory amendments will come into force on July 1, 2023, and others in effect on September 1, 2023, to allow employers time to comply.
- Ontario's allowable level of exposure to harmful substances from diesel exhaust in underground mines will now be the most protective in North America.
- Effective September 1, 2023, the new exposure limit will be a time-weighted average exposure to elemental carbon of not more than 0.12 milligrams per cubic metre of air, instead of 0.4 milligrams per cubic metre of air based on total carbon.

Effective Sept 1, 2023

183.2 Where diesel-powered equipment is operated in an underground mine, the time-weighted average exposure of a worker to elemental carbon shall not be more than 0.12 milligrams per cubic metre of air.

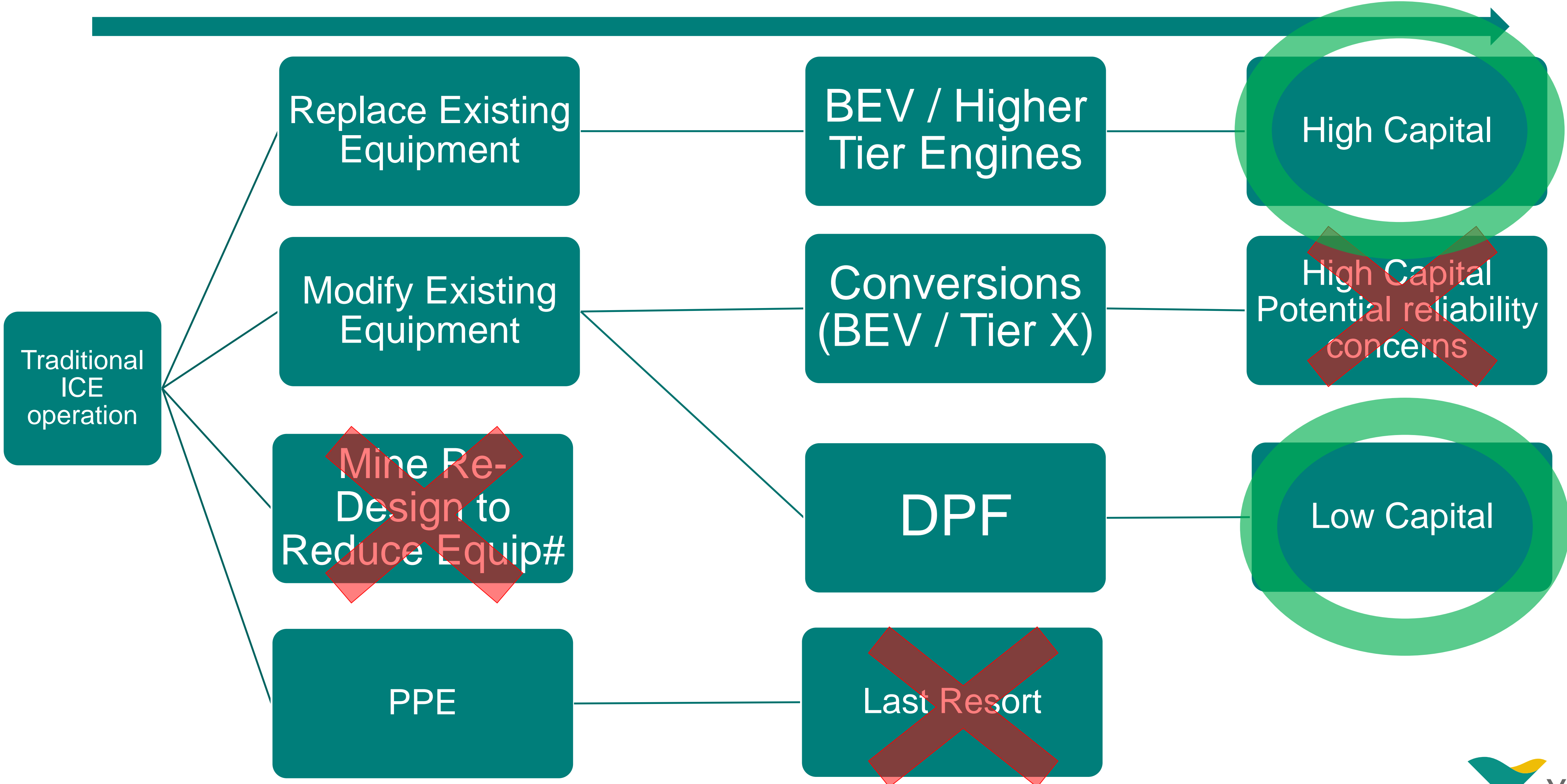
Decisions on Path to Reduced Emissions

Time

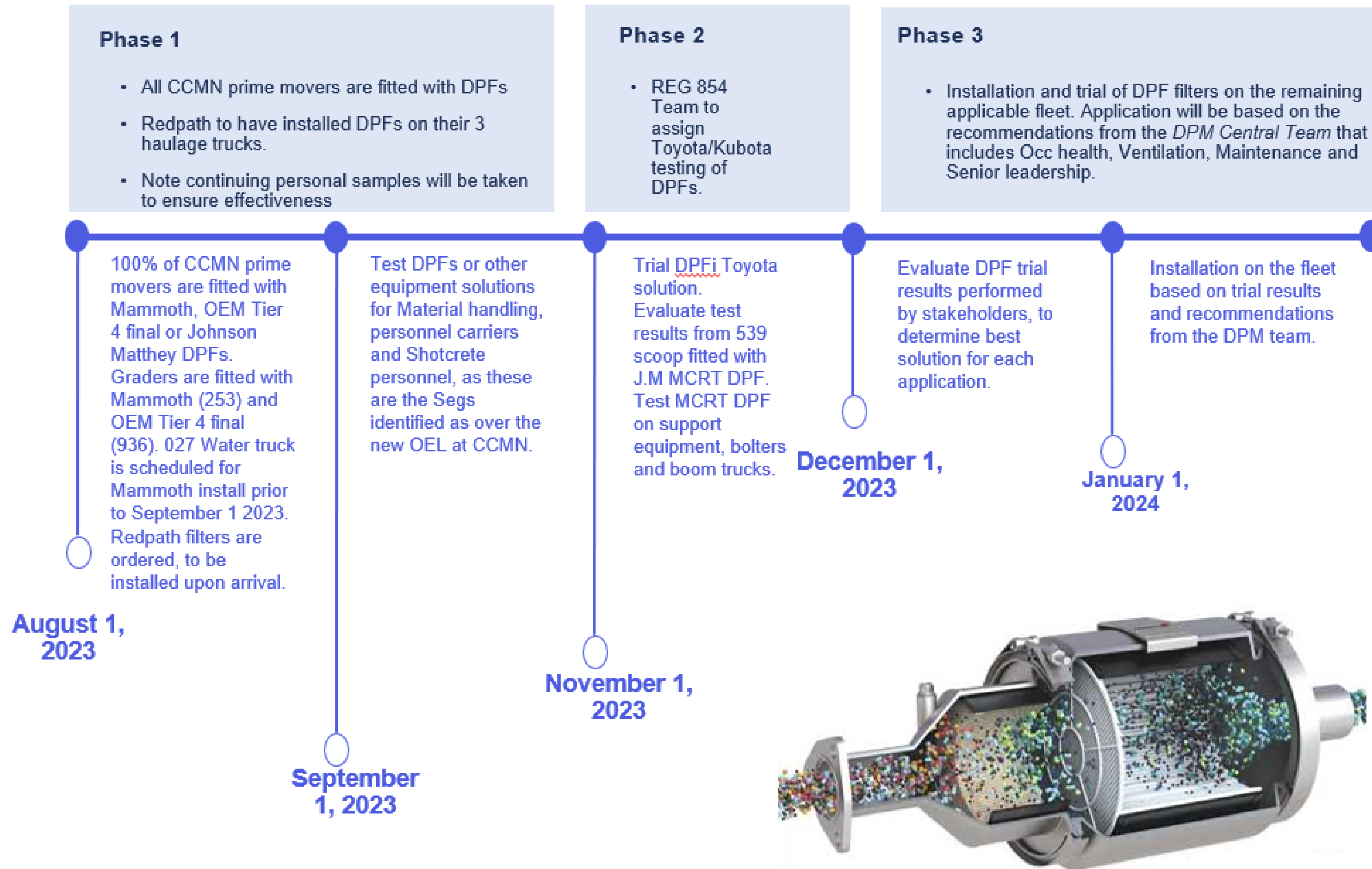


Decisions on Path to Reduced Emissions

Time



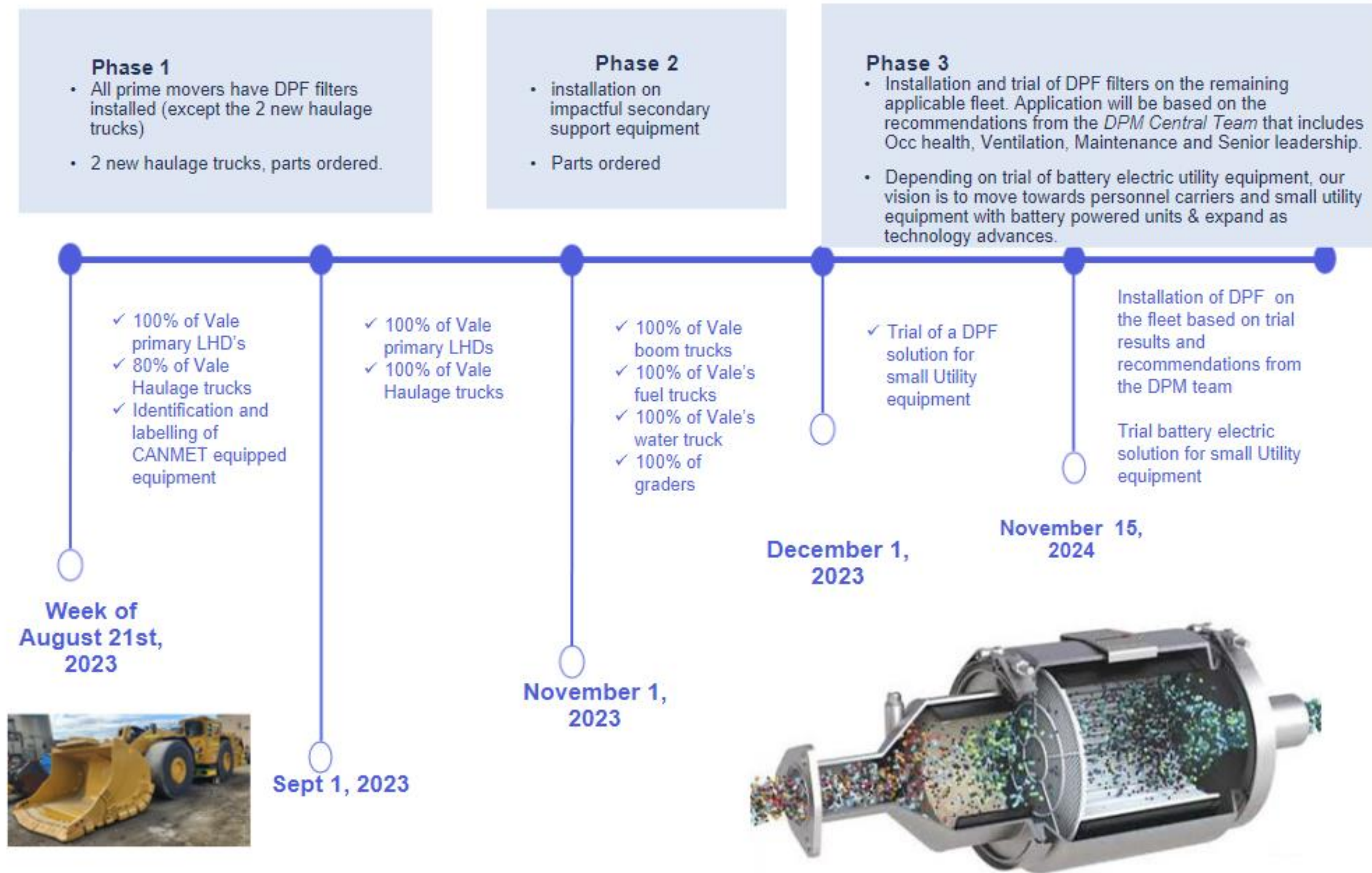
CCMN MINE DPF TIMELINE



Current Fleet:

- 9 Trucks with DPF (Mammoth)
- 12 Scoops
- 1 Tier 4 with DPF
- 1 BEV
- 2 JM MCRT Filter
- 9 Tier 3 with Mammoth DPF
- 1 Grader with DPF
- 1 Water Truck

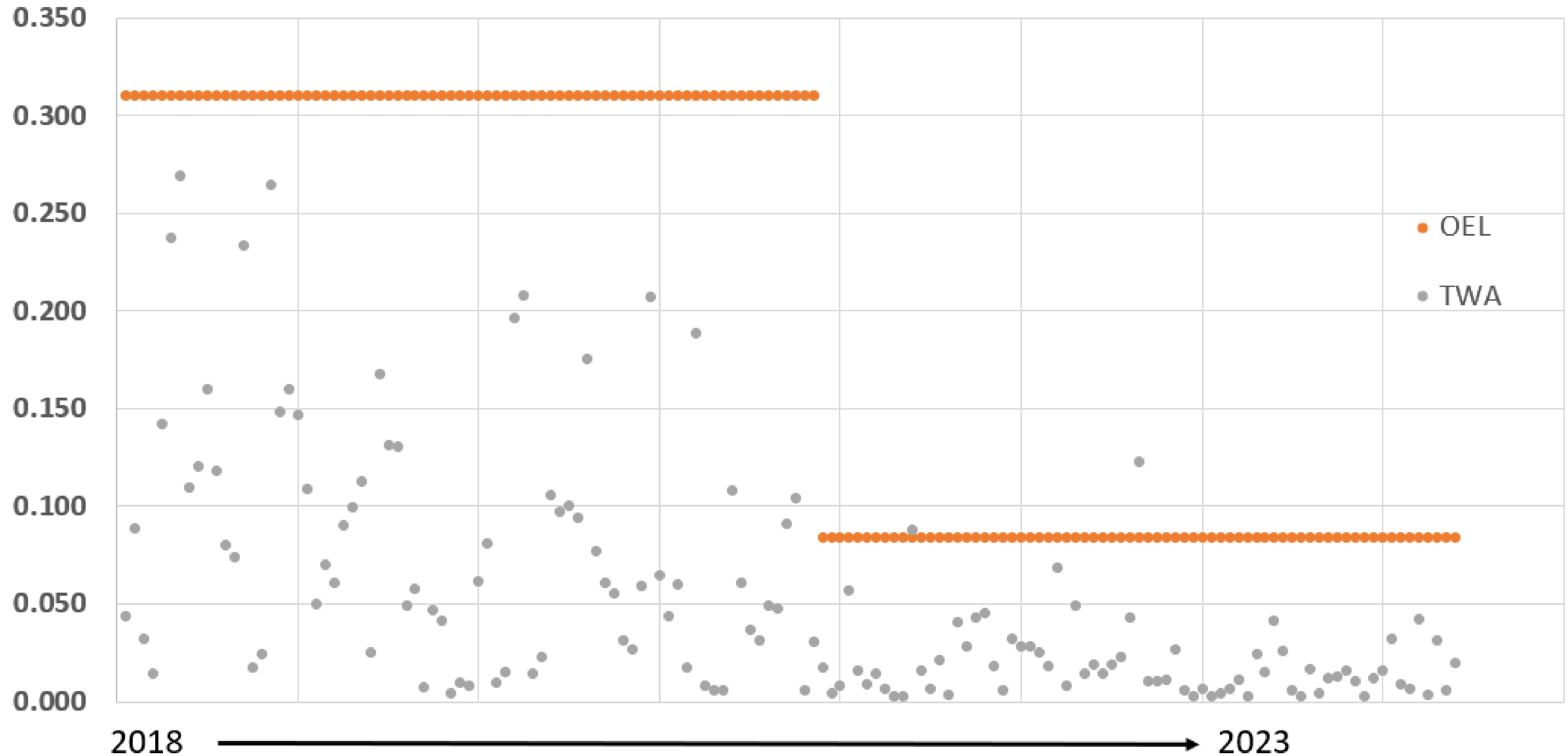
COPPER CLIFF SOUTH MINE DPF TIMELINE



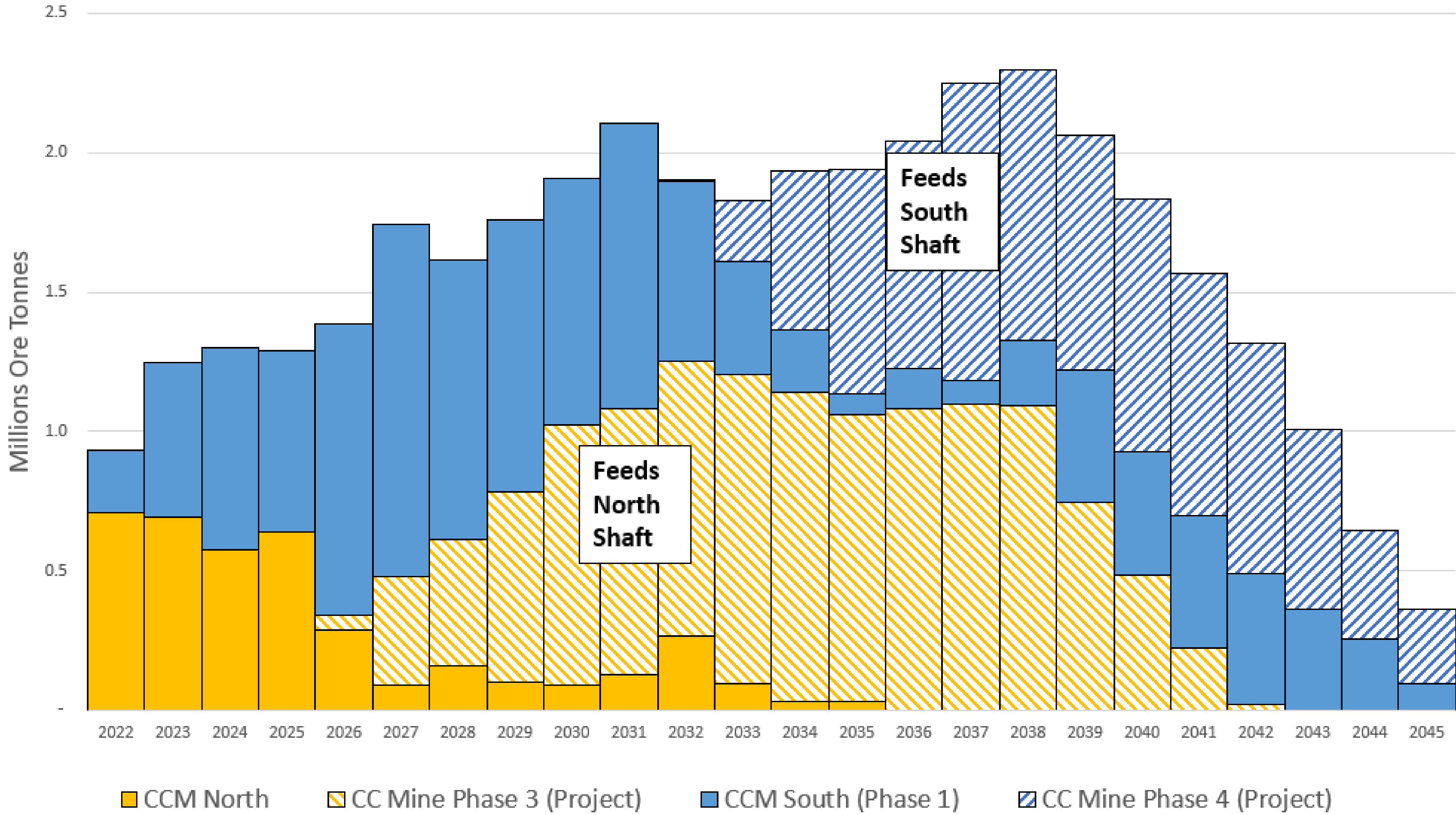
Current Fleet:

- 5 Trucks with DPF (Mammoth)
- 6 Scoops
- 2 Tier 4 with DPF
- 1 BEV
- 3 Tier 3 with Mammoth DPF
- 1 Emulsion Loader BEV

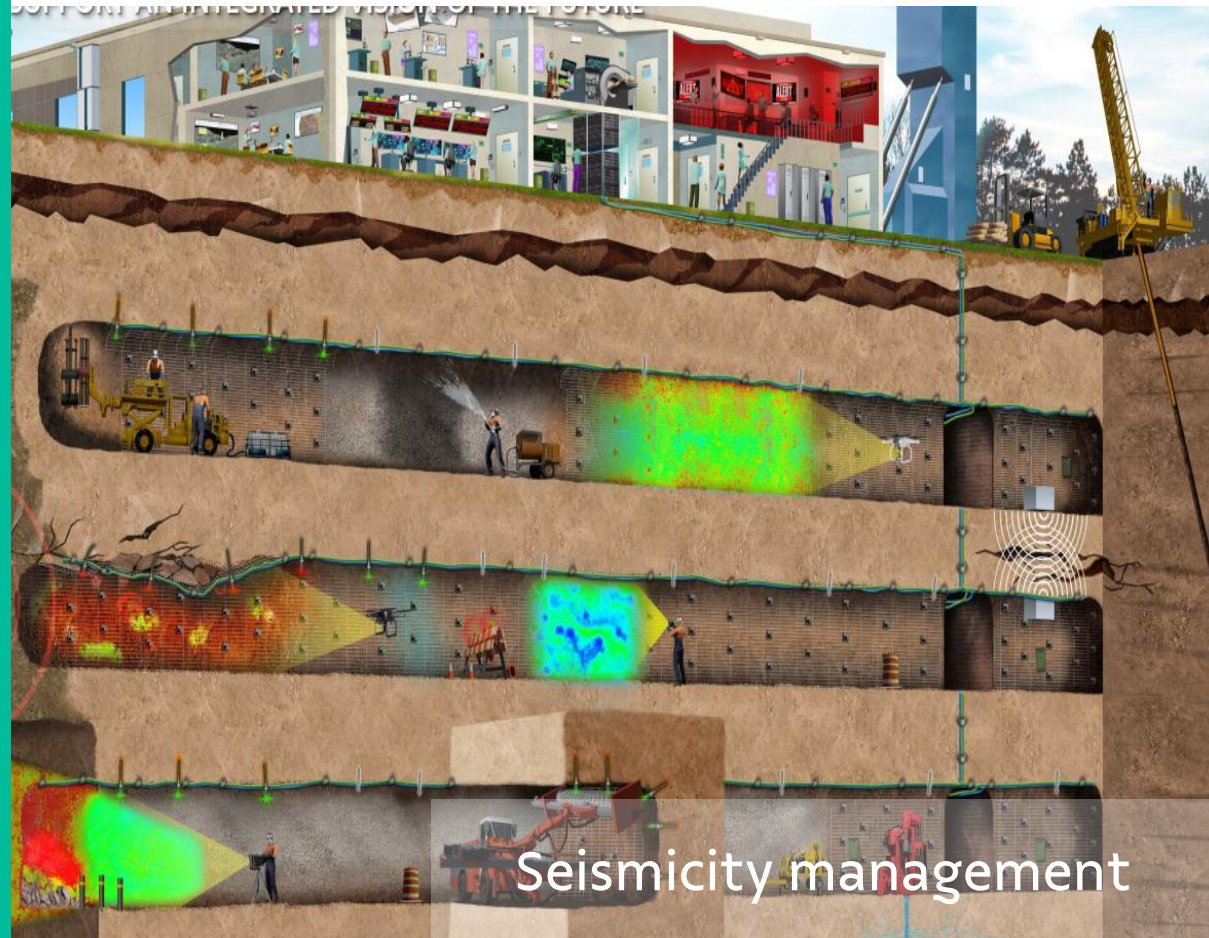
Copper Cliff Complex TWA ($\mu\text{g}/\text{m}^3$) of Elemental Carbon vs. OEL (2018 - 2023)



CC Mine 2021 Life of Mine Plan - Ore Production



Innovation will be key in seizing this opportunity



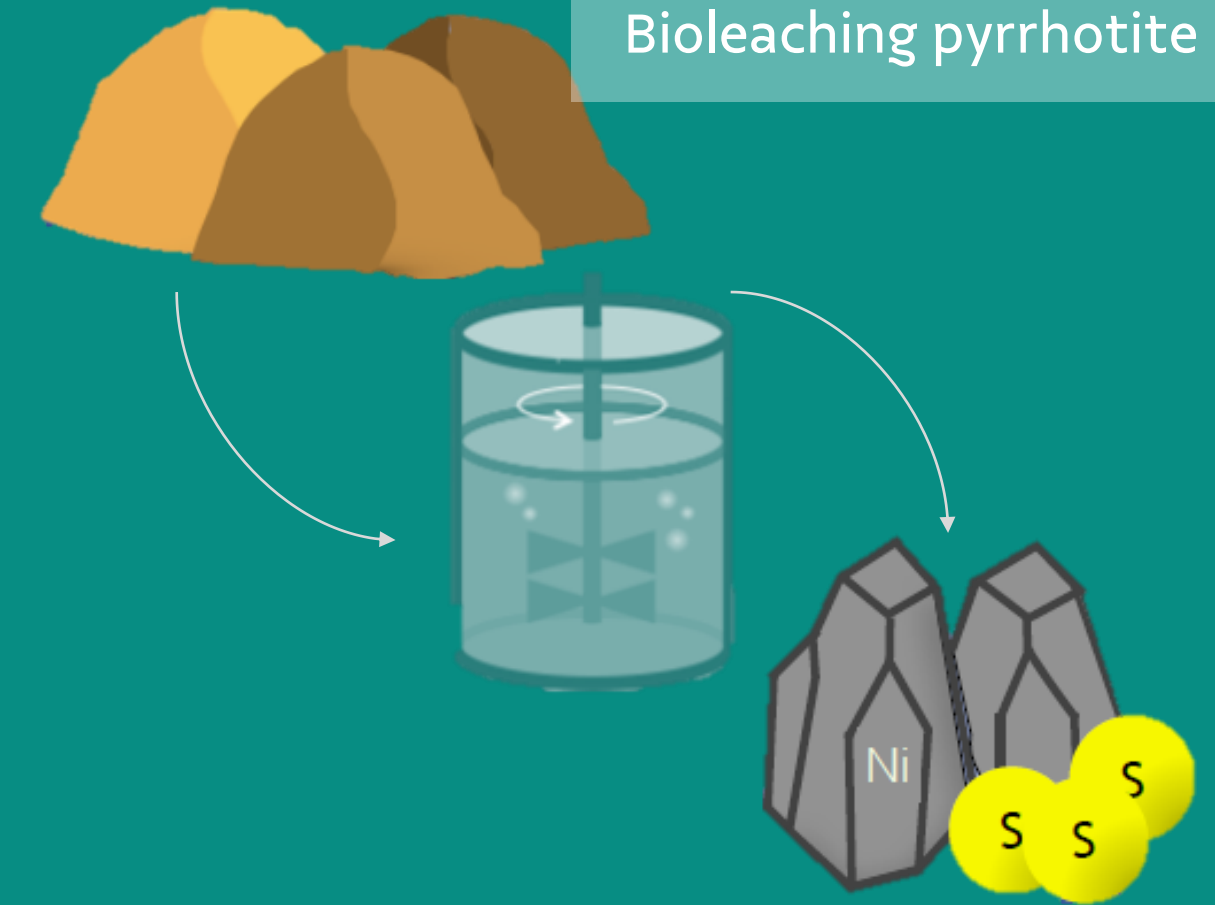
Seismicity management

Intelligent

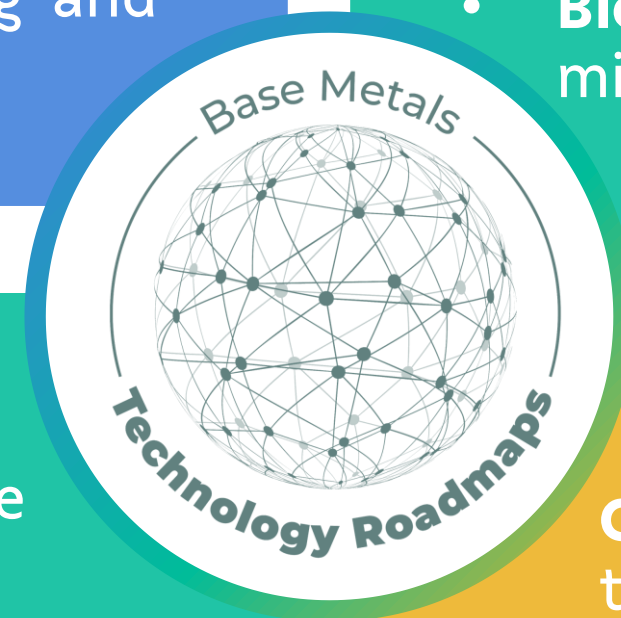
- **Ubiquitous LTE** and fiber optic access enabling new technologies
- **Seismicity and environment** manage through advanced sensing and design techniques
- **iROC** (integrated Remote Operation Center) visualizing and managing conflict along all processes

Sustainable

- **Battery electric and advanced ventilation controls** reducing ventilation constraint and enabling deeper mine.
- **Ore sorting** leveraged to reduce mine waste, improving head grade
- **Biomining** increasing recovery and minimizing tailings outputs



Bioleaching pyrrhotite



Safe

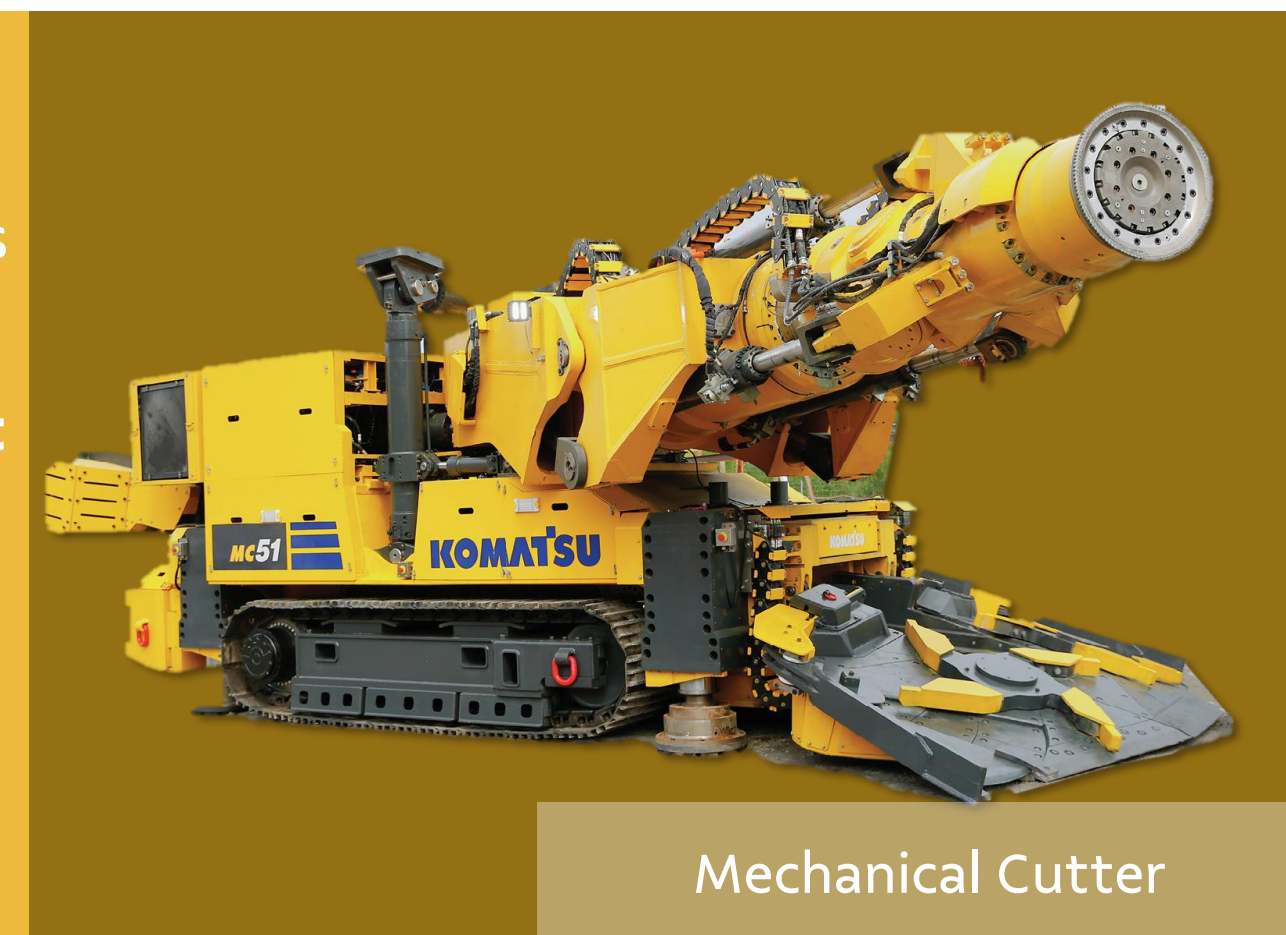
- **Mechanize** all high exposure processes
- **Fully Autonomous Fleet** removing people from risk environment
- **Collision Avoidance** making sure that everyone gets home safe
- **Use of drones & robots** in high-risk conditions

Stable and Reliable

- **Continuous development** process to increase production stability
- **Alternatives material movement** to minimize use of trucks haulage



Remote Charging unit



Mechanical Cutter

Thank you!

