



Terrestrial Environment

Phase 2 Proposal

Final Hearing Iqaluit and Pond Inlet November 2019

Presentation Overview

- Description of Assessment
- Mitigation and Monitoring
- Technical Review Summary
- Project Certificate Conditions
- Conclusions



Description of Assessment

Technical Supporting Document

Mary River Project | Phase 2 Proposal | FEIS Addendum | August 2018

TSD 09 Vegetation Baseline and Impact Assessment



Vegetation

- Abundance and Diversity
- Health
- Culturally Valued Vegetation

TSD 10 Terrestrial Wildlife Baseline and Impact Assessment



Wildlife

- Caribou
- Wolf

TSD 12 Migratory Birds Baseline and Impact Assessment



Birds

- Seabirds and Waterbirds (7)
- Species at Risk (5)
- Peregrine Falcon
- Lapland Longspur

Select Examples — Additional Assessment Information

- Rail alignment summary report
- Noise Modelling for Train Passes
- Railway Embankment “Sensitivity” Analysis for Caribou Crossing Potential
- Risk Assessment Workshops
- Borrow Source Investigation Factual Data Report
- Consideration of Fine Materials and Soils in Railway Embankment Construction

Phase 2 Considerations



Mine Site

▷↳ζσ◁ϣ⋈^b

Same Development Area

Same Sensory Disturbances

Same Assessment of Impacts to Terrestrial Environment



Rail/Road Corridor

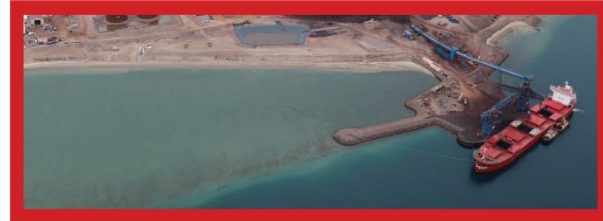
◁⁹ᵇᵈ∩⁹ᵇ⁹ᵇ▷⁹ Δσ⁹ᵇᵇ

Structure and Modifications

Short-term Increase in Traffic

Long-term Decrease in Traffic

- **Habitat Loss**
- **Increased Disturbance**
- **Potential Barrier to Movement**



Milne Port

የፖሊስ ጋር ምክር ቤቱ

Increased Development Area

Increased Activity

- **Habitat Loss**
- **Increased Disturbance**

Study and Assessment Areas

- Potential Development Area
- Regional Study Area
- North Baffin Island Caribou Range
- Informed by Inuit Knowledge



Methods

Footprint

Zone of Influence

Project and Cumulative Impacts

Environmental Data Sources

- Baseline inventory
- Project-specific surveys
- Caribou collar data

Inuit Knowledge

- Interviews, workshops, written reports, discussion

Analytical

- Habitat models
- Caribou population predictions
- Variable levels of disturbance
- Vegetation plots
- Project features

Lessons Learned



Learning and Knowledge

Information at broad and site-specific scales

- Inuit Knowledge
- Historical regional surveys
- Baffinland study area surveys
- Project-based surveys

Fourteen (14) years near-continuous monitoring

- Including six (6) years operational monitoring

Collaboration

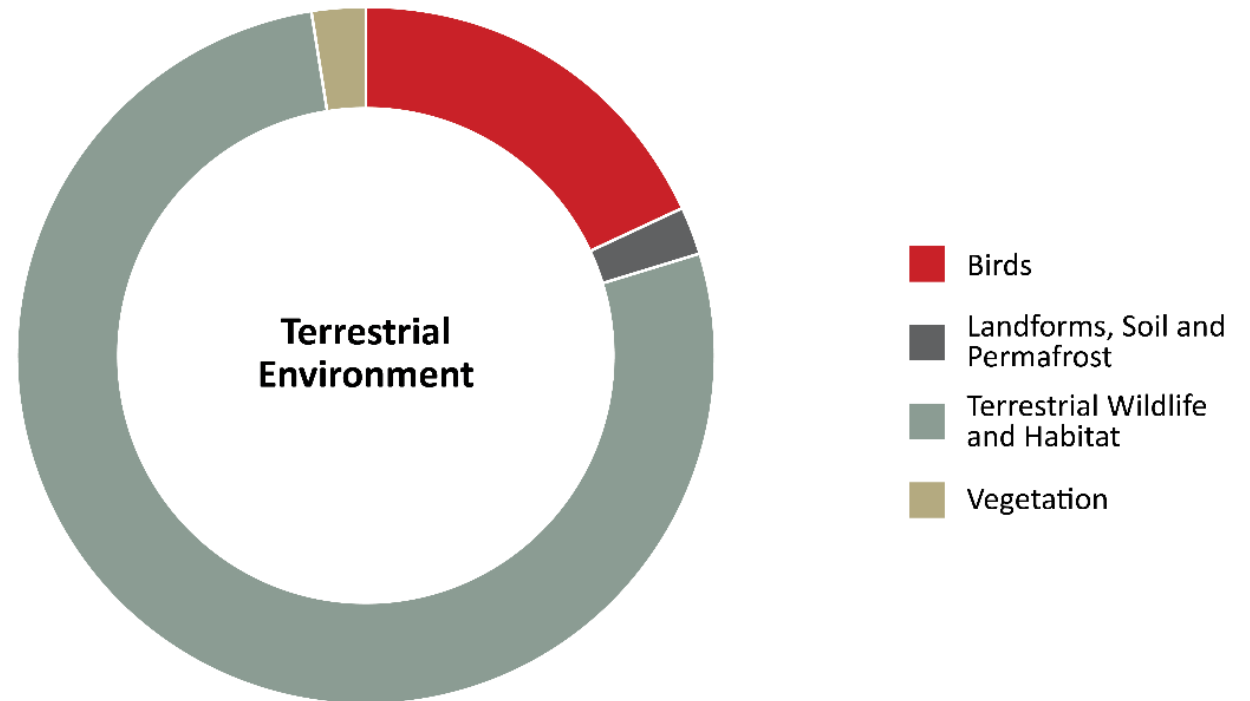
Inuit Knowledge and Inuit Participation

| Knowledgebase | | Years | | | | | | | | | | | | | | |
|---------------|-----------------------------|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | | '05 | '06 | '07 | '08 | '09 | '10 | '11 | '12 | '13 | '14 | '15 | '16 | '17 | '18 | '19 |
| Vegetation | Traditional Knowledge | | | ✓ | | | | | | | | | | | | |
| | Ecosystem Classification | ✓ | ✓ | ✓ | ✓ | | | | | | | | | | | |
| | Rare and Diversity | ✓ | ✓ | ✓ | ✓ | | | | | ✓ | | ✓ | ✓ | ✓ | ✓ | |
| | Soil and Plant Metals | | | | ✓ | | | | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ |
| Wildlife | Traditional Knowledge | | | ✓ | ✓ | | | | | | | ✓ | | | | ✓ |
| | Caribou-related surveys | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Wolf den surveys | | | ✓ | ✓ | ✓ | ✓ | | | | ✓ | | | | | |
| | Helicopter flight heights | | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Snowbanks and tracks | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Birds | Shorebird and Songbird | | | | | | | | ✓ | ✓ | ✓ | | | | ✓ | ✓ |
| | Waterfowl | | | | | | | | ✓ | ✓ | ✓ | ✓ | | | | |
| | Active Nesting Birds | | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Cliff-nesting Raptors | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Collaboration | GN Caribou collars | | | | ✓ | ✓ | ✓ | ✓ | | | | | | | | |
| | CWS Seabirds and Shorebirds | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Arctic Raptors | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Community Feedback

A total of 44 comments or questions related to the Terrestrial Environment.

- 1 related to Vegetation
- 8 related to Birds and Bird Habitat
- 34 related to Wildlife and Wildlife Habitat
- 1 related to Landforms, Soil, and Permafrost



Inuit Knowledge



Traditional Knowledge Plants 2007



'Kajjuqtikkut' Arctic Bay Working Group 2008



Pond Inlet Caribou Focus Group 2008



Phase 2 Caribou Workshop 2015



Railway Workshop 2019

Addressing Uncertainty

Collected data

Engage with Inuit knowledge holders

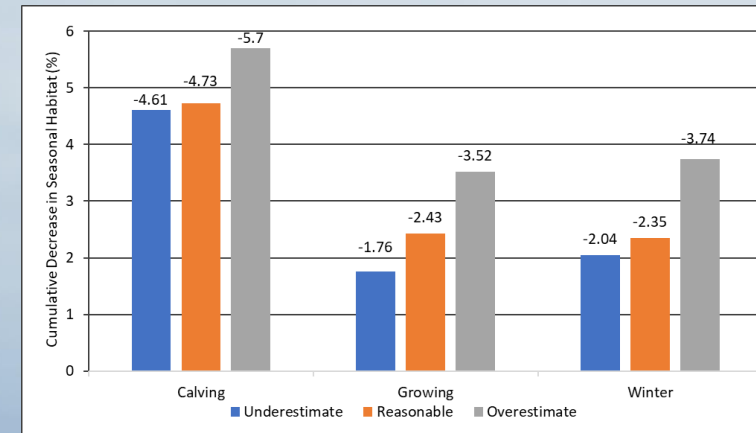
Multiple iterations of potential habitat impact models

- Sensitivity analysis — underestimate, reasonable, overestimate
- Growing, winter and calving habitat impact predictions (9 potential outcomes)
- Caribou population scenarios (8 potential outcomes)

Monitoring

Oversight

Lessons learned



An aerial photograph of a large, deep blue reservoir. A wide, light-colored road or path runs along the left side of the water, separating it from a steep, snow-covered embankment. The embankment shows signs of erosion and is dotted with patches of snow and dark vegetation. The surrounding landscape is flat and covered in snow, with distant mountains visible under a cloudy sky.

Mitigation and Monitoring

Project Mitigation

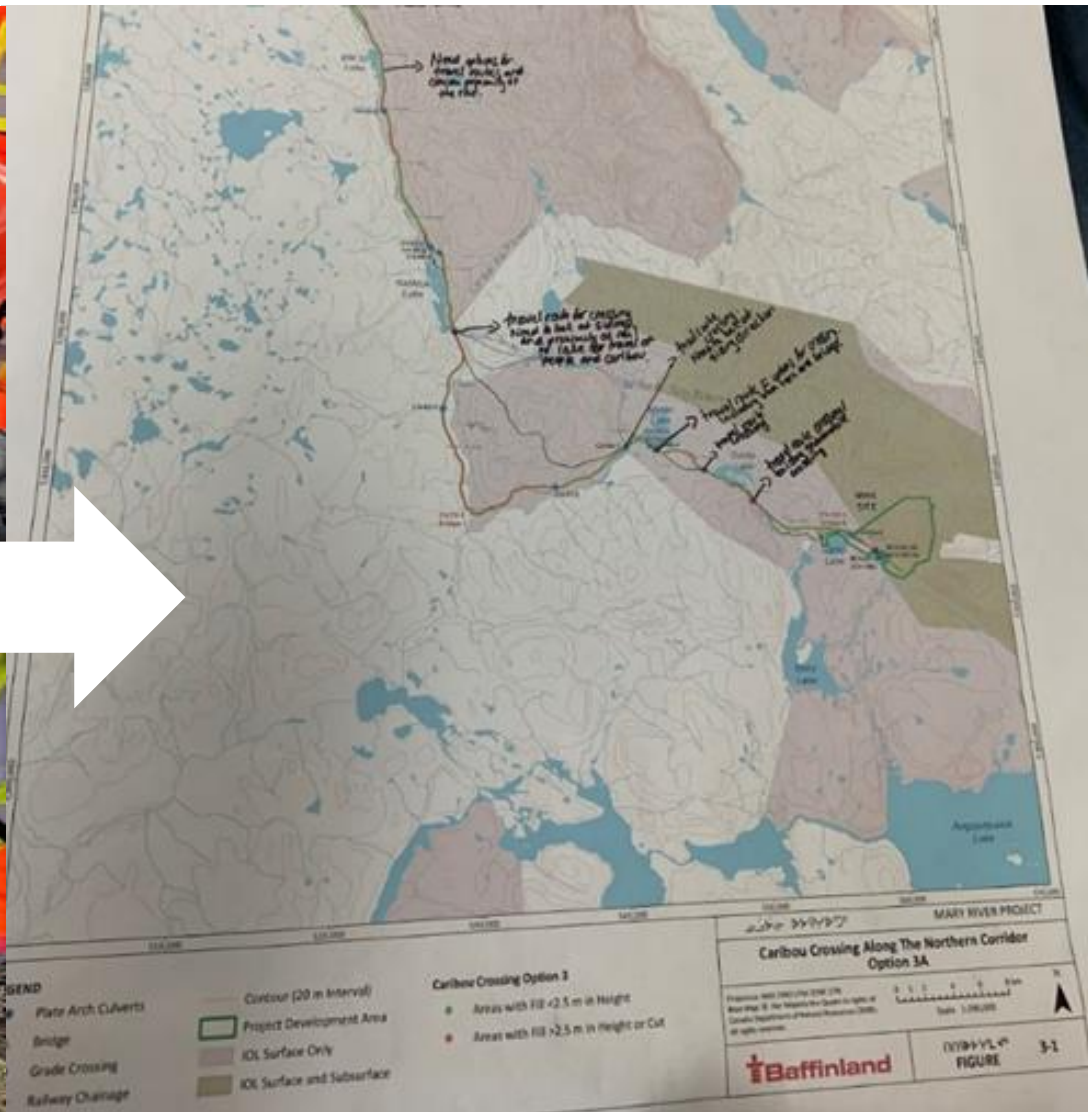
Mitigation in Design

- Habitat: Minimize footprint
- Movement: Trains, embankment engineering and crossings

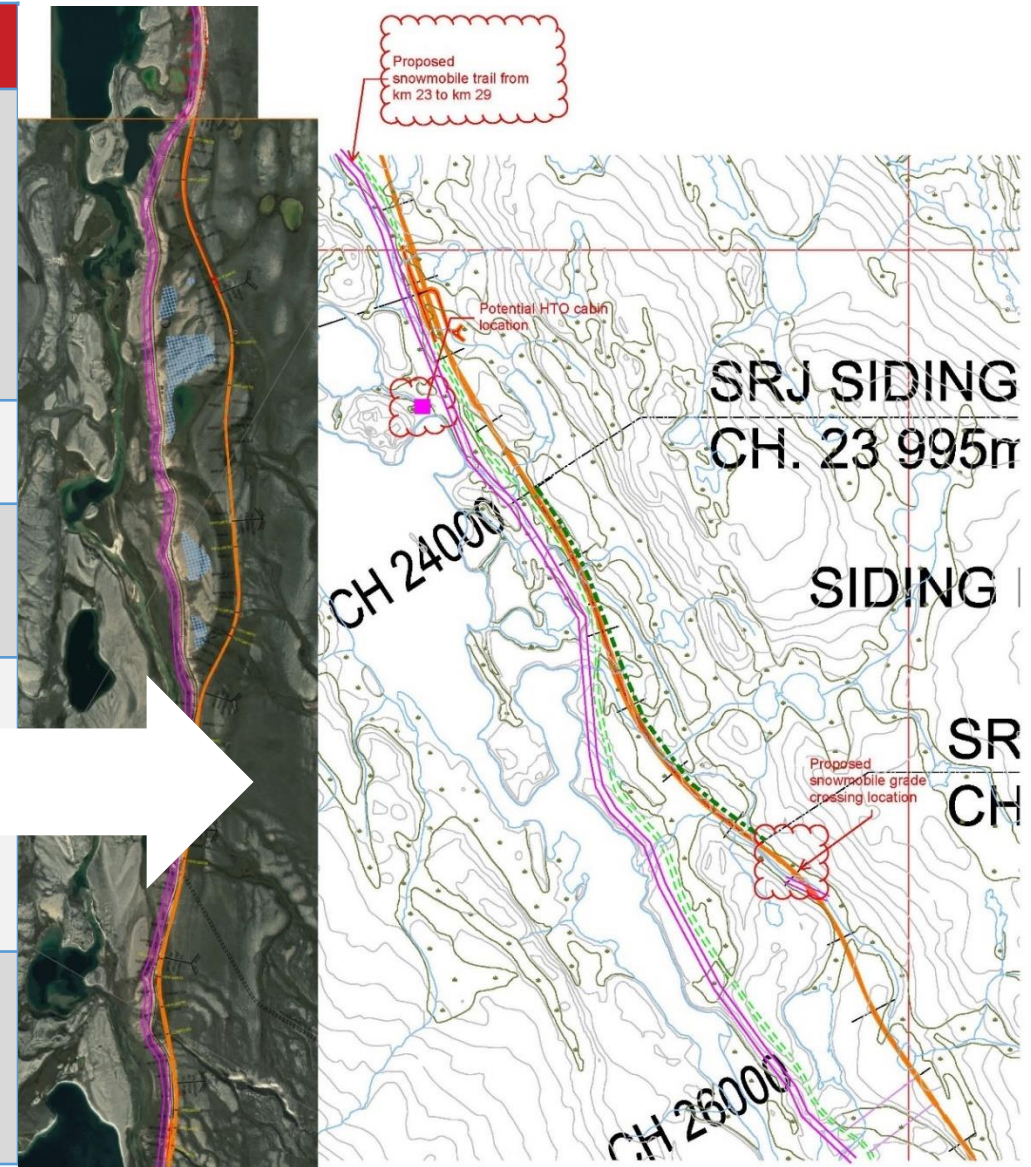
Mitigation in Operation

- Habitat: Minimize footprint, reclaim unused areas, dust control measures
- Movement: Wildlife has right-of-way, let the leaders pass, snow management
- Mortality: Non-Inuit no hunting, speed limits, protecting nests, employee awareness training
- Health: Air and noise management



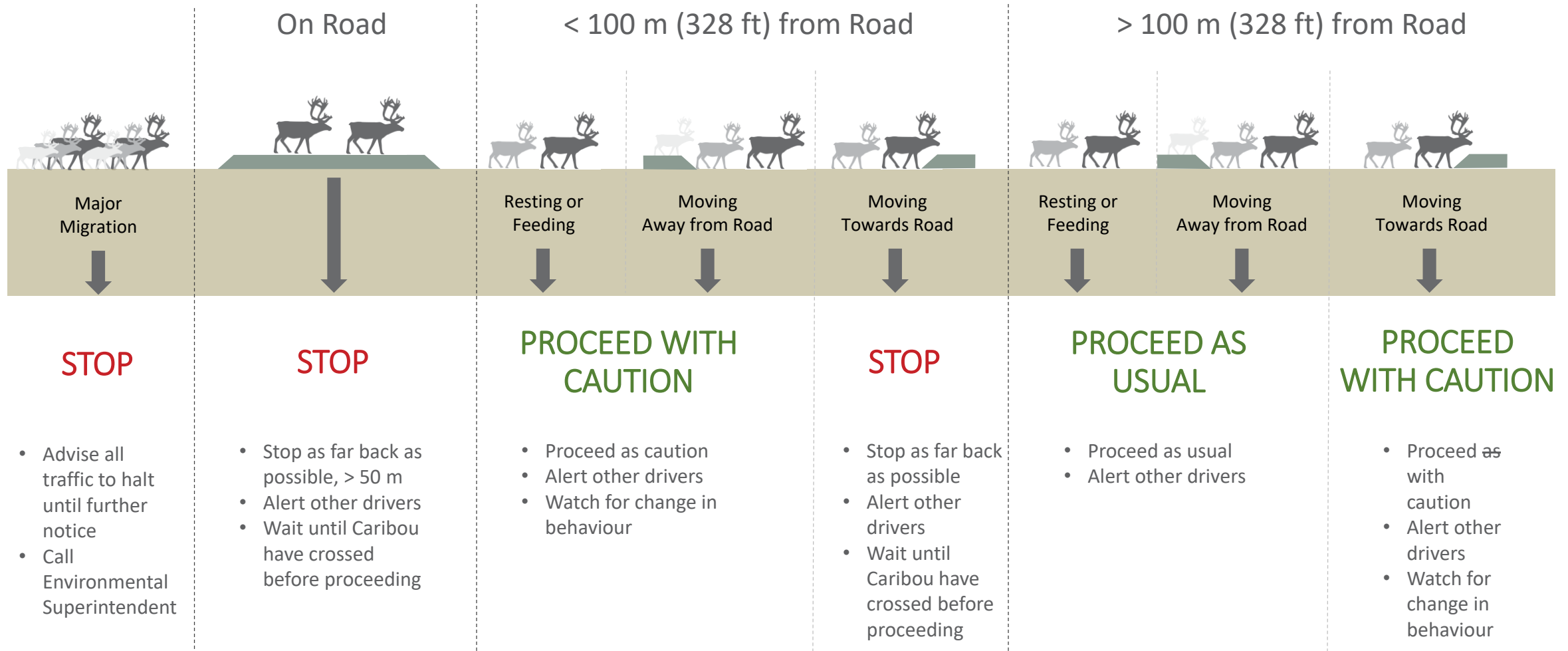


| Rail Km | Point of Interest Note | Baffinland Mitigation Notes |
|-----------------|---|---|
| Km 32 | Identified caribou movement and human crossing. | Consider what can be proposed. There are two culvert underpasses at Km 34 and Km 34.5. Provide a snow mobile trail between Km 29–33. Propose a culvert underpass at Km 29.5 |
| Km 29 | MHTO requested a snow machine crossing. | Underpass proposed at Km 29.5 |
| Km 26.5 | MHTO recommends a snow machine crossing. | Build a snow machine crossing. Propose a snow mobile trail between Km 23 and Km 29 |
| Km 25 – Km 24.8 | MHTO requests a snow machine crossing — in the winter, snowbanks are too high here. Two underpasses would be required in this area. | Another corridor for movement and consider options for travel route. Propose an HTO cabin in this area |
| Km 12 | Snow machine travel around the falls on Phillips Creek. | Baffinland consider alternatives to ensure safe travel, propose the provision of a snow mobile trail between Km 11.5 and 12.5 |

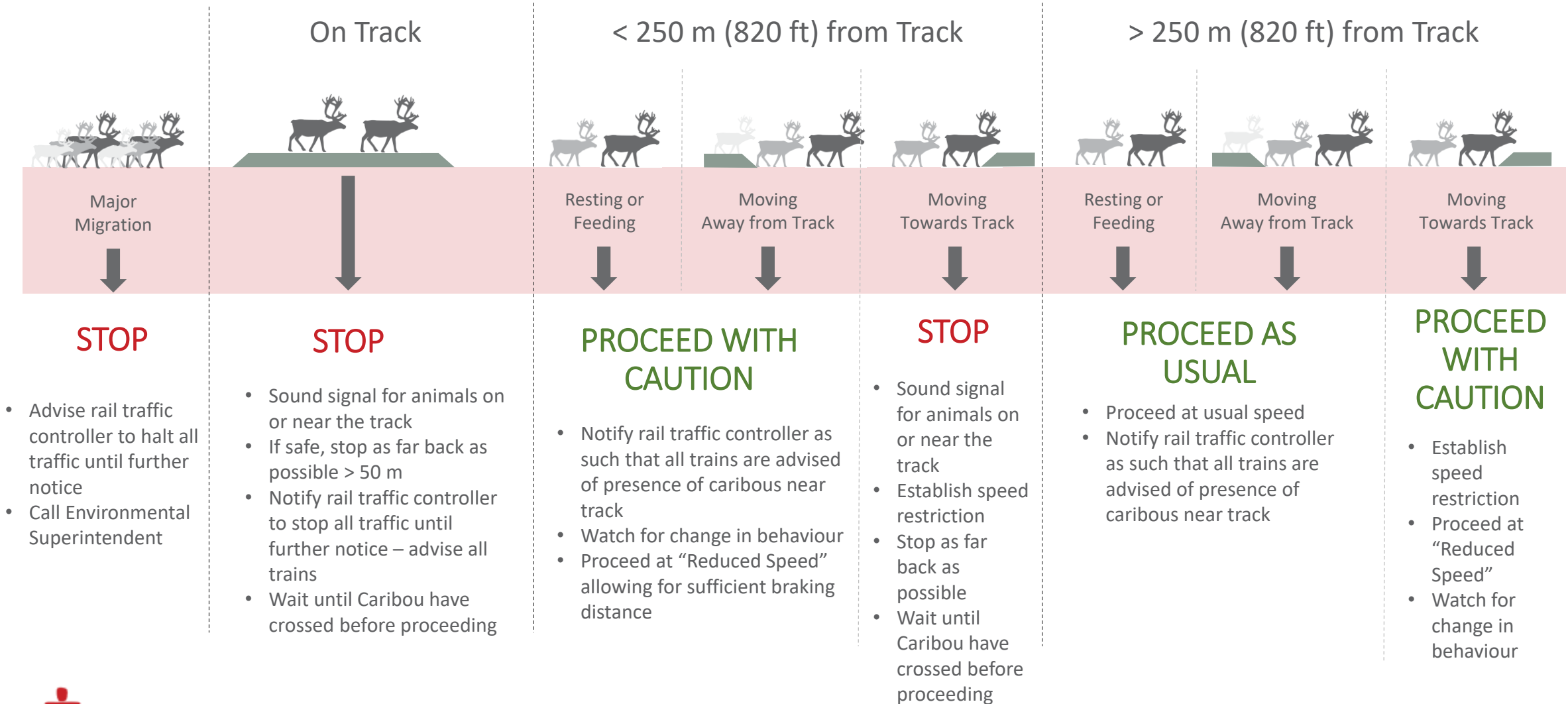




Caribou Decision Framework — Road



Caribou Decision Framework — Rail



Project Mitigation

Design

- 1:2 slopes ≥ 2 m (6.6 ft) ≤ 4 m (12.1 ft)
- Type 8 (< 6 in) embankment material
- Level crossings (humans and wildlife)
- Plate arch culverts (humans and wildlife)
- ~66% of rail passable by caribou without further mitigation
- Reduced disturbance compared to truck traffic

Operation

- Constant vigilance for animals and people
- Slow speeds and reasonable stopping distances
- Wildlife monitors present
- Hi-rail car used for monitoring
- Let the leaders pass
- Modify embankment as necessary



Monitoring and Follow-up Programs

Terrestrial Environment Mitigation and Monitoring Plan

(TSD 28, Appendix U)

Vegetation

- Dust fall
- Metal uptake
- Abundance and diversity

Birds

- Active migratory bird nest survey
- Contribution to regional bird monitoring
- Cliff-nesting raptor research

Caribou

- Project-specific monitoring (height of land, snow tracks, constant vigilance, harvester observation)
- Crossing structure monitoring
- Contribution to regional caribou monitoring

Terrestrial Environment Working Group

Culture, Resource and Land Use Monitoring



Inuit Involved In Monitoring





Phase 2 Terrestrial Impacts

The Phase 2 Project will have impacts that are not significant

Rail alignment deviation selection does not change outcome of assessment

Vegetation

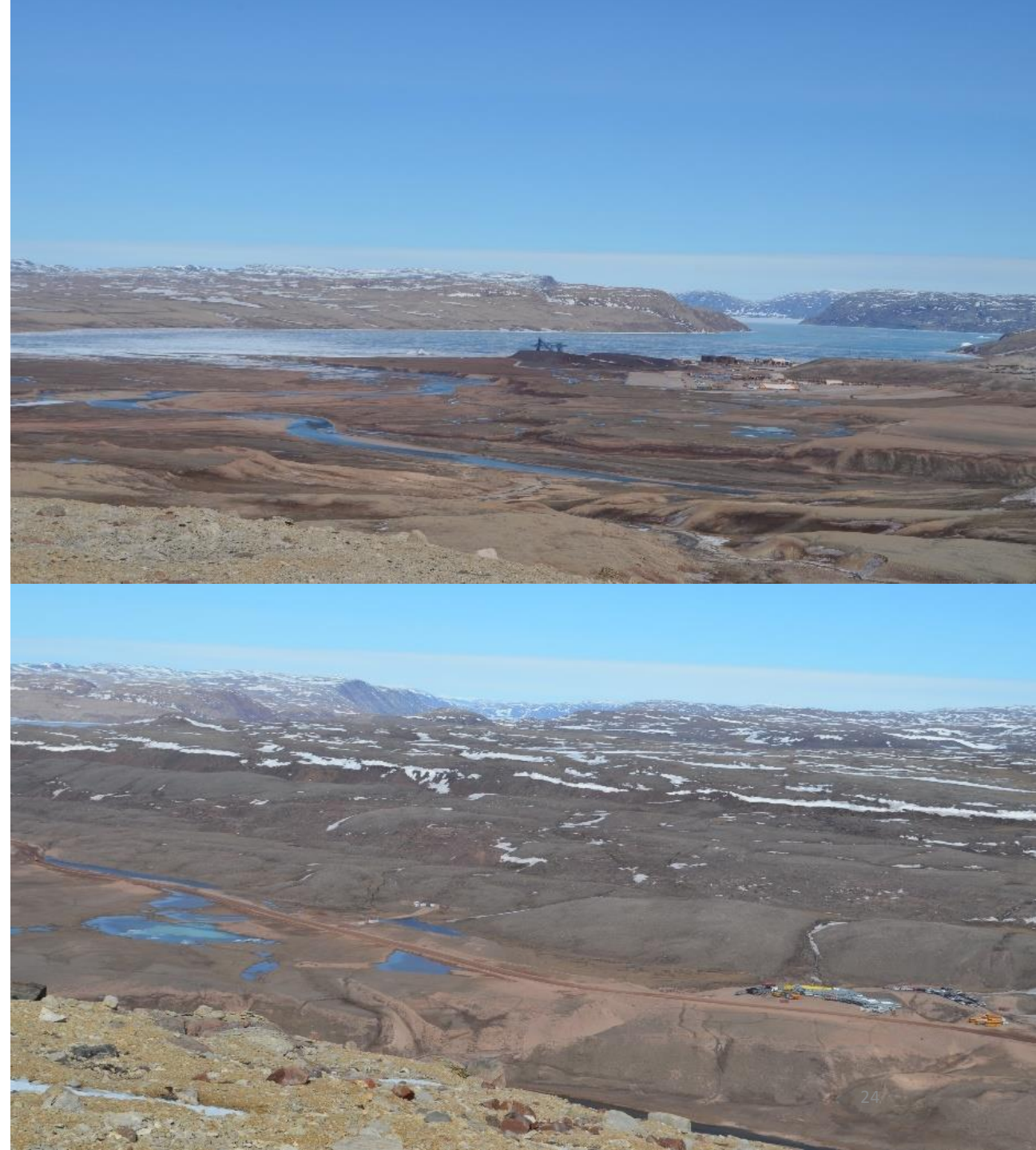
- Cumulative loss
- Forage (lichen) impacts
- Reclamation potential

Wildlife

- Cumulative habitat impacts
- Caribou movement can be mitigated
- Population will increase over time

Birds

- Cumulative habitat impacts



Key Issues Summary

- Railway as a potential barrier to human and caribou movement
- Railway alignment alternatives
- Cumulative impacts on caribou habitat
- Inuit knowledge incorporated in determining impact significance
- Regional monitoring efforts by Baffinland



Incorporating Lessons Learned

- Inuit participation and knowledge
- Dust
- Plants
- Birds
- Caribou
- Collaboration
- Lessons from other projects



Terrestrial Environment Oversight

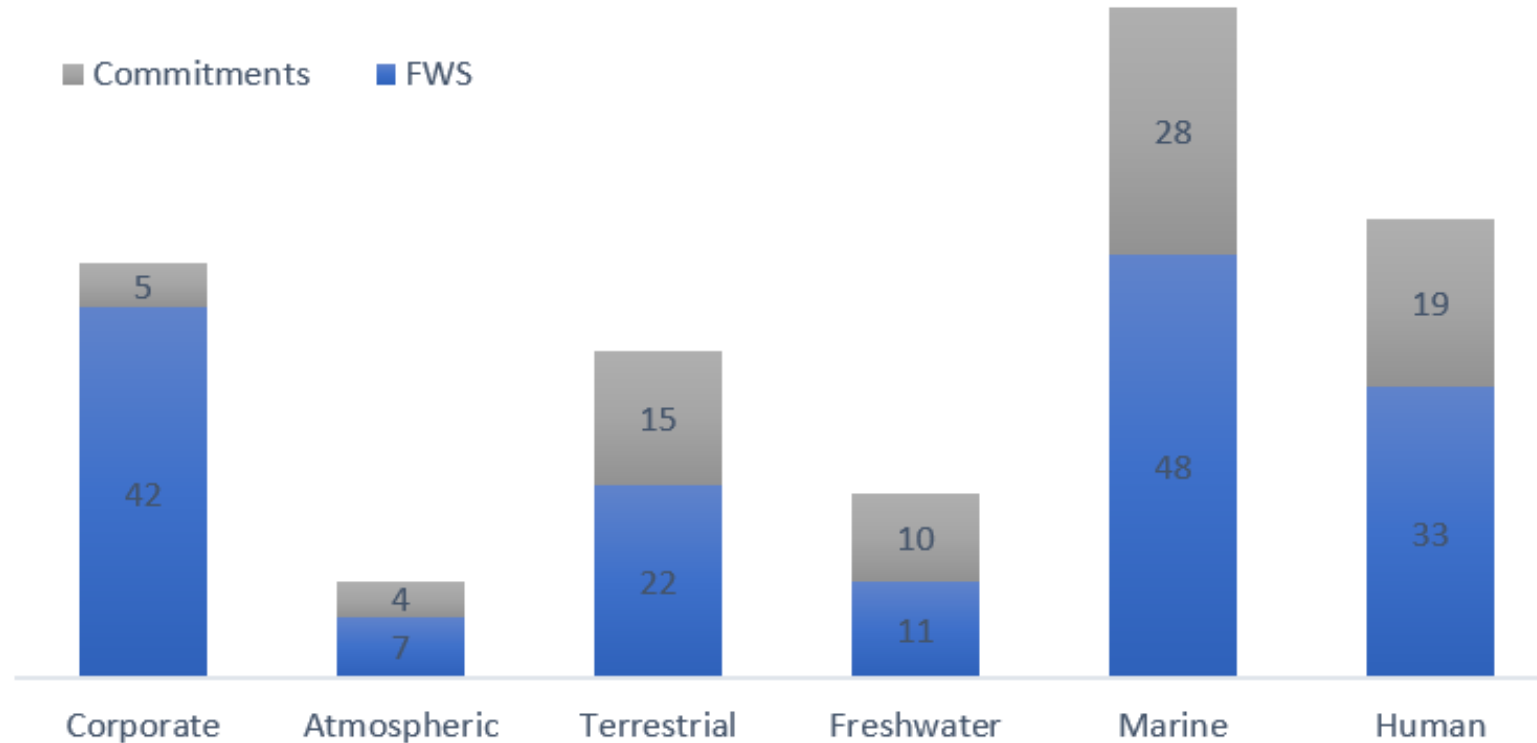
| | |
|----------------------------------|--|
| Annual Monitoring Reports | Feedback from Terrestrial Environment Working Group and Mittimatalik Hunters and Trappers Organization incorporated into program design and reports for the following year |
| NIRB Annual Reports | Summarizes annual operational activities, monitoring programs, trends, and compliance with regulatory permits |
| Topic Specific Meetings | Face-to-face meetings with Mittimatalik Hunters and Trappers Organization, Hamlets, and Qikiqtani Inuit Association representatives — discuss specific issues and concerns |
| Project Update Meetings | Annual meetings with Inuit and Qikiqtani Inuit Association representatives to update on ongoing operations or proposed Project changes |
| Site Visits | Mittimatalik Hunters and Trappers Organization and Hamlet site visits to see and discuss live operations |
| Inspections and Audits | Regulatory audits or inspections to ensure compliance with existing permits and approvals |
| Inuit Participation | Inuit Advisory Panel, community engagement and on the ground participation |
| Adaptive Management | Terrestrial Environment Working Group — submits technical comments/responses, face-to-face meetings to discuss proposed revisions or additions to existing mitigation measures |

An aerial photograph of a large, deep blue reservoir. A wide, light-colored road or path runs along the left side of the water, bordered by a steep, snow-covered embankment. The surrounding landscape is flat and covered in patches of snow and brown vegetation. In the distance, more land and possibly other water bodies are visible under a cloudy sky.

Technical Review Summary

Final Written Submissions

Final Written Submissions and Commitments



Select Examples – Commitments

- Regional caribou monitoring and railway design changes
- Study of snowbank heights and snow depth at representative locations along the North Railway
- Develop a mutually agreed upon caribou research agreement
- Modifications to North Railway Crossings
- Support a Harvester's Survey



Project Certificate Conditions

Project Certificate Conditions

- Existing 39 Terms and Conditions and 27 Commitments direct monitoring and mitigation
- Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) updated regularly based on “lessons learned”
- Existing monitoring and mitigation adequate to cover potential impacts of Approved Project and Phase 2 Proposal
- No new conditions required



Conclusion

Conclusion

- The terrestrial environment, outside of the Project Development Area, is adequately protected from Project disturbance
- Community input to the Project Proposal has made improvements to the protection plans
- The Mittimatalik Hunters and Trappers Organization, the Qikiqtani Inuit Association and regulators continue to monitor the effectiveness of Baffinland's Terrestrial Environment Mitigation and Monitoring Plan



