



Critical Minerals Workshop

Driven primarily by their role in the transition to a low-carbon and digitized economy, global demand for critical minerals is rising.

Critical minerals are considered essential for renewable energy and clean technology applications (batteries, permanent magnets, solar panels and wind turbines). They are required inputs for advanced manufacturing supply chains, including defence and security technologies, consumer electronics, agriculture, medical applications and critical infrastructure.

The Government of Canada has recently identified **31 minerals** that could position Canada as a leading supplier of critical minerals. These minerals are considered critical for the sustainable economic success of Canada and its allies and will help to position Canada as a leading mining nation as set out in the **Canadian Minerals and Metals Plan**.

In the United States, 35 elements, minerals, and mineral groups are currently defined as critical minerals. Canada is currently a supplier for 13 of the 35 US critical minerals.

The Northwest Territories (NWT) has several mining projects with critical minerals as a primary commodity. As Canada moves to secure and develop critical mineral commodities, doors are opening for projects such as Fortune's NICO, Cheetah Resources/Vital Metals' Nechalacho, Osisko's Pine Point, Cantung/Mactung and NorZinc's Prairie Creek to help fill an anticipated demand. The Nechalacho project has already transitioned to an early stage of critical mineral production.

This workshop is designed to establish a common level of understanding among NWT leaders, residents and business, and industry stakeholders concerning the role of critical minerals in future resource development within our territory. The outcomes of the workshop will contribute to an initial Critical Minerals Action Plan for the NWT and will identify how and where these commodities fit into a renewed NWT Mineral Development Strategy.

RECOMMENDED READING:

- [Canadian Minerals and Metals Plan](#)
- [Canada and the United States Advance Collaboration on Critical Minerals](#)

Keynote Speaker

Hatch supplies engineering, project and construction, business consulting and operational services to the mining, metallurgical, energy and infrastructure industries.

Mr. Siddhartha Subramani (Sid) is a Principal in Hatch's Advisory practice and leads the transactions and market analysis services globally.

He has 16 years of diverse experience in finance and engineering and specialist expertise in equity capital markets, market analysis, valuation and transaction advisory in the energy and mining industries.

At Hatch, Sid has led and sponsored various transactions advisory engagements in copper, gold, lithium, energy fuels and infrastructure assets globally. In addition, he has led a variety of market analysis engagements for battery metals, energy and infrastructure.

Prior to joining Hatch, Sid was at *Veritas Investment Research* where he was an Equity Research Analyst covering North American mining equities. As part of an independent equity research firm, he advised institutional investors on gold macro fundamentals, industry dynamics and provided ongoing research coverage and commentary to support their investments. Research scope included financial and fundamental analysis as well as relative valuation to identify investment opportunities.

Sid has design, commissioning and start-up experience at large open-pit mines (Meadowbank, Endako) and was also involved with due-diligence, strategy and performance improvement mandates across energy, mining and infrastructure.

He has developed operating costs, financial models and economic assessments for clients in infrastructure, alumina, copper, iron ore and gold sectors.

We look forward to your input as the following broad themes are discussed:

Awareness, Engagement, Information Sharing, and Understanding of Critical Minerals Development in the NWT: What do you think the public perception is about critical minerals now? What messages would be most useful for the public to know about critical minerals? How might we convey this information to the public?

Marketing and Promoting the NWT's Critical Minerals Potential: What should we emphasize? What activities and tactics should we be using?

NWT Critical Minerals Commodities – What and Where: What commodities should we pursue, why? How might an NWT Critical Minerals Action Plan be informed by regional (e.g., Indigenous regions, geologic regions, industrial regions) knowledge, input, and lessons learned?

Critical Minerals Partnerships and Collaborations: What types of partnerships or collaborations make sense for your organization? How might the GNWT facilitate and encourage more collaborations, partnerships, and relationships?

Other Themes, Goals, Considerations, and Challenges: What has not been covered during other discussions that you would like to mention or highlight during this workshop?

NWT Critical Minerals Virtual Workshop November 9, 2021

Agenda

Virtual session opens at 8:30 am with session kicking off at 9:00 am and closing out at 4:20 pm.

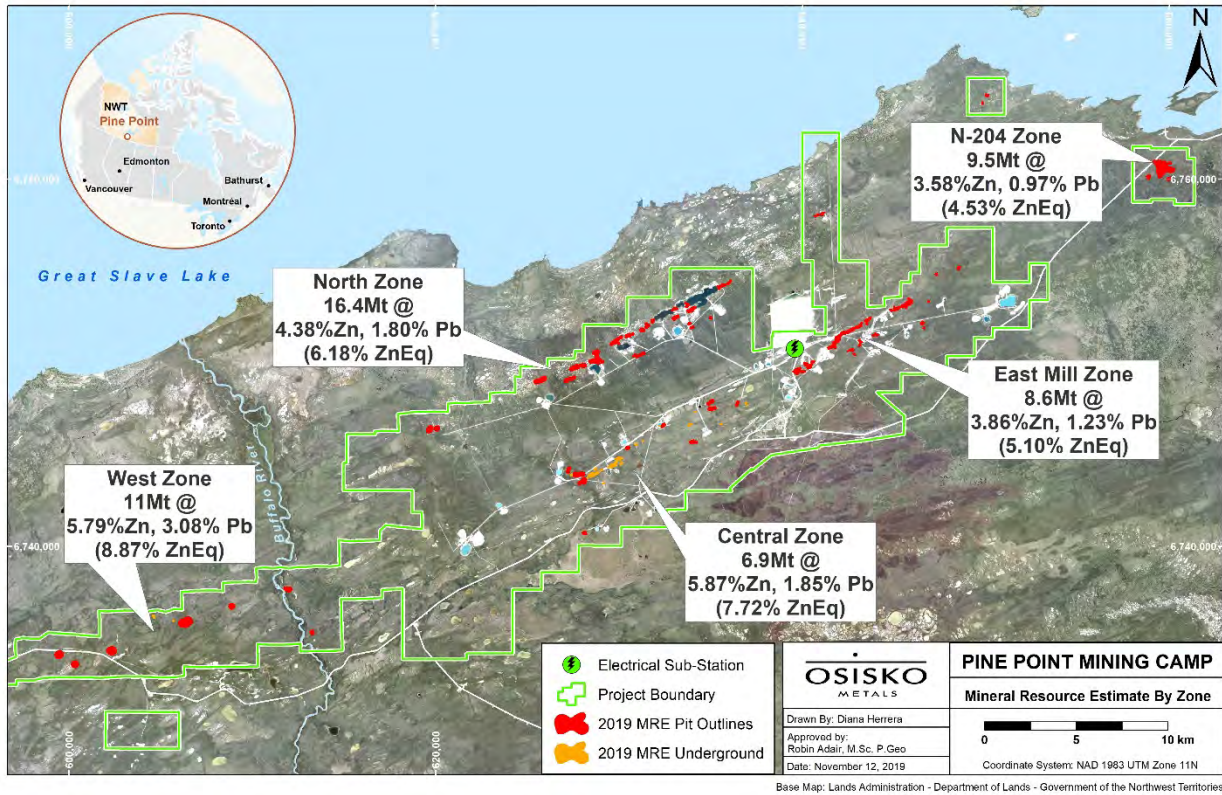
<i>Time</i>	<i>Session</i>
9:00 am	Introductions and set the stage for the day
9:30 am	Keynote Speaker – <i>Mr. Siddarth (Sid) Subramani, Hatch Ltd.</i>
10:15 am	Health Break
10:30 am	Introduction to Four Preliminary Themes of an NWT Critical Minerals Action Plan
11:00 am	Group Discussion of Theme 1 – Awareness, Engagement, Information Sharing, and Understanding of Critical Minerals Development in the NWT
Noon	Lunch Break
1:10 pm	Breakout Session for Theme 2 – Marketing and Promoting the NWT’s Critical Minerals Potential
1:45 pm	Breakout Session for Theme 3 – NWT Critical Mineral Commodities – What and Where?
2:15 pm	Health Break
2:30 pm	Breakout Session for Theme 4 – Critical Mineral Partnerships and Collaborations
3:00 pm	Group Discussion of Other Themes, Goals, Considerations, and Challenges
3:30 pm	Wrap Up: What We Heard
4:20 pm	End of Formal Program

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Workshop Information Package



Nechalacho Project. Image by Bill Braden for Cheetah Resources.



Pine Point Mining Camp, Osisko Metals



NICO Project, Fortune Minerals Ltd.

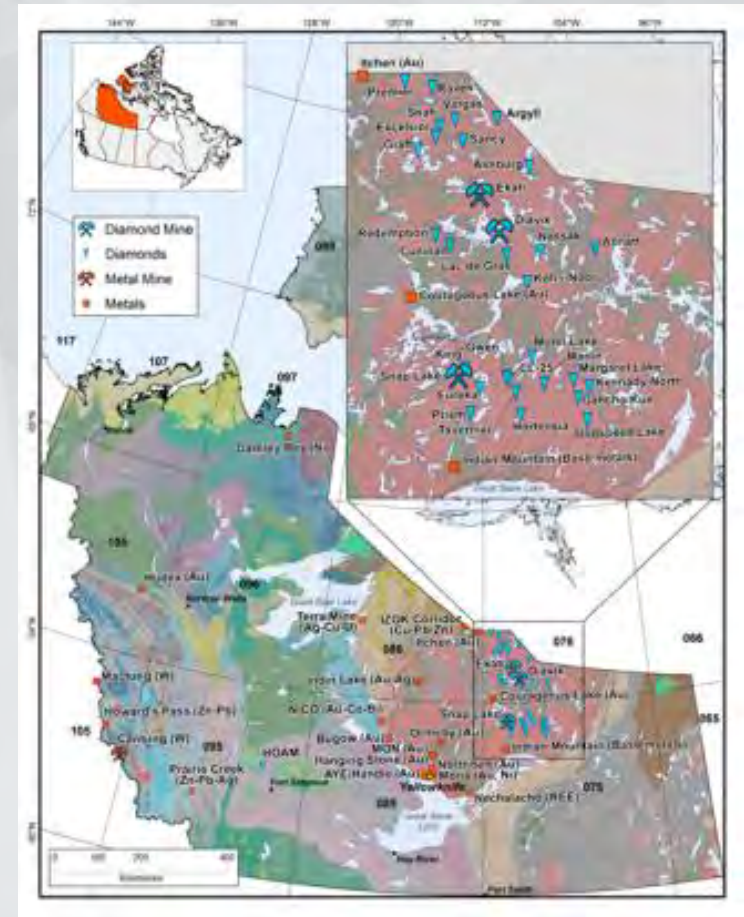


Prairie Creek Mine, NorZinc Ltd.

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NWT Mineral Resource Wealth

- The NWT's resource wealth is well known
- Rich and diverse geology allows for exploration of various commodities
- Long history of exploration – over \$46 billion in mining revenues since 1932
- World diamond leader: 5th in the world for production by value



NWT Technology Metal Map

NWT Major Mining Project Locations 2018

- NWT Communities
- - - Limit of Exclusive Economic Zone 200
- - - Limit of Exclusive Economic Zone Pursuant to Bilateral Boundary Agreement
- International Boundary
- Provincial or Territorial Boundary
- Major Road
- Winter Road
- Mineral Deposits**
- Commodity**
- ▲ Base Metals
- ◆ Diamond
- Rare Earth Elements
- Tungsten
- Inuvialuit Settlement Area
- Gwich'in Settlement Area
- Sahtu, Dene and Metis Settlement Area

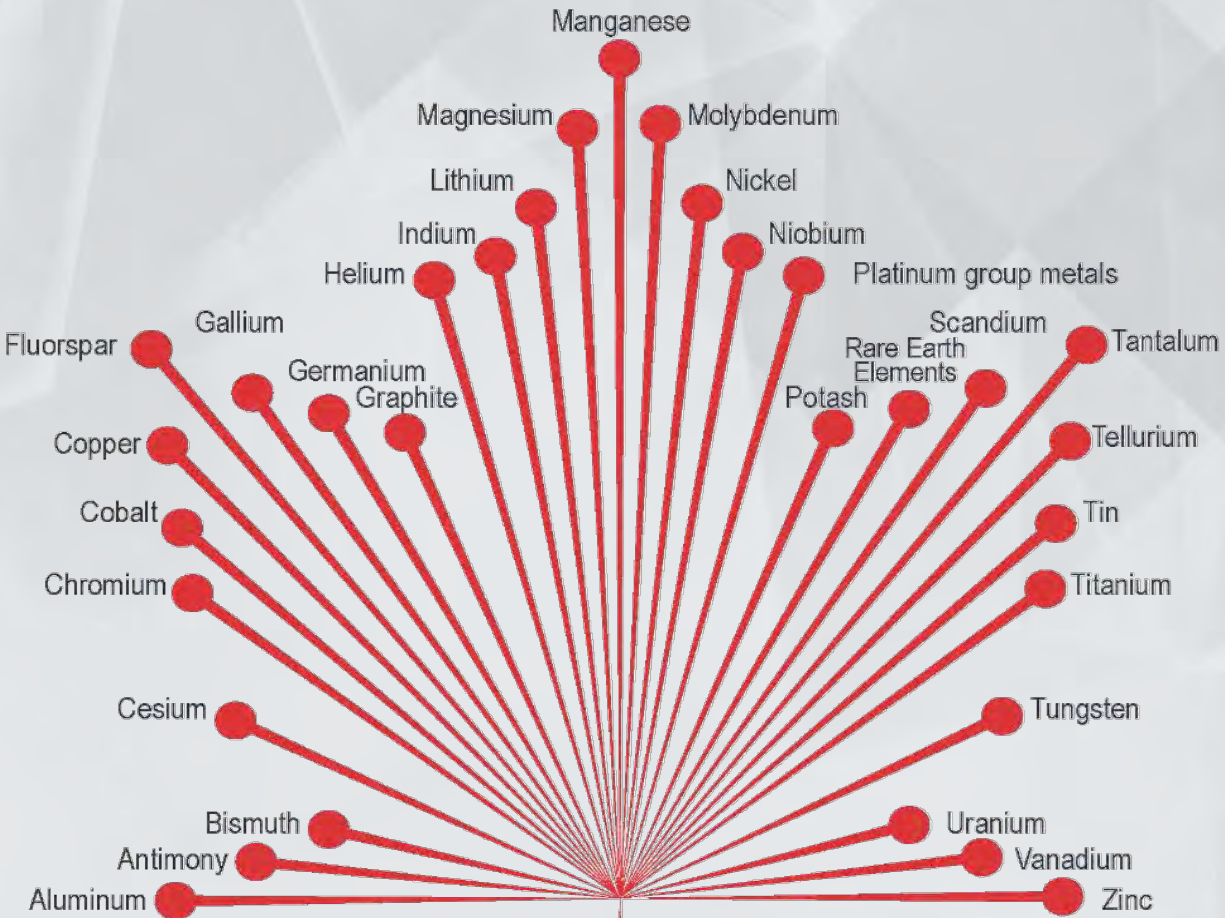
Document: Major_Mineral_Project_Sites_Pam_AEE_Pres_v2_Jun7_2018.mxd
 Document Security: LOW
 Source: Petroleum Resources Division, Industry Tourism and Investment
 Projection: Modified Lambert Conformal Conic
 Central Meridian: 124.5°W
 Standard Parallels: 62°N 70°N
 Datum: NAD83



- ⊗ Nico Co-Bi-Cu-Au
- ⊗ Pine Point Pb-Zn-Ag
- ⊗ Prairie Creek Pb-Zn-Ag
- ⊗ Mactung- Cantung (tungsten)
- ⊗ Coates Lake (copper)
- ⊗ Hidden Lake (lithium)
- ⊗ Nechalacho (rare earth metals, lithium, beryllium, thorium etc)



Canada's List of Critical Minerals



Northwest Territories

Industry, Tourism and Investment

Critical Minerals in Current Demand

Battery Materials

- Cobalt ★
- Lithium ★
- Nickel
- Graphite
- Manganese
- Copper ★
- Vanadium

Magnet Materials

- Cobalt ★
- REE ★

Photovoltaic Materials

- Gallium
- Germanium ★
- Indium ★
- Tellurium ★

★ Significant in NWT

After Simandl, Simandl & Paradis 2021



NWT Resources

Canada's List of Critical Minerals* (March 2021)	Element Symbol	NWT presence (✓✓ = significant; ✓ = less significant or less known)	Significant NWT Deposits and Other Potential Sources (not comprehensive)
Aluminum	Al	-	
Antimony	Sb	-	
Bismuth	Bi	✓✓	NICO
Cesium	Cs	✓✓	Nechalacho
Chromium	Cr	-	
Cobalt	Co	✓✓	NICO
Copper	Cu	✓✓	Coates Lake/Redstone; various locations
Fluorspar	F	✓✓	Nechalacho
Gallium	Ga	-	
Germanium	Ge	✓✓	Nechalacho
Graphite	C	✓	Metamorphosed sedimentary rocks
Helium	He	-	
Indium	In	✓✓	Nechalacho; byproduct of zinc mining
Lithium	Li	✓✓	Nechalacho; Big (Murphy); Hidden Lake; Li-Cs-Ta pegmatites
Magnesium	Mg	-	
Manganese	Mn	-	
Molybdenum	Mo	✓	Various locations
Nickel	Ni	✓	Slave and Churchill Geological Provinces
Niobium	Nb	✓✓	Nechalacho; DeStaffany; Li-Cs-Ta pegmatites
Platinum group metals	<i>PGM</i>	✓	Slave and Churchill Geological Provinces
Potash	K	-	
Rare earth elements	<i>REE</i>	✓✓	Nechalacho; Churchill and Bear Geological Provinces
Scandium	Sc	✓✓	Nechalacho
Tantalum	Ta	✓✓	Nechalacho; DeStaffany; Li-Cs-Ta pegmatites
Tellurium	Te	✓✓	Nechalacho
Tin	Sn	✓	Various locations
Titanium	Ti	✓	Mafic plutonic rocks; byproduct of vanadium mining
Tungsten	W	✓✓	Cantung; Mactung; Lened; Slave and Bear Provinces
Uranium	U	✓	Proterozoic sedimentary rocks; granitic rocks
Vanadium	V	✓	Mafic plutonic rocks; black shales
Zinc	Zn	✓✓	Pine Point; Prairie Creek; Selwyn; Mackenzie Mtns
(n = 31)		(n = 23)	

* Critical minerals are minerals that can be mined in Canada, are essential for our domestic industries and security, and improve the stability and sustainability of supply chains that serve Canada and its allies (Government of Canada definition).



Significant NWT Deposits

Significant Deposit	Element(s)	Owner
Nechalacho	Cs, F, Ge, In, Li, Nb, REE, Sc, Ta, Te	Vital Metals, Avalon Advanced Materials
NICO	Bi, Co, Cu	Fortune Minerals
Pine Point	Zn	Osisko Metals
Prairie Creek	Zn	NorZinc
Selwyn	Zn	Selwyn-Chihong Mining
Coates Lake/Redstone	Cu	Redbed Resources
Cantung	W	North American Tungsten (in receivership)
Mactung	W	Government of NWT
Lened	W	unknown
Big (Murphy)	Li	Erex International
Best Bet	Li	Erex International
Moose 1 & 2	Li, Nb, Ta	Government of Canada (contaminated site management)
Hidden Lake	Li	FAR Resources



Potential Sources of NWT Critical Minerals

- New discoveries that are economic to mine
- Old discoveries that have become economic to mine
- Old discoveries with previously-unrecognized potential
 - (a deposit was evaluated for mineral X but also contains minerals Y and Z that weren't considered to be valuable at the time)
- By-product of mining other commodities (e.g., zinc)
- Reprocessing waste materials (mostly tailings) from past mining
- Recycling



NWT's Past Production of Critical Minerals

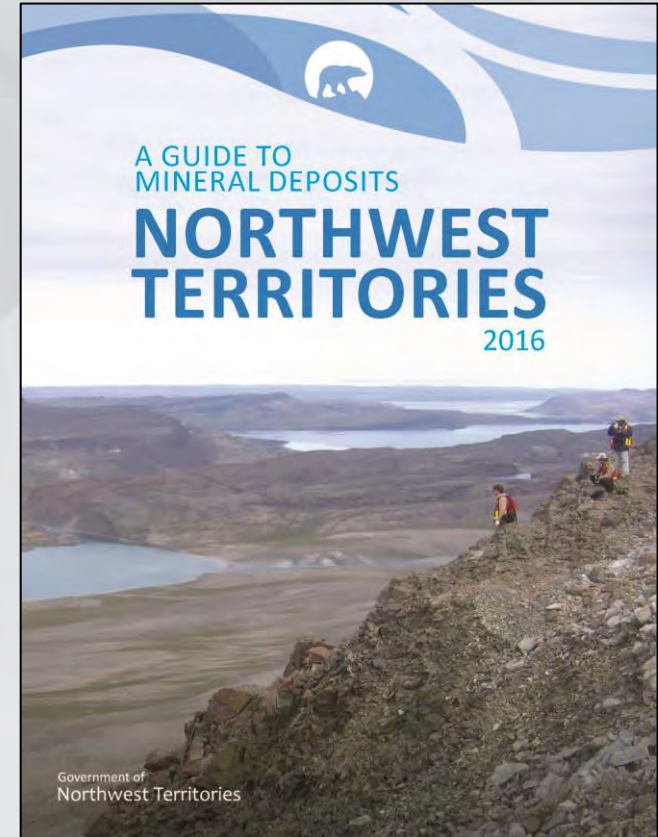
- Past production mainly began in the 1940s. Higher-tonnage mining of tungsten (Cantung) and zinc (Pine Point) was initiated in the 1960s
- A variety of information sources are available for past producers
- These compilations are handy references

The Operational History of Mines in the Northwest Territories, Canada



An Historical Research Project by Ryan Silke

- 2009 -



RARE EARTH ELEMENT INFORMATION



Rare earth elements (REEs) are a group of 15 elements referred to as the lanthanide series in the periodic table of elements. REEs are key components in many electronic devices that we use in our daily lives as well as in a variety of industrial applications.

REEs are categorized as being either “light” or “heavy”:

- **Light REEs** (lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium and scandium) are produced in global abundance and are in surplus supply.
- **Heavy REEs** (terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium and yttrium) are produced mainly in China and are in limited supply. Global efforts to bring new resources to the marketplace continue.

Scandium and yttrium, while not true REEs, are also included in this categorization because they exhibit similar properties and are always found in the same ore bodies.

Rare earth elements uses, 2019



Many of Canada’s most advanced REEs exploration projects contain high concentrations of the globally-valued heavy REEs used in high-technology and clean-energy applications. The NWT’s **Nechalacho Project** is one of these deposits.

Source:

Adapted from <https://www.nrcan.gc.ca/science-data/science-research/earth-sciences/earth-sciences-resources/earth-sciences-federal-programs/rare-earth-elements-facts/20522>