

# **Bralorne-Takla Mercury Mine**

## **Collaborative Remedial Planning for Historic Mine Clean-Up and Reclamation Project**

RemTech, October 2018



# Contributors

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**Tony Gillett** - SNC-Lavalin Inc.

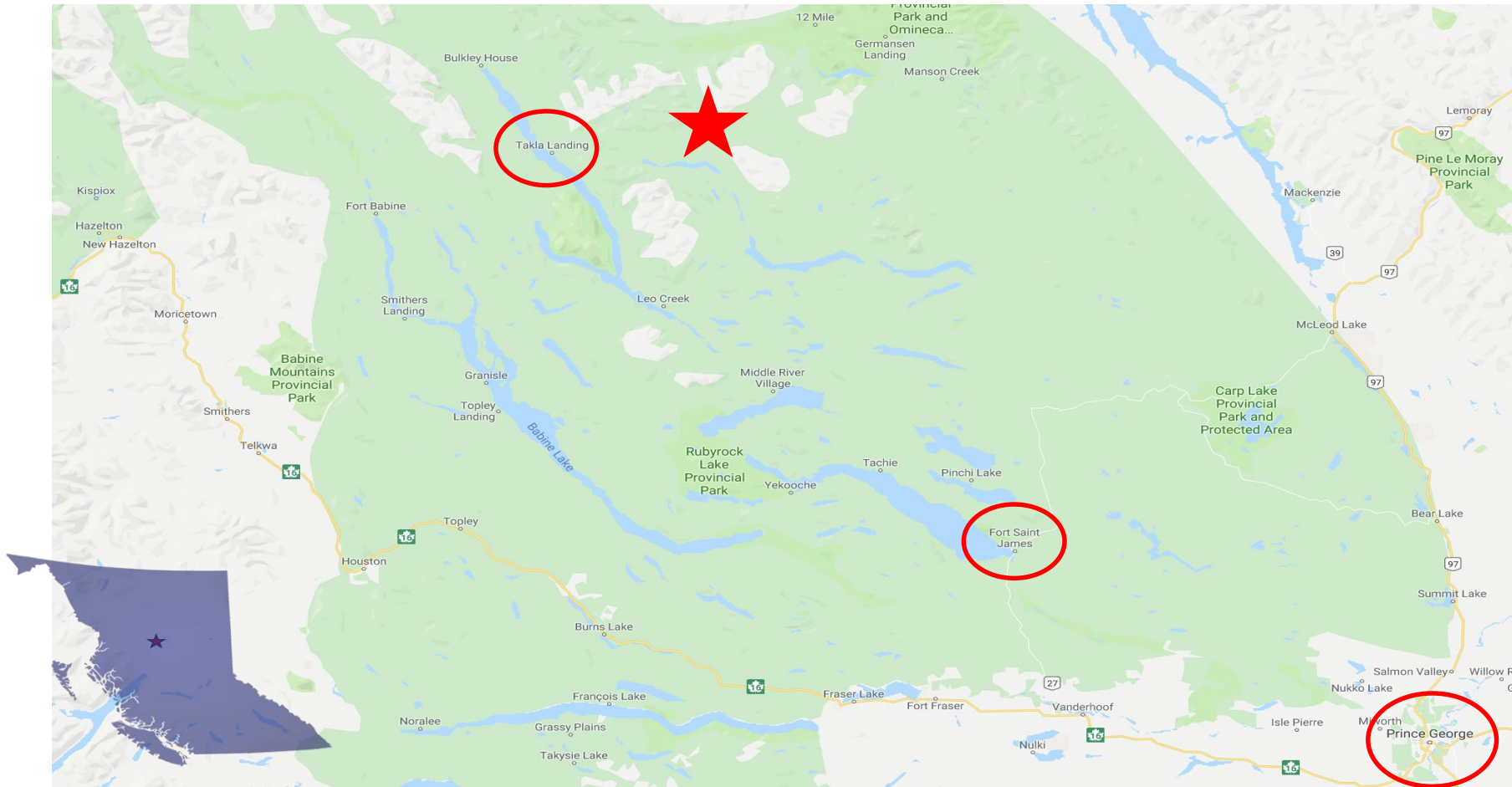
**Beth Power** - Azimuth Consulting Group Partnership

# Presentation Outline

- Background
- Collaborative approach to risk management
- Remediation
- Long-term monitoring and maintenance
- Learning & outcomes



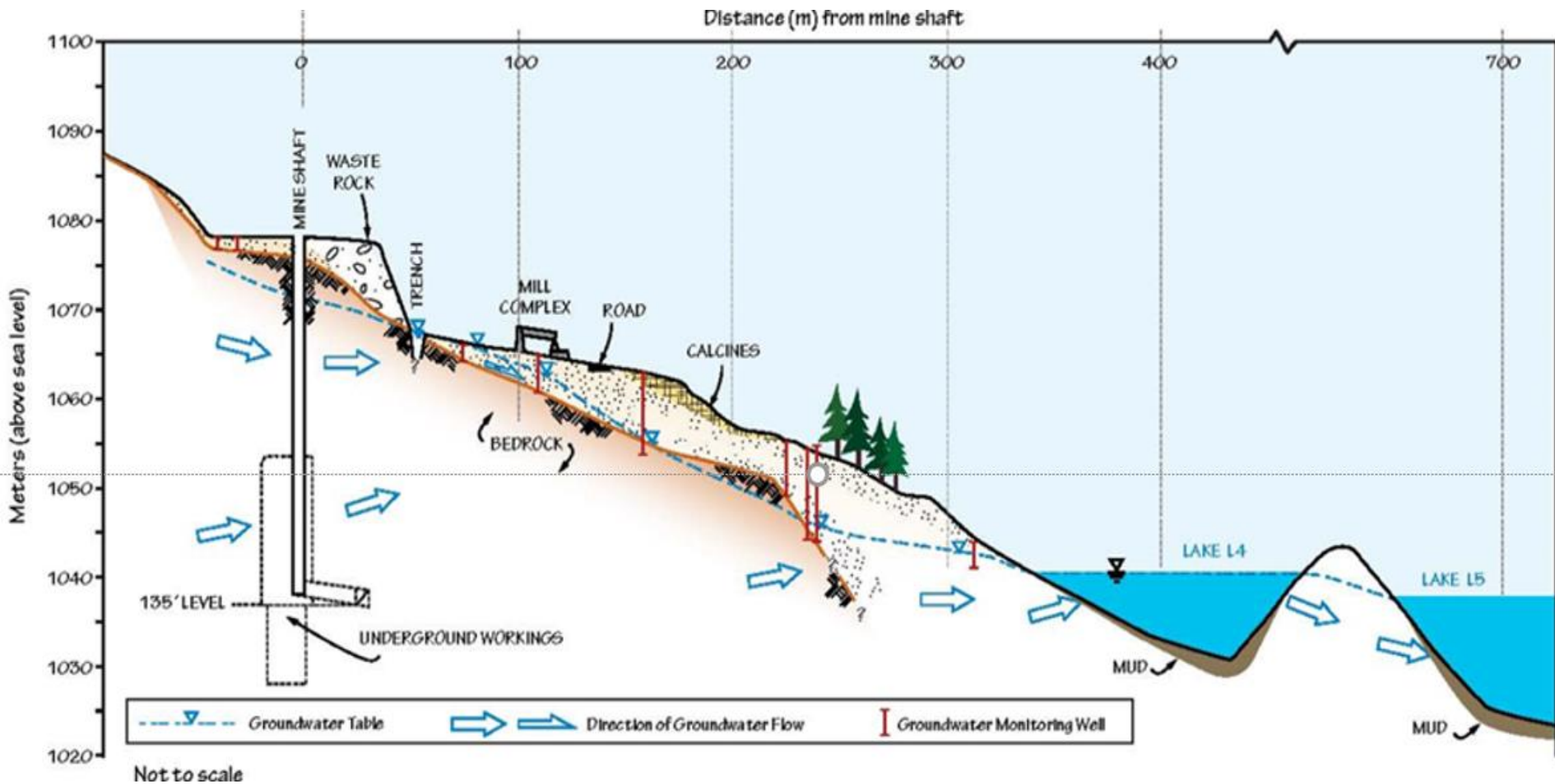




**~180 km from Fort St. James - in Takla Nation territory**

# Background

- During WWII, cinnabar was roasted for mercury (Hg)
- All below and above ground works were abandoned in place
- ~3 ha impacted by core mine activities
- No “Responsible Person” = Orphan site
- Resource road access
- Site prioritized for remediation
- Hg, methyl-Hg, other metals and hydrocarbons in mine waste, soil, surface water, groundwater and sediment;
- Hazardous Waste: leachable Hg, liquid Hg, asbestos – primarily at mill complex



# Engagement Strategy

(see previous presentation)

## Communication Plan

Technical Working Group

Community  
meetings

TN on all  
Field Work

Traditional  
Knowledge

Remedial  
Planning  
Workshops

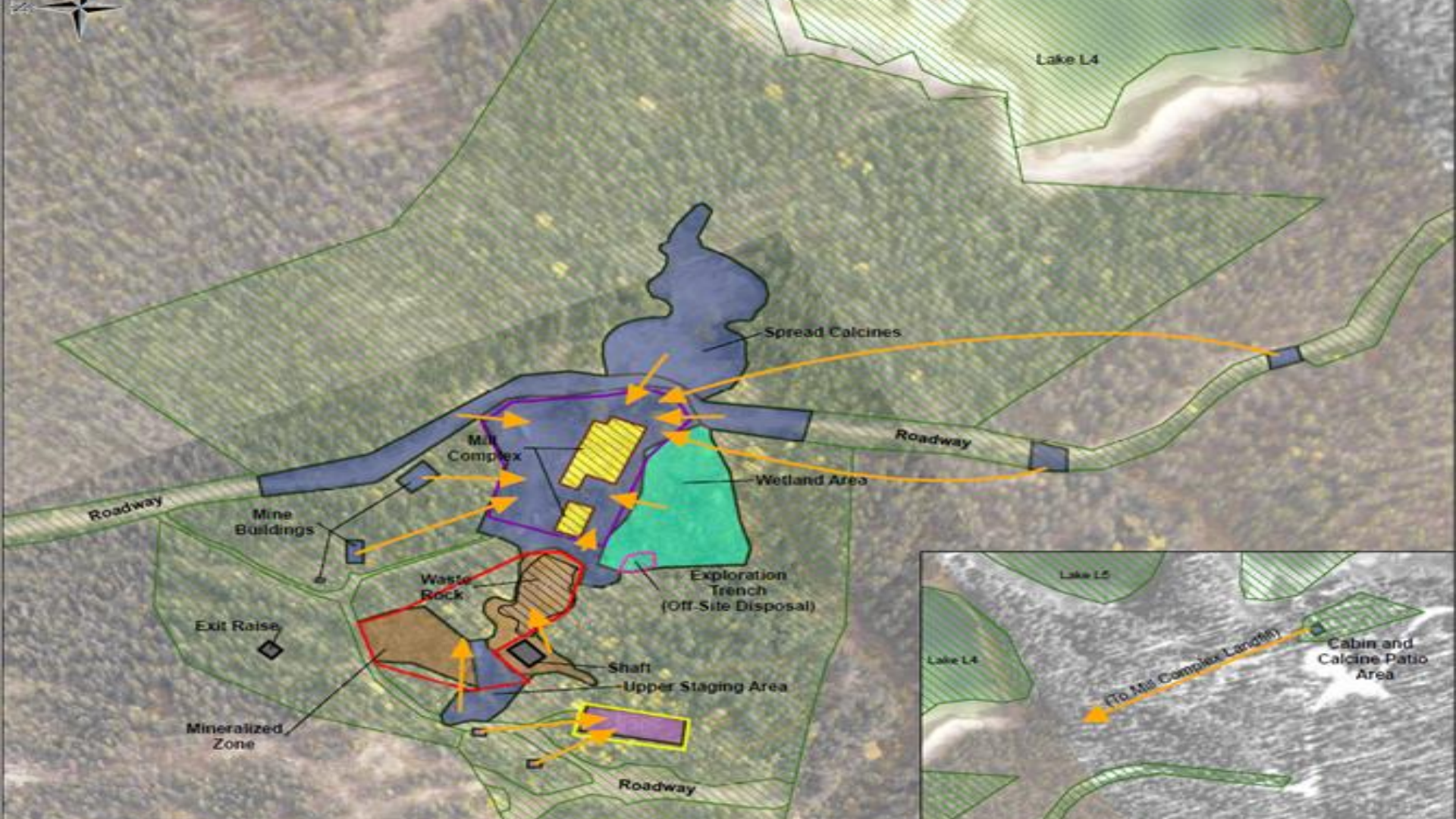
Education /  
Closure!

# Remedial Planning Workshops

- Agreed remediation objectives, reviewed conceptual options, discussed decision criteria
- Short-listed options and reviewed in detail







# Conceptual Remediation Plan

- Off-site disposal of all Hazardous Waste, metal and garbage.
- On-site management of non-Hazardous Waste mine contaminated soil, mine waste and demolition debris in two landfills.
- Reclaim disturbed areas & covers to forest habitat using native species.
- Risk manage isolated contamination within naturally reforested areas.
- Simple soil covers over excavated areas to eliminate exposure to soil or bedrock with naturally high metals concentrations.
- Education and recognition program with the TN community about the Bralorne-Takla Mine Site remediation work and risk-based land use restrictions.



# Capping Mine Openings



# Abatement and Demo – Structures with Asbestos and Mercury





# Off-site Disposal of Hazardous Waste



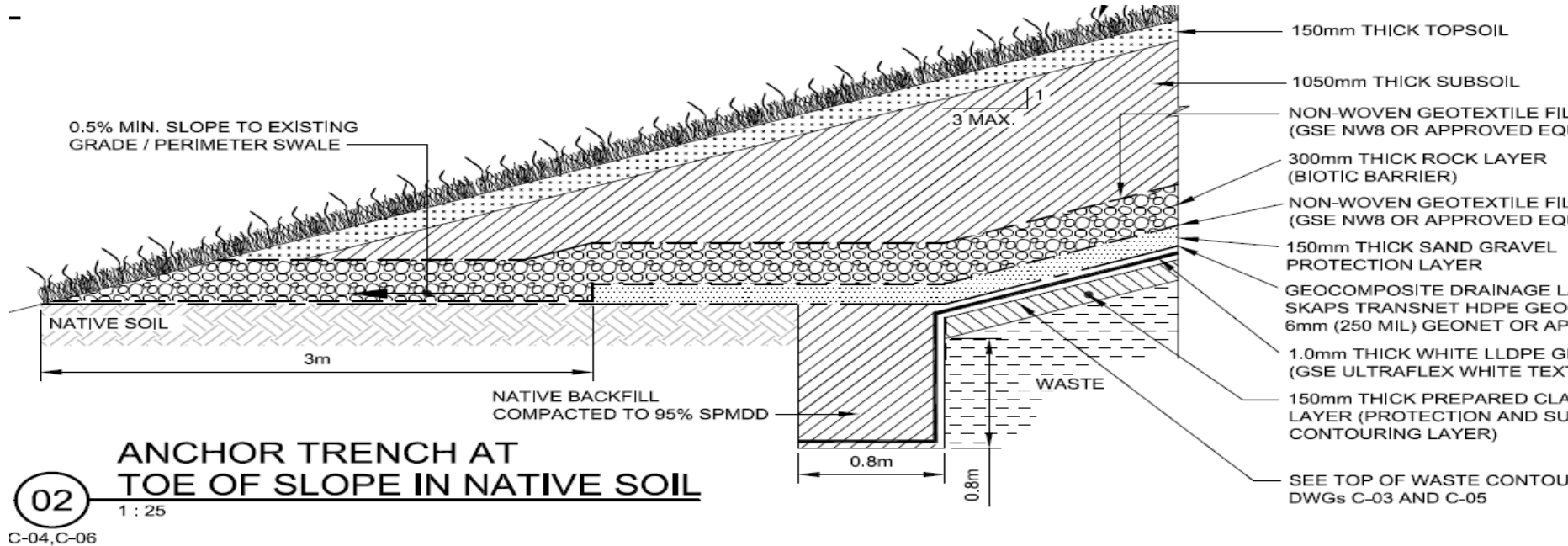


# Consolidation and Landfill





# Cover Design to Accommodate Return to Forest Ecosystem



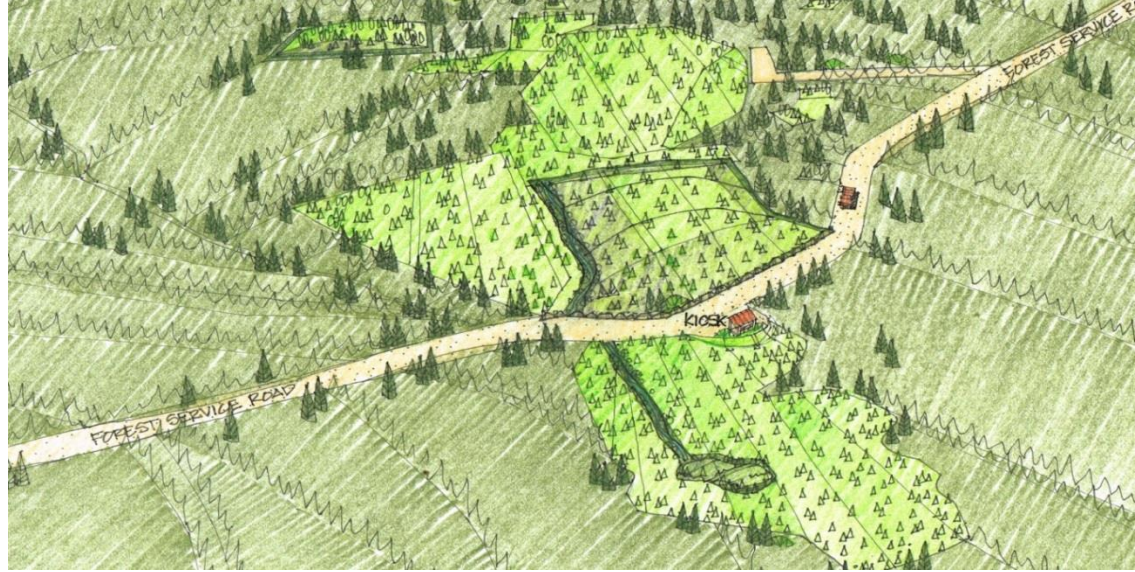
# Site Recontouring & Drainage





# Revegetation Planning

- Forested wildlife habitat
- Landfills fit topography
- Rough & loose with Coarse Woody Debris.
- Shrubs propagated from collected seeds
- Fall seeding, spring planting
- Planting prescriptions varied to fit site conditions





# Vegetation Performance and Maintenance



- 16 plots for: plot total % cover, seedling survivorship, height, relative vigor, species composition, noxious or nuisance weeds
- Meet or exceed targets after one growing season



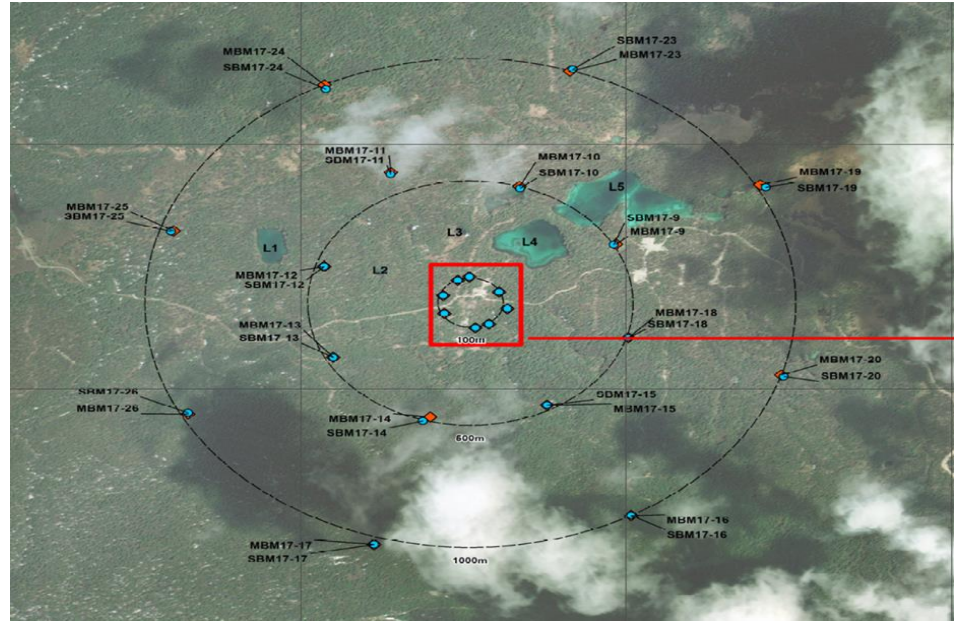
**Spring and Fall 2017**

# Long-Term Monitoring and Maintenance

Risk Control	Monitoring Activity
Engineered Risk Controls	
Landfill Covers	<ul style="list-style-type: none"> <li>Landfill gas monitoring</li> <li>Surface and groundwater monitoring and sampling</li> <li>Geotechnical inspection (erosion, slope failure)</li> </ul>
Simple Soil Covers	<ul style="list-style-type: none"> <li>Geotechnical inspection (erosion, slope failure)</li> </ul>
Drainage network	<ul style="list-style-type: none"> <li>Geo-hyrotechnical inspection (erosion, failure, armouring, capacity)</li> </ul>
Former Seasonally Wet Area	<ul style="list-style-type: none"> <li>Ensure groundwater not at ground surface</li> </ul>
Vegetation Establishment	<ul style="list-style-type: none"> <li>Annual inspection of vegetation re-growth and health satisfies performance targets</li> <li>Photo point monitoring</li> </ul>
Roadways	<ul style="list-style-type: none"> <li>Confirm FSR is maintained, no vegetation encroachment</li> </ul>
Mine Openings	<ul style="list-style-type: none"> <li>Geotechnical inspection of caps/soil covers (erosion, slope failure, undermining)</li> </ul>
Administrative Risk Controls	
Land Use Restriction Signage*	<ul style="list-style-type: none"> <li>Ensure signage is present/legible</li> <li>Inspect for adherence to land use restrictions (no camping, no digging, no groundwater use, no buildings, no harvesting plants, no off-road traffic)</li> </ul>
Worker Health and Safety Plans	<ul style="list-style-type: none"> <li>Ensure Health and Safety Program addresses potential exposure to contaminants for workers on-site (future excavations)</li> </ul>
Map Reserve	<ul style="list-style-type: none"> <li>Check records to ensure map reserve remains in place so site is not disturbed</li> </ul>

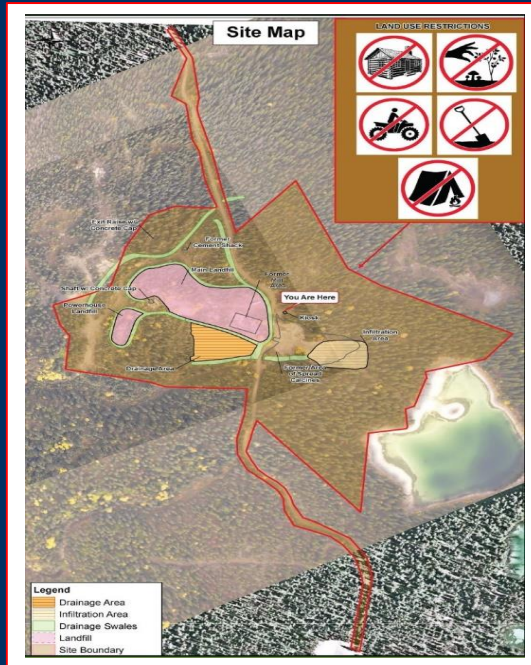
# Post-Remediation Monitoring

- Edible plants will be sampled when re-established - favourable results would allow removal of related land use restrictions.
- Monitoring:
  - Off-site of feather moss and conifer needles.
  - Fish tissue monitoring at lakes to address TN concern (Hg in fish did not pose risks to human health)
  - On-site mercury vapour monitoring.



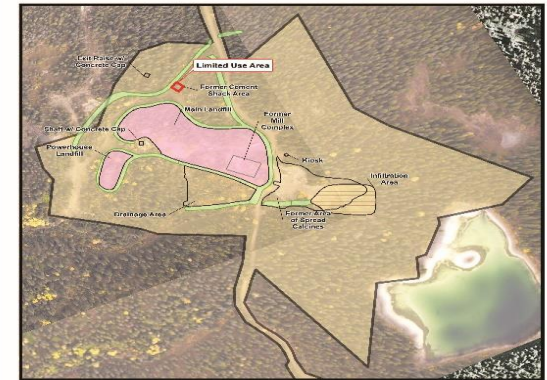


# Post-Remediation Management and Communication



## Limited Use Recommendation

Soils in this area (near the former Cement Shack) were formed on shallow bedrock and contain naturally high levels of mercury, arsenic and other metals. Walking and hiking through this area are safe but other recreational activities are not recommended. Similar precautions apply in other highly mineralized areas that occur naturally along the Pinchi Fault.

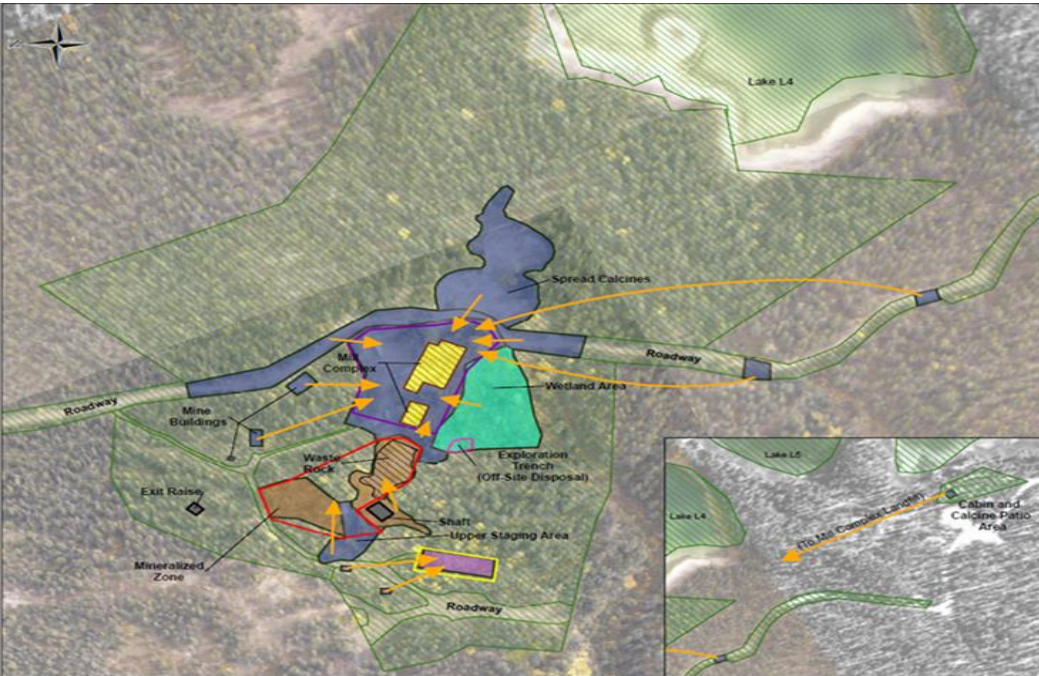


# Outcomes

1. Human and ecological risk assessment was integral to assess and manage risks related to site contamination.
2. An iterative approach adjusted through TN input addressed uncertainties and revised risk estimates using new data and information.
3. Engagement strategy followed through to support remedial planning – ensuring that both CCSP and TN objectives were known and addressed
4. Novel challenge - design and construction of landfill covers to accommodate re-growth of a forest ecosystem.
5. Information about administrative controls is posted at the mine site to advise users of land use restrictions that minimize potential exposure to contaminants; these communications were necessary to address remedial objectives.



# What Does Closure Look Like To You?



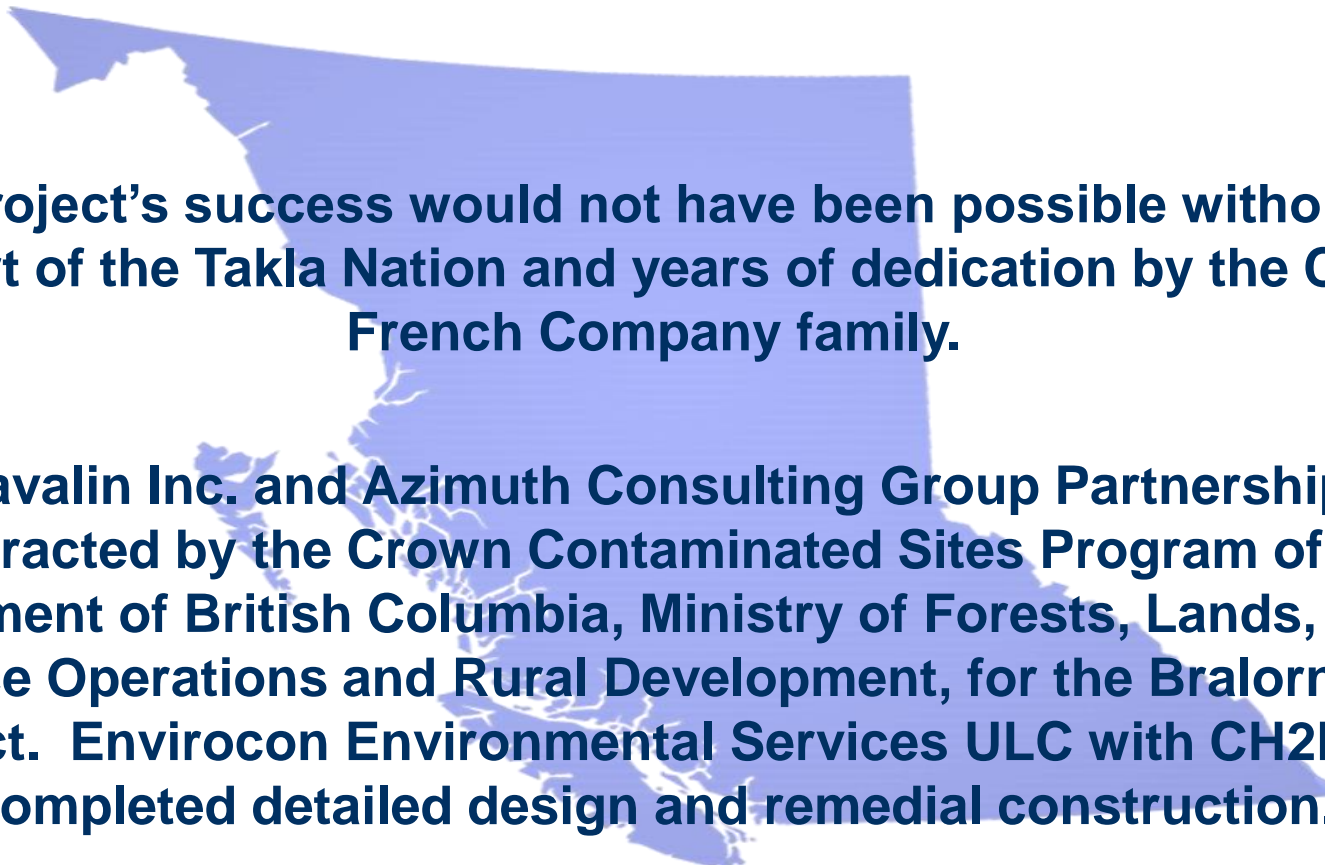
[https://youtu.be/wveuqfL1-c4.](https://youtu.be/wveuqfL1-c4)











**This project's success would not have been possible without the support of the Takla Nation and years of dedication by the Charlie French Company family.**

**SNC-Lavalin Inc. and Azimuth Consulting Group Partnership were contracted by the Crown Contaminated Sites Program of the Government of British Columbia, Ministry of Forests, Lands, Natural Resource Operations and Rural Development, for the Bralorne-Takla project. Envirocon Environmental Services ULC with CH2M Hill completed detailed design and remedial construction.**

**Questions?**