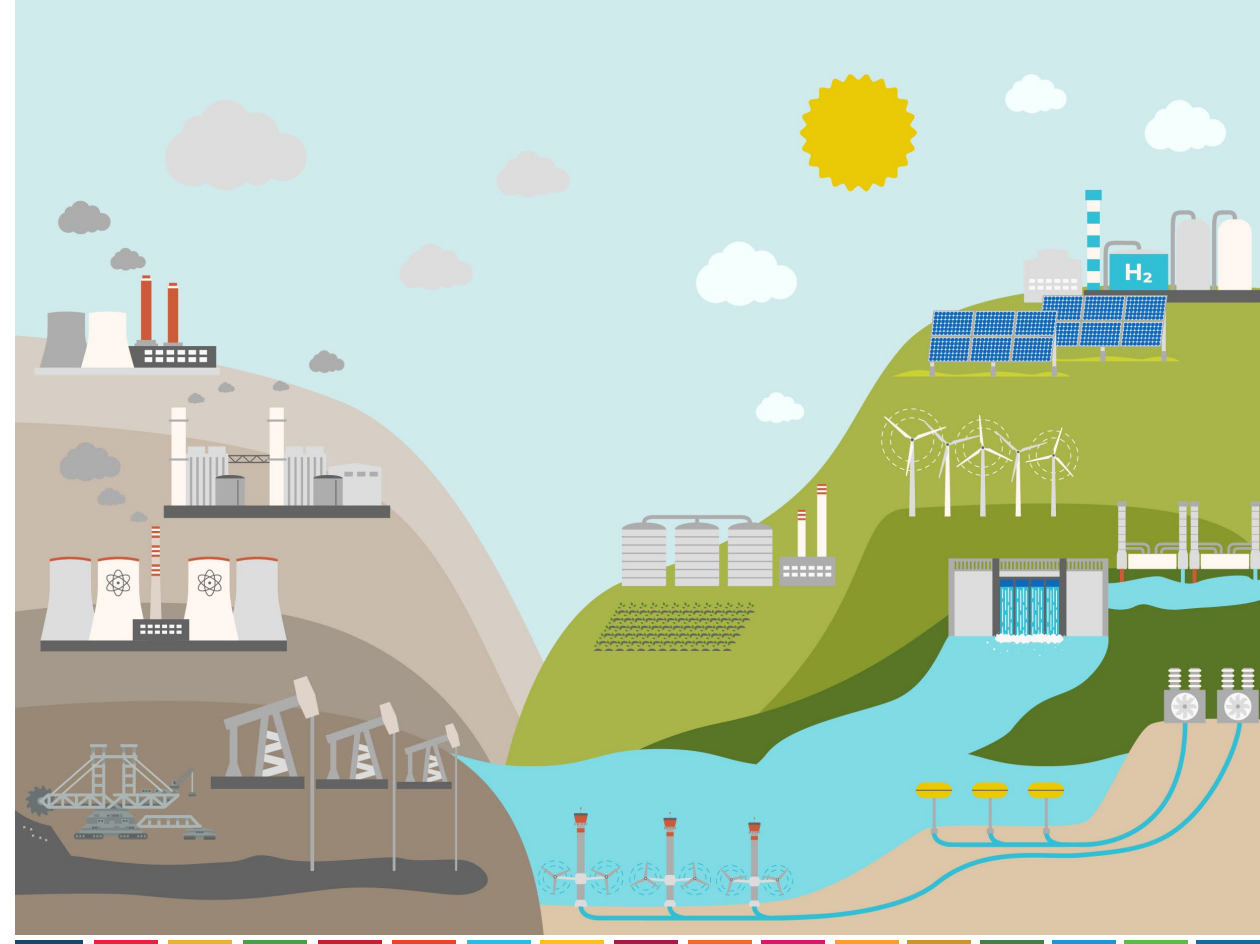


Classifying the production of lithium, cesium and tantalum from the Tanco mine, Manitoba, Canada, according to UNFC – A Case Study

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Claude Deveau
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RESOURCE MANAGEMENT WEEK
2024



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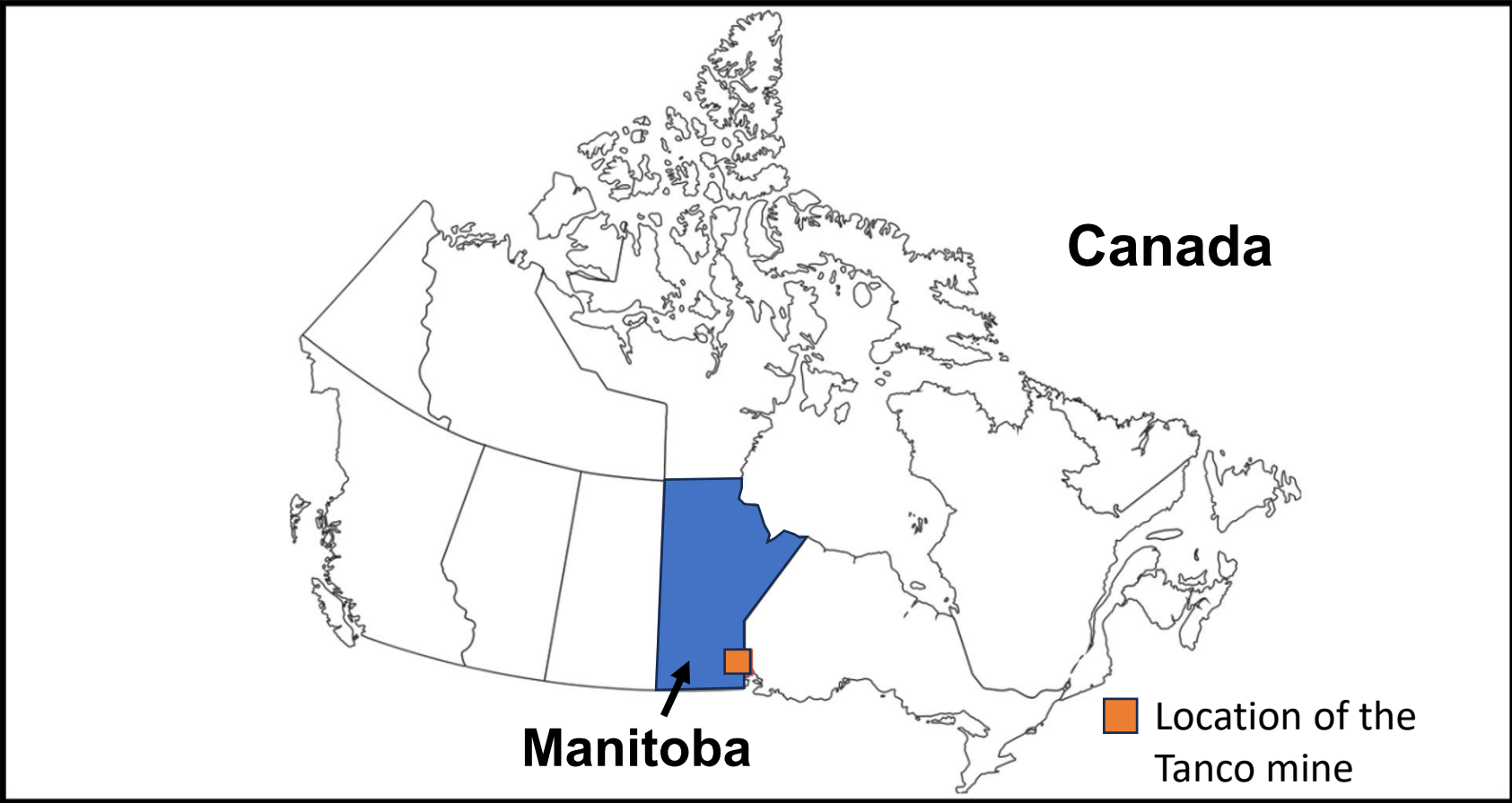
UNFC Case Study: Tanco mine

- Why make a case study of the Tanco mine?
 - Active operation of critical minerals;
 - Multicommodity;
 - Very well studied deposit (geology);
 - Not a lot of information on the resource estimation;
- Demonstrates the challenges of the classification of multiproduct mines.
- Example of application of the United Nations Framework Classification (UNFC) for Resources.



The Tanco Mine

Location

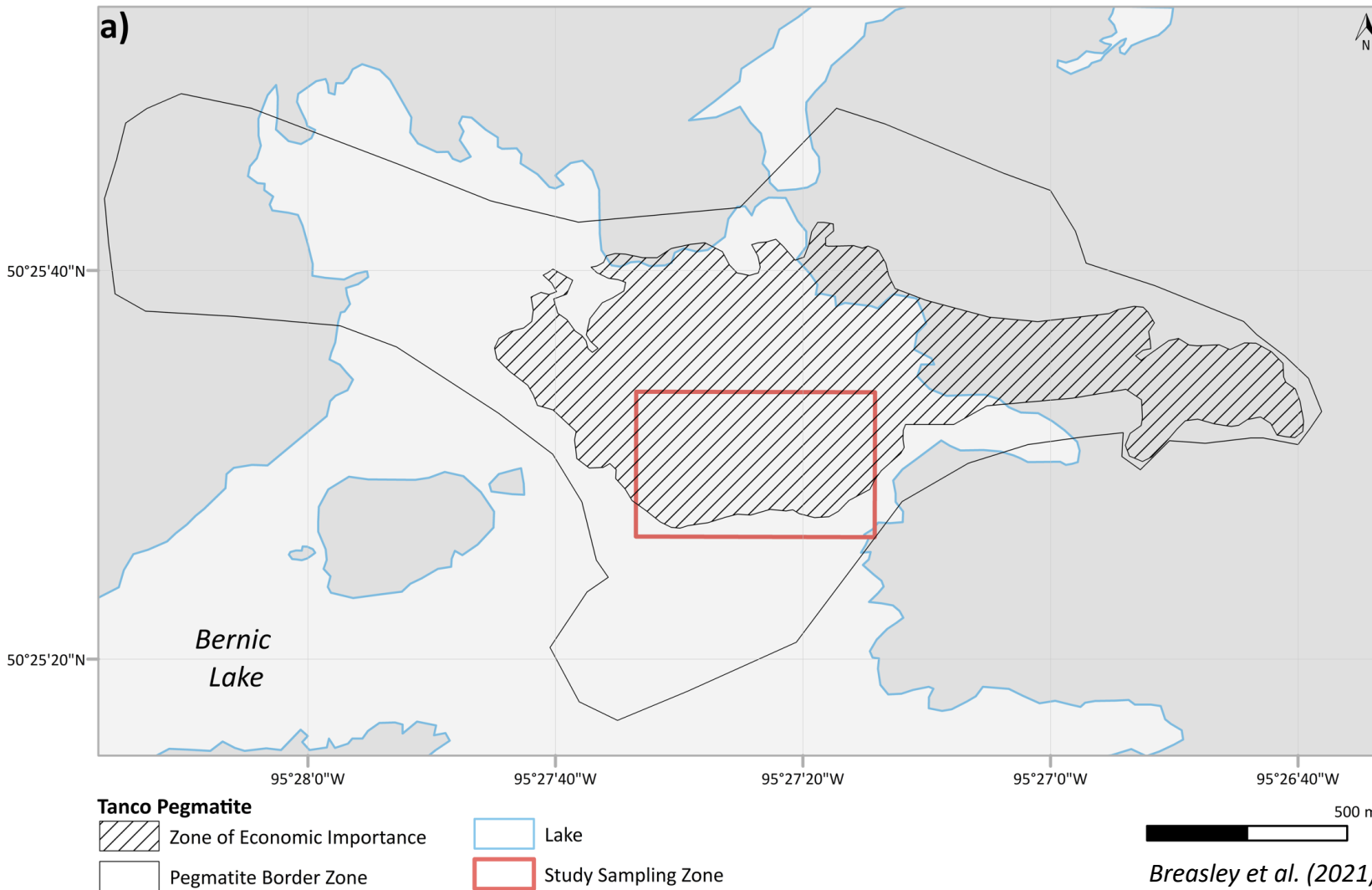




Bernic Lake

Tanco pegmatite

Characteristics

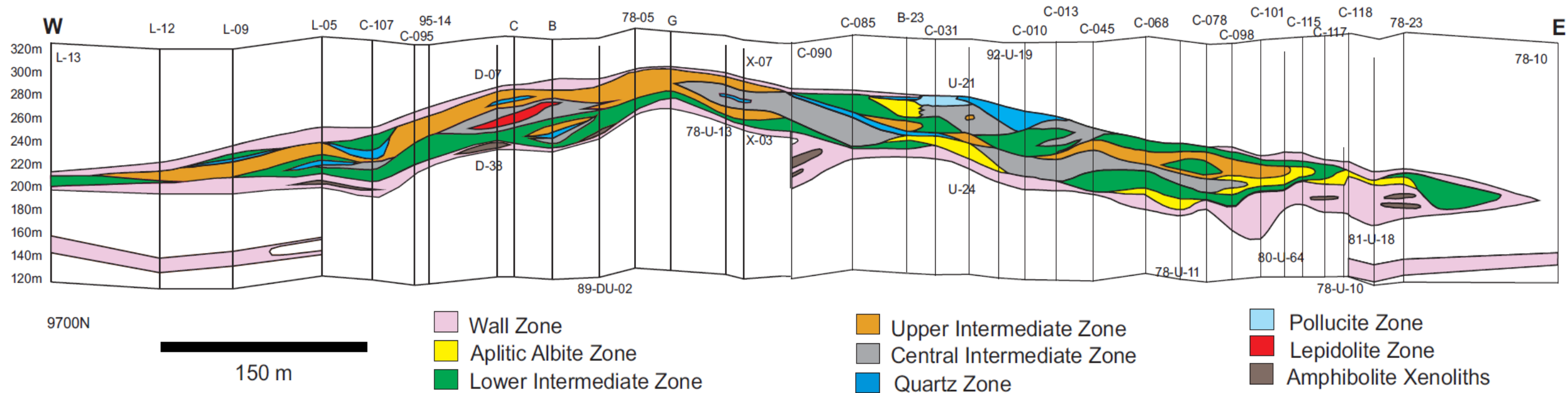


- Known maximum lateral dimensions: 1060 m (N–S); 1520 m (E–W); up to 100 m thick (E–W) through its center; ~ 40 m thick on average;
- Pegmatite is subhorizontal; intruded metamorphic rocks: amphibolite and gabbro;

- Age: approximately 2631 ± 12 Ma (Camacho et al., 2012);
- ~ 2627 drill holes (above and underground); ~ 172 km of recovered core;

The Tanco pegmatite

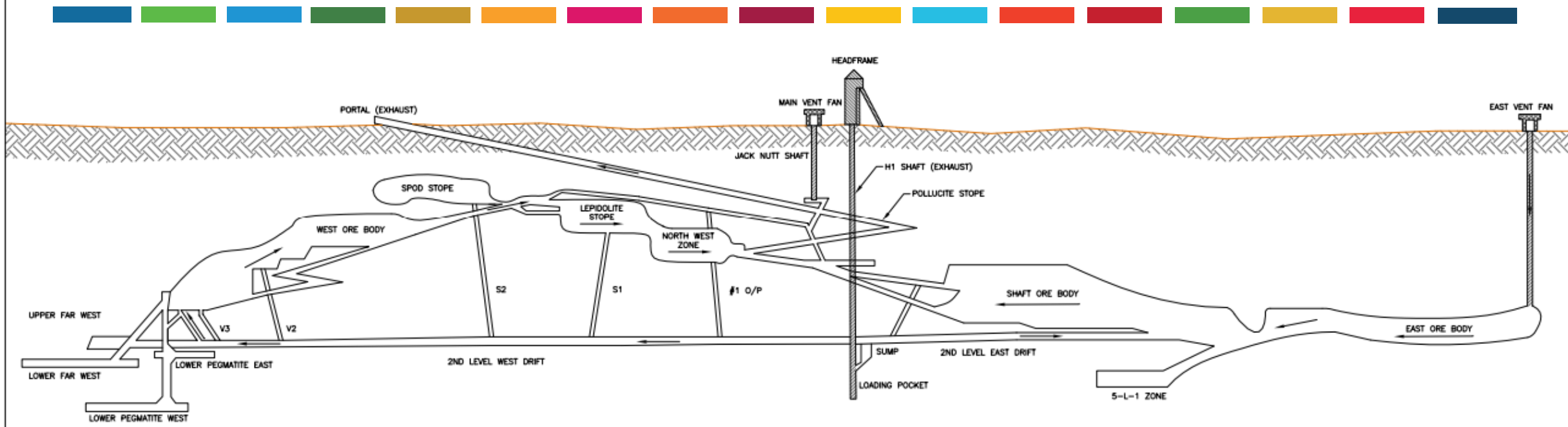
Zonation





The Tanco pegmatite

Idealized mine cross-section



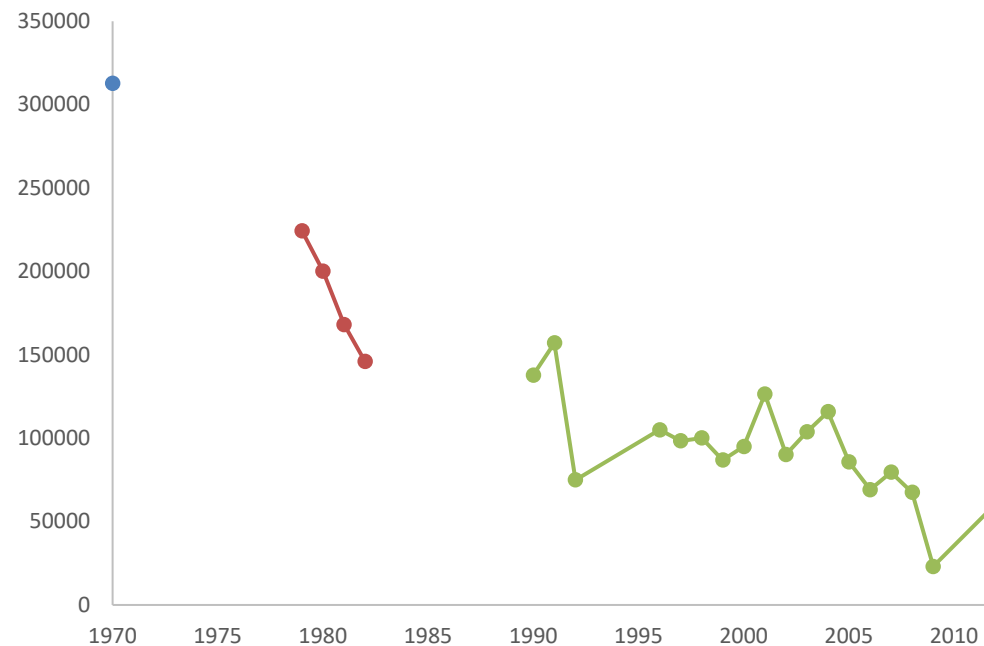
Cross-section of the Tanco mine looking southwest (from Tetrattech, 2013).



The Tanco mine

Production

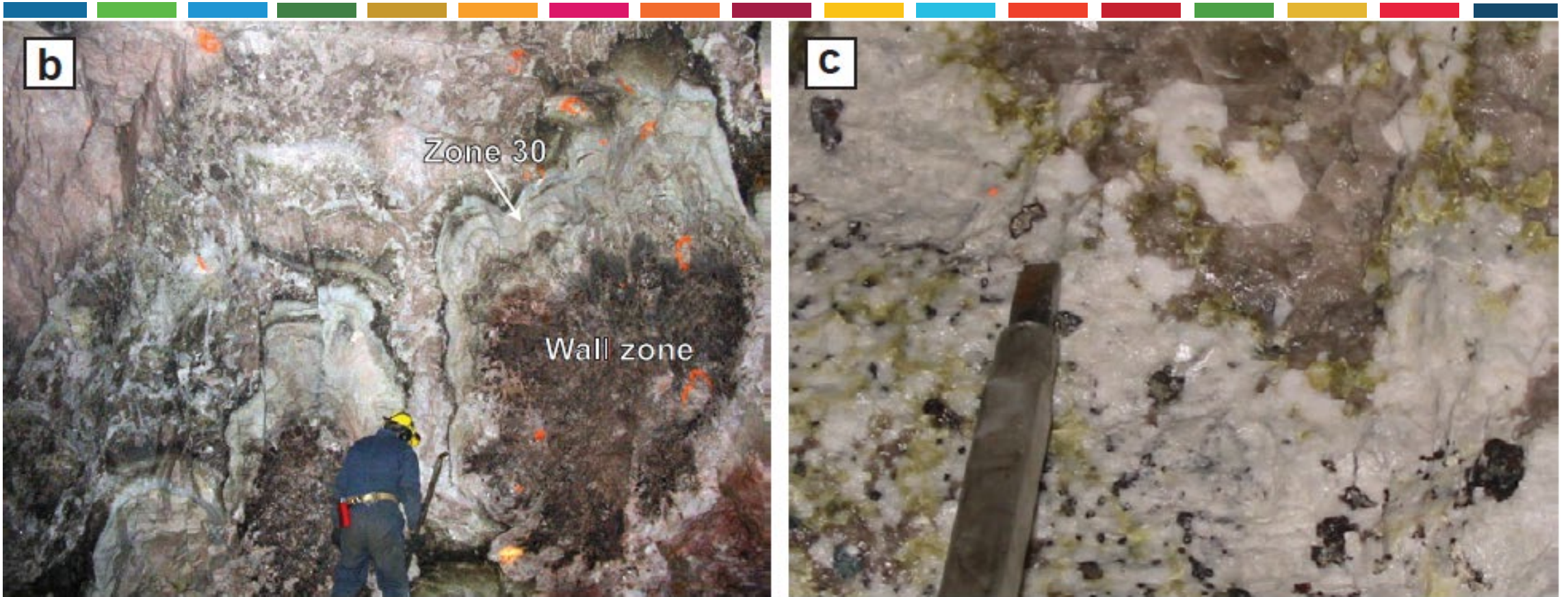
- Produced tantalum (Ta) ore (*tantalite*) since 1967 (off and on); cesium (Cs) ore (*pollucite*) and lithium (Li) ore (*spodumene*);



Production of contained Ta metal at the Tanco mine

The Tanco pegmatite

Mineralogy



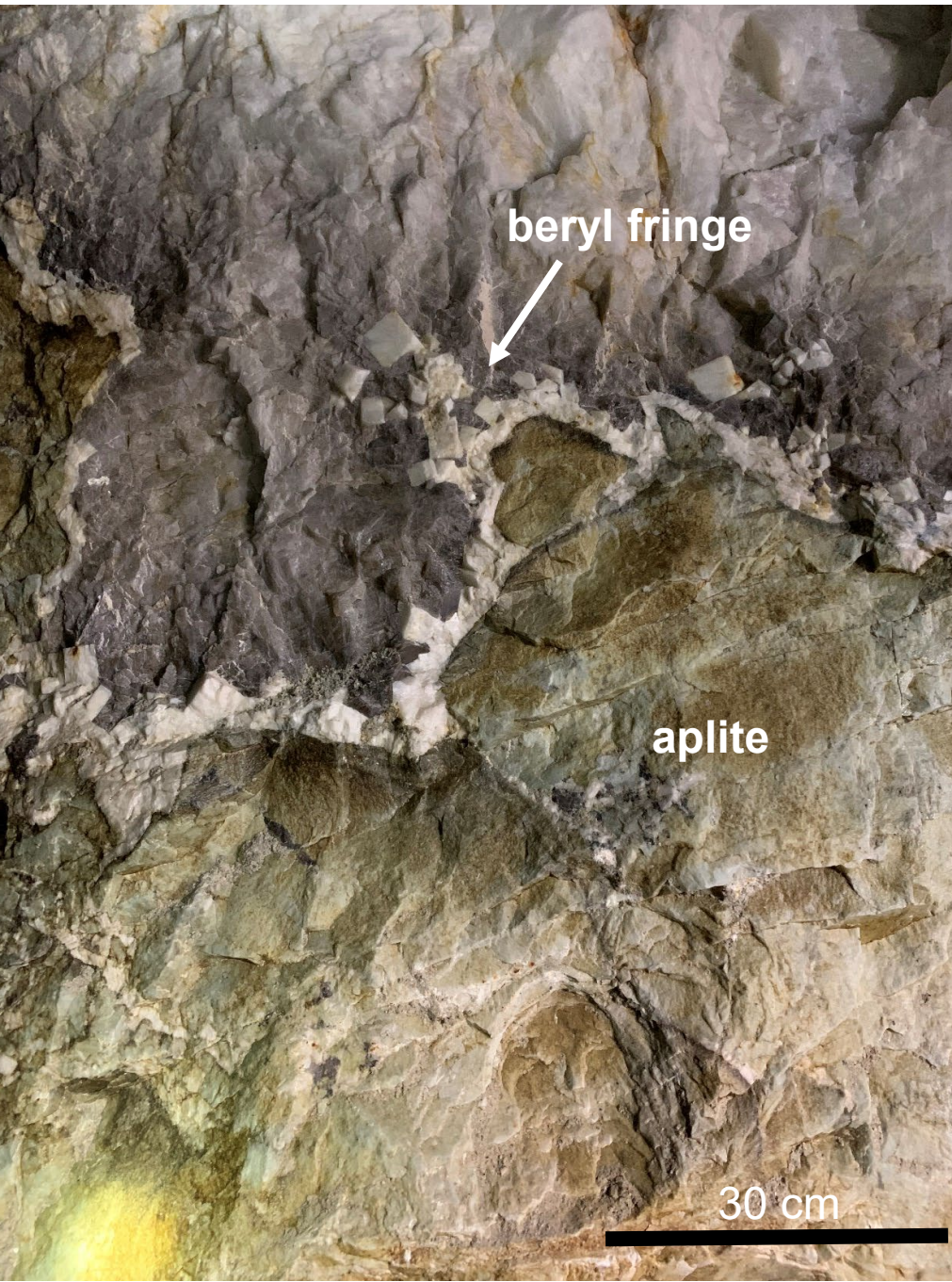
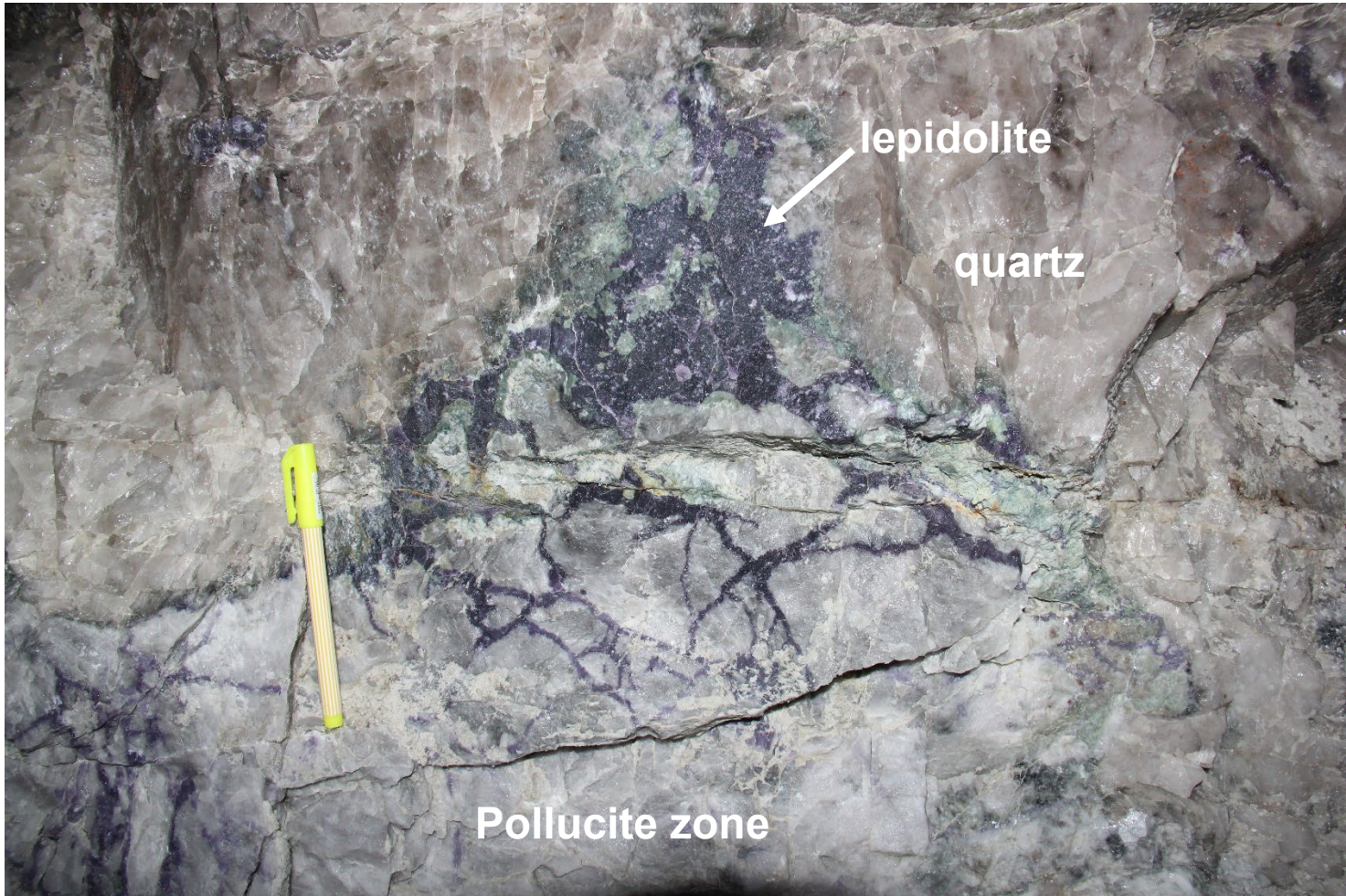
Contact with albite-quartz assemblage; green colour is due to the presence of the green mica.

Tantalum mineralization in an albite-beryl-mica assemblage; scaling bar chisel end is 25.5 cm.



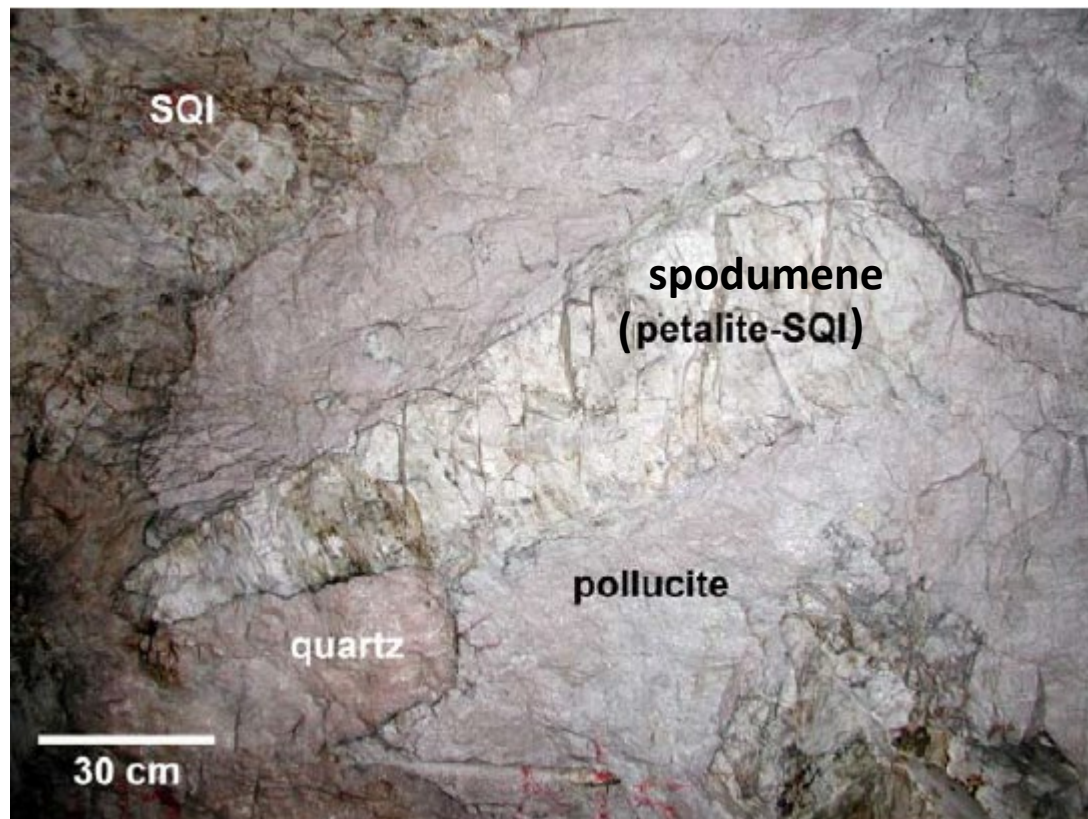
The Tanco pegmatite

Mineralogy



The Tanco pegmatite

Mineralogy



Spodumene – quartz intergrowth (SQI) pseudomorph of petalite, which grew toward pollucite



Lower border zone contact; black tourmaline crystals grew inward from the walls of the dike, and fine-grained tourmaline pervasively dots the rock.

The Tanco pegmatite: underground



Scooptram close to one of the spodumene zone pillars illustrating the room and pillar method used at Tanco.

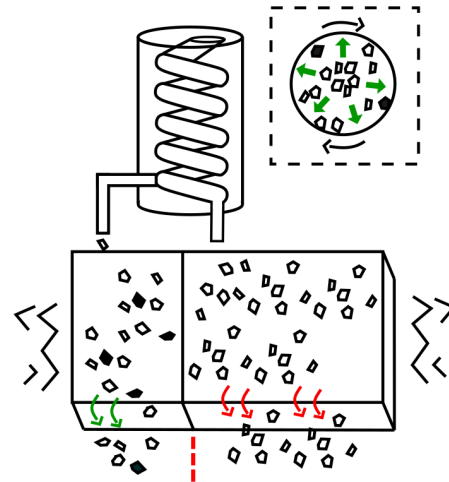
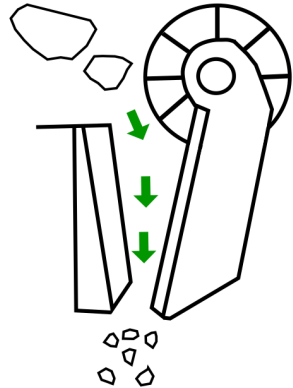
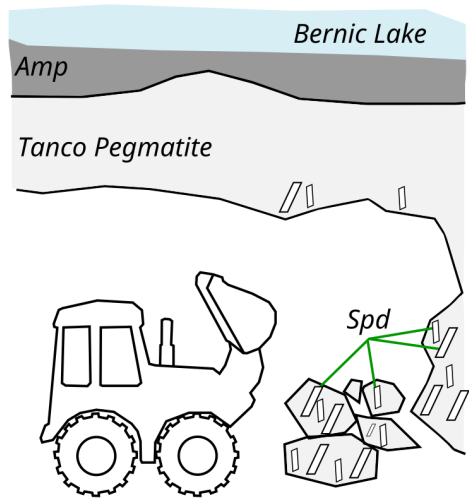


Custom designed aerial lifts ("giraffe").



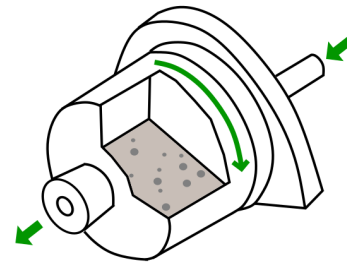
- ① Mining
- ② Jaw Crusher
- ③ Heavy Media Separation
- ④ Ball Mill

Processing-Li



Sink
e.g.
Spd
Qz
Amp

Float
e.g.
K-spar
Na-spar

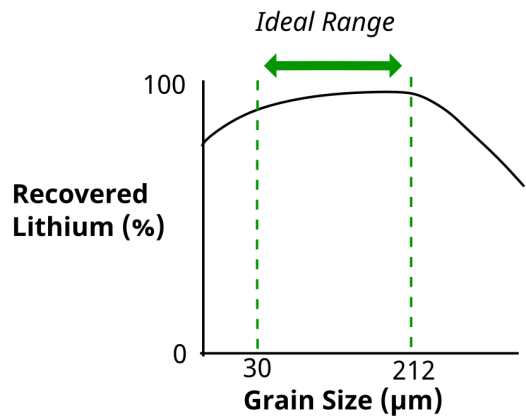


Specific Gravity of Spodumene= 3.15 gm/cc

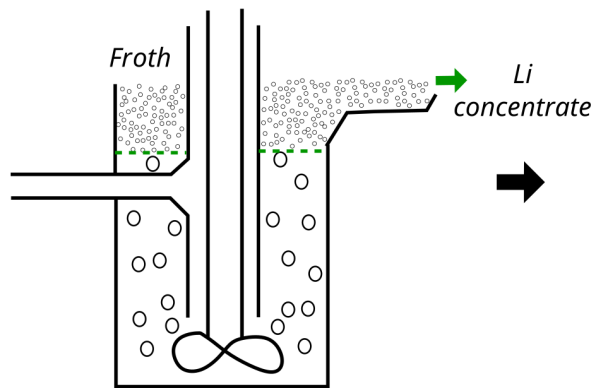
Specific Gravity of Petalite= 2.43 gm/cc

Specific Gravity of Quartz= 2.65 gm/cc

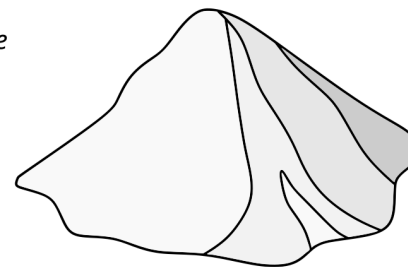
⑤ Sizing Classification



⑥ Froth Flotation



⑦ Lithium concentrate powder

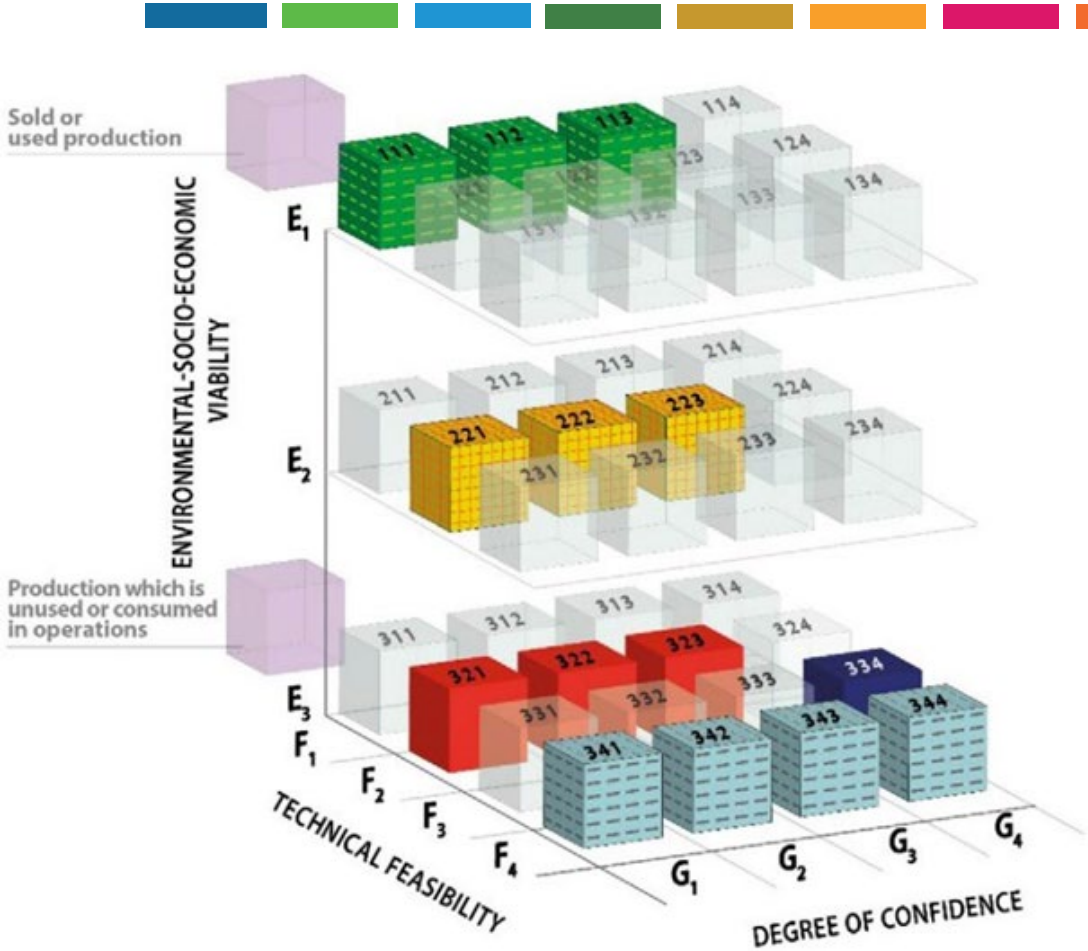


Modified from Breasley et al. (2023)



UNFC Case Study: Tanco mine

Classification



- Reserve estimates (**public record**) are a variety of historical formats;
- Considered non-compliant with current Canadian National Instrument (NI43-101) requirements;
- The deposit has a mineable resource in current underground operations (amalgamated value that includes measured, indicated and inferred):
 - 2,324,400 tonnes with a Li₂O grade of 1.859% containing a Li₂O metal quantity of 43,206.78 tonnes;
 - 3,709,570 tonnes with a Ta₂O₅ grade of 0.109% containing a Ta₂O₅ metal quantity of 4,037.52 tonnes;
 - 116,400 tonnes with a Cs₂O grade of 13.83% containing a Cs₂O metal quantity of 16,100 tonnes.

UNFC Case Study: Tanco mine

Classification

- UNFC should be applied to the different commodities separately;
- E-axis (*Environmental-Socio-Economic Viability*): 1.1 for Lithium and Cesium; 3.3 for Tantalum;
- F-axis (*Technical Feasibility*): 1.1 for Lithium and Cesium; 2.3 for Tantalum;
- G-axis (*Degree of Confidence*): G3 for Lithium, Cesium and Tantalum (reserve estimates include measured, indicated and inferred).

	Classification	Type	Commodity	Quantity (tonnes)	Grade	Metal Content	Sub Class	E	F	G
Cesium										
	113	Underground	Cs ₂ O	116,400	13.80%	16,100	In Production	1	1.1	3
Lithium										
	113	Underground	Li ₂ O	2,324,400	1.86%	43,206.78	In Production	1	1.1	3
Tantalum										
	333	Underground	Ta ₂ O ₅	3,709,570	0.10%	4,037.52	Development Not Viable	3	2.3	3



UNFC Case Study: Tanco mine

Conclusion

- Multicommodity production: can produce Lithium or Cesium without producing Tantalum;
- Not throwing the other products away, but it allows for selective mining (also include tailings reprocessing);
- Market drives what mine is producing so the classification changes through time (Tantalum classification example);
- One or two of the commodities are profitable enough, the mine can operate; if only one of the commodities is being produced and is not profitable, the mine might shut down.

Year	Type	Commodity	Quantity (tonnes)	Grade	Sub Class	E	F	G
1982	Underground	Ta ₂ O ₅	1,047,000	0.144%	In Production	1	1.1	3
	Tailings	Ta ₂ O ₅	647,000	0.065%		2	2.3	3
2010	Proven	Ta ₂ O ₅	414,521	0.073%	In Production	1	1.1	1
	Indicated	Ta ₂ O ₅	1,019,680	0.076%		2	2.2	2
	Inferred	Ta ₂ O ₅	519,848	0.080%		3	2.3	3
2022	Underground	Ta ₂ O ₅	3,709,570	0.10%	Development Not Viable	3	2.3	3

Tantalum classification



THE VIEWS EXPRESSED ARE THOSE OF Tania Martins of the Manitoba Geological Survey AND DO NOT NECESSARILY REFLECT THE VIEWS OF THE UNITED NATIONS.

Thank you!

Tania Martins

A/ Chief Geologist, Precambrian Geoscience Section,
Manitoba Geological Survey

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Date 24 | 4 | 2024, Geneva



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