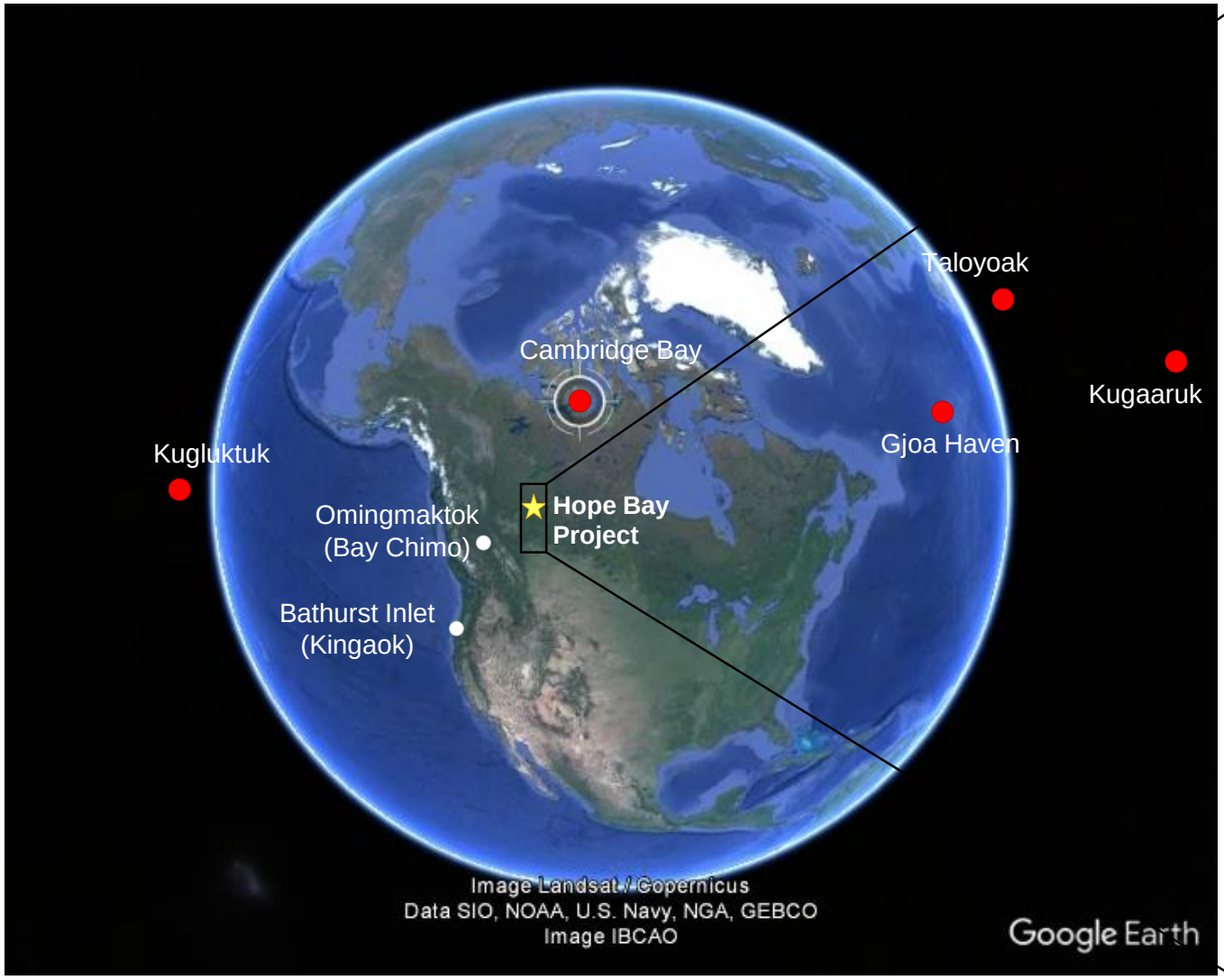
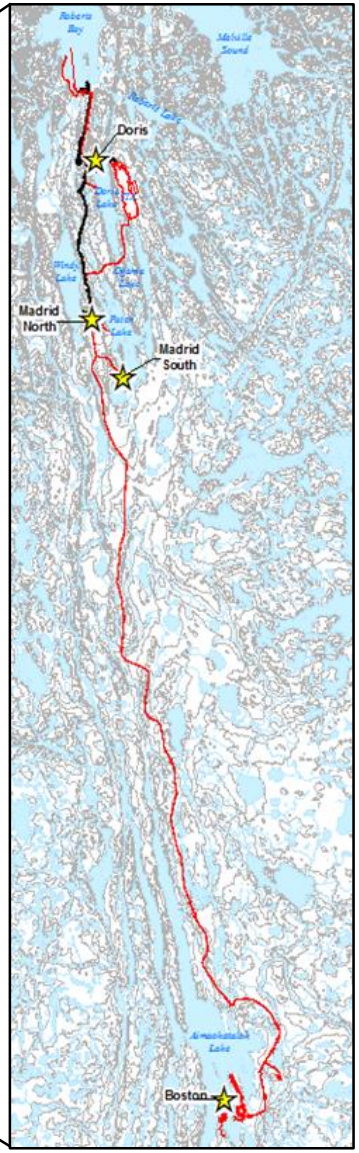
Boston-Madrid Project
Nunavut Water Board Final Hearing: Community Session
TMAC Resources Inc.

Cambridge Bay, Nunavut | October 2018

Project Location





Approved Doris Project (2AM-DOH1323)

Existing Permits and Licences - Doris

Project Certificate

- Issued 2006, Amended 2016
  - Allows Construction, Development, Production, Closure
  - Environmental compliance and protections
  - 2000 tonnes per day
  - Discharge Effluent to Roberts Bay

Type A Water Licence 2AM-DOH1323

- Issued 2007, Amended 2016, Applies from 2013 to 2023
  - Water Use
    - Doris Lake - 480,000 m^3 per year - Mining and Processing
    - Windy Lake – 22,000 m3 per year - Domestic
    - Reclaim Water – no limit - Processing
  - 2.5 million tonnes to Tailings Area
  - Reclamation Security - $31 Million

All operations comply with all Federal and Territorial laws and regulations

- Effluent to comply with Metal Mining Effluent Regulation

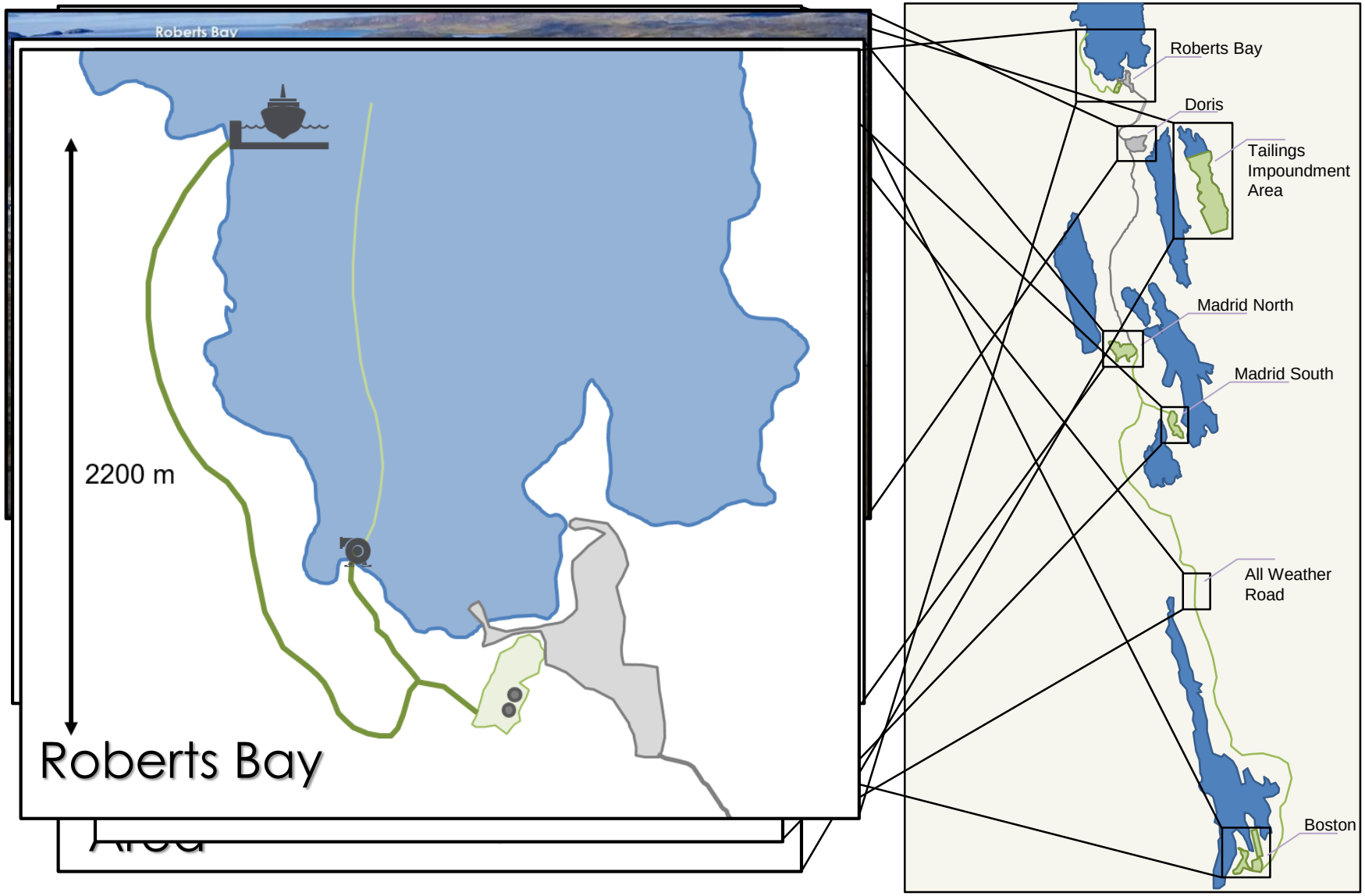
Monitoring and Reporting

- **Aquatic Effects Monitoring Plan**
- **Environmental Effects Monitoring Program**
- **Surveillance Network Program**
  - Type A Water Licence –monthly
  - Type B Water Licence(s)- monthly
- **NWB Annual Reports**
  - Type A and Type B Water Licence
  - Due March 31

Madrid- Boston Project Highlights

Madrid and Boston Highlights	
Mining	• Underground mining and crown pillar recovery with waste rock stored above ground temporarily and then put back into the underground mines.
Processing	• Nominal capacity of 6,000 tonnes of ore processed per day
Gold Production	• Gold production at Doris and Boston. Concentrates produced at Madrid North
Transportation	• Sealift arrives at Roberts Bay and utilize cargo dock and jetty • Gold bars flown out to market from Doris and Boston • Road connecting Madrid and Boston to Doris and Roberts Bay
Employment	• Fly in-fly out operation from Edmonton and Kitikmeot • 870 workers during peak operations (for approximately 14 years)
Economic Benefit	• Royalties, mineral taxes and other payments of approximately $500 million over the life of the Hope Bay Project for Canada, Nunavut, KIA and NTI (excluding Doris)

Hope Bay Project Layout



Proposed Amendment No. 2 Type A

- **Scope includes Doris, Madrid Sites and All Weather Road**
  - Expand 2AM-DOH1323 Amendment No. 1 by incorporating into this Licence the scope of all facilities and activities authorized under the Type B Licence 2BB-MAE1727
    - Camp Capacity – 400 persons
    - Expand TIA capacity to 18 million tonnes
    - Water Allowance:
      - Domestic from Windy Lake: 43,800 m3/year
      - Industrial from Doris Lake: 1,930,000 m3/day
    - Concentrator at Madrid
    - AWR to Boston
    - **<u>Allows commercial mining</u>**

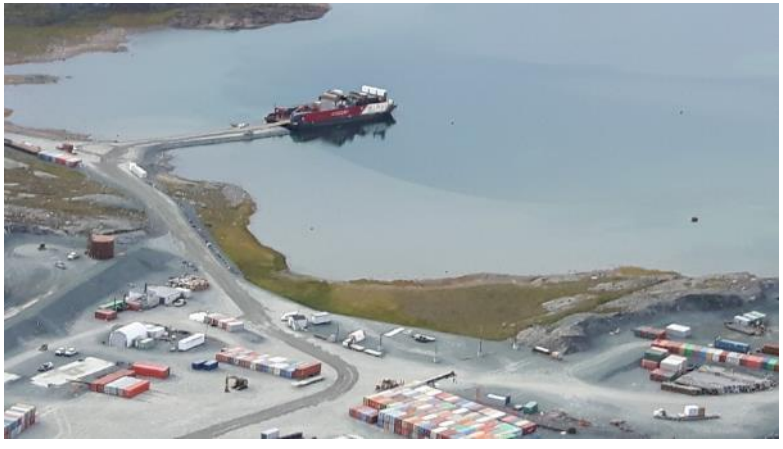
Proposed Boston Type A

Project Certificate and Boston Type A Water Licence

- **Scope:**
- Construct and operate Boston Site
- Camp Capacity – 300 persons
- Tailings Management Area capacity of 5.1 million tonnes
  - Water Allowance:
    - Domestic from Aimaokatalok Lake 33,000m3/year
    - Industrial from Aimaokatlok Lake 450,000m3/year
- 2400 t/d process plant
- Allows water use, waste management and construction of all surface infrastructure
- **Allows commercial mining**

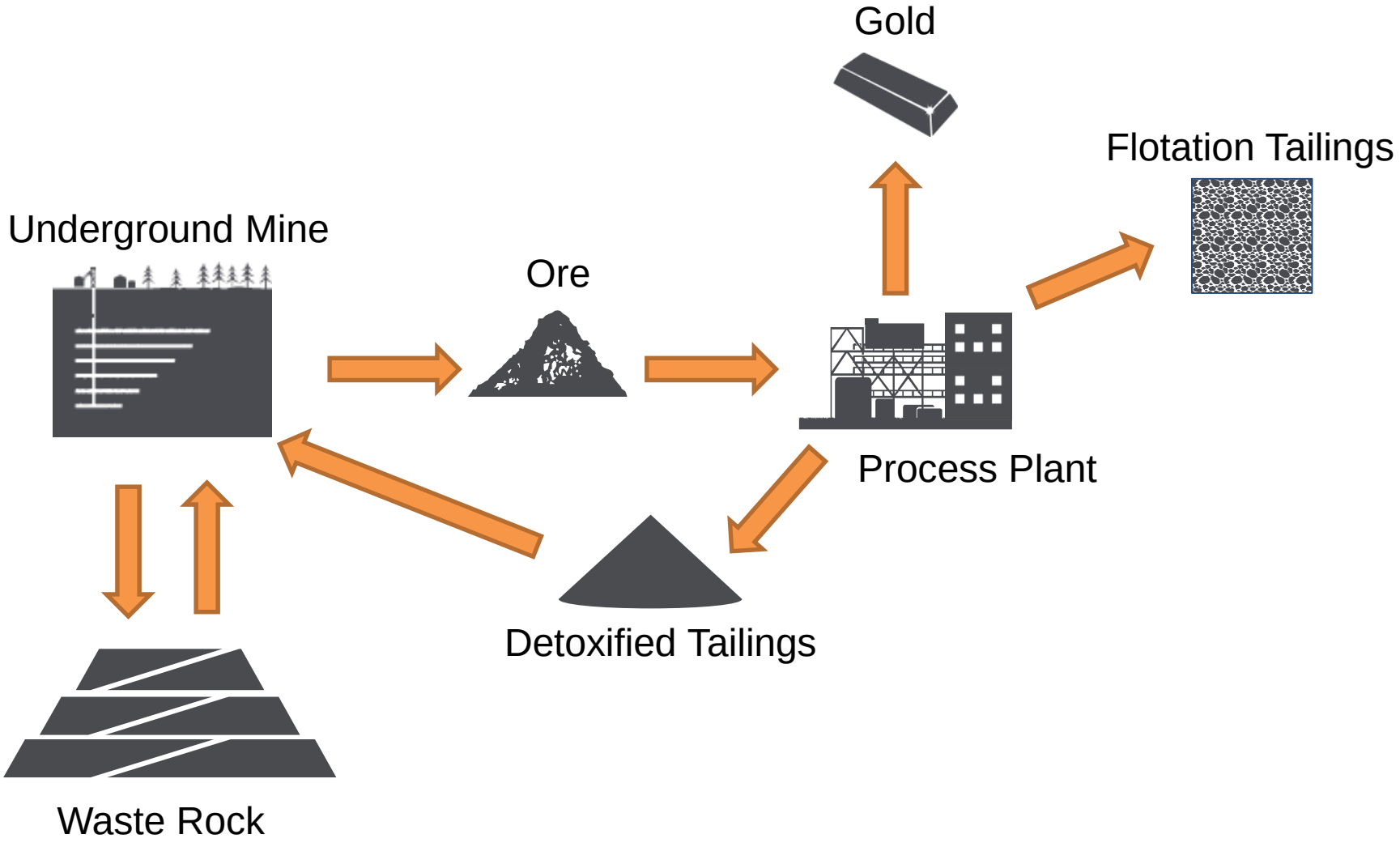
Closure and Reclamation

- **Doris-Madrid Interim Closure and Reclamation Plan was updated**
- **Boston Conceptual Closure and Reclamation Plan was developed**
- **Overall objectives of closure planning at Hope Bay:**
  - Physical Stability
  - Chemical Stability
  - Future use and aesthetics
- **Planning provides basis to estimate financial security**

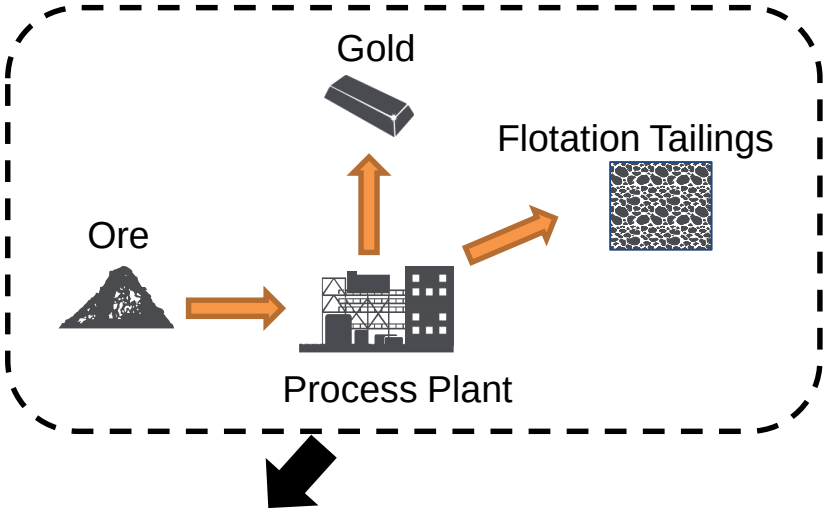


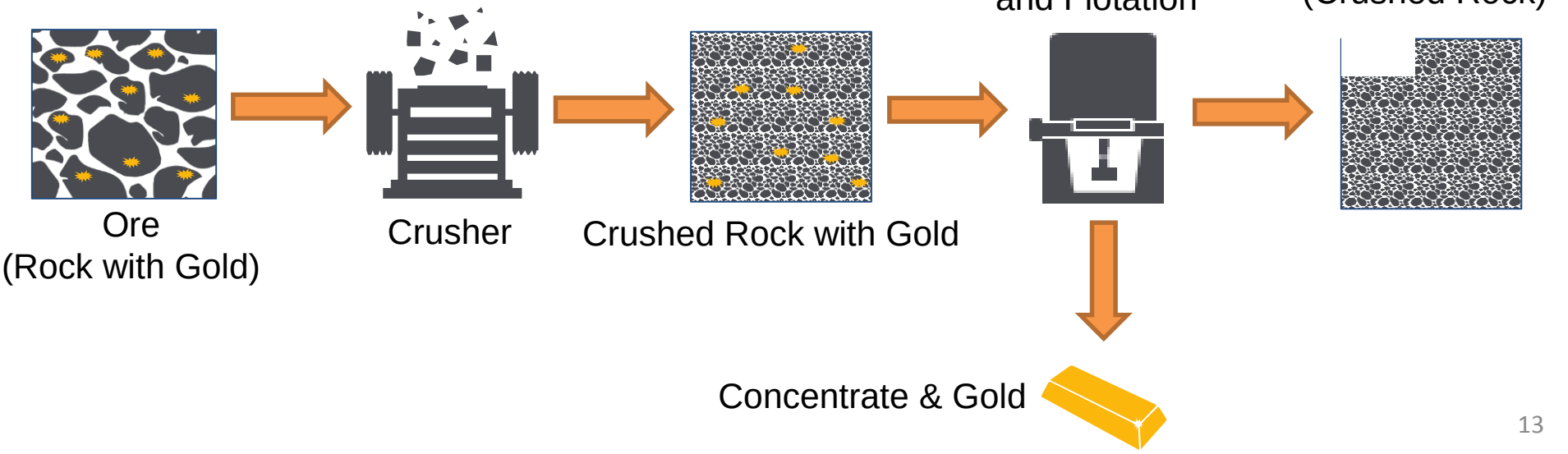
Tailings and Waste Rock Management

Tailings and Waste Rock

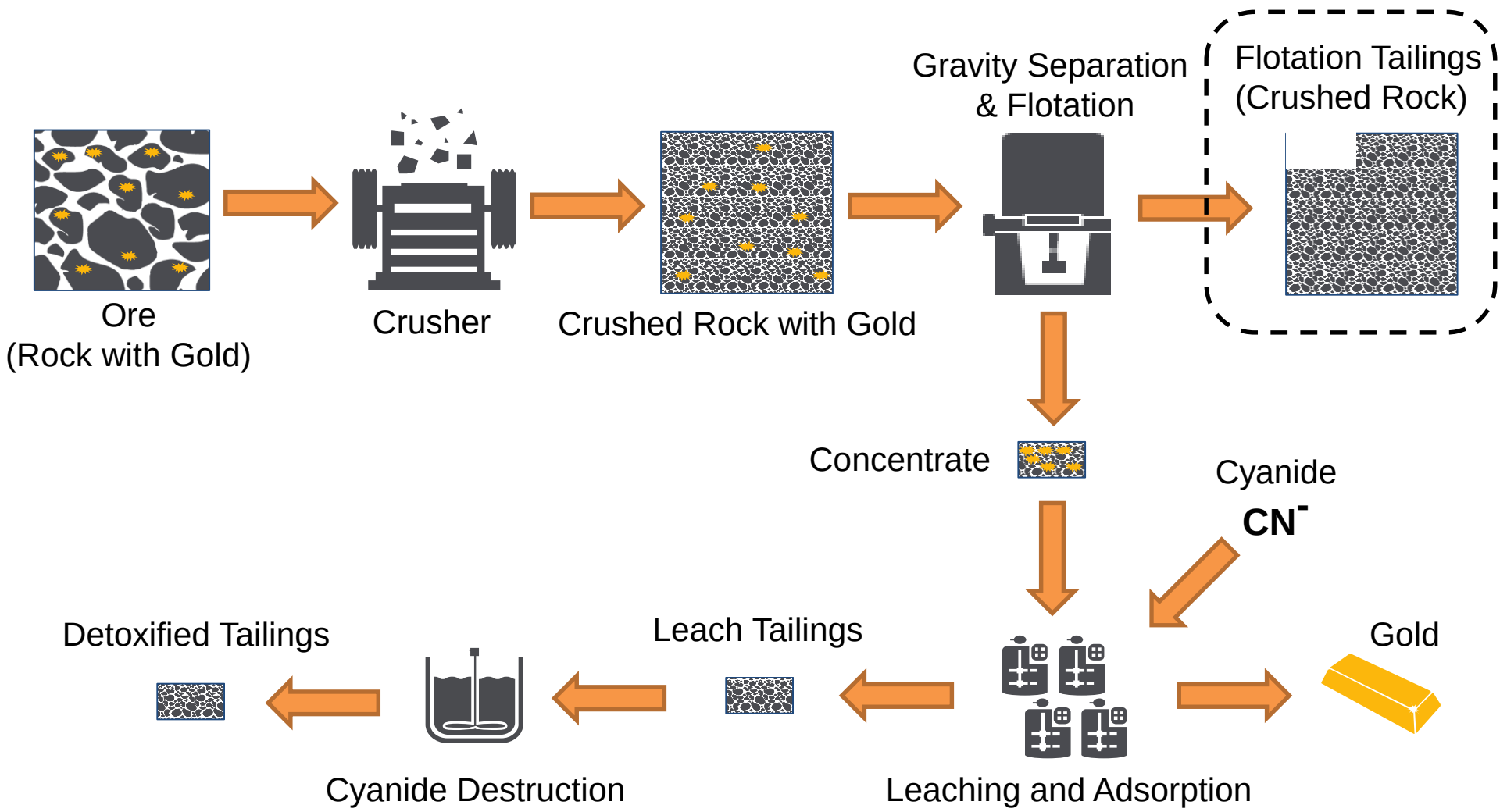


Flotation Tailings

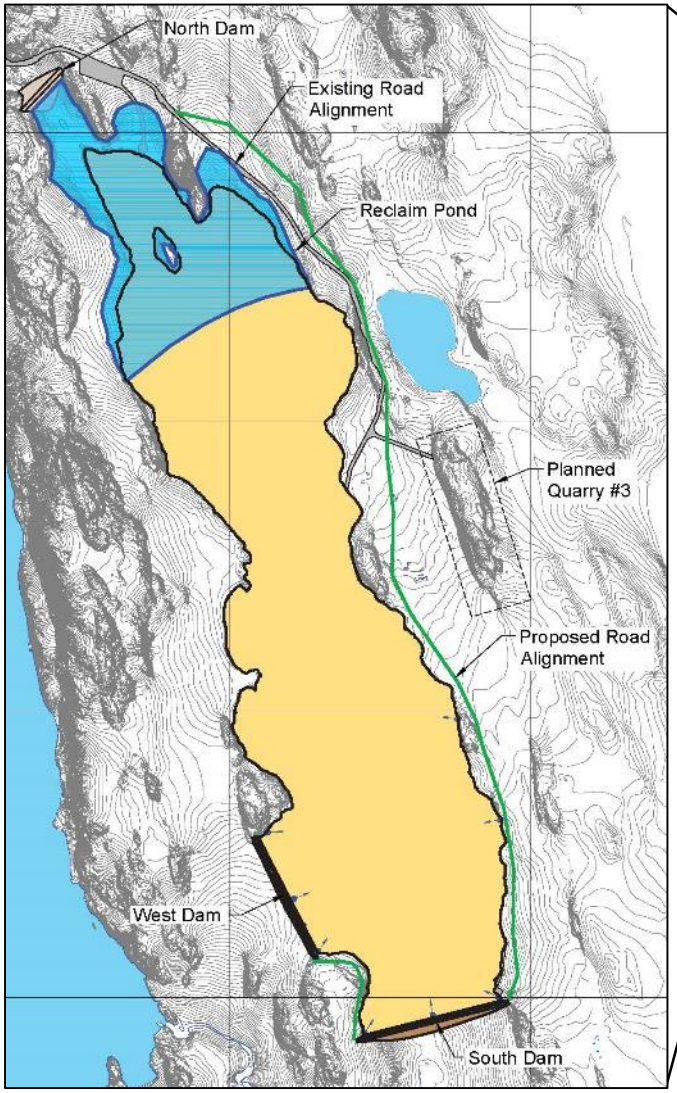


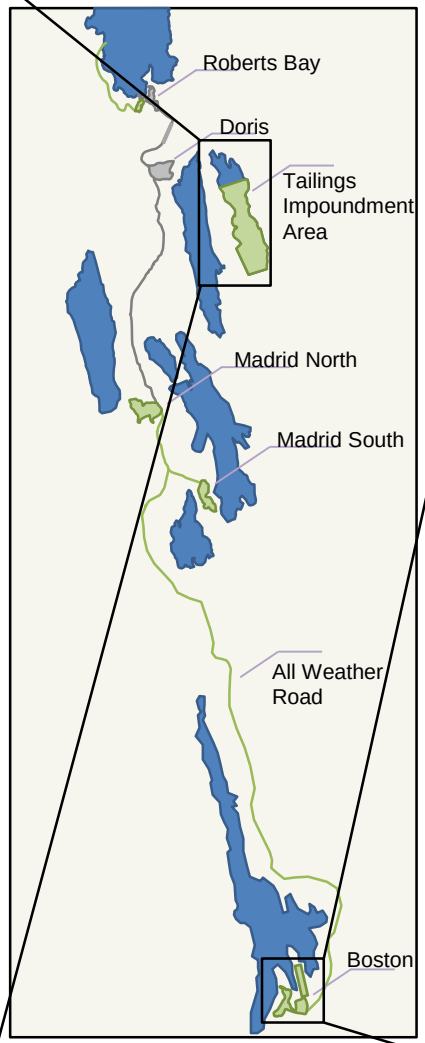


Detoxified Leach Tailings

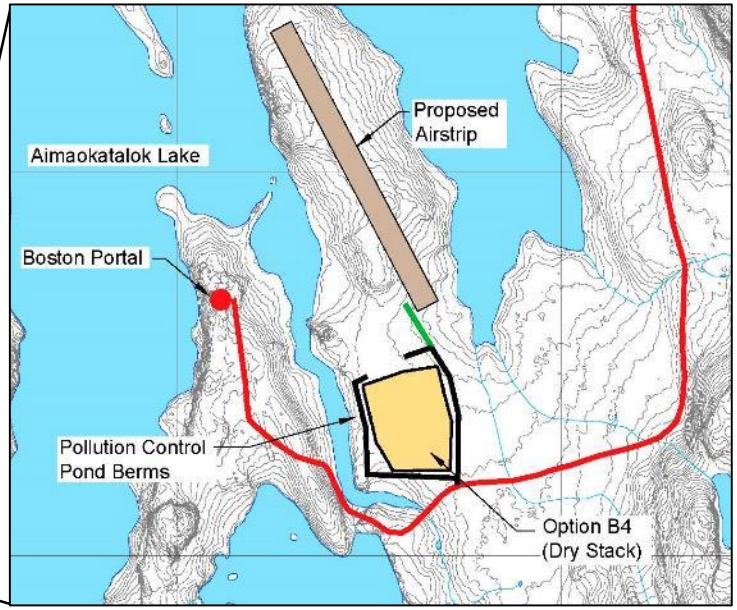


Overview of Tailings Management

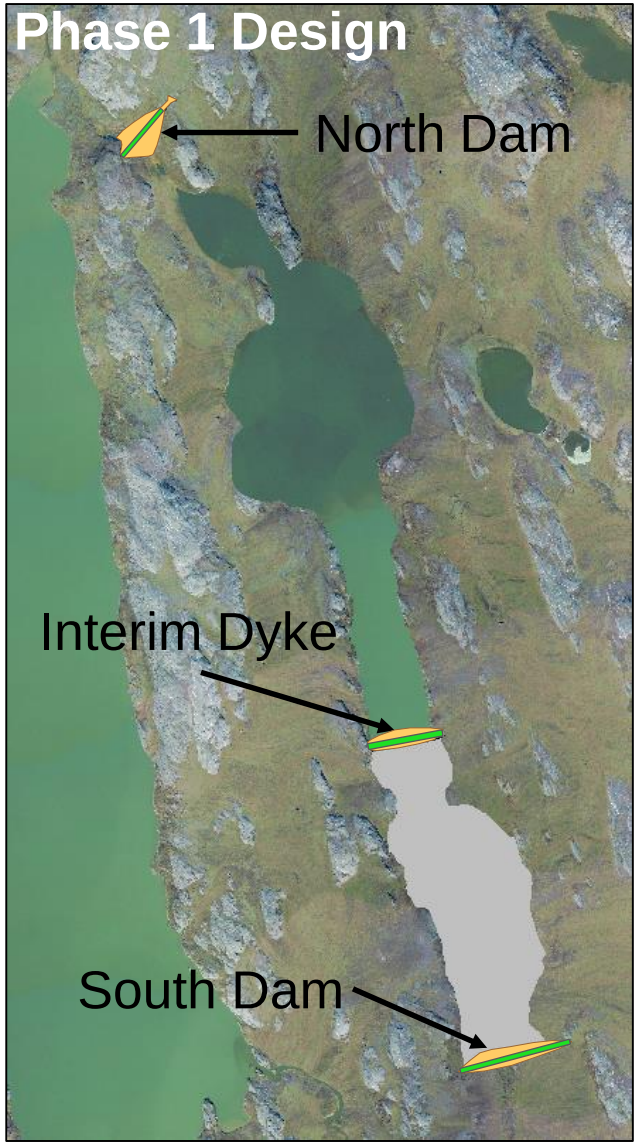


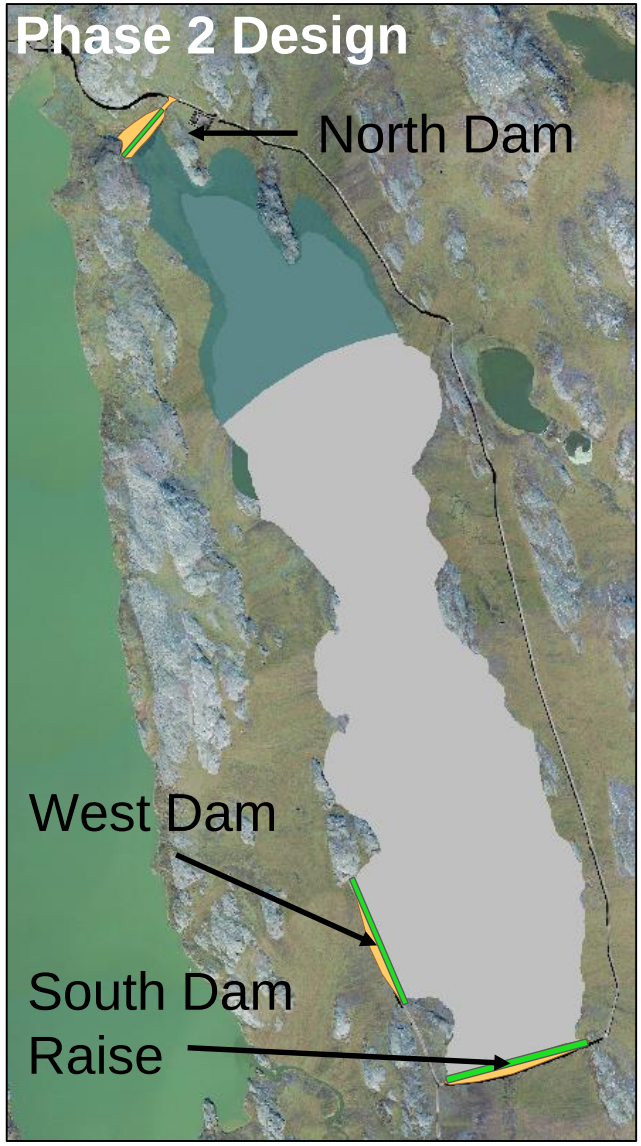


- Doris – Conventional Tailings Impoundment Area
- Boston – Dry Stack Tailings Management Area



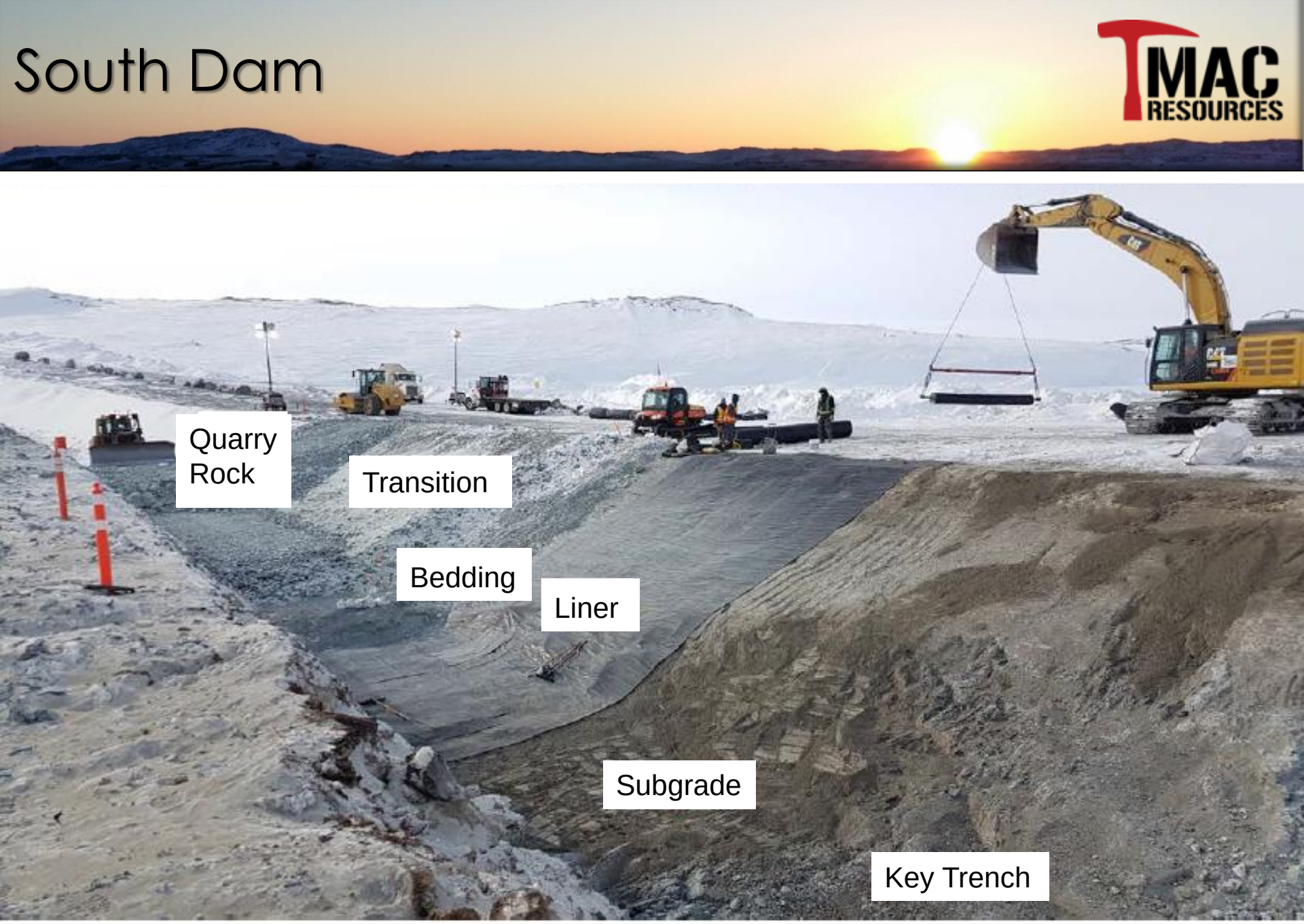
Tailings Impoundment Area - Doris





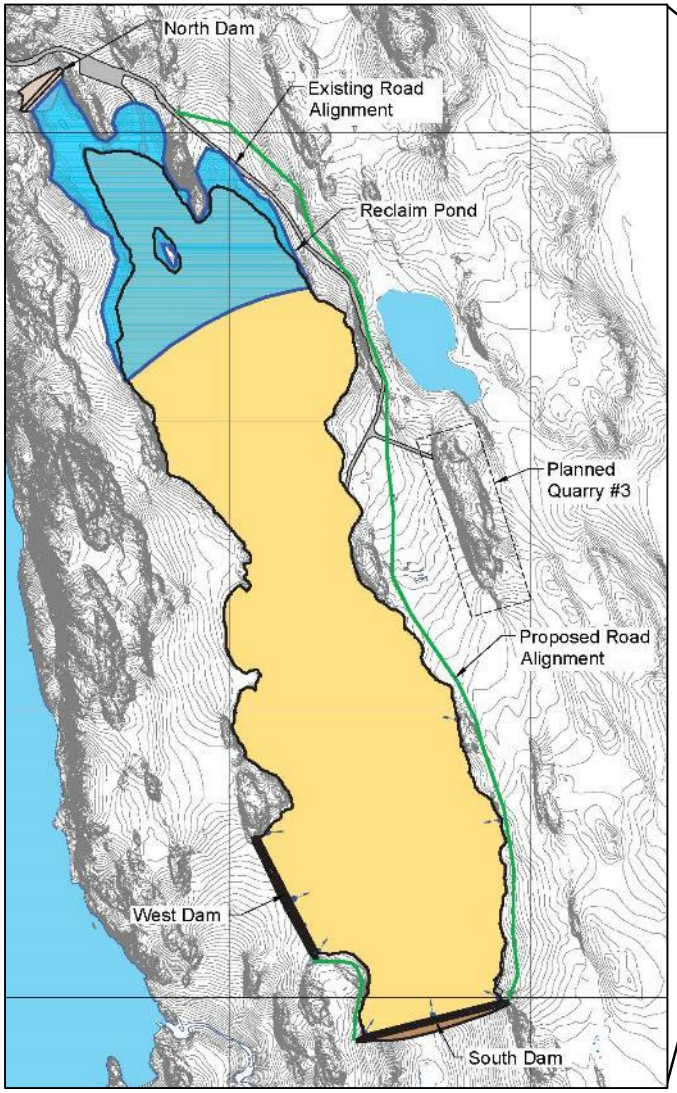
North Dam

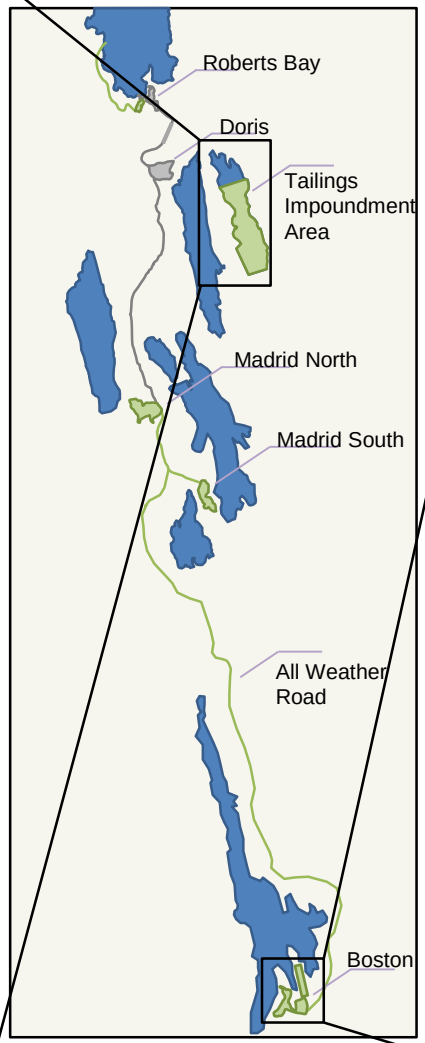
South Dam



Tailings Impoundment Area - Closure

Summary of Tailings Management





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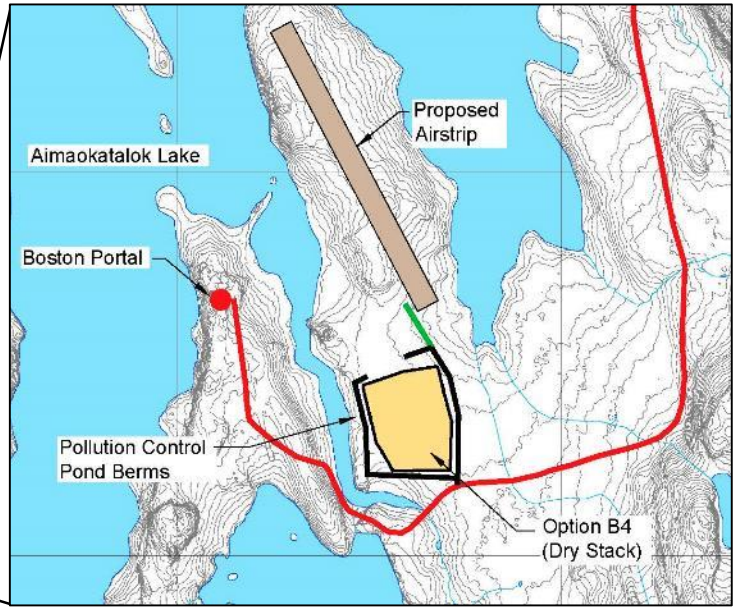
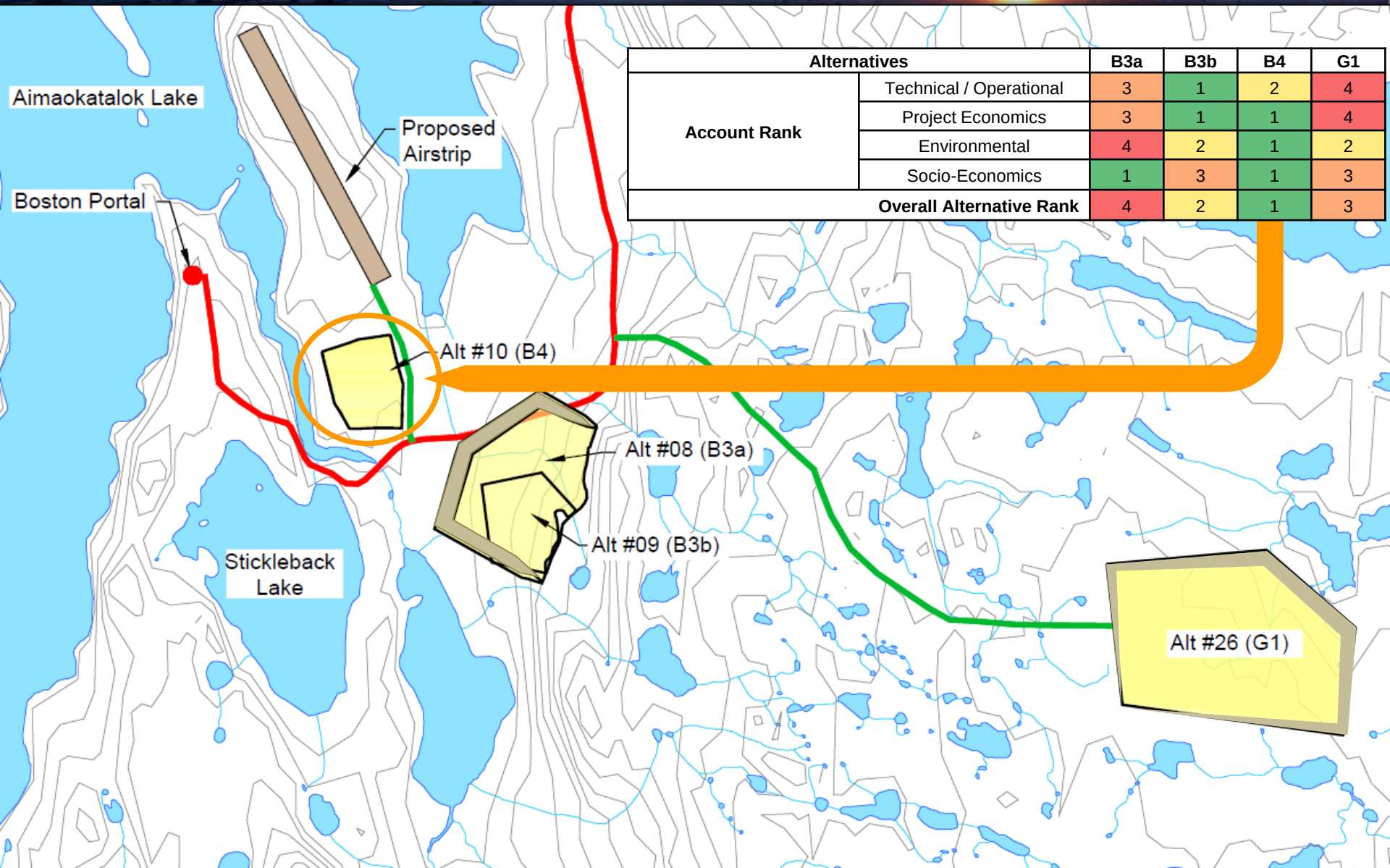
- Boston – Dry Stack Tailings Management Area



Alternative Analysis - Boston

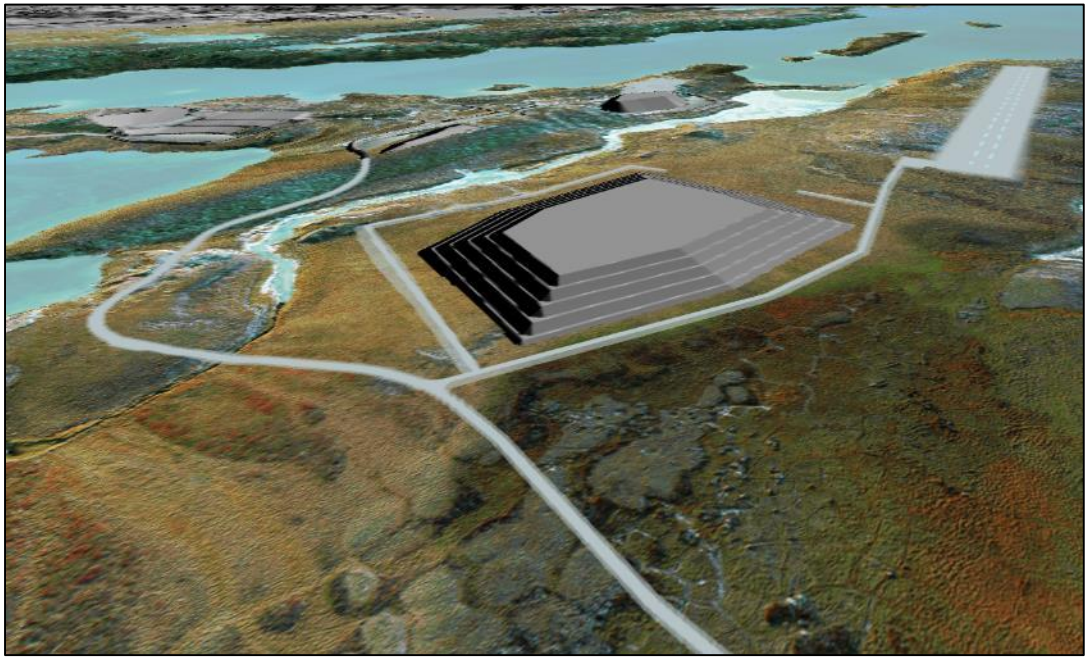
Alternatives		B3a	B3b	B4	G1
Account Rank	Technical / Operational	3	1	2	4
	Project Economics	3	1	1	4
	Environmental	4	2	1	2
	Socio-Economics	1	3	1	3
Overall Alternative Rank		4	2	1	3



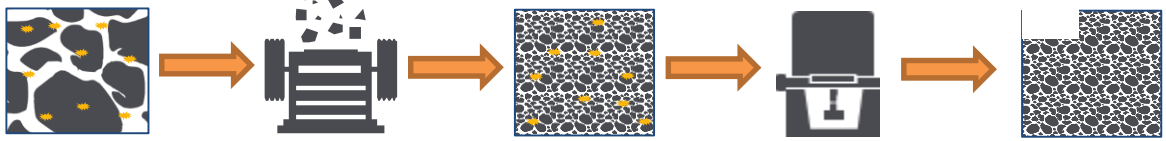
Tailings Management Area - Boston

Tailings Management Area - Boston

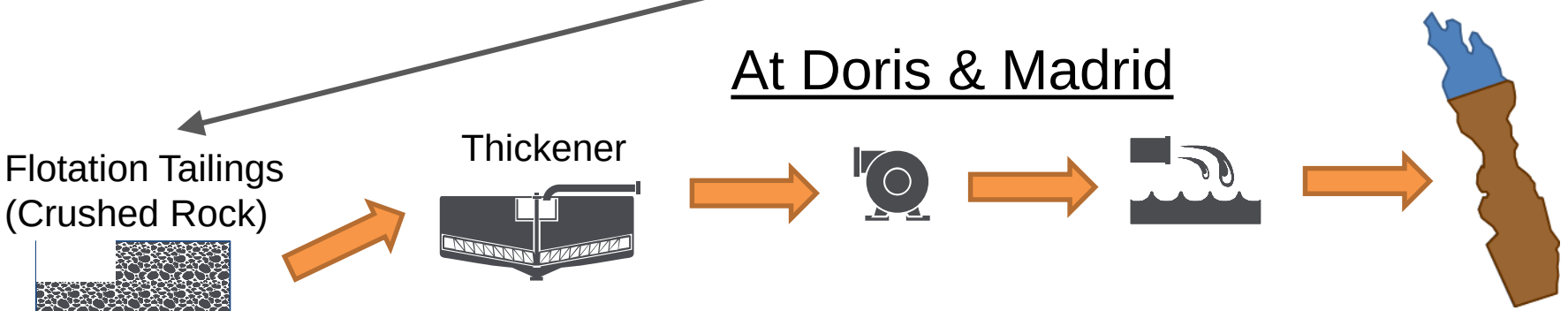
- Filtered tailings
- Trucks, Dozers, Compactors
- Stackable and compactable
- Similar to:
  - Raglan
  - Fort Knox
  - Pogo



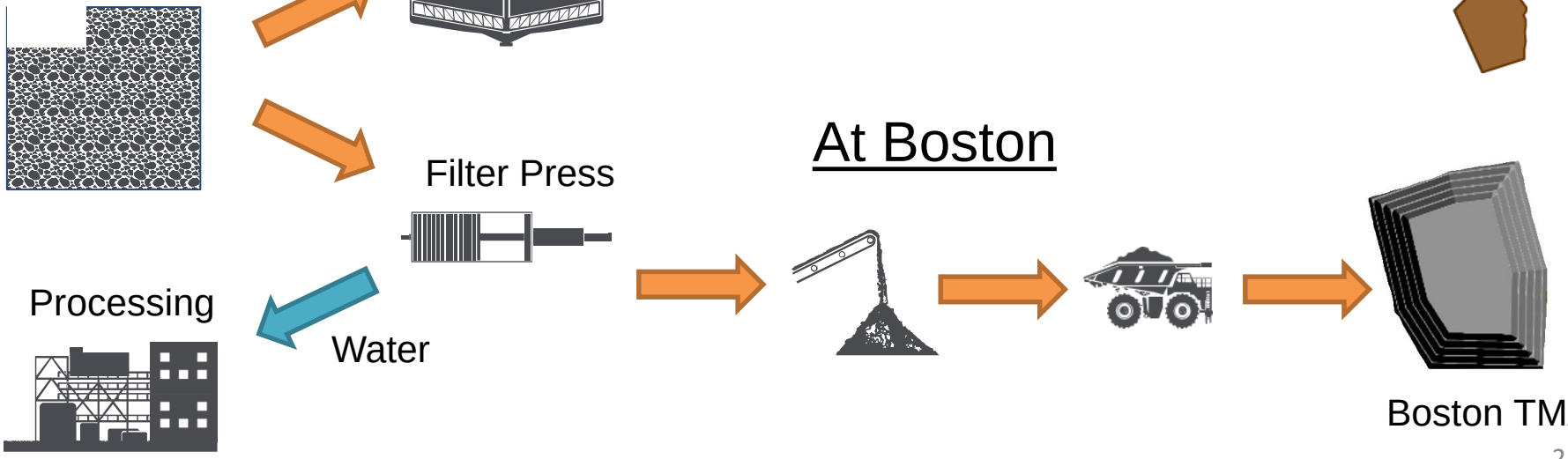
Tailings



At Doris & Madrid



At Boston



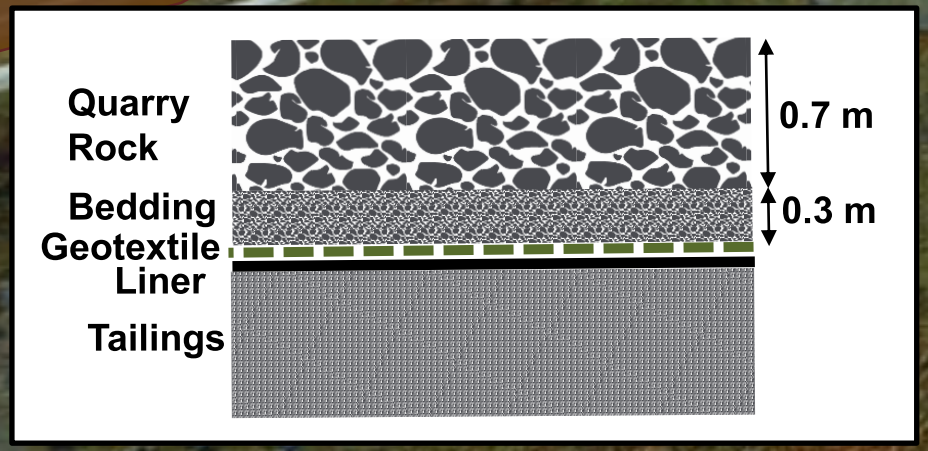
Dust Management

https://www.polymerinnovations.com.au/solutions/road-stabilisation/

http://www.monitoringagency.net/PhotoGallery/tabid/93/Default.aspx

https://www.cooperfluidsystems.com.au/index.php/products/dust-suppression

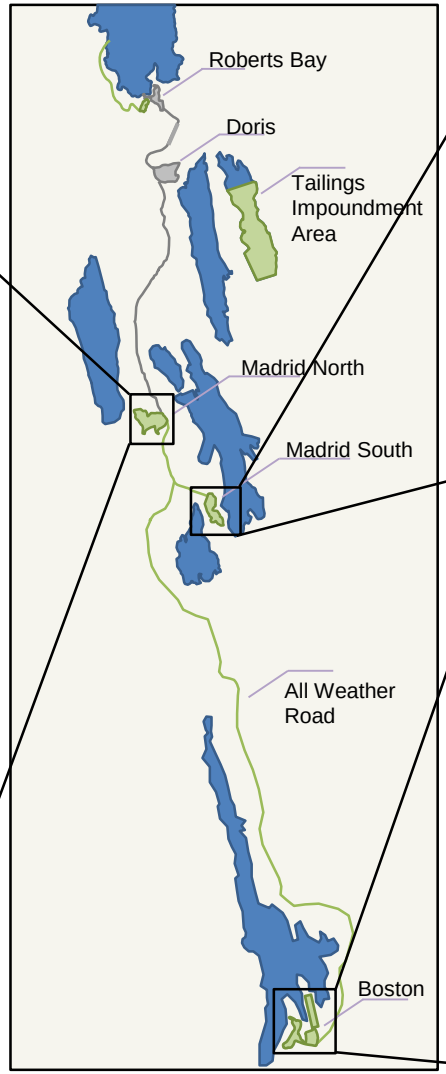
Tailings Management Area - Boston Closure



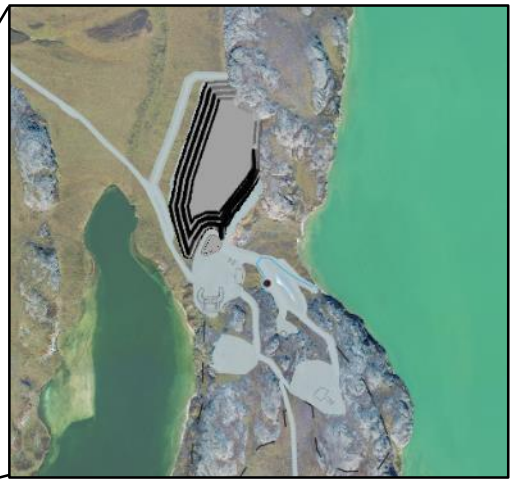
Summary of Waste Rock Management

Temporary Waste Rock Piles

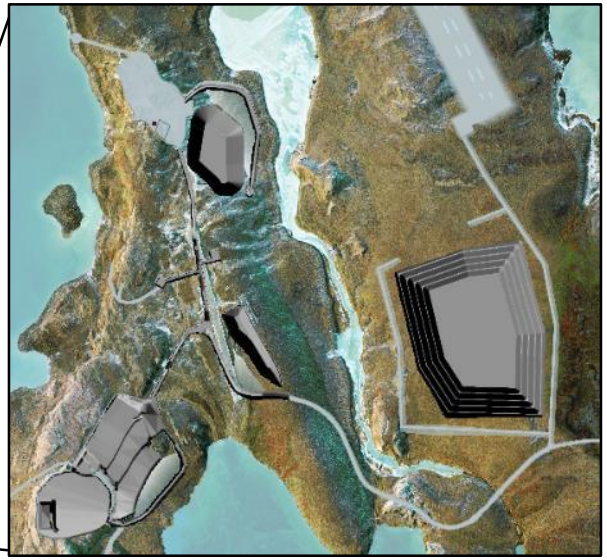
Madrid North



Madrid South

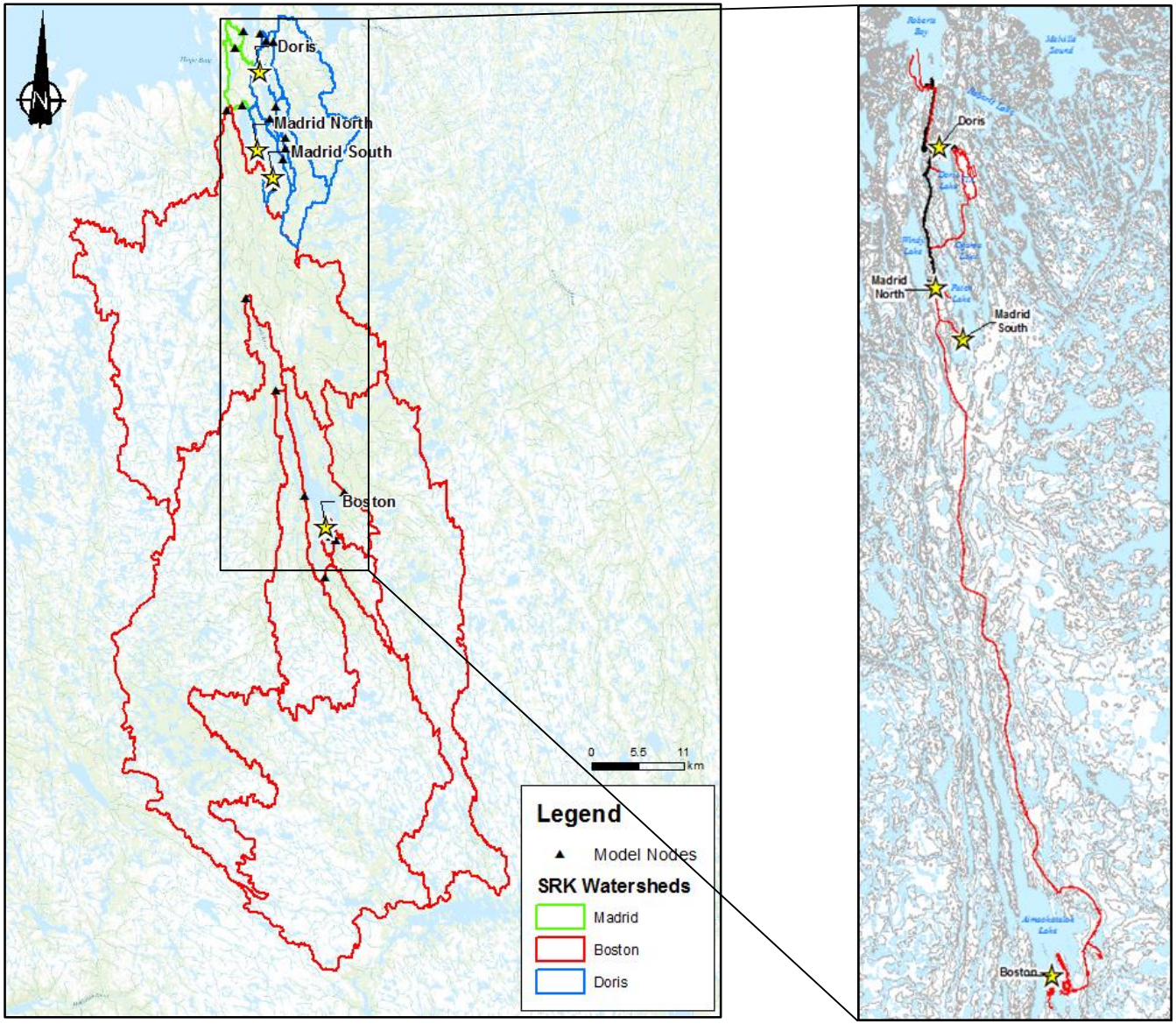


Boston

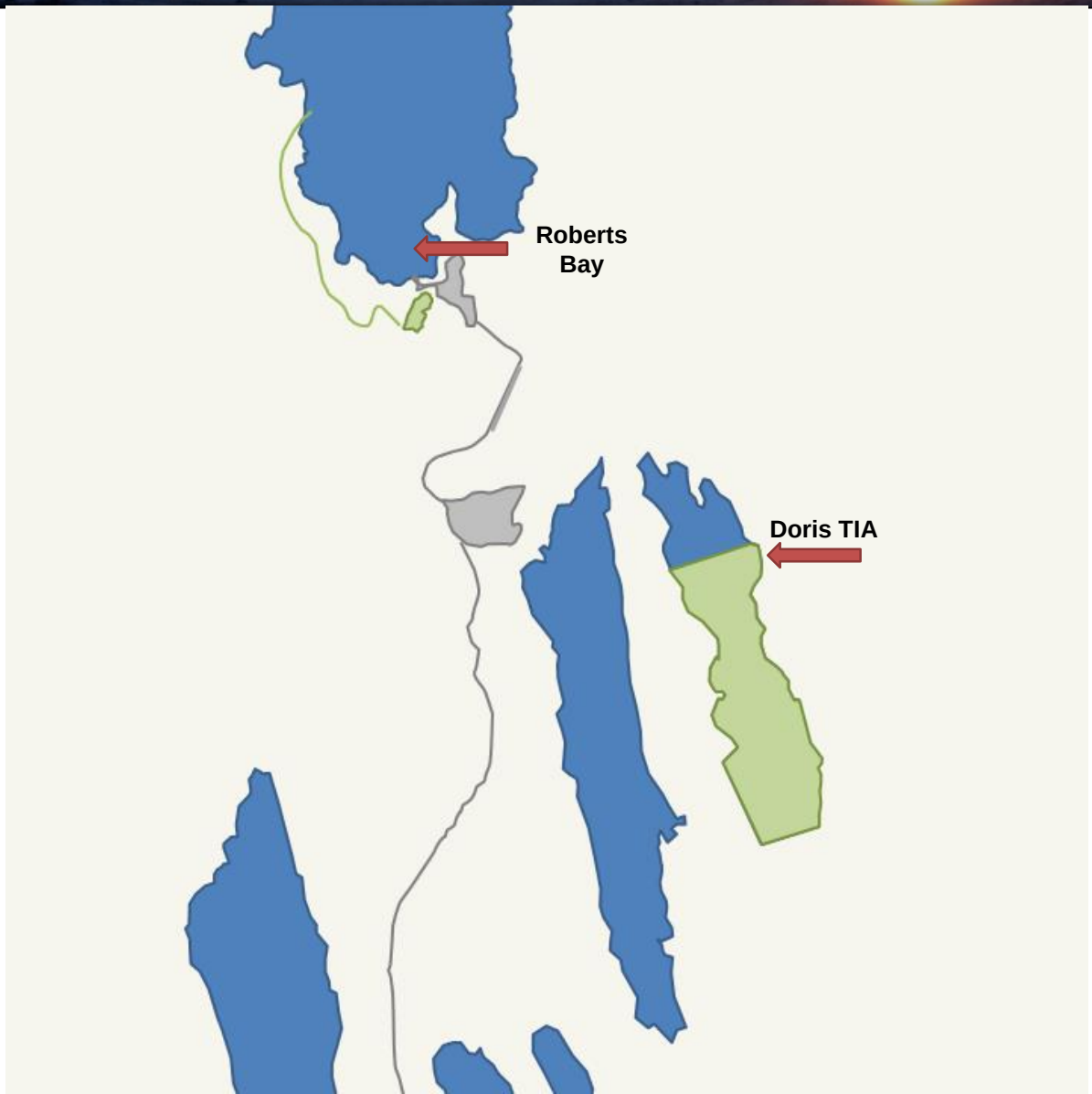


Water Management

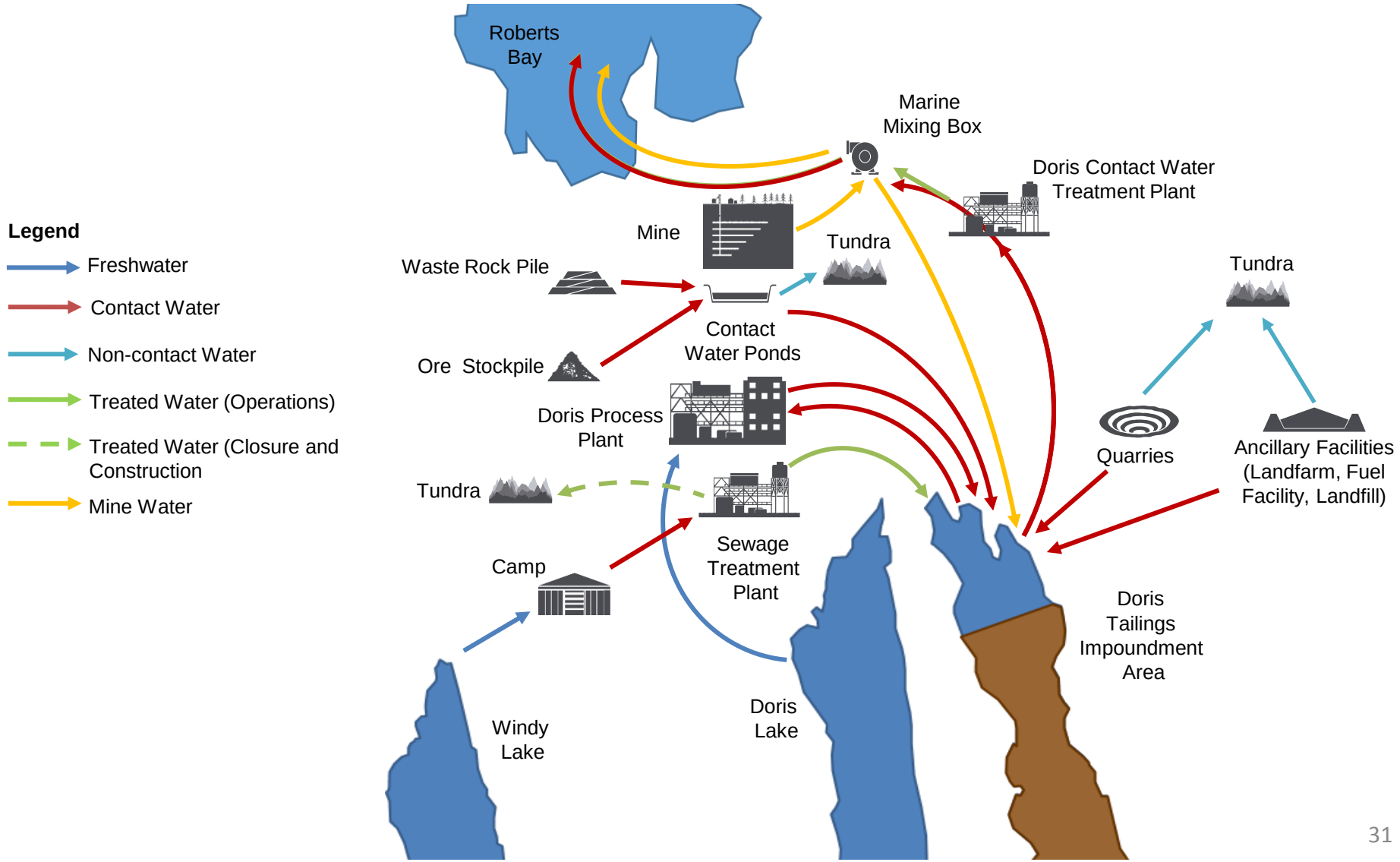
Hydrological Setting



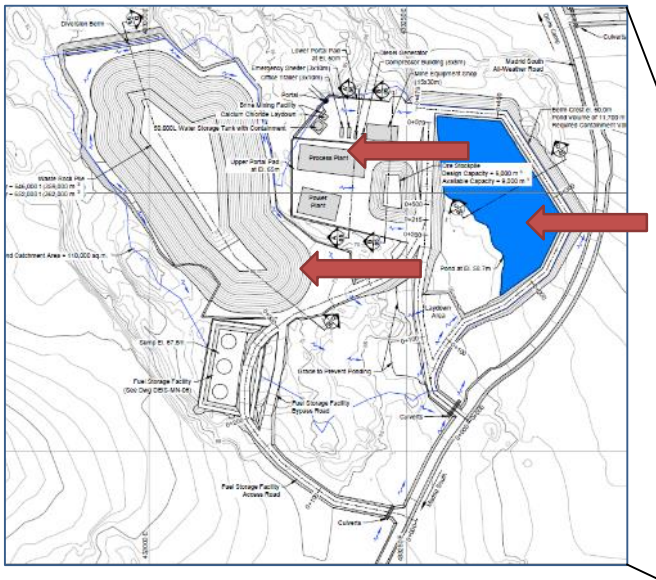
Doris Water Management



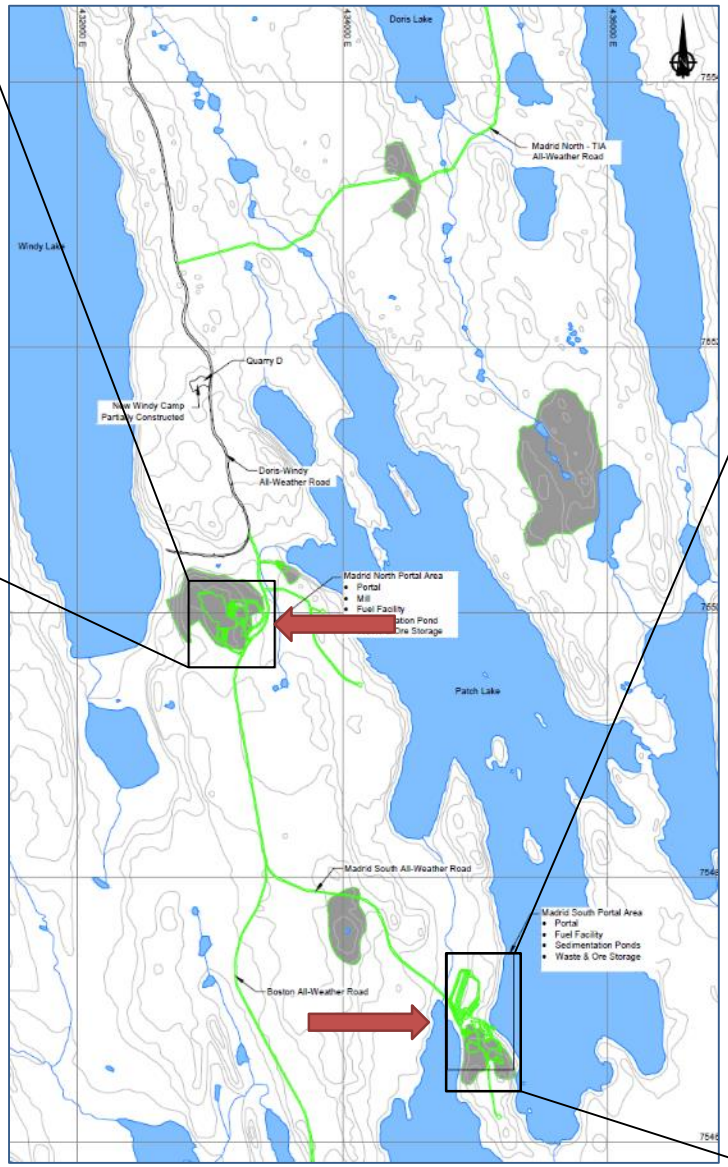
Doris Water Management



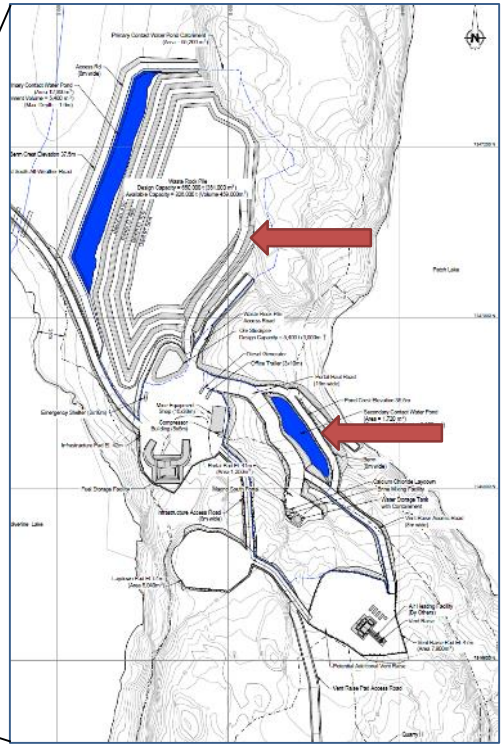
Madrid Site Layout



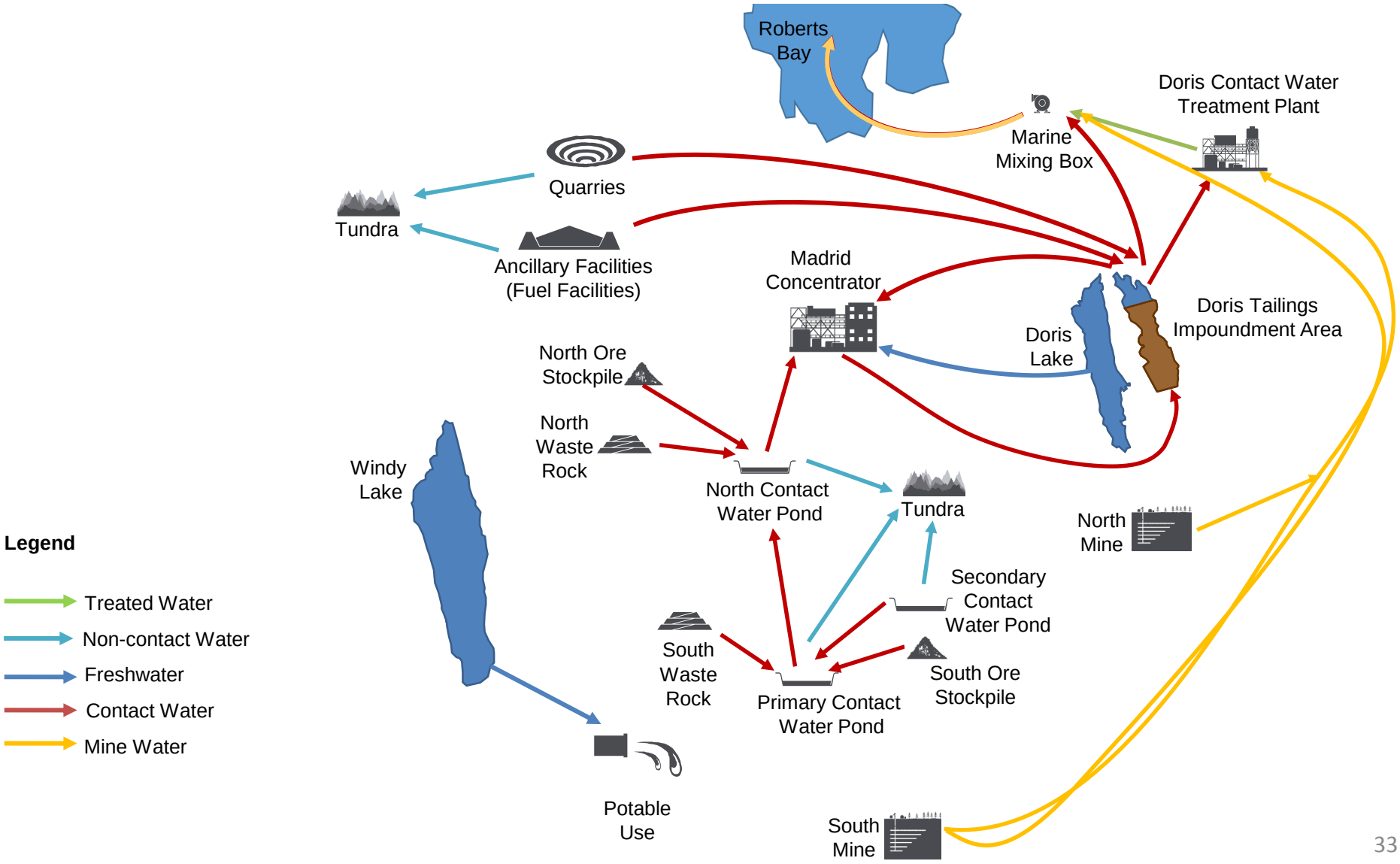
Madrid North



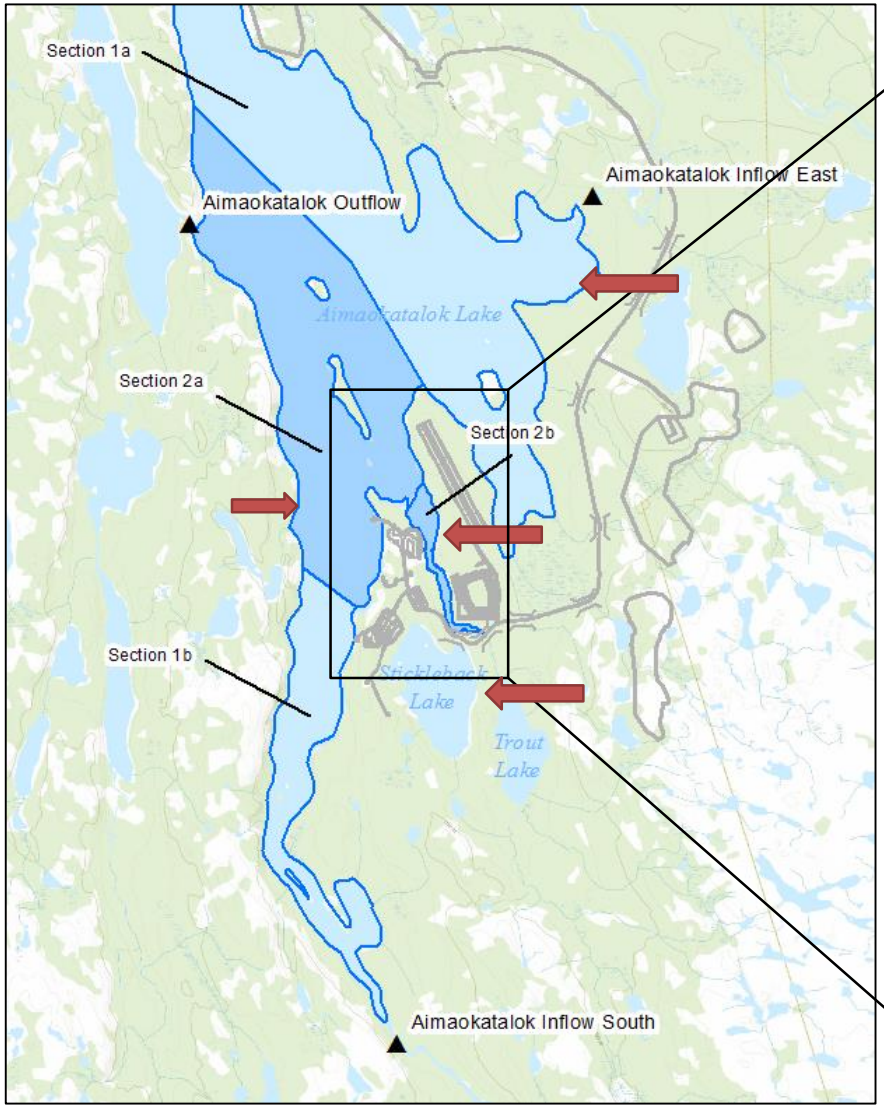
Madrid South

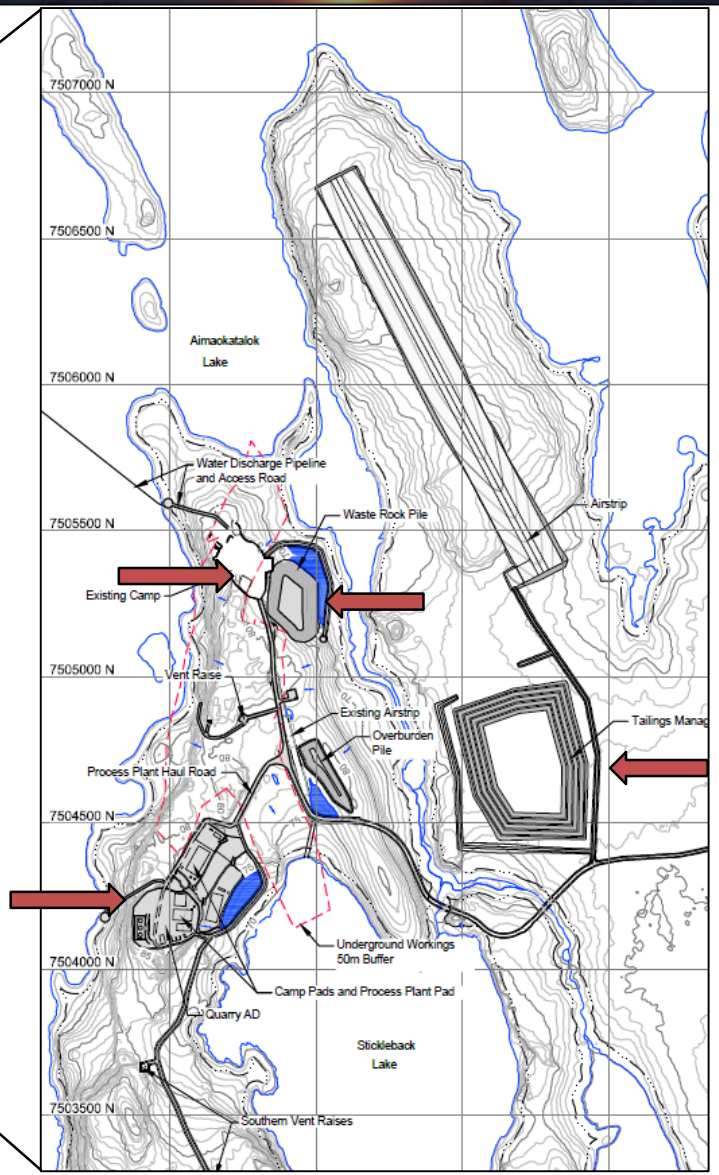


Madrid Water Management

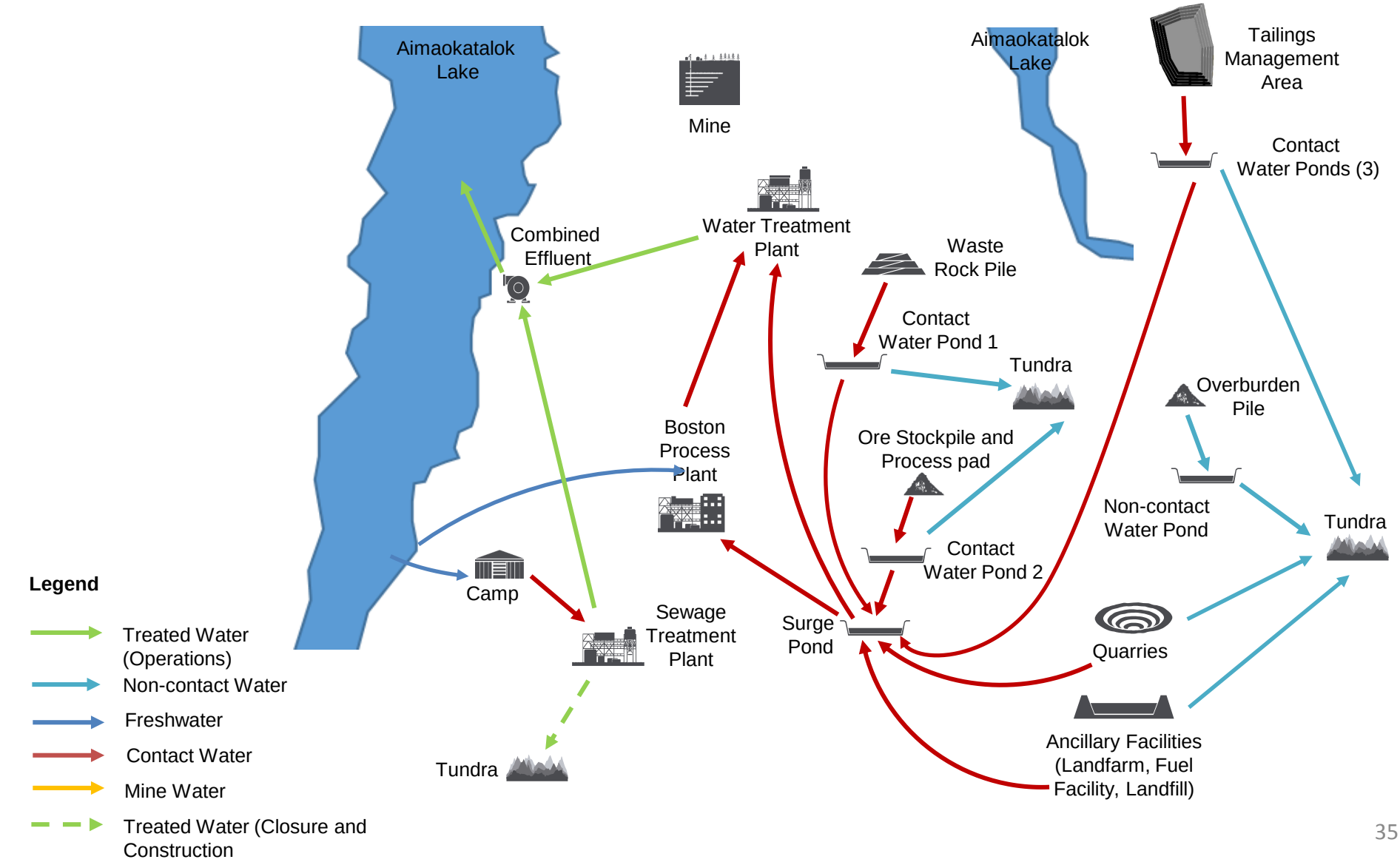


Boston Site Layout and Aimaokatalok Lake





Boston Water Management




Freshwater Environment

Freshwater Environment

- **Madrid-Boston Phase 2**
  - Valued Ecosystem Components:
    - Surface Hydrology
    - Surface Water Quality
    - Sediment Quality
    - Fish
      - Fish Community
      - Fish Habitat

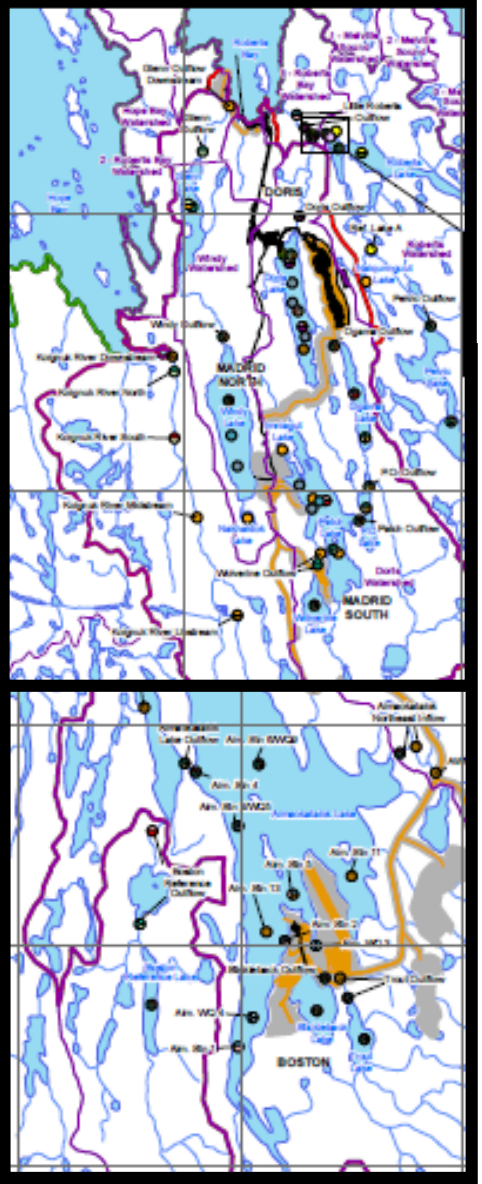
➢ No Significant Residual Effects of Project on Freshwater Environment

Freshwater Environment – Monitoring

Potential effects on the Freshwater Environment will be monitored:

- Aquatic Effect Monitoring Program
- Environmental Effects Monitoring under the Metal and Diamond Mining Effluent Regulations
- Surveillance Network Program under applicable Type A water licences
- *Fisheries Act* Authorizations and Offsetting

Baseline and Existing Environment



- **Freshwater data has been collected in Hope Bay Belt since 1993**
  - Project lakes and streams
  - Reference lakes and streams

- **Freshwater lake and stream data includes:**
  - Hydrology (streams) and lake levels
  - Water quality (winter and summer)
  - Sediment quality (summer)
  - Primary producers
  - Secondary producers
  - Fish and fish habitat, including tissue metals

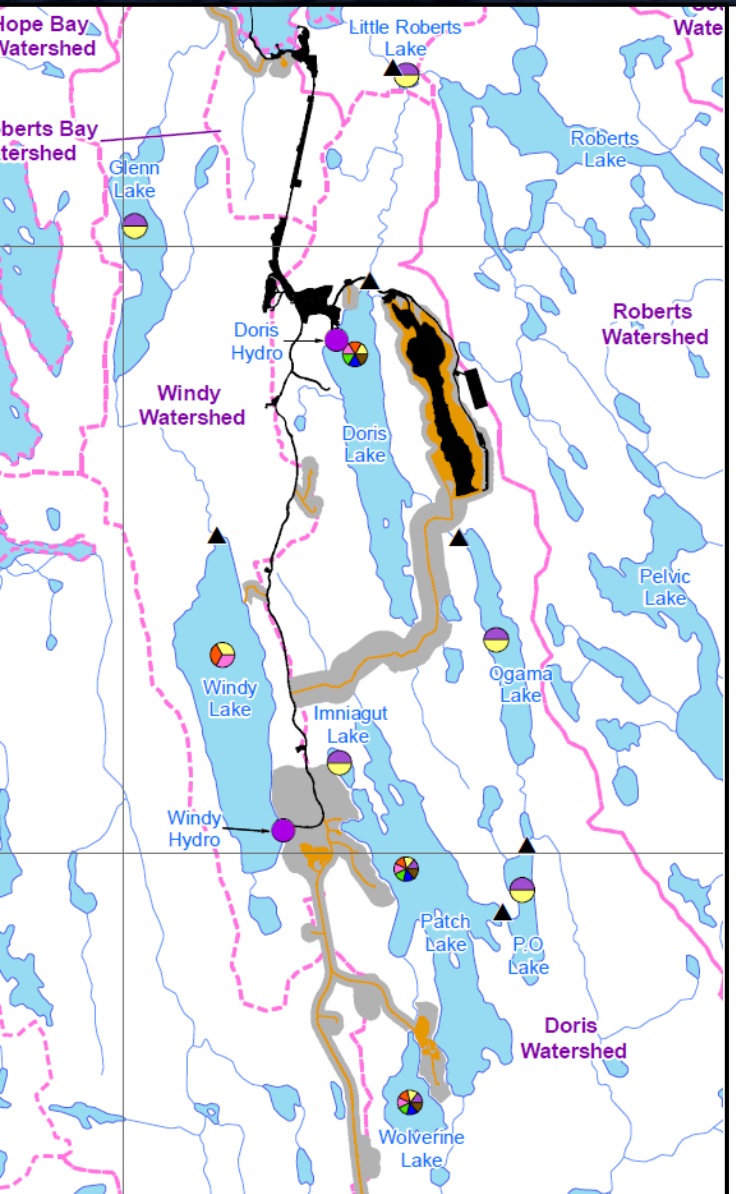
Aquatic Effects Monitoring Program

Aquatic Effects Monitoring Program evaluates potential aquatic effects from point (treated discharge) and non-point (runoff, dust) Project sources following mitigation.

<u>Refinements from Intervenor Comments:</u>

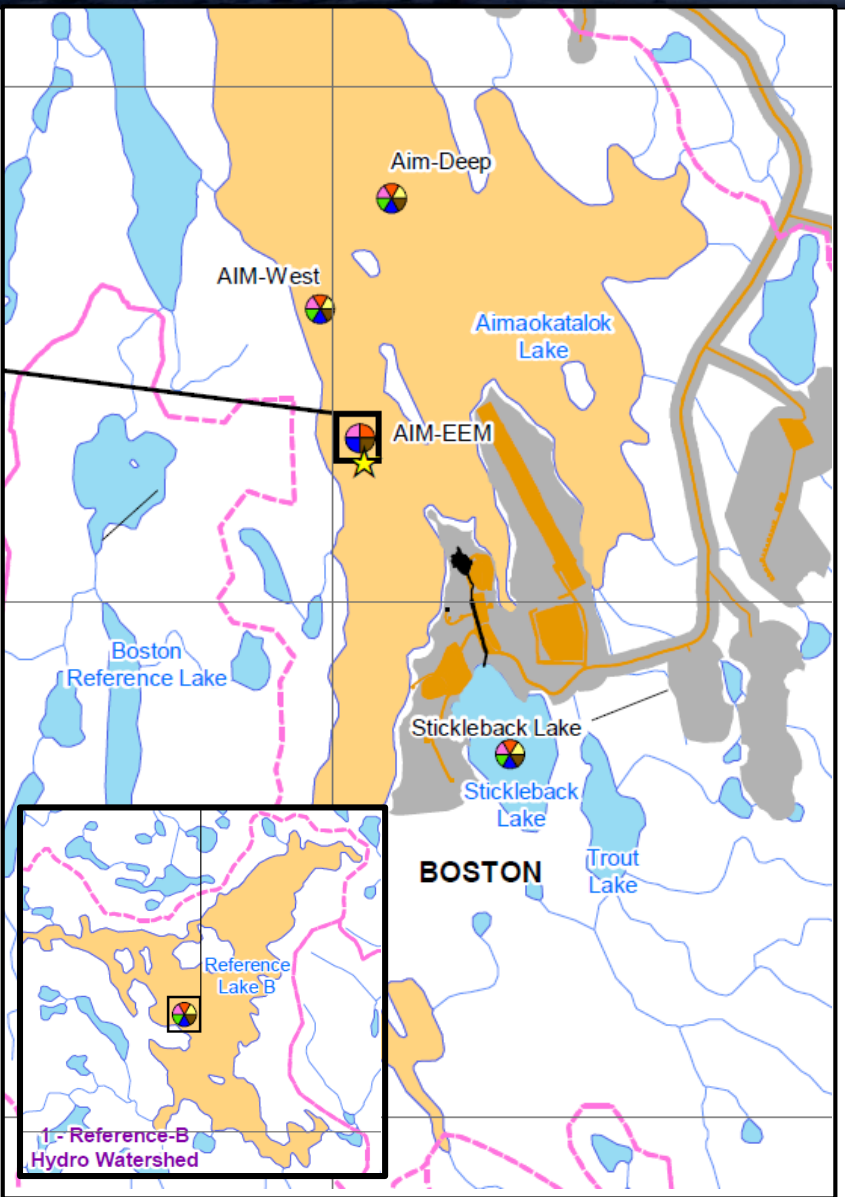
- Belt-wide program (Doris, Madrid, and Boston areas)
- Aquatic Response Framework
- Enhanced harmonization of program with federal Metal and Diamond Effluent Regulations
- Inclusion of water level and stream flow data (Fisheries Offsetting)
- Windy Lake sampling
- Additional cyanide analyses

Aquatic Effects Monitoring Program
North Belt (Doris and Madrid)



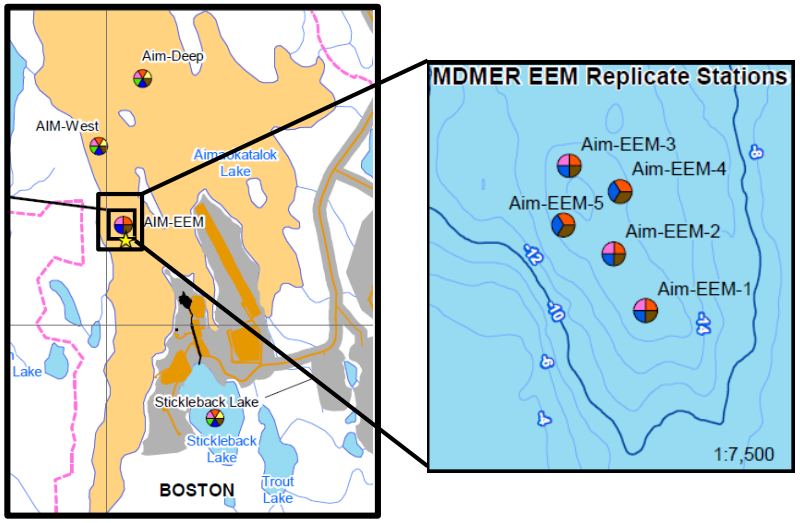
- **Non-point sources**
  - water withdrawal and inflows
  - runoff and dust
- **Doris, Patch, Windy, Wolverine Lakes**
  - water level
  - water and sediment quality
  - biology
- **Ogama, P.O., Glenn, Little Roberts**
  - water level

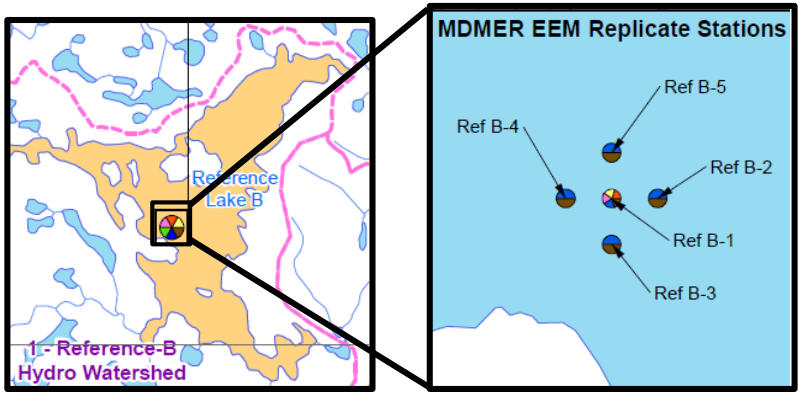
Aquatic Effects Monitoring Program
South Belt (Boston)



- **Aimaokatalok Lake**
  - Point source (treated discharge)
  - Non-point source (runoff, dust)
  - 2 Program sites
  - 1 Federal Effluent Regulation site
- **Stickleback Lake**
  - Non-point source (runoff, dust)
  - 1 Program site
- **Reference Lake B**
  - 1 Program/ Federal Effluent Regulation site

Metal and Diamond Mining Effluent Regulations Monitoring Program





- **Discharge of treated water to Aimaokatalok Lake**
- **Requirement under *Fisheries Act***
  - Water, sediment, benthic invertebrates, fish
  - Before-After-Impact-Control Design (BACI)
  - Sites based on hydrodynamic modelling

Fisheries Act Authorizations

Authorizations required for all project activities resulting in loss of fish habitat/productivity

- Water withdrawal from streams/lakes
- Stream culvert crossings
- Footprint of pipe/intakes on lake bottom

Existing Authorizations and monitoring for Doris Mine

- Tail Lake Outflow
- Roberts Bay Jetty

Anticipated Authorizations for Madrid-Boston

- Authorizations need to be in place prior to any loss in fish habitat or productivity from Project
- Currently under development with Fish Offsetting plan

Fisheries Offsetting Program




Offsetting required to balance all loss of fish habitat/productivity

- Workshop with Inuit Environmental Advisory Committee attended by Fisheries and Oceans Canada
- Development considers comments from KIA, Nunavut boards, and Federal Family
  - adaptive management processes
  - lake water levels and stream flows
  - ground-truth offsetting site options
- Include mine site and offsite community based-fish productivity enhancements
- Baseline work to support offsetting in 2018
- TMAC will continue to work with Inuit and other Interested Parties through Offsetting process

Fisheries Monitoring

Fisheries monitoring under:

- Metal and Diamond Mining Effluent Regulations
- *Fisheries Act* Authorizations
- Fisheries Offsetting program
- Other programs (e.g., stream crossing construction monitoring plan, Commitment DFO-3.1.1)

Summary

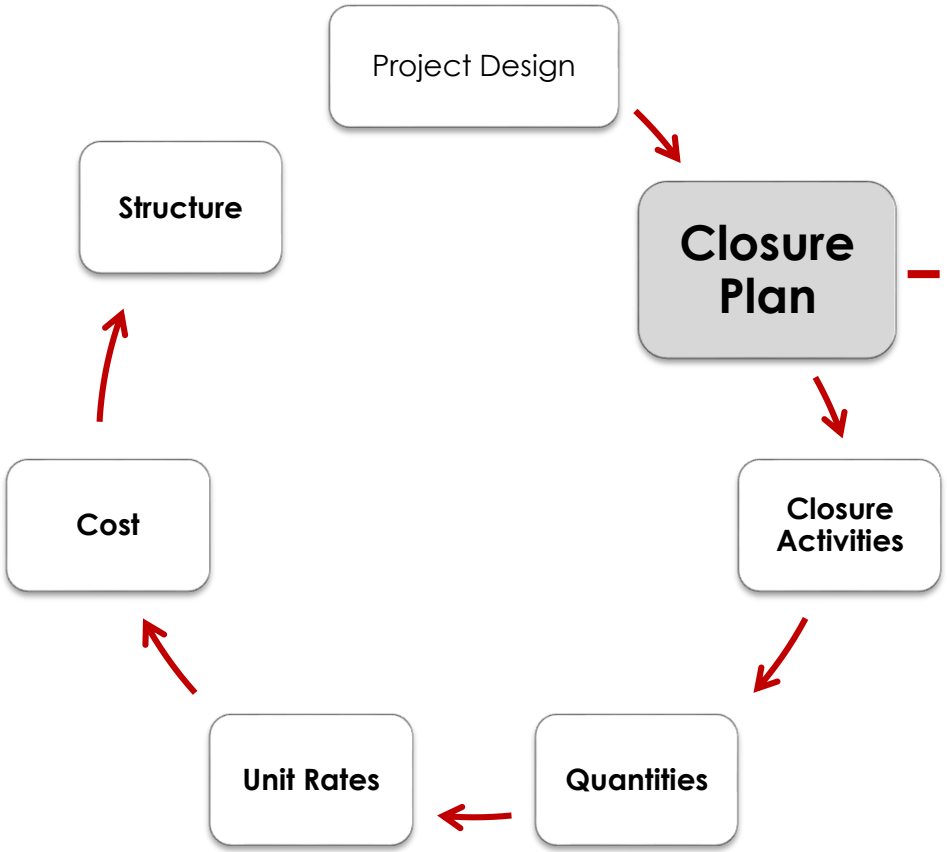
TMAC has put extensive effort to understand and mitigate potential effects to the freshwater environment related to the Hope Bay Project, including:

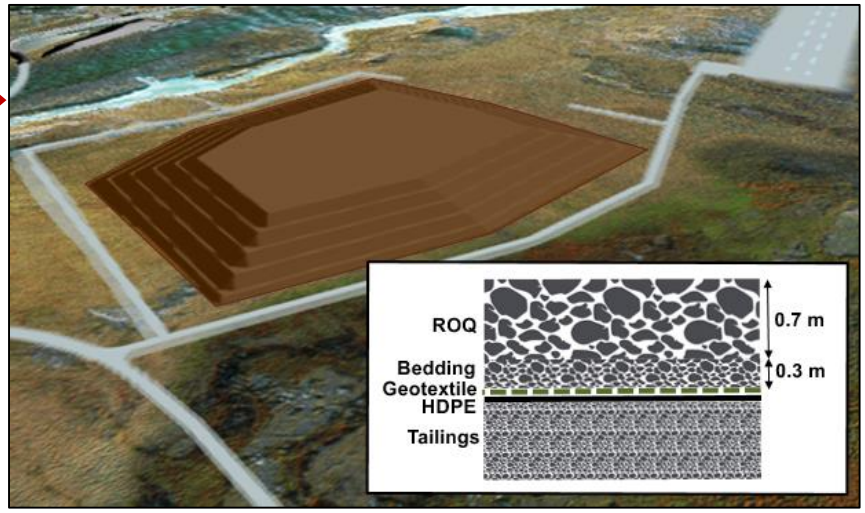
- Comprehensive baseline characterization
- Predictive water quality, quantity, and effluent dispersion modelling
- Development of comprehensive monitoring programs
- Consultation with Inuit Communities, Kitikmeot Inuit Association, and Federal Family, including consideration of technical comments and recommendations
- Future workshop with the Inuit Environmental Advisory Committee

TMAC is committed to working cooperatively with Inuit, Nunavut Boards, and the Federal Family through the water licencing process to ensure its activities in the Hope Bay Belt are protective of the Freshwater Environment. Future workshop with the Inuit Environmental Advisory Committee

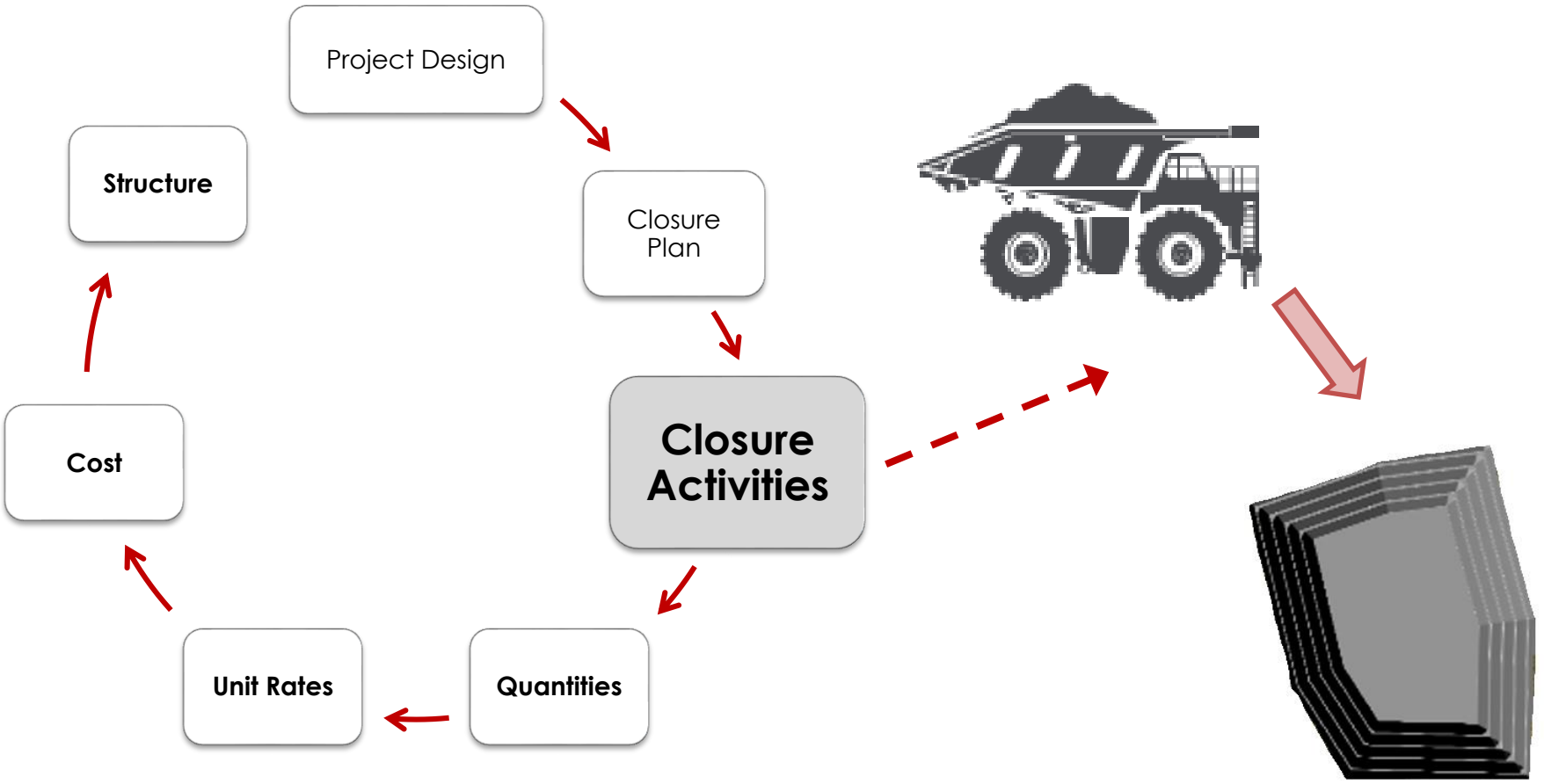
Closure Planning and Financial Security

Closure Planning & Financial Security

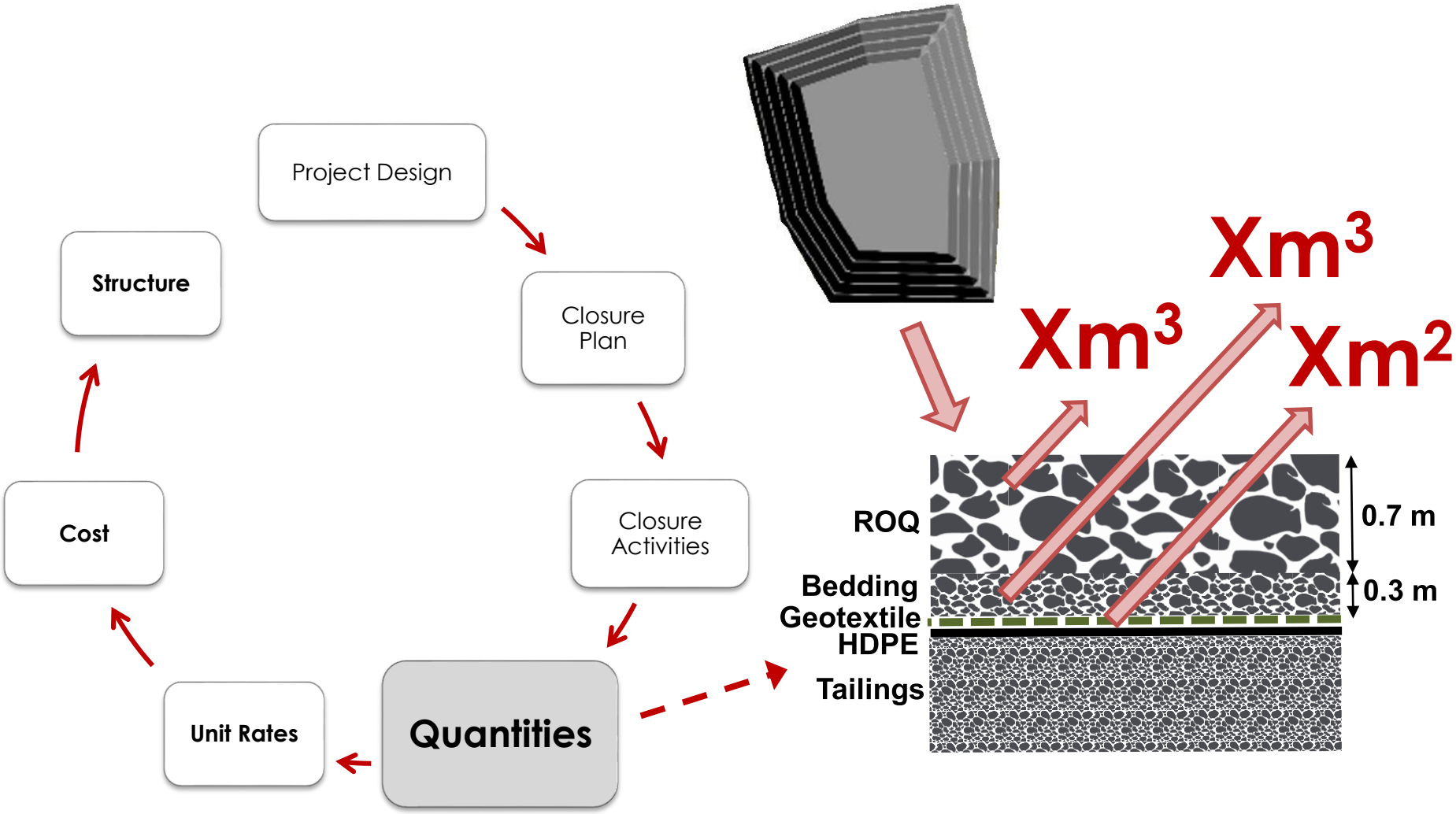




Closure Planning & Financial Security

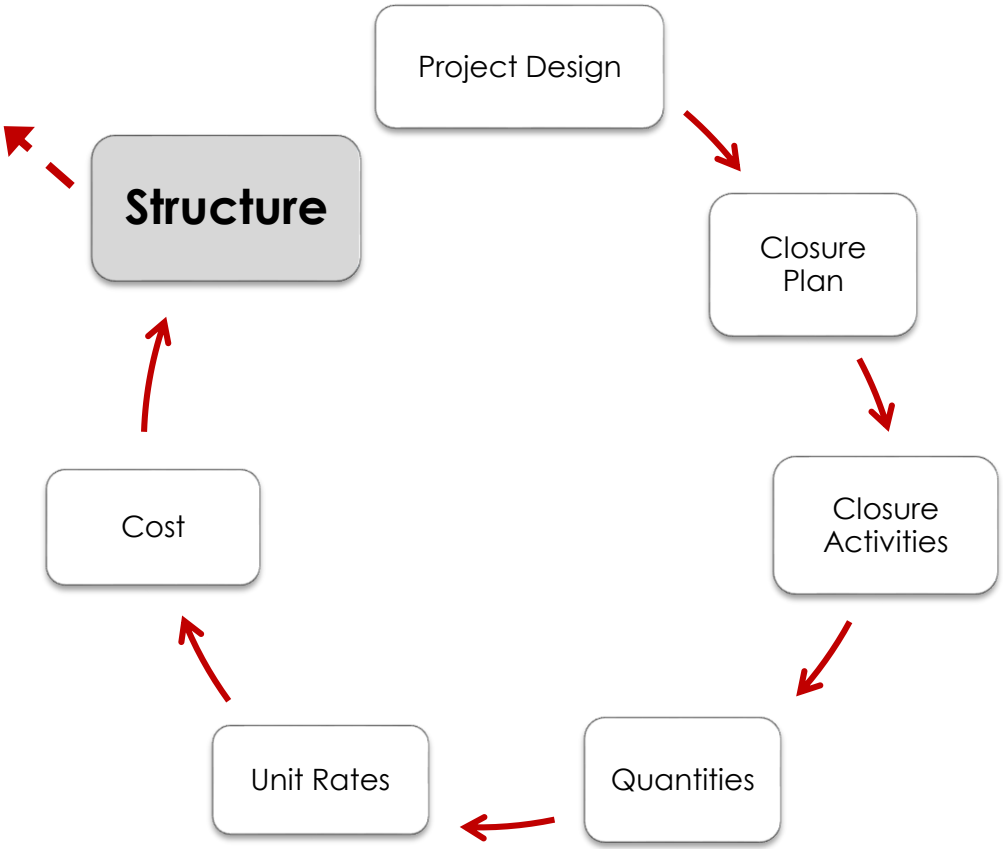


Closure Planning & Financial Security



Closure Planning & Financial Security

Land and Water Split



Closure Planning & Financial Security

- Outcomes for Phase 2

Management Approach

Environmental Management System

- TMAC has a functioning environmental health and safety management system for our existing operations
- Inherent in the management system is reporting, adaptive management and continual improvement with input from stakeholders

Key Aims of EMS:

Identify environmental licence, Project Certificate, IIBA and regulatory requirements	Environmental protection measures to avoid or minimize environmental impacts	Incorporate Inuit Participation and Knowledge	To establish monitoring programs	Monitor and Report	Ensure employee awareness	Adapt monitoring and analysis as required in consultation with parties

Management Plan Overview

Biophysical Management Plans

1. Surface Emergency Response Plan
2. Underground Emergency Reponses Plan
3. Oil Pollution Prevention Plan (OPPP)/Oil Pollution Emergency Plan (OPEP)
4. Doris Project Domestic Wastewater Treatment Management Plan
5. Boston Sewage Treatment Operations and Maintenance Management Plan
6. Groundwater Management Plan
7. Doris-Madrid Water Management Plan
8. Boston Water Management Plan
9. Water and Ore/Waste Rock Management Plan
10. Boston Sewage Treatment Operation and Maintenance Plan
11. Quarry Management & Monitoring Plan
12. Explosives Management Plan
13. Air Quality Management Plan
14. Noise Abatement Management Plan
15. Doris Aquatic Effects Monitoring Plan
16. Wildlife Mitigation and Monitoring Plan
17. Madrid Tailings Impoundment Area Operations, Maintenance, and Surveillance Manual
18. Boston Tailings Management Area Operations, Maintenance, and Surveillance
19. Waste Rock and Ore Management Plan
20. Non-hazardous Waste Management Plan
21. Hydrocarbon Contaminated Material Management Plan
22. Spill Contingency Plan
23. Hazardous Waste Management Plan
24. Incinerator Management Plan

Environmental Protection Plan

Socioeconomic Management Plans

1. *Health* and Safety Management Plan
2. Community Involvement Plan
3. Heritage Resource Protection Plan
4. Human Resources Plan

Closure and Reclamation Plans

1. Doris-Madrid Interim Closure and Reclamation Plan
2. Doris-Madrid Interim Closure and Reclamation Detailed Cost Estimate
3. Boston Conceptual Closure and Reclamation Plan
4. Boston Conceptual Closure and Reclamation Plan, Detailed Cost Estimate

Thank You, Questions