Tacora Resources Inc.

Scully Mine

Assessment of Alternatives for Tailings Disposal

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HATCH					

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List of Acronyms

Acronyms / Units	Description
AACE	Association for the Advancement of Cost Engineering
ARD	Acid Rock Drainage
BAT	Best Available Technology
CAPEX	Capital expenditure
CofA	Certificate of Approval
FS	Feasibility Study
GISTM	Global Industry Standard on Tailings Management https://globaltailingsreview.org/global-industry-standard/
Ha	Hectares or 10,000 m^2 (area)
LoM	Life of Mine
m^2	Square metres (area)
m^3	Cubic metres (volume)
MAA	Multiple accounts analysis
MDMER	Metal and Diamond Mining Effluent Regulations
ML	Metals Leaching
Mm^3	Million cubic metres (volume)
Mt	Million dry tonnes
Mtpa	Million dry tonnes per year
NAG	Non-Acid Generating
OoM	Order of Magnitude Study
OPEX	Operating expenditure
PFS	Pre-Feasibility Study
SWOT	Strengths, Weaknesses, Opportunities, and Threats
t	Tonnes
t/m^3	Dry tonnes per cubic metre (density)
TIA	Tailings Impoundment Area

List of Terminologies

Terminology	Description
Brown-field	A site where there has been or currently being used for industrial purposes on the land. It is opposite to a green-field site.
Centerline dike construction methodology	A dam construction methodology whereby the crest centreline of the dam raise section retains in the same alignment with each raise. The deposited tailings adjacent to the dam is allowed to drain and then can be compacted to be used to form the foundation for an upstream section of the subsequent dam levels as the dam is raised. Refer to Section 4.1.1 for additional description.
Closure	Closure is the period of time when the ore-extracting activities of a mine including tailings deposition in the TIA have ceased, and final decommissioning and mine reclamation are being completed. The objective is to return any physically disturbed areas to a state as near to the pre-mining condition as possible or potential land uses, as soon after the disturbance as practical. It also applies to the end of the life of a particular component of the mine, while the rest of the facility remains active. For example, a tailings impoundment may have reached the end of its operating life and the mining company wants to build a new one. The mining and processing are going to continue, but the old tailings impoundment must go into permanent closure.
Cyclone	A cyclone (or hydrocyclone) is an equipment used in mineral processing for classification of fine-coarse particles, and solid-liquid separation (dewatering) of feed slurry in a set of conically shaped housing. Slurry is fed into the hydrocyclone tangentially under a certain pressure. This creates a centrifugal movement, pushing at a design threshold, the heavier particles outward and downward alongside the wall of the conical part. Heavier particles are discharged through the apex at the bottom outlet as underflow, while the lighter particles are discharged from the top outlet as overflow.
Dam breach	A failure of the dam structure that results in loss of tailings and/or water containment with release and runout into the downstream area.
Dikes (also referred to as dams)	An earth-fill embankment structure used to retain water, tailings and/or water containing any other substance. Refer to Dam Safety Guidelines 2007 and Revised in 2013 (CDA, 2013).
Downstream dike construction methodology	A dam construction methodology whereby the crest centreline of the dam raise section moves in the downstream direction with each raise. Refer to Section 4.1.1 for additional description.
Green-field	A site where there has never been any industrial development or use on the land. The site is in a natural condition.
Process flow diagram	A diagram (flowsheet) for illustrating the general flow of plant processes and major equipment.
Progressive reclamation	Progressive reclamation will be carried out where practical during the Construction and Operations phases of the TIA, with an intent of a permanent closure state. Progressive reclamation reduces the effects of the environment on the disturbed areas, contributes to the achievement of a sustainable ecosystem sooner, and provides an opportunity to test reclamation strategies. Progressive reclamation will be carried out when a disturbed area is no longer required for operational purposes.

Terminology	Description
Seepage	A process in which a liquid flows slowly through a porous medium such as natural soils in the ground or a sandy fill of a tailings dike structure.
Spigot	Spigots are multiple outlets along a larger-diameter, delivery pipeline used to distribute tailings along a perimeter of the TIA. Multiple spigotting helps to reduce the discharge velocity of the tailings slurry being pumped to the TIA compared to single point (end-of-pipe) deposition.
Sterilized ore	Ore that is deemed to be no longer economically viable for mining the remaining ore due physical factors that have added costs of mining relative to the present price of the ore (e.g. filling of tailings into pit, flooding of pit, major pit slope failure, etc).
Tailings	A mineral waste that are by-products/residues from the mining process for extracting of ore. This by-product material comprises of fine particles liberated from the crushing and milling of the ore feed, and sometimes contains reagents used during the ore extraction process.
Thickener	A thickener is an equipment used in mineral processing for solid-liquid separation (dewatering) of feed slurry by principally sedimentation in a large diameter tank. The two outputs are the underflow (mostly concentrated/densified slurry) and overflow (mostly water). A mechanical racker system and flocculant dosage are employed within the thickener to promote separation and settlement characteristics of the feed slurry.
Upstream dike construction methodology	A dam construction methodology whereby the crest centreline of the dam raise section moves in the upstream direction with each raise. The deposited tailings adjacent to the dam is allowed to drain and then can be compacted to be used to form the foundation for subsequent levels as the dam is raised. Refer to Section 4.1.1 for additional description.

Executive Summary

Hatch conducted an assessment of alternatives for tailings disposal to store a revised life of mine (LoM) tailings production of 261 million tonnes (Mt) for the Tailings Expansion Project at Tacora's Scully Mine operations located near Wabush, Newfoundland & Labrador.

The purpose of this assessment of alternatives for tailings disposal is to objectively and rigorously assess feasible mine waste disposal options for the Tacora's Tailings Expansion Project in accordance with the Guidelines for the Assessment of Alternatives for Mine Waste Disposal, presented by the Mineral Processing Division of Environment and Climate Change Canada (ECCC, 2016), herein referred as the "ECCC Guidelines".

Presently, the tailings are generated at a rate of 6 to 8 million tonnes per year (Mtpa) as a by-product of the ore milling process and are dewatered to typically between 35% and 45% solids by weight using an existing conventional thickener at the process plant.

The tailings are presently disposed using thickened tailings slurry discharged in the permitted conditions of the existing Tailings Impoundment Area (TIA). Refer to Figure ES-1 for a general project location plan. The current disposal area under the Schedule 2 Permit is projected to reach capacity in approximately Year 2026, and utilizes the existing tailings deposition practices when the lake level will inundate the defined distances upstream of three identified tributaries feeding into the South Flora Lake. The objective of this order of magnitude (OoM) study is to evaluate strategies for the long-term plan management and storage of the tailings to a revised LoM, which is projected in 2047 (Tacora, 2021). This long-term plan for tailings management is referred to as the Tailings Expansion Project.

A summary of tailings production and storage requirements for the Tailings Expansion Project is presented in Table ES-1. A total of about 261 Mt of tailings will be produced over 22 years of planned mine life referenced from Year 2026. The equivalent total volume storage requirements will depend on the tailings disposal methodology in slurry form contained within an impoundment or in compacted filter cake form on a stack. For the slurry disposal method within an impoundment facility, the required storage volume is estimated to be 200 Mm^3 (assuming 1.6 t/m^3 settled dry density), while for the filter cake disposal method within a stack facility, the required storage volume is estimated to be 160 Mm^3 (assuming 2.0 t/m^3 compacted dry density). A contingency of 25% additional volume has been included for this scoping level of study to account for uncertainties with topographic data, deposit density/slope, frost entrapment, ore reserve and remaining capacity of the existing TIA.

Table ES-1: Summary of Tailings Production and Storage Requirements

Parameter	Assumption
Process plant operations	24 hour, 365 days/year operation at 90% availability
Tailings production rate	Typically ~12.3 Mtpa
Life of mine	22 years (2026 to 2047)
Total tailings production	261 Mtonnes
Required total storage capacity	200 Mm^3 at 1.6 t/m^3 density for slurry deposition 160 Mm^3 at 2.0 t/m^3 density for filtered tailings stack (includes additional 25% volume contingency)

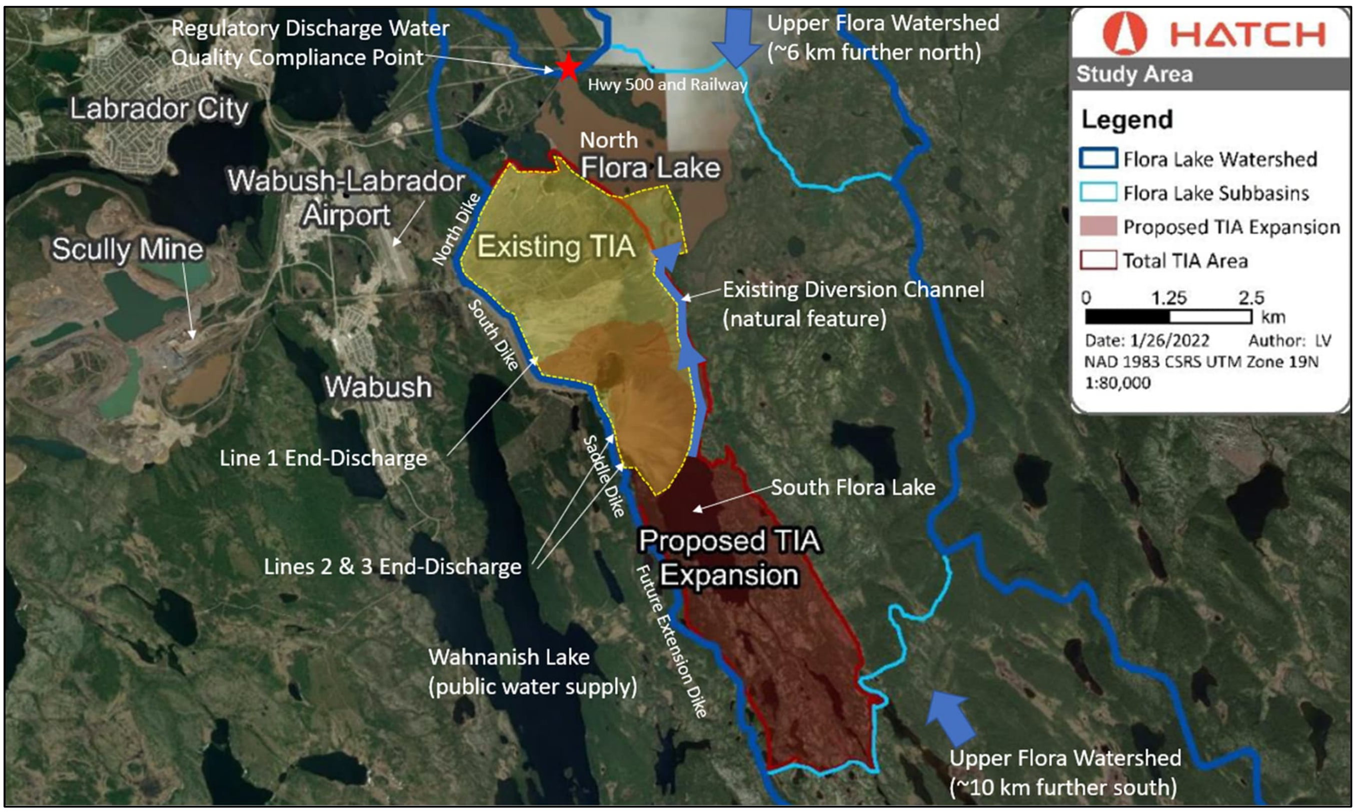


Figure ES-1: General Project Location Plan

STEP 1 – Identify Candidate Alternatives

Candidate Tailings Disposal Technologies

The selected tailings dewatering, transport and disposal method for the project must provide for stable, long-term containment and minimize impacts to the surrounding environment while still allowing the operation to be financially viable. This suitability of tailings dewatering and transport technologies is principally governed by the rheological characteristic curve of the tailings (i.e., solids concentration versus static yield stress relationship). The dewatering equipment, transport and disposal strategy are selected according to the targeted tailings form that is defined on the rheological characteristic curve. The principal tailings dewatering, transport and disposal technologies are categorized below:

- Thickened Slurry Tailings Impoundment
- Paste Tailings Impoundment
- Filtered Tailings Stack (also known as "Dry Stack")
- Co-Disposal Stack of Filtered Tailings with Waste Rock
- Off-site Markets for Commercial Re-Purposed Applications

Detail description and features associated with each technology option are provided in Section 4.1 of this report.

A summary of potential technologies for Tacora tailings disposal is presented in Table ES-2.

Candidate Tailings Disposal Sites

A high-level alternatives assessment for the siting of the expansion TIA was evaluated in coherence with the possible tailings disposal technologies. The initial exercise was to define and apply a threshold criteria to establish the regional boundaries for selecting candidate sites. Within the suitable regions, a number of candidate sites were identified.

Threshold criteria were used to "establish the regional boundaries for selecting candidate alternatives" (ECCC 2013). The following threshold criteria were developed and applied to the project area for the identification of possible disposal sites:

- Exclusion based on distance - Maximum 15 km radius search from Tacora's process plant. This is a practical distance threshold for a feasible transport of tailings slurry between the plant site and the designated TIA.
- Exclusion based on aviation zone restriction - Aviation zone restrictions of the nearby Wabush Airport on permitted maximum height of constructed structures within the zone.
- Exclusion based on presence of protected areas - Avoid designated Provincial Parks, Communities, and heritage designated areas. Avoid development and impacts within the Wahnahnish Lake Watershed due to its use by the Wabush Community for supply of public drinking water.

The regions considered are shown on Figure ES-2. The description of each region and the suitability for further assessment to identify candidate sites are presented in Table ES-3.

Table ES-2: Summary of Potential Technologies for Tacora Tailings Disposal

Technology	Potential Technology for TIA Expansion Project	Principal Justification
Thickened Slurry Impoundment	**Yes**	Existing experience, simple operation, immaterial greenhouse gas emissions and minimal electricity demand but lower storage efficiency results in larger environmental footprint and surface water management impacts. Refer to Section 4.1.1
Paste Tailings Impoundment	No	Cannot sustain slurry in paste form with expected steep rheological curve of Tacora tailings which are relatively coarse grained. This rheological curve makes for an impractical application of this technology. Refer to Section 4.1.2
Filtered Tailings Stack	**Yes**	Reduces environmental footprint impact and better geotechnical stability but complex operation, greater labour resourcing, high greenhouse gas emissions, high electricity demand and challenges, particularly during winter periods (compaction and dust control). Refer to Section 4.1.3
Co-Disposal Stack Filtered Tailings with Waste Rock Dump	No	Waste rock quantity insufficient to achieve benefit of waste rock dominant strength properties (1:1 ratio waste rock to tailings). Unreliability to achieve uniform homogenous mixing filtered tailings with coarse run-of-mine rocks (>1 m diameter particles). Thus, it is unfeasible for the application of this technology. Refer to Section 4.1.4
Off-site markets for commercial re-purposed applications	No	Off-site commercial application examples of tailings can be used as aggregates for paving, concrete and other bulk construction earthworks. Requires dewatering by filter equipment for enabling off-site transport (e.g. rail or dump trucks permitted on public roads). Not feasible considering high tailings production rate, limited local market demand/capitalization in the region, and no means of low-cost bulk transport to make this a viable opportunity.

Summary of Identified Candidate Alternatives

An identification and evaluation of possible technologies for dewatering, transport and disposal methodology of tailings, as well as possible disposal sites were described in the previous sections. A consolidation of candidate alternatives, that have been identified with respect to a holistic assessment of possible combinations with dewatering technologies and disposal sites, is summarized in Table ES-4. The locations of the identified candidates are illustrated on Figure ES-2.

Table ES-3: Suitability Assessment of Regions for Accommodating Candidate Disposal Sites

Region	Potential Region for TIA Expansion Project	Principal Justification
Flora Lake Watershed	**Yes**	• Connected with brown field of existing Tacora's tailings disposal operation situated within this watershed • RioTinto's IOC Mine has an existing tailings disposal operation located downstream of the same watercourse system • Potential disposal sites can be defined within portions of the watershed
Moosehead Lake Watershed	**Yes**	• Green field • No mining activities • Presence of residential dwellings and recreational use of area by local community • Potential disposal sites can be defined within portions of the watershed
Long Lake Watershed	**Yes**	• Green field but can be connected with brown field of existing Tacora's waste dump and open pit operations that are situated within this watershed • Significant number of existing land and mineral claims presents limited available area for TIA as well as obstacles to establish easement corridor for tailings slurry pipeline, utilities and access road infrastructure • Presence of residential dwellings and recreational use of area by local community
Wahnahnish Lake Watershed	No	• Not permitted for any disposal of tailings since this watershed is currently used as public water supply for communities of Wabash and Labrador City

Notes:

1. Specific disposal sites within a designated watershed region can be defined to suit requirements as illustrated on Figure ES-2.

Table ES-4: Summary of Identified Candidate Alternatives

Candidate Alternatives	Technology and Transport	Disposal Site	Construction Approach	Operation Approach	Closure Approach
Base Case (Expansion to Existing TIA)	Thickened slurry transported via pumps and pipelines	Upstream dike impoundment in Flora Lake Watershed	Extend slurry pipelines and additional pumpstations; clear dike footprint; construct containment dike on western perimeter; construction diversion channels	Subaerial perimeter deposition with discharge of effluent via single sedimentation pond (North Flora Lake)	Progressive vegetation cover; construct surface drainage ditches
Alternative 1	Thickened slurry transported via pumps and pipelines	Downstream dike Impoundment in Moosehead Lake Watershed	Extend slurry pipelines and additional pumpstations; construct containment dike on low perimeters and main sedimentation pond dike; construction diversion channels	Subaerial cone deposition with discharge of effluent via two sedimentation ponds	Progressive vegetation cover; surface drainage ditches; decommission sedimentation pond dikes
Alternative 2	Filtered tailings transported via haul trucks	Stack in Flora Lake Watershed	Extend slurry pipeline system, construct local filter plant; mobile fleet equipment shop, clear stack footprint	Stacking with mobile fleet; runoff directed to single sedimentation pond (South Flora Lake)	Progressive vegetation cover; surface drainage ditches; demolish all infrastructures
Alternative 3	Filtered tailings transported via haul trucks	Stack in Moosehead Lake Watershed	Extend slurry pipeline system, construct local filter plant; mobile fleet equipment shop, clear stack footprint	Stacking with mobile fleet; runoff directed to two sedimentation ponds	Progressive vegetation cover; surface drainage ditches; demolish all infrastructures
Alternative 4	Thickened slurry transported via pumps and pipelines	Upstream dike full-perimeter impoundment straddles Flora Lake Watershed and Moosehead Lake Watershed; North of Highway 500	Extend slurry pipelines and additional pumpstations; construct containment dike along full perimeter and sedimentation pond dikes; construct diversion channels	Subaerial perimeter deposition with discharge of effluent via two sedimentation ponds	Progressive vegetation cover on dike with tailings beach covered at closure; construction surface drainage ditches; decommission sedimentation pond dikes; demolish all infrastructures
Alternative 5	Filtered tailings transported via haul trucks	Stack in Flora Lake Watershed within subcatchment of Albert Lake; North of Highway 500	Extend slurry pipeline system, construct local filter plant; mobile fleet equipment shop, clear stack footprint	Stacking with mobile fleet; runoff directed to single pond	Progressive vegetation cover; surface drainage ditches; demolish all infrastructures
Alternative 6	Thickened slurry transported via pumps and pipelines	Upstream dike full-perimeter impoundment in Long Lake Watershed	Extend slurry pipelines and additional pumpstations; construct containment dike along full perimeter and sedimentation pond dikes; construct diversion channels	Subaerial perimeter deposition with discharge of effluent via sedimentation ponds	Progressive vegetation cover on dike with tailings beach covered at closure; surface drainage ditches; demolish all infrastructures
Alternative 7	Filtered tailings transported via haul trucks	Stack in Long Lake Watershed	Extend slurry pipeline system, construct local filter plant; mobile fleet equipment shop, clear stack footprint	Stacking with mobile fleet; runoff directed to single sedimentation ponds	Progressive vegetation cover; surface drainage ditches; demolish all infrastructures
Alternative 8	Thickened slurry transported via pumps and pipelines	In-pit disposal within exhausted Scully Mine open pit(s)	Rearrange slurry pipeline system to pits, construct containment dikes to compartmentalize the pit where required to store tailings and enable mining in other pit sections	Subaerial perimeter deposition with discharge of effluent via sedimentation ponds	Tailings mostly submerged in flooded pit; vegetation cover exposed tailings beaches; surface drainage ditches; demolish all infrastructures

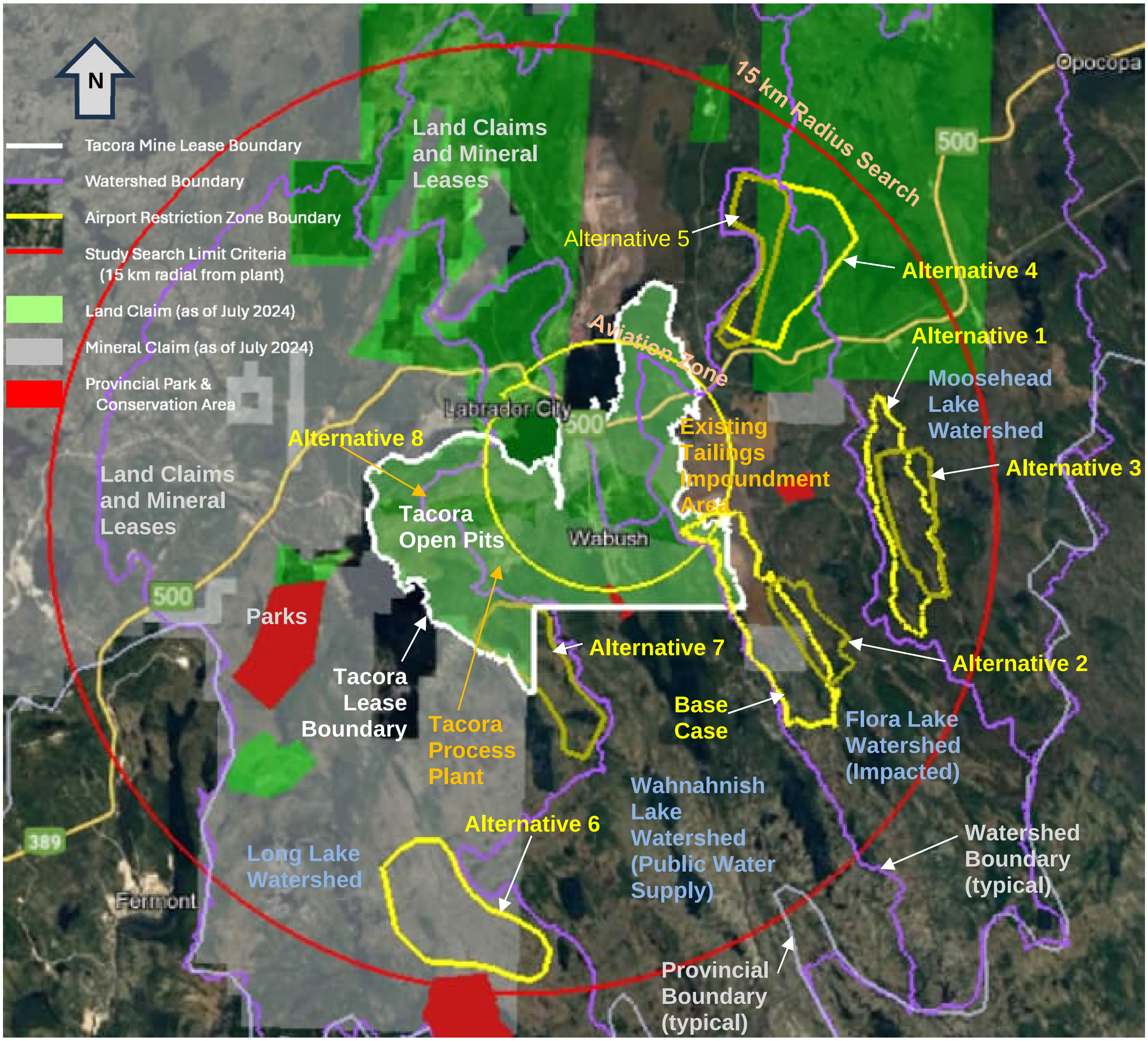


Figure ES-2: Location of Identified Candidate Alternatives and Key Constrains

STEP 2 - Pre-Screening Assessment

Five pre-screening criteria were defined for the project and applied to the identified candidate alternatives in order to exclude alternatives that are "non-compliant with certain unique minimum specifications that have been developed for the project" (ECCC 2013). The Guidelines describe this process as a "fatal-flaw analysis" where fatal flaws are defined as any site characteristic that is "so unfavorable or severe that, if taken singly, it would eliminate that site as a candidate".

Table ES-5 presents an assessment of outcomes regarding the application of the pre-screening criteria to the candidate alternatives. Candidate alternatives which do not comply with the pre-screening criteria were removed from further consideration in the assessment.

Table ES-5: Pre-Screening Criteria Summary Table

Pre-Screening Criterion	Base Case	Altern. 1	Altern. 2	Altern. 3	Altern. 4	Altern. 5	Altern. 6	Altern. 7	Altern. 8
Criterion 1 – Would the candidate have insufficient capacity for the proposed mine life?	No	No	No	No	**Yes**	**Yes**	No	No	**Yes**
Criterion 2 – Would the candidate result in negative life of mine economics?	No	No	No	No	No	No	No	No	**Yes**
Criterion 3 – Would the candidate overlie land or mineral claims held by others (including access and utility corridor to a disposal site)?	No	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**	No
Criterion 4 – Would the candidate require slurry transport infrastructure crossing the routes of existing public Highway 500 and commercial railway?	No	No	No	No	**Yes**	**Yes**	No	No	No
Criterion 5 – Would the TIA preclude future exploration or mining of a potential resource?	No	No	No	No	No	No	No	No	**Yes**
Should the candidate be excluded from further assessment?	No	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

The region's abundance of natural lakes and water courses frequented by fish significantly limits the identification of alternative footprints for tailings disposal that would not overprint such natural waters. As illustrated on Figure ES-2, Candidate Alternative 8 (in-pit disposal) is the only option that avoids impacting these natural waters. However, due to its exclusion based on pre-screening criteria, the preferred option among the remaining viable candidates will overprint natural waters and thus, necessitate regulatory provisions to designate the affected natural waterbodies as tailings impoundment areas for mine waste management.

An opportunity to utilize open pits for tailings in-pit disposal was assessed based on availability and suitability according to Tacora's mine plan. Given the pit configuration, development plan and waste rock storage requirements, there was no technically feasible opportunity for in-pit tailings disposal option for Tacora without unsafe operation and disruptions. Furthermore, infilling of tailings in depleted pits would effectively sterilize and eliminate the potential economic value for future mining of any underlying low-grade ore based on today's market value defining the cut-of-grade.

STEP 3 - Alternatives Characterization

Through the holistic evaluation and screening of suitable technologies for dewatering, transport and disposal methodology of tailings in parallel with suitable disposal sites, a list of identified tailings disposal alternatives is presented and described in Table ES-6. Figure ES-3 illustrates the relative locations of each disposal option.

Detail description and features associated with each disposal option are provided in Section 6 of this report.

A summary of the CAPEX and OPEX can be found in Table ES-7. The detailed breakdown of the CAPEX and OPEX can be found in Section 6.5 and Appendix A.

Tacora presently operates in the Flora Lake Watershed, located just upstream of Rio Tinto IOC's tailings disposal site within the same watercourse system. Consequently, impacting separate, undisturbed nearby watersheds would not be environmentally beneficial and would require more capital cost to construct an entirely new tailings facility.

It should be recognized that there are significant benefits for utilizing and developing within the single watershed system that already has two operating tailings facilities: Tacora Scully Mine (Flora Lake Watershed) and RioTinto IOC (Wabush Lake Watershed) operations. These mentionable benefits apply regardless of the tailings technology implemented and include:

- Integration/extension with existing TIA, sedimentation pond, and associated infrastructures for power, slurry pipeline transport and access road corridor.
- All the impacts associated with the development can be confined into a single watershed of the existing tailings facility, that of Flora Lake Watershed which drains to the north into Wabush Lake. This understanding could expediate the environmental impacts assessment, community consultation and permitting processes.

Table ES-6: Identified Alternatives for Multiple Account Analysis

Option	Dewatering	Transport	Disposal Site
Base Case (Expansion of Existing TIA)	• Thickened slurry using existing thickener at the Plant Site	• Centrifugal pumps and pipelines	• Expansion slurry impoundment (south of existing TIA) in Flora Lake Basin • Brown-field
Alternative 1	• Thickened slurry using existing thickener at the Plant Site	• Centrifugal pumps and pipelines	• New slurry impoundment in Moosehead Lake Basin • Green-field
Alternative 2	• Filtered tailings using new dewatering plant near tailings stack operation	• Centrifugal booster pumps and pipelines to new dewatering plant adjacent the disposal site. • Mobile equipment fleet at disposal stack area	• New stack (south of existing TIA) in Flora Lake Basin • Partially green-field since stack footprint on undeveloped land but has surface drainage connected to the developed South Flora Lake
Alternative 3	• Filtered tailings using new dewatering plant near tailings stack operation	• Centrifugal booster pumps and pipelines to new dewatering plant adjacent the disposal site. • Mobile equipment fleet	• New stack in Moosehead Lake Basin • Green-field

Table ES-7: Summary of OoM Combined CAPEX and OPEX Estimate

Item	Normalized Cost ($/tonne of tailings)			
	Base Case Thickened Slurry Impoundment at Flora	Alternative 1 Thickened Slurry Impoundment at Moosehead	Alternative 2 Filtered Tailings Stack at Flora	Alternative 3 Filtered Tailings Stack at Moosehead
Total CAPEX (per tonne of solid tailings)	0.7	1.79	1.67	1.88
Total OPEX (per tonne of solid tailings)	0.48	1.55	4.78	4.79
Total Cost (per tonne of solid tailings)	**1.18**	**3.34**	**6.46**	**6.66**

Notes:
1. Total installed cost of equipment estimated with Lang Factor of 5.1 (EEA Guide, 2015)
2. CAPEX includes sustaining CAPEX for tailings area earthworks (staged development to be assessed in future engineering).
3. AACE Class 5 Estimate (-35%/+65%).

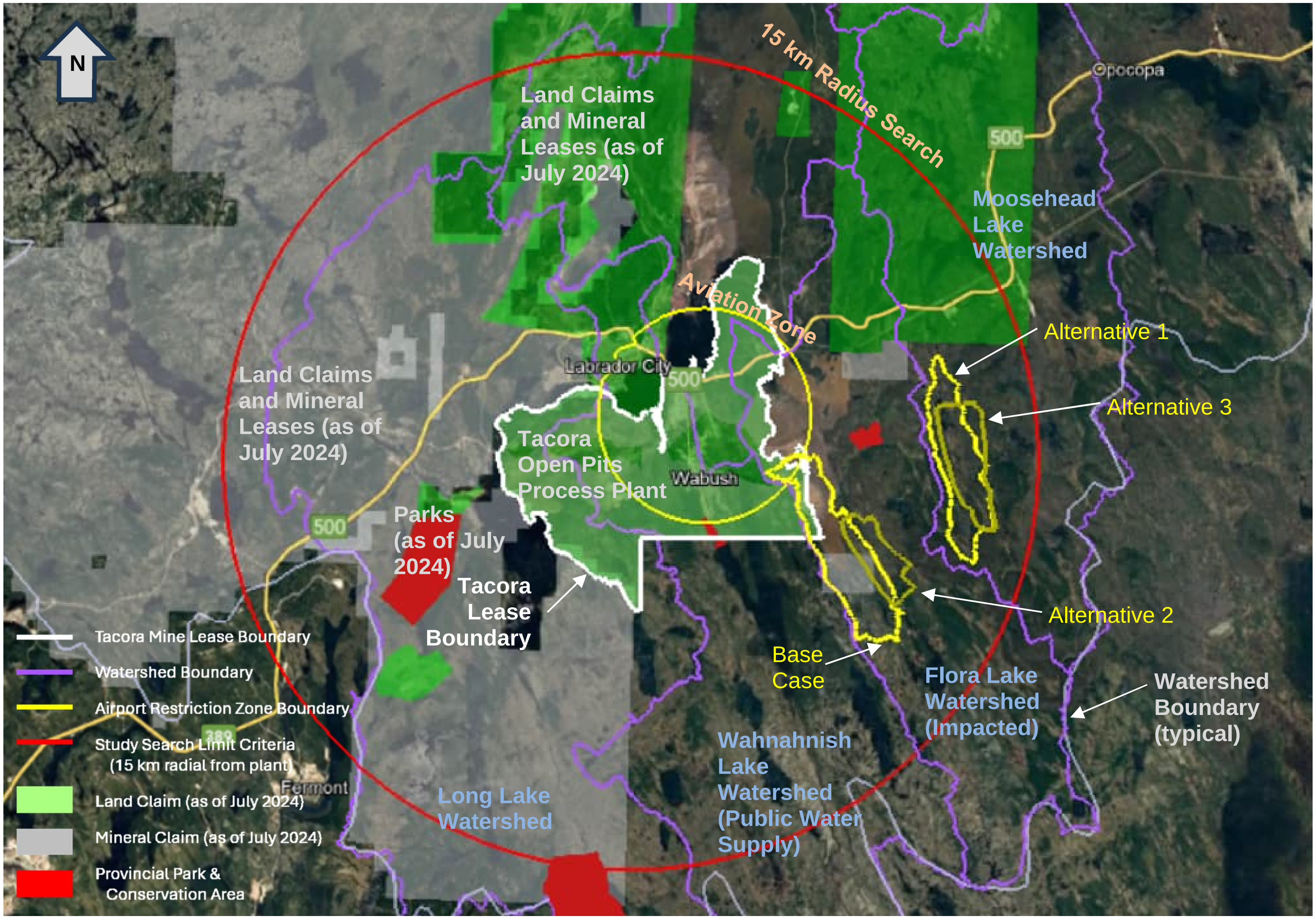


Figure ES-3: Map of Identified Tailings Site Options

STEP 4 - Multiple Accounts Ledger

The multiple accounts assessment (MAA) was carried out in accordance with the ECCC Guidelines to identify the best feasible tailings disposal option for the Tailings Expansion Project.

A multi-criteria matrix was generated and workshops for scoring of options were conducted over several sessions with stakeholder participations from Tacora, SEM and Hatch.

A multiple accounts ledger includes a three-level hierarchy comprised of accounts, sub-accounts and indicators. The accounts identify the general area of consideration and include the following:

1. Environmental impacts
2. Project financial
3. Technical and operational, and
4. Socio-economic impacts.

STEP 5 – Value-Based Decision Process

A quantitative analysis was carried out for indicators and sub-accounts associated with the accounts. The defined indicators and sub-accounts were assigned ranking values by the stakeholders. Each indicator and sub-account merit score was calculated with an assigned indicator weight distribution. The details of the racking values and scores are presented in Section 7. The overall account merit score and rating were determined for each account associated with each alternative, as summarized in Table ES-8 and plotted on Figure ES-4. It should be noted that these account merit ratings are unweighted against each account.

Table ES-8: Summary of Account Merit Ratings (Unweighted)

Account	Account Merit Rating (Ra)			
	Base Case Thickened Flora	Alternative 1 Thickened Moosehead	Alternative 2 Stack Flora	Alternative 3 Stack Moosehead
Environmental	3.89	2.17	2.53	1.58
Financial	4.22	2.49	3.60	1.96
Technical and Operational	4.65	3.06	3.23	2.81
Socio-Economic	4.93	1.99	5.18	2.14

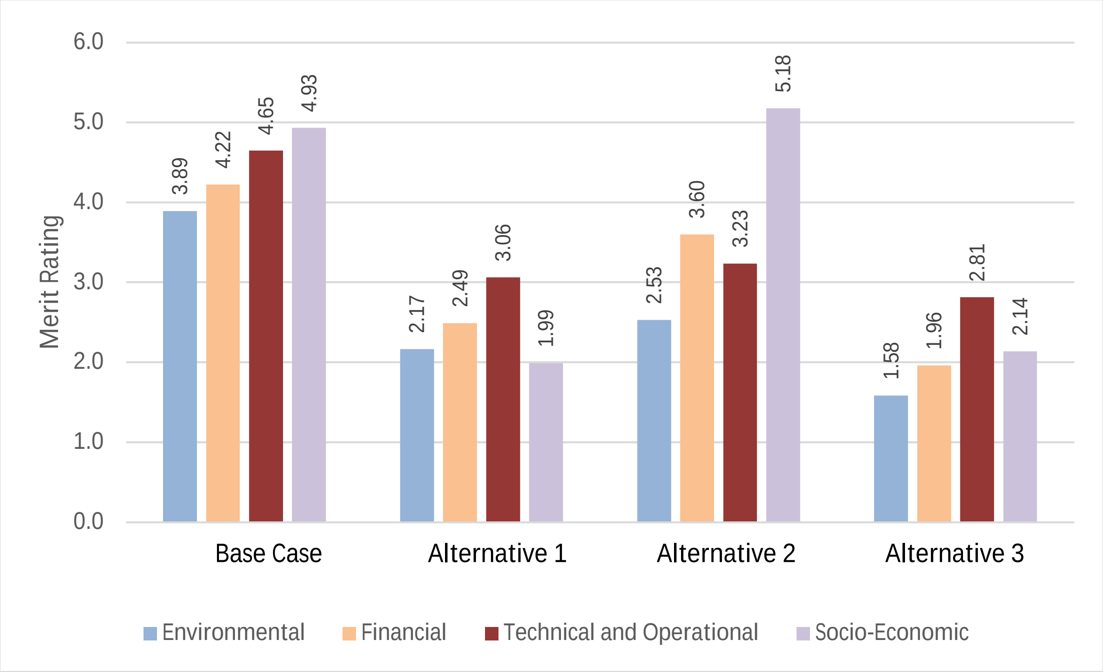


Figure ES-4: Summary Plot of Account Merit Ratings (Unweighted)

The base case scenario of account weights as suggested in Section 2.6.2 of the ECCC Guidelines are as follows (refer to Figure ES-5):

- Environment impacts = 6
- Project financial = 1.5
- Technical and operational = 3, and
- Socio-economic impacts = 3.

As provided in the Guidelines, the base case scenario includes weighting the environment account twice as important as the technical and socio-economic accounts, which in turn are weighted twice as important as the project economics account.

The alternative merit ratings calculated for each alternative are summarized in Table ES-9. The findings suggest the preferred option and consider the best available technology for the tailings disposal of the Tacora's Tailings Expansion Project is the Base Case with an alternative merit rating of 4.33 out of a maximum of 6.00. The runner-up option of Alternative 2 has an alternative merit rating of 3.39 which was marginally higher than Alternative 1 (rating of 2.36).

Table ES-9: Summary of Alternative Merit Score and Rating (Weighted)

Account	Weight Distribution (%)	Weight Indicator (W)	Alternative Merit Score (S x W)			
			Base Case Thickened Flora	Alternative 1 Thickened Moosehead	Alternative 2 Stack Flora	Alternative 3 Stack Moosehead
Environmental	45%	6	23.33	13.00	15.17	9.50
Financial	11%	1.5	6.34	3.73	5.40	2.94
Technical and Operational	22%	3	13.94	9.18	9.70	8.44
Socio-Economic	22%	3	14.79	5.96	15.53	6.41
Alternative merit score (Σ{S x W})			58.39	31.88	45.80	27.29
Alternative merit rating (Ra = Σ{S x W} / ΣW)			**4.33**	**2.36**	**3.39**	**2.02**

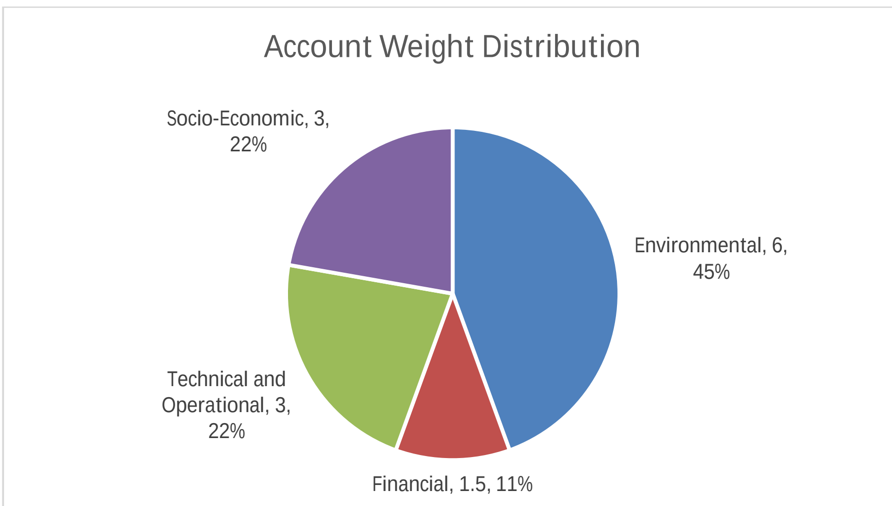


Figure ES-5: Weight Distribution of Accounts

STEP 6 - Sensitivity Analysis of Accounts

A sensitivity analysis was carried out to evaluate the robustness of the analytical process, to manage bias and subjectivity, and to determine the degree to which various options are influenced by the choice of weightings.

Five scenarios were given consideration, including the “Base Case” account weighting factors required by the ECCC Guidelines:

- Scenario 1: Base scenario using account weight distribution as per Section 2.6.2 of ECCC Guidelines
- Scenario 2: All accounts weighted equally as per Section 2.6.2 of ECCC Guidelines;

- Scenario 3: Increase weight importance on CAPEX due to risk of obtaining capital investment changed weighting on all accounts to bias financial: Env=25% (4); Fin=38% (6); Tech=25% (4); Socio=13% (2)
- Scenario 4: Increase weight distribution (scoring) importance on Tech & Ops risks for dike stability and safety: Env=22% (3); Fin=22% (3); Tech=45% (6); Socio=11% (1.5)
- Scenario 5: Increase weight distribution (scoring) importance on socio-economic account: Env=22% (3); Fin=11% (1.5); Tech=22% (3); Socio=45% (6)

The results of the sensitivity analyses are documented in Table ES-10. The sensitivity analyses found that the result of the MAA is robust and not sensitive to change. For all scenarios, the relative order of preference did change somewhat between Alternatives 1, 2 and 3; however, the Base Case remained distinctly the preferred option in all scenarios considered.

Table ES-10: Sensitivity Analysis of Account Merit Rating (Weighted)

Analysis Scenario	Scenario Description	Alternative Merit Rating			
		Base Case Thickened Flora	Alternative 1 Thickened Moosehead	Alternative 2 Stack Flora	Alternative 3 Stack Moosehead
1	Base scenario (as per Section 2.6.2 of ECCC Guidelines); Env=45% (6); Fin=11% (1.5); Tech=22% (3); Socio=22% (3)	**4.33**	2.36	3.39	2.02
2	Equal weighting on all accounts (as per Section 2.6.2 of ECCC Guidelines)	**4.42**	2.43	3.63	2.12
3	Increase weight importance on CAPEX due to risk of obtaining capital investment changed weighting on all accounts to bias financial: Env=25% (4); Fin=38% (6); Tech=25% (4); Socio=13% (2)	**4.33**	2.49	3.44	2.10
4	Increase weight importance on Tech & Ops risks for dike stability and safety: Env=22% (3); Fin=22% (3); Tech=45% (6); Socio=11% (1.5)	**4.42**	2.62	3.37	2.28
5	Increase weight importance on socio-economic account: Env=22% (3); Fin=11% (1.5); Tech=22% (3); Socio=45% (6)	**4.56**	2.32	3.98	2.14

Conclusions and Recommendations

Using the methodology and the MAA decision making tool as outlined in the Guidelines on The Assessment of Alternatives for Mine Waste Disposal (ECCC, 2016), the preferred option and considered best available technology for the tailings disposal of the Tacora's Tailings Expansion Project is the Base Case with an alternative merit rating of 4.33 out of a maximum of 6.00 (refer to Table ES-9). The general arrangement of the Base Case option is shown on Figure ES-3.

A sensitivity analysis comprising of five additional scenarios was carried out to evaluate the robustness of the analytical process and to determine the degree to which distinct options are influenced by the choice of weightings. The sensitivity analysis found that the MAA is robust and not sensitive to change. For all scenarios, the Base Case remained distinctly the preferred option (refer to Table ES-10). In conclusion, the Base Case of thickened slurry tailings disposal in the expansion facility at the Flora Lake Watershed is the preferred option based on the balance obtained through the environmental, financial, technical and socio-economic project risks.

The storage of thickened tailings in earthen impoundments has increased environmental and perceived social implications compared to filtered tailings in a stack but for Tacora, the thickened tailings technology remains the preferable option. The use of upstream raised containment dikes as the earthen impoundment would still be required for this option, but these are considered low consequence structures with a rare probability risk of instability. Short runout distances from a hypothetical dam breach (i.e. limited to a slump failure) would be expected given there would be no direct retaining of a pond immediately upstream of the dikes to otherwise cause a fluidized, long runout distance that is typical of other thickened tailings impoundments.

1. Introduction

Hatch conducted an assessment of alternatives for tailings disposal to store a revised life of mine (LoM) tailings production of 320 million tonnes (Mt) at Tacora's Scully Mine operations located near Wabush, Newfoundland & Labrador.

Scully Mine currently utilizes an existing Tailings Impoundment Area (TIA) approved under Schedule 2 of the Metal and Diamond Mining Effluent Regulations (MDMER) of the Fisheries Act. Based on current mining rates and tailings production, the existing TIA is expected to reach full capacity before ore reserves are completely mined. The current disposal area under the Schedule 2 Permit is projected to reach capacity in approximately Year 2026 utilizing the existing tailings deposition practices. The objective of this order of magnitude (OoM) study is to evaluate strategies for the long-term plan management and storage of the tailings to a revised LoM, which is projected in 2047 (Tacora, 2021). This long-term plan for tailings management is referred to the as Tailings Expansion Project.

Recent tailings dam failures at Mount Polley Mine, Samarco Mine and Bromadinho Mine resulted in a breach of containment and subsequent discharge of tailings and water to the surrounding environment. Independent review panels completed forensic studies on these failures and recommended determining Best Available Technology (BAT) for tailings disposal specific to a project site. Hence, BAT was considered in the evaluation of alternative tailings disposal options presented herein. As projects proceed through design and permitting phases, it is anticipated that overall and individual project components will be optimized. The principal technologies considered in this study are those commonly used in the mining industry:

- Thickened Tailings Impoundment
- Paste Tailings Impoundment
- Filtered tailings stack (also known as "Dry Stack")
- Co-Disposal of Filtered Tailings with Waste Rock

1.1 Scope of Work

The scope of work for the assessment of alternatives for tailings disposal includes the following tasks and deliverables:

- Data gathering and review of available information.
- Identification and pre-screening of all potential options, definition of selection criteria and weighting factors in consultation with project stakeholders.
- Order of magnitude evaluation of candidate options including development of general layout, volumetric calculations of facility geometries, CAPEX and OPEX estimate calculations.

- Multiple Account Assessment (MAA) workshops to rank and score the preferred options with project stakeholders.
- Summary presentation of assessment findings.

The assessment was completed following the Guidelines for the Assessment of Alternatives for Mine Waste Disposal, presented by the Mineral Processing Division of Environment and Climate Change Canada (ECCC, 2016), herein referred as the "ECCC Guidelines".

2. Background Information

2.1 Existing Tailings Management Overview

The Scully Mine had been in operation from 1965 to 2014, when the mine was shut down by Cliffs Natural Resources, and then was back in operation in 2019 after the mine was acquired by Tacora Resources Inc. ("Tacora"). The TIA is located approximately two kilometres northeast of the Town of Wabush, adjacent to the Wabush Airport, approximately five kilometres east of the Wabush Mines plant site, as shown on Figure 2-1. The TIA was developed within the Flora Lake Watershed to store the tailings generated by the beneficiation process since the start of operation in 1965. It was formed by constructing dikes in areas of low topography along the western rigid of the Flora Lake Watershed and depositing tailings into the lake from west to east, away from the Town of Wabush and its water supply from the adjacent Wahnahnish Lake Watershed. As deposition progressed, Flora Lake was divided into two bodies of water by the advancing tailings beach, which are namely North Flora Lake and South Flora Lake. The western perimeter of the TIA is formed by three dikes:

1. North Dike, which extends from the Tailings Line Road to the north end of the TIA;
2. South Dike, which extends from the Tailings Line Road south toward Wahnahnish Lake and east toward South Flora Lake; and
3. Saddle Dike, which is an extension of South Dike across a topographic low section.

Supernatant water of the discharged tailings slurry, along with the natural runoff from the upper Flora Lake Watershed, is conveyed northward through a natural drainage pathway known as the Diversion Channel. This channel is formed by the tailings beach and the eastern valley hillside. The water flows into North Flora Lake which serves as a sediment control (i.e. sedimentation pond) prior to final discharge into the downstream receiver of Wabush Lake. It should be noted that this receiving Wabush Lake is used as a tailings disposal facility for a nearby iron ore mine operated by RioTinto (Iron Ore Company - IOC).

All existing dikes, except the Saddle Dike, have been raised using the upstream construction methodology. The Saddle Dike was constructed as a starter embankment with a future plan for upstream raises. Since the foundation of the dikes are at least 15 m above the level of the Flora Lakes and Diversion Channel outlets, it is not possible for a pond to hydraulically develop against or be retained by the upstream raised dike structures. Thus, use of upstream raised containment dikes as the earth-fill impoundment are considered low consequence structures with a rare probability of risk for dike instability. Short runout distances from a hypothetical dam breach (i.e. limited to a slump failure) would be expected given there would be no direct retaining of a pond immediately upstream of the dikes to otherwise cause a fluidized, long runout distance that is typical of other upstream raised tailings impoundments.

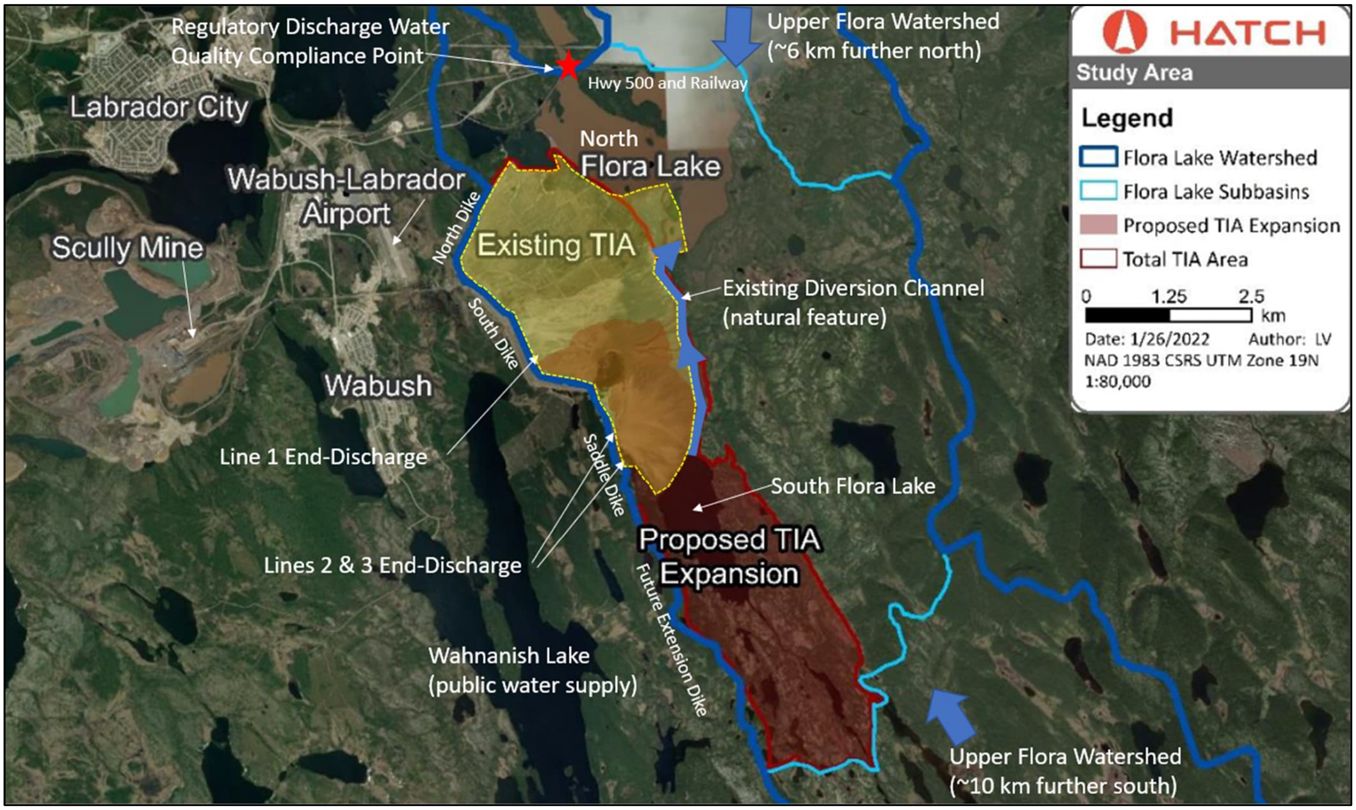
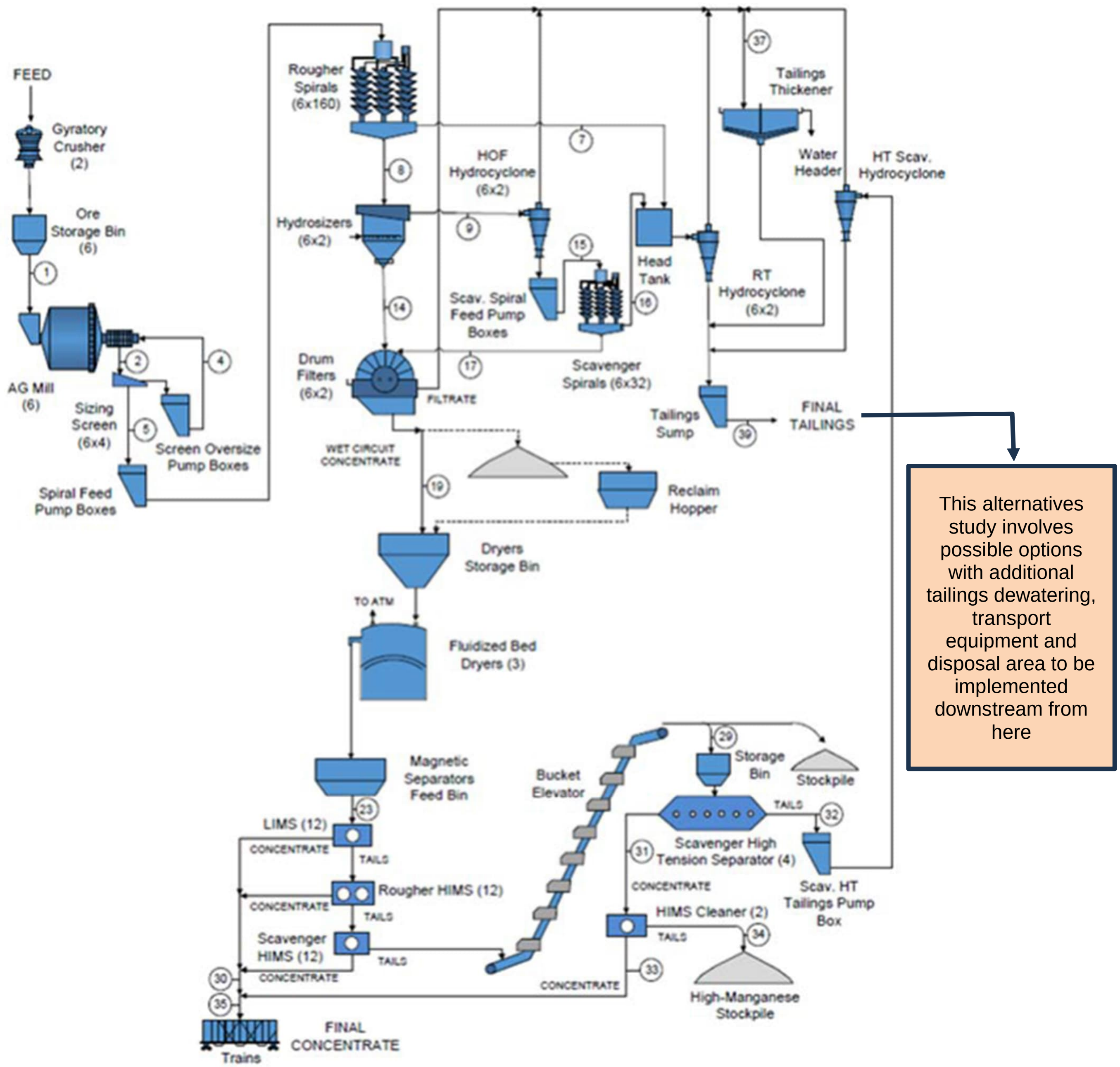


Figure 2-1: General Project Location Plan

Presently, the tailings are generated at a rate of 6 to 8 million tonnes per year (Mtpa) as a by-product of the ore milling process and are dewatered to typically between 35% and 45% solids by weight using an existing conventional thickener at the process plant. Figure 2-2 illustrates a simplified process flow diagram of the existing process plant. The underflow of the thickener is pumped to a transfer box and is then pumped using a staged series of centrifugal pumps in two rubber lined pipelines overland from the process plant to the TIA. A spare third steel pipeline, a gland seal water supply line and overhead powerline are provided to support the slurry transport system.

Slurry is typically discharged from end of pipe at strategic locations along the dike crest of the western perimeter of the TIA. The discharged slurry forms a deposit beach that slopes largely from west to east where the tailings particles segregate and the supernatant water with the finer particles is carried to the far reaches of the beach deposit against the eastern valley hillside or into the South Flora Lake.



Reference: Figure 17.1 Scully Mill Flow Sheet from 2021 Feasibility Study Update Report (Tacora, 2021)

Figure 2-2: Simplified Process Flow Diagram of Existing Process Plant

The deposition plan for the current thickened tailings operation will reach a configuration whereby the compliance of the existing Schedule 2 Permit criteria could be exceeded which is projected to be in approximately Year 2026 when the lake level would inundate defined distances of three identified tributaries feeding to the South Flora Lake. Potential contingencies for tailings storage are available within underutilized sections of the existing

TIA to extend and gain an additional 2 to 3 years of storage capacity, if necessary to continue operations under the current Schedule 2 Permit criteria.

2.2 Project Setting

This section provides an overview of the Project setting to provide context for the alternatives assessment and provide a description of the general character of the area where the Project will be developed. Generally, the information used in the assessment is based on regional mapping and other database sources and not on baseline field studies. This approach was adopted for the alternatives assessment because field investigations and studies were not carried out for all of the areas overlain by the identified alternatives.

2.2.1 Site Climatic and Seismicity

The site is located within the extensive Mid Subarctic Forest ecoregion (Meades 1990i), which encompasses the upland plateaus of central and western Labrador. This area has a continental, subarctic climate with cool, short summers and long cold winters. At Wabush Airport, daily average temperatures range from -27.8°C in January to +19.1°C in July, with an annual average temperature of -3.1°C. The annual total precipitation is approximately 839.5 mm where 428.7 cm is reported as snowfall, with prevailing westerly winds (Environment Canada https://climate.weather.gc.ca/ accessed 2021-03-25). The cold climate conditions must be factored into the operability of a tailings facility.

The site has low seismicity with a peak ground acceleration of 0.0372g for site class A at 2%/50 years (0.000404 per annum) probability according to the National Building Code 2020 of Canada Seismic Hazard Tool.

2.2.2 Foundation Conditions

The region is characterized by elongated shallow valley topography with glacial and lacustrine deposits over bedrock; frequent rock outcrops. Fresh waterbodies and watercourses are scattered throughout the land which presents challenges of siting a tailings facility without avoiding any natural waterbodies and watercourses.

Based on available information on the characterization of the existing TIA, the overburden thickness at the TIA is variable ranging from less than 1 m to greater than 10 m; with an average thickness of 5 m (Golder, 1993, 2007, 2013). Topsoil found at the site varies from 0.1 to 0.55 m thick and consists of moist, dark brown, silty sand with organics. This is underlain by a glacial till that is the dominant surficial material type. The glacial till is comprised of silt, sand and gravel and has been described as a ‘blanket layer’ of varying thickness. Standard Penetration Tests (SPT) and laboratory testing indicate the till is generally compact to dense, firm to hard, with low plasticity. Occasionally eolian sediments overlie the glacial till to form a surficial cover up to 5 m thick in the main valley of the TIA and are more prevalent on the northwest facing slopes. Colluvium deposits are commonly found on hillside spurs below bedrock outcrops. Bedrock consists of competent, low permeability Nicola Group volcaniclastic and sedimentary rocks.

Detailed information including test pit logs, borehole logs and laboratory test results can be found in the existing geotechnical investigation and stability assessment reports.

No specific surficial geological mapping and site investigation data exists beyond the immediate confines of the existing tailings area. Thus, the foundation conditions in other areas were assumed to have similar characteristics but a specific site investigation is required should a preferred site be selected for further engineering study.

2.2.3 Environmental Assessment

Environmental Assessment Registration (Tacora, 2021) has been prepared specifically in relation to the undeveloped area south of the current TIA (a studied area for potential candidate site of the Expansion Project) by Tacora with assistance from Sikumiut Environmental Management Ltd. (SEM). It should be noted that field investigations and studies were not carried out for all of the areas overlain by the identified alternatives.

There are no known historic and heritage resources within the studied area, however, there are no existing environmental studies that focus on cultural or historical resources. The studied area has already been heavily impacted and is located within an region that has been subject to on-going mining activity for the past five decades. It is therefore unlikely that the area contains, or that the Project will result in the disturbance or destruction of historic and heritage resources. Public access to the studied area is restricted so land and resource use and other activities do not currently take place on the site. No interactions with, or adverse effects upon, commercial, municipal, traditional or recreational activities in the area are therefore anticipated.

2.2.4 Land Tenure

Land tenure information including the map leases/staked claims, and mineral rights data sets were obtained in July 2024 from the Mineral Lands Division using the Province's Oracle based Mineral Rights Administration System (MIRIAD). Land tenure was used as a pre-screening criterion in the alternatives assessments.

Tacora will undergo the Claims to Lease process for the unpatented claims where the selected future Project components will be located as necessary. As part of this process, Tacora will confirm surface rights reservations for any surface water body and will complete the required regulatory approval to allow access or place infrastructure within the surface rights reservation.

There are no federal lands, including national parks, within the region. However, provincial parks are identified on Figure 4-21. The Project is located wholly within the Province of Newfoundland and Labrador.

2.3 Tailings Characterization

2.3.1 Physical Properties

The particle size distribution of the existing tailings deposit as well as the whole tailings stream are presented on Figure 2-3. Generally the tailings are considered coarse tailings comprised of mostly sand size particles with 8% to 22% fines content (i.e. passing the 75 micron sieve). The particle diameter passing 80% by weight (D_{80}) is 400 microns and particle diameter passing 10% by weight (D_{10}) is 80 microns. The slurry tailings are hydraulically deposited in the existing TIA during the historical and current operations. Hydraulic segregation of the tailings particles was observed at the discharge site with the coarser particles settling nearest to the discharge location and finer particles being washed and settle further down the beach slope. However, the variation of the tailings particles due to hydraulic segregation appears to result in minor changes in the particle size distribution.

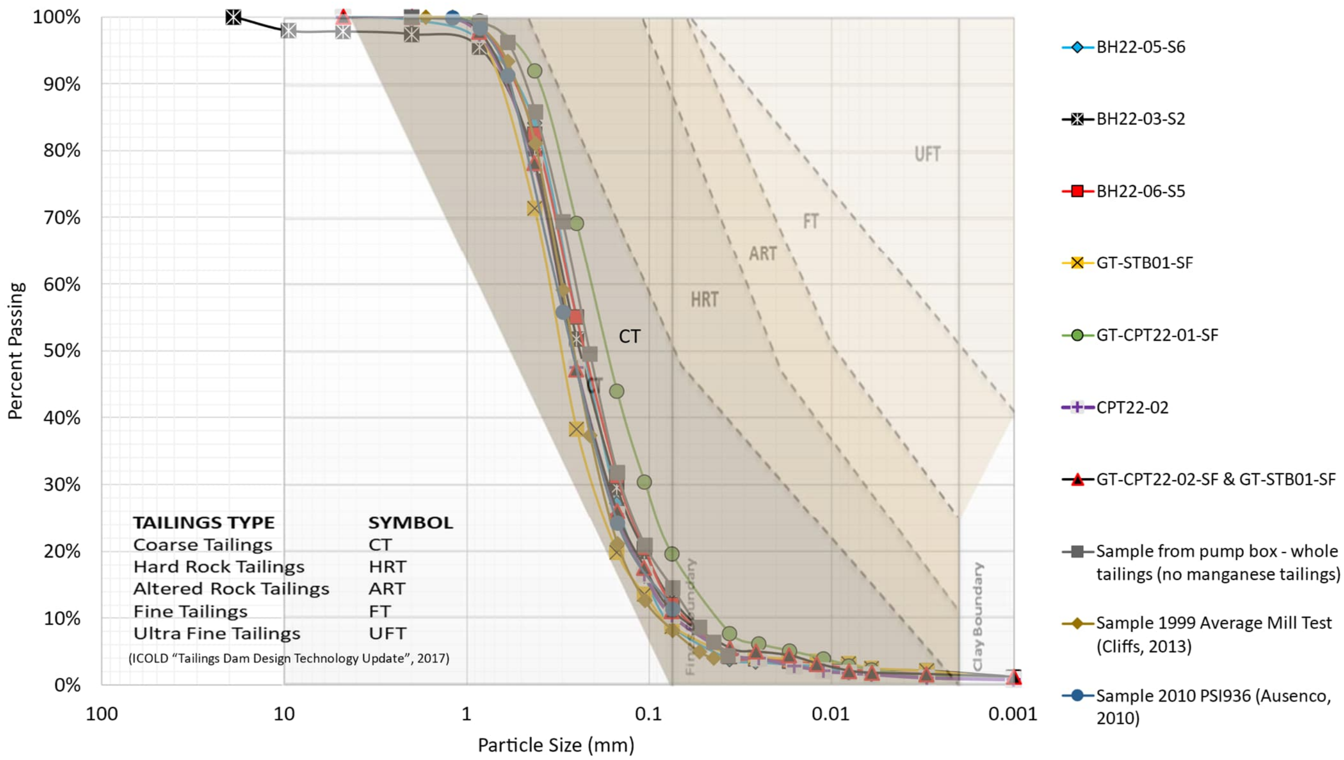


Figure 2-3: Particle Size Distribution of Tacora Iron Tailings Samples (taken from Whole Tailings Stream and in Beach Deposit at the TIA)

Geotechnical properties of the tailings were derived from existing geotechnical reports (Golder 1997, 2007, 2012) and are summarized in Table 2-1. Additional laboratory testwork to confirm the geotechnical properties of the current representative tailings is ongoing and the confirmatory results were not available at the time of the present study.

Table 2-1: Summary of Geotechnical Properties of Tailings

Property	Value
Plasticity (Atterberg limits)	Non-plastic
Specific gravity	3.1
Shear strength friction angle	35 degrees
Hydraulic conductivity at saturation (k_{sat})	$5x10^{-5}$ m/s (generally free draining)

The rheological properties of Tacora tailings were not available for the study. However, based on Hatch's experience and database of similar coarse iron tailings, the yield stress versus concentration relationship is expected to have a sharp increase in yield stress response beyond a concentration threshold. Figure 2-4 shows an example of a rheological curve on similar coarse iron tailings. Rheological testwork is recommended to be carried out to confirm assumption and understanding of the current Tacora tailings.

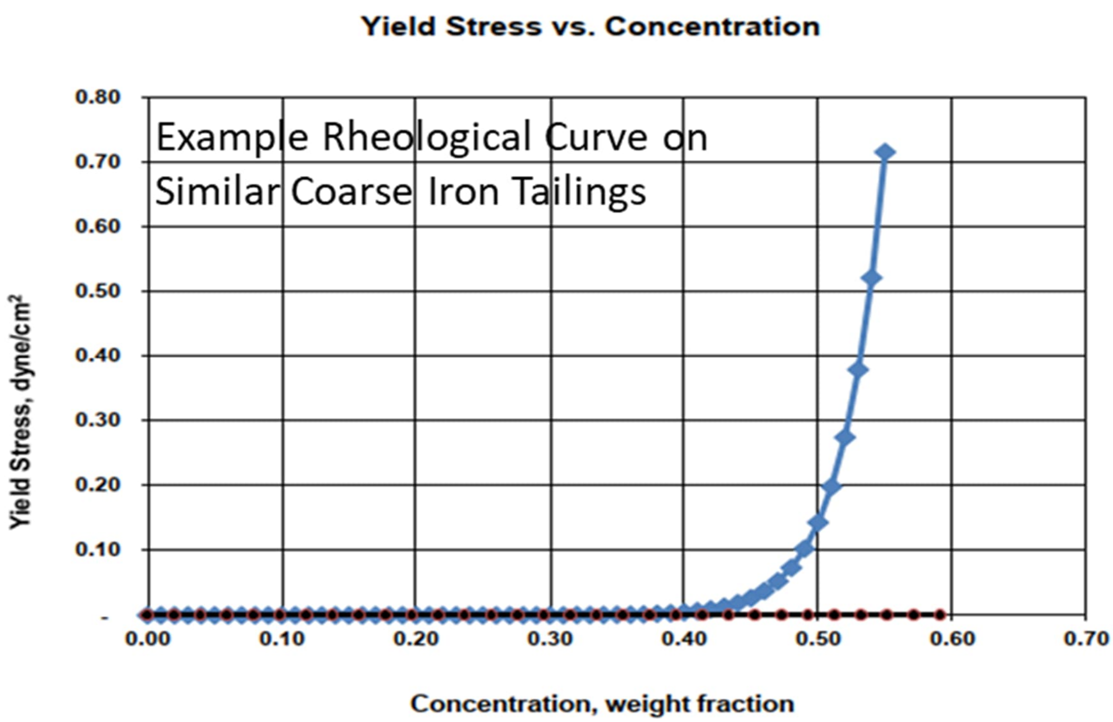


Figure 2-4: Example Rheological Curve of Similar Coarse Iron Tailings

2.3.2 Geochemistry and Water Quality

The ore minerals being extracted at the Scully Mine are hematite, magnetite, and martite while the waste rock is predominantly quartz and hydrated iron oxides such as limonite and goethite. These ore and waste units are overlain by a glacial till which varies in thickness across the property. There are no significant amounts of Acid Rock Drainage (ARD) related minerals (e.g. sulfides) present in the Scully deposits. In addition, since the restart of the Scully Mine, effluent and water quality samples are collected and analyzed on a weekly, monthly and quarterly schedule as required under Tacora's Certificate of Approval ("CofA") by ECCC and MDMER at final discharge points and exposure sites. Metal levels for these samples have not exceeded the limits specified in these regulations.

Tacora has completed an acid rock drainage and metal leaching assessment to characterize with a laboratory testing program, and evaluate the potential for acid generating or metals leaching (ML) of their Scully Mine tailings to further confirm this understanding. The findings are reported by Ecometrix (2024). Overall, results based on the Carb-NP, Sobek-NP and total sulphur-based AP verified that all ore and tailings assessed are non-PAG with low risk of metal leaching. The waste rock materials were confirmed to have little to no potential to generate acidic drainage; with only 1 sample (2% of all samples) having an NPR less than 2, but was likely non-PAG based on Sobek-NPR classification. None of the key constituent concentrations from the leach tests exceeded the MDMER regulatory criteria. These results are corroborated with the effluent chemistries regularly monitored at Flora Lake showing drainage effluents of circumneutral pH levels and low metal concentrations prior to exiting the site.

2.4 Tailings Production Schedule and Storage Requirements for Life of Mine

The tailings production schedule for the life of mine is based on the May 2021 edition of the mine plan. The annual production in tonnage of tailings and mine waste rock are presented in Table 2-3 and plotted on Figure 2-5. The process plant will operate on a 24-hour, 365 days/year basis at 90% availability. A summary of tailings production and storage requirements is presented in Table 2-2.

It was assumed that the currently permitted area of the existing Tailings Impoundment Area will reach its storage capacity by end of 2025. For the Tailings Expansion Project, a total of about 261 Mt of tailings will be produced over 22 years of planned mine life commencing from Year 2026. The equivalent total volume storage requirements will depend on the tailings disposal methodology in slurry form contained within an impoundment or in compacted filter cake form on a stack. For slurry disposal method within an impoundment facility, the required storage volume is estimated to be 200 Mm^3 (assuming 1.6 t/m^3 settled dry density), while for the filter cake disposal method within a stack facility, the required storage volume is estimated to be 160 Mm^3 (assuming 2.0 t/m^3 compacted dry density). A contingency of 25% additional volume has been included in the total estimate for this scoping level of study to account for uncertainties with topographic data, deposit density/slope, frost entrapment, ore reserve and remaining capacity of existing TIA.

Table 2-2: Summary of Tailings Production and Storage Requirements

Parameter	Assumption
Process plant operations	24 hour, 365 days/year operation at 90% availability
Tailings production rate	Typically ~12.3 Mtpa
Life of mine	22 years (2026 to 2047)
Total tailings production	261 Mtonnes
Required total storage capacity	200 Mm^3 at 1.6 t/m^3 density for slurry deposition 160 Mm^3 at 2.0 t/m^3 density for filtered tailings stack (includes additional 25% volume contingency)

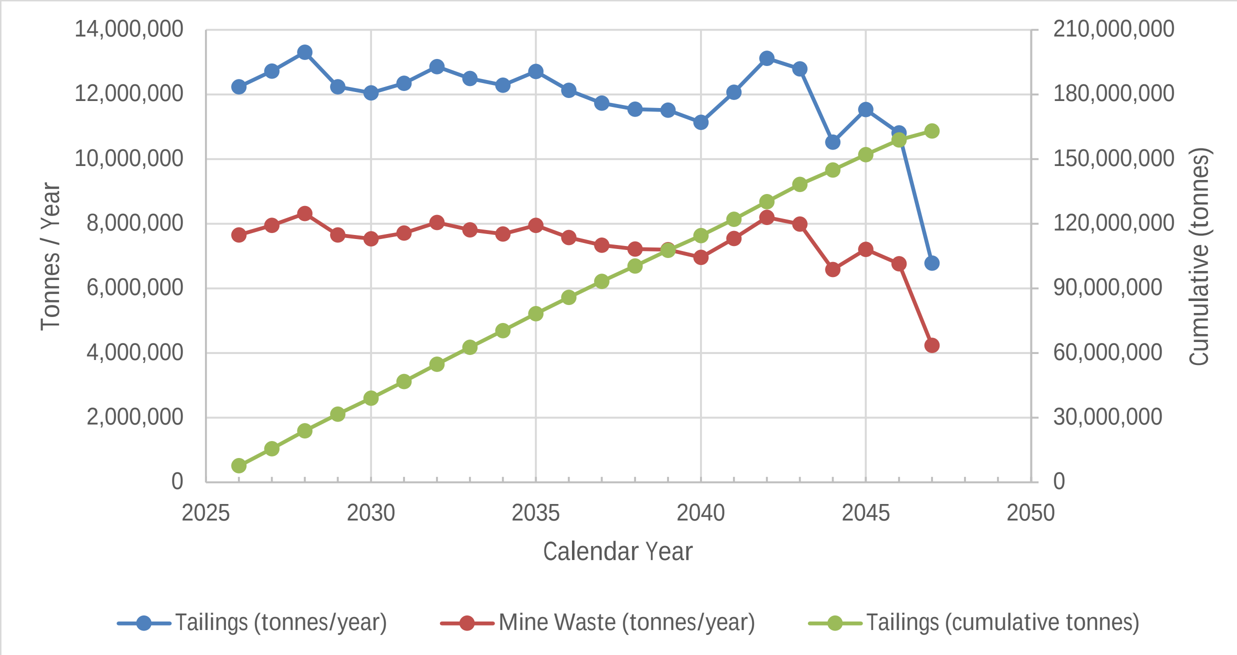


Figure 2-5: Tailings and Mine Waste Rock Production Schedule for Life of Mine

Table 2-3: Detailed Mine Plan and Tailings Production Schedule for Life of Mine

Time	Total Mined	Waste Rock	Ore Milled	Concentrate	Tailings		
(year)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(tonnes)	(m^3) (See Note 2)	(cumulative m^3) (See Note 2)
2021 to 2025	*157,457,899*	*66,152,948*	*88,101,624*	*29,135,443*	*58,966,181*	*36,853,863*	*Excluded and assumed storage in existing permitted area*
2026	32,000,001	10,849,316	18,239,425	6,000,000	12,239,425	7,649,641	7,649,641
2027	32,000,001	10,857,995	18,715,115	5,998,777	12,716,338	7,947,711	15,597,352
2028	32,000,000	13,268,163	19,292,453	5,986,939	13,305,514	8,315,946	23,913,298
2029	31,999,995	13,431,096	18,235,961	6,000,000	12,235,961	7,647,475	31,560,773
2030	31,999,999	14,788,665	18,043,468	5,998,995	12,044,473	7,527,796	39,088,569
2031	31,999,999	14,387,214	18,334,101	5,995,136	12,338,965	7,711,853	46,800,422
2032	32,000,000	16,242,488	18,802,219	5,945,693	12,856,526	8,035,329	54,835,751
2033	32,000,001	15,206,232	18,474,522	5,980,363	12,494,159	7,808,849	62,644,600
2034	31,999,999	15,369,356	18,231,560	5,947,966	12,283,594	7,677,247	70,321,847
2035	36,000,001	18,774,384	18,656,724	5,942,420	12,714,304	7,946,440	78,268,287
2036	35,999,997	17,878,960	18,121,039	6,000,000	12,121,039	7,575,649	85,843,936
2037	35,128,924	17,395,630	17,733,295	6,000,000	11,733,295	7,333,309	93,177,245
2038	32,308,343	14,769,098	17,539,246	6,000,000	11,539,246	7,212,029	100,389,274
2039	32,631,216	14,479,128	17,510,918	6,000,000	11,510,918	7,194,323	107,583,597
2040	32,000,001	14,577,358	17,132,691	6,000,000	11,132,691	6,957,932	114,541,529
2041	33,943,706	14,224,024	18,064,422	6,000,000	12,064,422	7,540,263	122,081,792
2042	36,000,000	17,360,813	19,080,480	5,966,479	13,114,000	8,196,250	130,278,042
2043	32,000,001	12,395,256	18,784,621	6,000,000	12,784,621	7,990,388	138,268,430
2044	31,999,998	18,523,967	16,441,245	5,914,816	10,526,429	6,579,018	144,847,448
2045	35,801,113	18,273,475	17,527,638	6,000,000	11,527,638	7,204,774	152,052,222
2046	32,015,351	12,767,194	16,810,282	6,000,000	10,810,282	6,756,427	158,808,649
2047	17,520,467	8,888,134	11,070,208	4,286,870	6,783,338	4,239,586	163,048,235
Total	**711,349,113**	**324,707,946**	**390,841,633**	**129,964,454**	**260,877,178**	**163,048,235**	

Notes:
1. Production schedule based on May 2021 Revision of Mine Plan (Tacora, 2021). It was assumed that the currently permitted area of the existing Tailings Impoundment Area will reach its storage capacity by end of 2025. For the Tailings Expansion Project, a total of about 261 Mt of tailings will be produced over 22 years of planned mine life commencing from Year 2026.
2. Volume conversion based on slurry deposition at 1.6 t/m^3 settled dry density (as shown on table). Alternative filtered tailings stacking will achieve greater compacted dry density of approximately 2.0 t/m^3 (volumes not shown). Excludes any additional contingency volume.

3. Assessment of Alternatives for Tailings Disposal Overview

Under the Metal and Diamond Mining Effluent Regulations (MDMER), tailings are considered mine waste and cannot be deposited in natural fish-bearing waterbodies. However, the MDMER also includes a provision to designate natural waterbodies as TIA's for the management of mine waste, as described per the ECCC Guidelines:

> *The MDMER stipulates that for mine waste to be deposited in a natural, fish-bearing waterbody, the waterbody must be listed in Schedule 2 of the Regulations, designating it as a tailings impoundment area (TIA). In the context of these guidelines, a TIA is a natural waterbody frequented by fish into which tailings, waste rock, low- grade ore, overburden and any effluent that contains any concentration of the deleterious substances specified in the MDMER, and of any pH, are disposed.*

The purpose of this assessment of alternatives for tailings disposal is to objectively and rigorously assess feasible mine waste disposal options for the Tacora Tailings Expansion Project in accordance with the ECCC Guidelines. The assessment of alternatives follows a transparent and standardized process which is broken into the following seven steps in the ECCC Guidelines:

Step 1. Identify candidate alternatives. Involves determining which methods and sites could be used for the storage of tailings. Refer to Section 4.

Step 2. Pre-screening assessment to screen out any alternatives which have a fatal flaw, ensuring at least one alternative does not overprint natural waters frequented by fish. Refer to Section 5.

Step 3. Alternative characterization. Characterize the alternatives from environmental, project financial, technical, and socio-economic perspectives. Refer to Section 6.

Step 4. Multiple-accounts ledger. The beginning of the MAA and includes setting up a ledger of evaluation criteria and measurement criteria (sub-accounts and indicators respectively). Refer to Section 7.1

Step 5. Value-based decision process. Each sub-account and indicator are assigned a value and weighted in importance (valuating, weighting and scoring in a quantitative analysis). Refer to Section 7.2

Step 6. Sensitivity analysis. An analysis that adjusts weightings utilized in the value-based decision process to manage bias and subjectivity, recognizing that not all stakeholders will place the same importance on each effect. Refer to Section 8.

Step 7. Presentation of the methodology and results as reported in this document.

The following sections provide detailed description and findings with each of the seven steps taken to complete the assessment of alternatives for tailings disposal and the identification of a suitable option for the Tailings Expansion Project.

4. Identify Candidate Alternatives (Step 1)

Step 1 of the alternatives assessment process is to develop a list of all “reasonable, conceivable, and realistic” (ECCC 2013) mine waste disposal alternatives. The range of candidate alternatives considered was based on examples in Canada and other jurisdictions (a range of geographies and project scales) and assessed based on technological possibility, project-specific parameters and environmental conditions. The following presents a discussion of this process and the identified candidates for the next step.

4.1 Candidate Tailings Disposal Technologies

Slurry tailings are the major by-product from the wet processing of most metal bearing ore. In a simplistic description, tailings are the result of crushing and milling of the ore in a processing plant to liberate the desired mineral product from the non-valued particles (waste or by-product), in order to separate or concentrate the desired product. These processes typically involve mixing with water. The process for metal recovery employed at Tacora is flotation, and the resulting slurry mixture consists of finely ground rock particles and water.

This by-product is known as tailings and its disposal and containment is a key challenge for the mining industry. The selected tailings dewatering, transport and disposal method for the project must provide for stable, long-term containment and minimize impacts to the surrounding environment while still allowing the operation to be financially viable. This suitability of tailings dewatering and transport technologies is principally governed by the rheological characteristic curve of the tailings (i.e., solids concentration versus static yield stress relationship). Figure 4-1 illustrates an example of dewatering equipment and transport modes for varying tailings dewatered forms. The dewatering equipment, transport and disposal strategy are selected according to the targeted tailings form defined on the rheological characteristic curve. The principal tailings dewatering, transport and disposal technologies are categorized below:

- Thickened Slurry Tailings Impoundment
- Paste Tailings Impoundment
- Filtered Tailings Stack (also known as “Dry Stack”)
- Co-Disposal of Filtered Tailings with Waste Rock
-

General information on these tailings disposal technology options is discussed in the sub-sections below.

The water/moisture content values are expressed differently between the process and geotechnical engineering basis. Process water content is expressed as a percent weight ratio of the Mass of Water / [Mass of Solids + Mass of Water], while geotechnical water is expressed as a ratio of Mass of Water / Mass of Solids. For the purposes of this report, water content is expressed as process water content basis, unless otherwise stated.

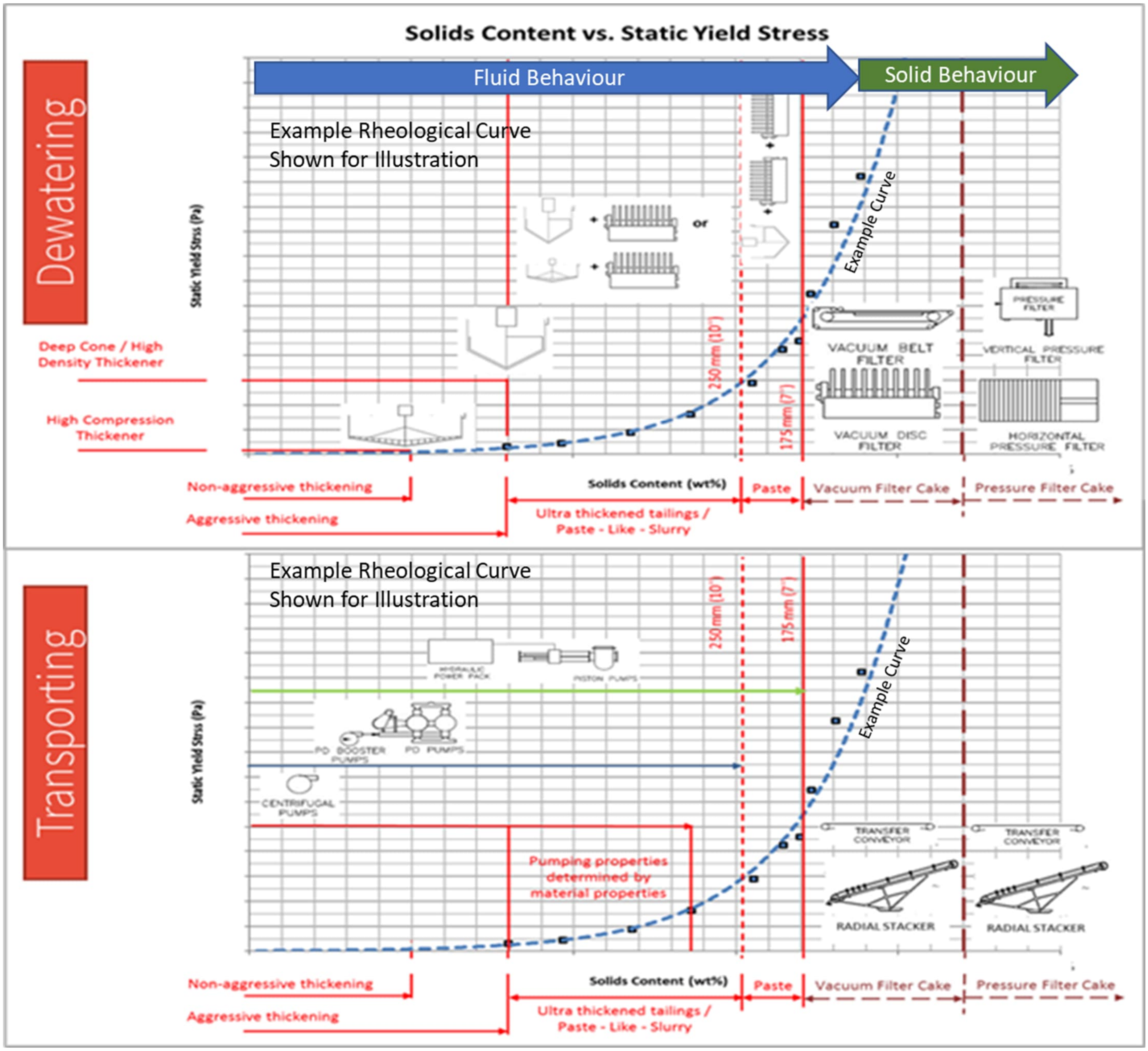


Figure 4-1: Illustration of Dewatering Equipment and Transport Modes for Varying Tailings Dewatered Forms

4.1.1 Thickened Slurry Tailings Impoundment

Thickened slurry tailings refer to tailings material that has been mechanically dewatered with thickener equipment (potentially with the use of flocculation additives) to create a denser slurry than is seen in unthickened tailings directly from the process milling circuit. This heavier slurry is typically segregated when discharged over land and has solids content in the range of 35-55% solids by weight. The high compression thickeners used to increase the solids content from the 30-35% range to the higher density tailings (typically up to 50%) can be located at the process plant or closer to the TIA and flocculent can be added to the thickening process in order to increase the rate of particle settlement. Figure 4-2 shows an example of a conventional high compression thickener equipment.

Figure 4-2: Conventional High Compression Thickener Equipment

A threshold of dewatering for thickened slurry tailings would be such that the slurry density is sufficiently low to use conventional centrifugal slurry pumps for slurry transport.

One of the main advantages of thickened tailings production is the recovery of water during the thickening process. Process make-up water requirements are reduced because water is recovered within the plant prior to placement in the TIA, relative to an unthickened tailings slurry setup. This results in a smaller volume of water being sent to the TIA, which, in turn, reduces water loss due to evaporation, seepage, and, if the water quality is suitable for direct discharge (no recycling), losses to the downstream receivers.

Tailings are slurried and pumped from the process plant and discharged into the TIA. Thickened tailings can be discharged from a single location (end of pipe discharge) or simultaneously operating, multiple discharge points (spigots). Deposition of tailings slurry is often by spigot from around the perimeter of the impoundment basin. Spigotted tailings form a shallow beach slope as the tailings solids drop from solution and the excess water flows down the beach which then forms a supernatant sedimentation pond at the low point of the basin. Selection of the deposition plan is influenced by the viscosity of the iron tailings and an overall beach slope of 1% to 3% can typically be achieved. The slope of the beach closer to the discharge outlets are often steeper than 3%. Understanding the achievable tailings slope is a key design and spatial storage consideration for thickened tailings. Thickened tailings performance relies on both the ore material being processed as well as the performance of the thickener. Figure 4-3 shows an example of Tacora's existing thickened slurry tailings discharge into the TIA.

Figure 4-3: Tacora's Existing Thickened Slurry Tailings Pipeline Discharge

The excess water (also known as supernatant water) can be recycled to the process plant using a barge or decant pumping system to reduce freshwater requirements at the process plant. Otherwise, when safe and practical, treated or clarified excess water may be released into the environment such as the case with the current operation at Tacora.

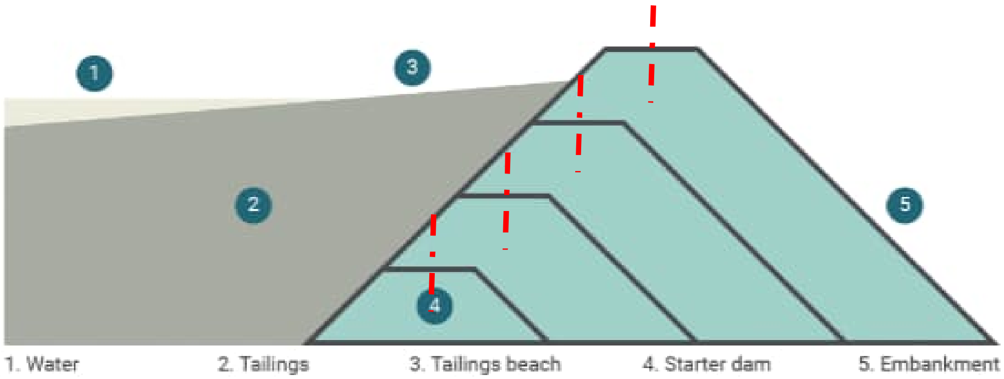
Considering the lowest density of the deposited tailings slurry and impounded supernatant pond, the footprint for conventional thickened slurry deposition would be larger than that of higher dewater tailings technologies such as filtered tailings stacks. Engineered embankments or dams can be constructed in strategic topographical locations to increase storage capacity while taking advantage of natural topography to minimize cost. It is worth noting that containment dams can be constructed in stages of raises throughout the mine life to maintain the required tailings storage capacity, optimize construction with mine development and operation, and to spread the capital costs of construction over a longer period. Starter dams are generally smaller, which can reduce capital cost. Figure 4-4 shows an example of a typical slurry tailings impoundment using earthen dam structures.

Figure 4-4: Example Slurry Tailings Impoundment Using Earthen Dam Structures

There is no "one size fits all" design solution for tailings containment dams. Each tailings dam is unique because of the variety of mine site conditions, including the climate and topography, the physical and geochemical properties of the ore and tailings, the amount of water, the impact on water quality, the planned height of the dam and the available construction materials (McLeod, 2016). Tailings dam designs must also include long-term closure plans and minimize risks to the physical, geochemical and ecological stability of the tailings facility (McLeod and Bjelkevik, 2017). Identifying the most appropriate method of tailings construction is important to ensure the safe and sustainable operation of a facility. Tailings storage facilities follow one of three construction methodologies of raising of a dike: downstream, upstream and centreline. These are described in the following:

Downstream Dike Construction Methodology

Downstream method starts with an impervious starter dam. Tailings are then discharged into the dam and as the embankment is raised, each new wall is constructed and supported on top of the downstream slope of the previous section, so the dam crest moves downstream with each raise. Refer to Figure 4-5. The downstream method was developed for areas with seismic activity and high rainfall or water collection.

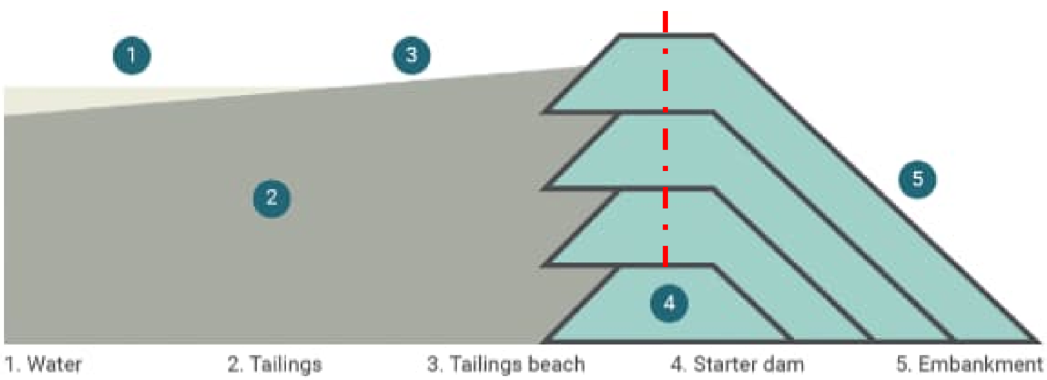


Reference: https://globaltailingsreview.org/about-tailings/

Figure 4-5: Downstream Raise Dike Construction Methodology

Centreline Dike Construction Methodology

The centreline method is a hybrid of upstream and downstream approaches. In centreline construction, the dam is raised vertically from the starter dam. The dam crest therefore remains fixed relative to upstream and downstream directions as the dam is sequentially raised. Refer to Figure 4-6. This construction method can also incorporate internal drainage to improve stability.



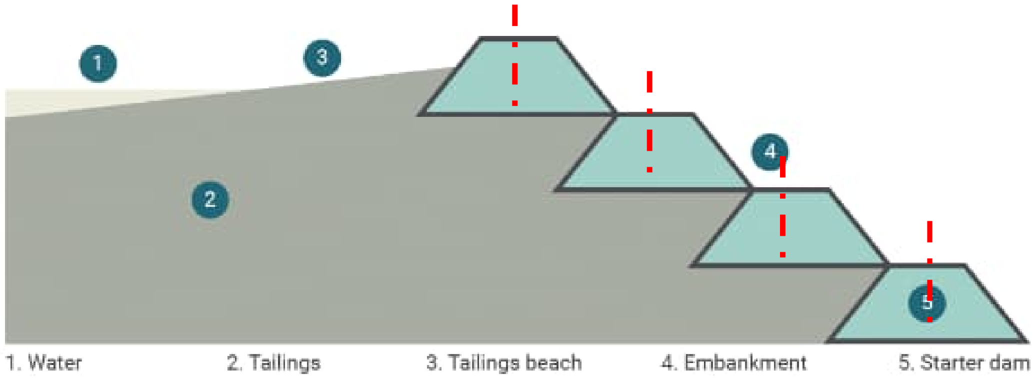
Reference: https://globaltailingsreview.org/about-tailings/

Figure 4-6: Centerline Raise Dike Construction Methodology

Upstream Dike Construction Methodology

The upstream construction method begins with a starter dam. The tailings are then discharged into the facility where they form a tailings beach. The deposited tailings adjacent to the dam slope is allowed to drain and then can be compacted to form the foundation for subsequent embankment levels as the dam is raised. As such, the crest of the dam moves upstream with each raise. Refer to Figure 4-7.

Upstream tailings dams need to be raised slowly, to allow the deposited tailings time to dry and consolidate enough to support a new level of the dam. These are ideally suitable for facilities in regions of low rainfall and low seismic activity.



Reference: https://globaltailingsreview.org/about-tailings/

Figure 4-7: Upstream Raise Dike Construction Methodology

In the event of a hypothetical dam breach, the environmental risk is relatively higher with a potentially larger quantity of released tailings particles along with its supernatant pond. Thickened tailings deposits may still be vulnerable to liquefaction and therefore some level of dike containment is required. Dust generation from exposed uncovered, dry tailings surfaces can be problematic, particularly where frequent wind gusts occur over elevated areas.

Progressive reclamation for slurry tailings facilities is generally not an option as the entire tailings deposit is typically built-up within a full-perimeter impoundment throughout the mine life until closure. This results in longer exposure of the tailings beach area. At the end of mine operations, reclamation of a tailings facility can require re-sloping of the downstream faces of impoundment dikes (if necessary) and placement of a cover over the tailings beach. Cover systems can range from a simple soil cover to multiple layers of synthetic and natural materials, depending upon site specific closure requirements and the geochemical characteristics of the tailings materials. The ponded supernatant water on the surface of the tailings facility needs to be pumped down as much as possible and either a wet or dry cover system constructed. Due to segregation and migration of fines material during tailings deposition, there is usually a layer of saturated, low density, silt to clay sized material below the pond which makes reclamation more challenging in these areas.

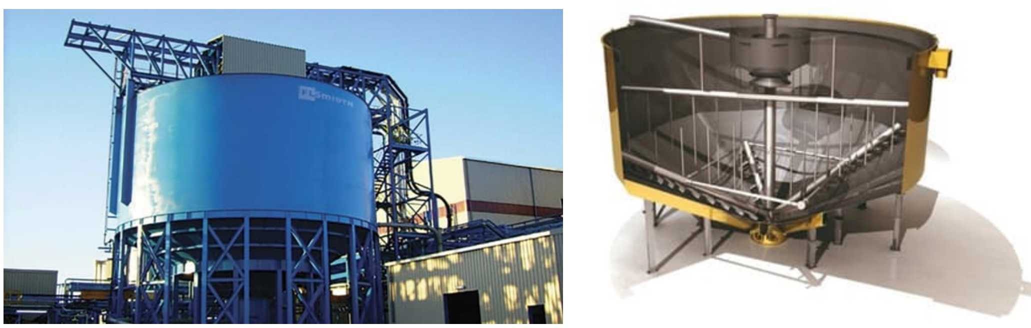
The thickened tailings option is considered the status quo technology that is currently adopted in the existing operation at Tacora. No new dewatering equipment will be required and only additional booster pump stations will be needed to extend the slurry transport to the reaches of the expansion TIA site. Considering the coarse sized particles of the Tacora tailings and absent/minimal supernatant pond, many of the technical challenges of dam breach with this thickened slurry disposal technologies are lessened.

Cycloned tailings is a variation of dewatering on a conventional slurry tailings where a conventional tailings slurry is pumped to the facility and cyclones are used to mechanically separate coarse tailings (underflow) from fine tailings and effluent (overflow). The coarse tailings can be used as a dam construction material and lowers the total volume of tailings stored between dams. The fine tailings (overflow) are stored as conventional slurry tailings behind the coarser material. Implementation of drainage zones are a key consideration for use of cyclone tailings as dam construction material, to avoid over-saturation or build-up of pore-pressure within the coarse fraction in the dam shell.

Cycloned tailings are typically used on projects where sufficient waste rock or borrow material is not available for dam construction or is a long distance from the tailings facility to render haulage costs prohibitively expensive. Tacora's whole tailings stream is suitable for dike construction as it has a narrow-graded coarse particle size distribution. As such, there is no benefit for adopting cycloned tailings at this time.

4.1.2 Paste Thickened Tailings Impoundment

Paste thickened tailings are described as tailings thickened (dewatered) to a point where they can still be pumped but high slurry viscosity may limit the range and flexibility of discharges of the slurry. They require specialized high-density thickeners. Typical solids contents for paste tailings are 60-75% and the material is non-segregating with a consistency similar to toothpaste. The paste characteristics of Tacora iron ore is unknown but it is believed to be difficult/impractical to achieve and sustain paste form given the coarseness of the Tacora tailings particles (i.e. likely to exhibit a steep rheological relationship with yield stress versus solids content). Laboratory rheological testing is needed to characterize the tailings behaviour to confirm this assumption basis. Figure 4-8 to Figure 4-10 show examples of paste thickener equipment, slump tests and discharge.



Reference: https://www.flsmidth.com/en-gb/products/thickening-and-clarifying/deep-cone-thickener

Figure 4-8: Deep Cone / High Density Thickener Equipment

Reference: https://www.flsmidth.com/en-gb/products/thickening-and-clarifying/deep-cone-thickener

Figure 4-9: Example Slump Tests on Paste (left) and Thickened (right) Tailings Samples

Reference: https://www.flsmidth.com/en-gb/products/thickening-and-clarifying/deep-cone-thickener

Figure 4-10: Example Paste Tailings Pipeline Discharge

The process scheme for paste tailings is challenging to clearly define without any rheological material testing information and engineering study. A high-level conceptual plan would be to take the thickener underflow slurry (30%) as described in the thickened option followed by:

- The feed would be to one of multiple specially purposed high density thickener circuits. These 'paste' thickeners would likely be located at different points around the upstream perimeter allowing multiple discharge points into the TIA. The 'paste' thickener is a high side wall tank which allows much more retention time and slurry is allowed to consolidate at a much higher solids content (60-75%). The thickener's mechanical equipment is much heavier duty to withstand higher torque requirements caused by much more viscous slurry.
- Paste thickener overflow water would be returned in a pipeline back to a reclaim water tank. The reclaim water would then be sent back to the process plant for reuse.
- The thickener underflow is highly viscous (sometimes described as like toothpaste with much free/bleed water) and requires special pumping requirements to deposit the material. Pumping may require positive displacement pumps together with high-pressure pipes to move the material and booster pump stations can be needed for larger distances.
- The material would be discharged from high points at the TIA and be allowed to move downhill of the basin in a non-segregating, plastic flow. Desiccation would occur, and minimal water would separate from the paste. Bleed water through consolidation of the deposit would be minimal but would be collected along with captured precipitation and recycled to the process plant, if the water quality (chemistry or turbidity) is considered unsuitable for direct discharge into the environment.

Capital costs of pumps and ongoing energy and operating costs are higher than for the thickened technologies previously discussed. A higher percentage of water is reclaimed at the paste thickener meaning it cannot be lost to entrapment, evaporation or seepage at the TIA and does not need to be stored in the TIA pond. This water is typically recycled through the process plant.

Relative to thickened slurry tailings, higher overall beach slopes in the range of typically 3% to 6% can be achievable and can reduce the required storage footprint for a given volume of tailings depending on discharge location (central versus perimeter discharge). Figure 4-11 illustrates an example of a TIA operating a central cone deposition with paste tailings.

An elevated discharge location on perimeters of impoundment will maximize the advantage of steeper beach slopes of paste tailings. Similar to the discussion for thickened tailings, the design beach slope is a key consideration. Paste tailings performance relies on both the material being processed as well as the performance of the high-density thickener. Depending on the fines content of the tailings stream, it may also be necessary to amend the tailings with ash or other fine material to consistently produce the desired paste product. Operations in cold/freezing climate could present challenges with loss of storage capacity due to entrapment of ice and snow, and instability of the beach surface undergoing freeze-thaw cycles.

Reference: Figure 1 from Avoiding Large Tailings Dams Without Going Underground-Robinsky's Thickened Tailings Concept (Fitton, 2017)

Figure 4-11: Example Central Cone Paste/Thickened Tailings Impoundment

Environmental risk is further reduced as water content is lowered because the water is not present to transport tailings farther downstream of the TIA in the event of a dam breach. Paste tailings deposits may still be vulnerable to liquefaction and therefore some level of containment is required. Progressive reclamation may be possible depending on the tailings deposition plan and can reduce the time of exposure of tailings to the environment. However, industry experience is limited and there is risk associated with this uncertainty. Dust generation from exposed uncovered tailings area can be problematic, particularly where frequent wind gusts occur over elevated dry tailings surfaces.

Paste thickened tailings can be very challenging from the standpoint of operations. Viscous paste creates pumping issues. High production mines such as Tacora would require multiple high-density thickeners and replacement of the existing slurry transport system with positive displacement pumping stations to manage the tailings discharge operations. In recent years, operational challenges have made paste thickening less popular in general mine tailings deposition.

Although some advantages over slurry deposition could be realized, there are a number of technical and financial issues which limit its application. A broad generality is that paste thickening is utilized primarily where the material augmented with cement can be pumped to serve as structural backfill into completed mine voids in underground operations and is not preferable in large surface storage facilities.

4.1.3 Filtered Tailings Stack

Over the past 15 years, tailings dewatering plants have been gathering more interest, with advances in technology, production capacity, reliability, and successful operations at an increasing number of sites around the globe. Filtration is capital and energy intensive and most of the historical projects have been smaller facilities in desert or arctic climates. In these environments, the cost of the water supply and water issues principally drive the financial viability.

The main advantages of this technology over a thickened slurry impoundment are the smaller footprint required for the stack and greater stability with a limited runout distance of tailings in a hypothetical stack embankment failure scenario. Progressive closure of completed exterior slopes and surfaces can be carried out to minimize dust emissions and sediment erosion.

Descriptions of several operations around the world are available in the literature (KCB, 2017). Most of these operations are constructed in the range of 3,000 tonnes per day (tpd) to 15,000 tpd in gold and silver mining operations. The largest similar process known is a 30,000 tpd iron ore process plant located in Australia. The filtration characteristics of Tacora iron ore tailings have not been tested and thus are unknown.

A serious financial (and environmental) issue associated with stack tailings is the significant energy consumption required for dewatering processes as well as transportation and placement. Energy consumption can also result in significant upstream greenhouse gas production and so the power source needs to be considered. The stack operation will generate greater dust and noise emissions from the traffic of the mobile fleet. Dust emissions during winter season will be challenging to management.

Several other considerations are noted as follows:

- Operation in cold climate with freezing temperatures during 8 months of the year at the Tacora site will be challenging to place and compact the damp filtered tailings to the required specifications and achieve stack stability (i.e. risk of entrapping frozen zones and later thawing in warmer months).

- Continuously producing filtered tailings at the target design specification moisture content is challenging and thus, mitigation measures need to be implemented for handling of off-specification material or upset conditions at the dewatering plant.
- The technology and operations are advancing in recent years, but it does not have proven long-term viability at the proposed greater than 30,000 tpd production rates. Therefore, there is a significant operational risk factor which would result in significant operational and cost implications.

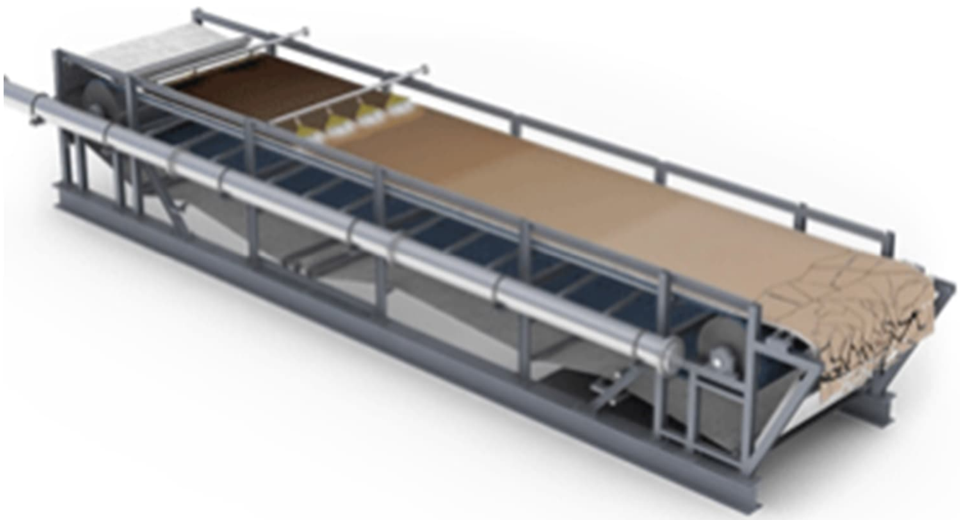
This disposal technology involves three key steps which are elaborated in the subsequent sections:

1. **Filtration technologies** to dewater the tailings to a target residue moisture content.
2. **Material handling** to transport the tailings from the mill to the dewatering plant and then to the storage facility.
3. **Stacking operation** to place and compact the filtered tailings in lifts at the storage facility.

4.1.3.1 Filtration Technologies

The current state-of-the-art filtration technologies that are principally used in the industry, are the following:

- *Vacuum Belt or Drum Filters* – These filters employ long horizontal conveyor or drum surfaces using a continuous filter cloth belt, with a vacuum applied below to remove water as shown on Figure 4-12. This filter type lends itself well to washing or detoxification processes because of the staged process as the filtered product moves across the belt. The disadvantage is that the pressure differential to drive the filtering process is limited by atmospheric pressure. This characteristic normally limits the moisture content achievable on a vacuum belt filter to typically 20% moisture by total slurry weight (80% solids) depending on the particle size distribution of the tailings. This technology does not lend itself well to large scale operations because of the considerable number of units and large footprint required to supply sufficient filter surface area for the throughput volume. Furthermore, a large, heated building footprint is required to house the equipment. These high moisture contents limit the applications to those where compaction of tailings is not required or the presence of other special material handling challenges.



Reference: https://www.westech-inc.com/products/horizontal-belt-filter

Figure 4-12: Horizontal Belt Filtration Equipment

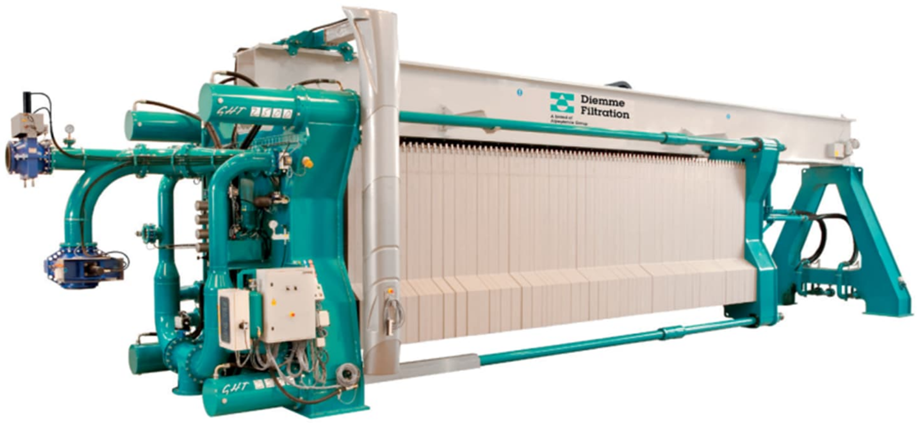
- *Vacuum Disc Filters* – these are well developed technologies that consist of a rotating disc or drum under vacuum or pressurized atmospheres as shown on Figure 4-13. The filter media can comprise filter cloth or ceramic discs. The more common vacuum disc filters have issues with blinding of the filter media and maintenance. Given the vertical disc arrangement of the filters, this equipment offers better efficiency of equipment size and footprint which result in smaller building footprint relative to horizontal vacuum belt filters. The disadvantage is that the pressure differential to drive the filtering process is limited by atmospheric pressure. Similar to most vacuum-based dewatering technology, the moisture content achievable on a vacuum belt filter is typically 20% moisture by total slurry weight (80% solids) depending on the particle size of the tailings.

Filter Cloth Disc Filters
Reference: https://www.flsmidth.com/en-gb/customer-stories/customer-stories-mining-2021/new-copper-mine-dewaters-backfill

Ceramic Disc Filters
Reference: https://cecminingsystems.com/technologies/ceramic-filtration-system/

Figure 4-13: Vacuum Disc Filtration Equipment

- *Pressure Filters* – These filters consist of a large number of vertically mounted plates with a filter media attached to the plate surface as shown on Figure 4-14. The filtered material is pumped into a chamber between two plates, when the chamber is full, compression is used to dewater the filter cake, and an opening mechanism pulls the plates apart allowing material to drop onto a conveyor belt below to discharge onto a stockpile. The next steps are to shake the plates to remove any material stuck to the surface, and then washing the filter cloths to prevent premature failure from fouling. Once completed, the cycle begins again. The press is closed or opened normally by large hydraulic piston. A high differential pressure of 3 to 5 atmospheres drive the dewatering process to achieve typical filter cake moisture content in the range of 10 to 20% depending on the particle size of the tailings.



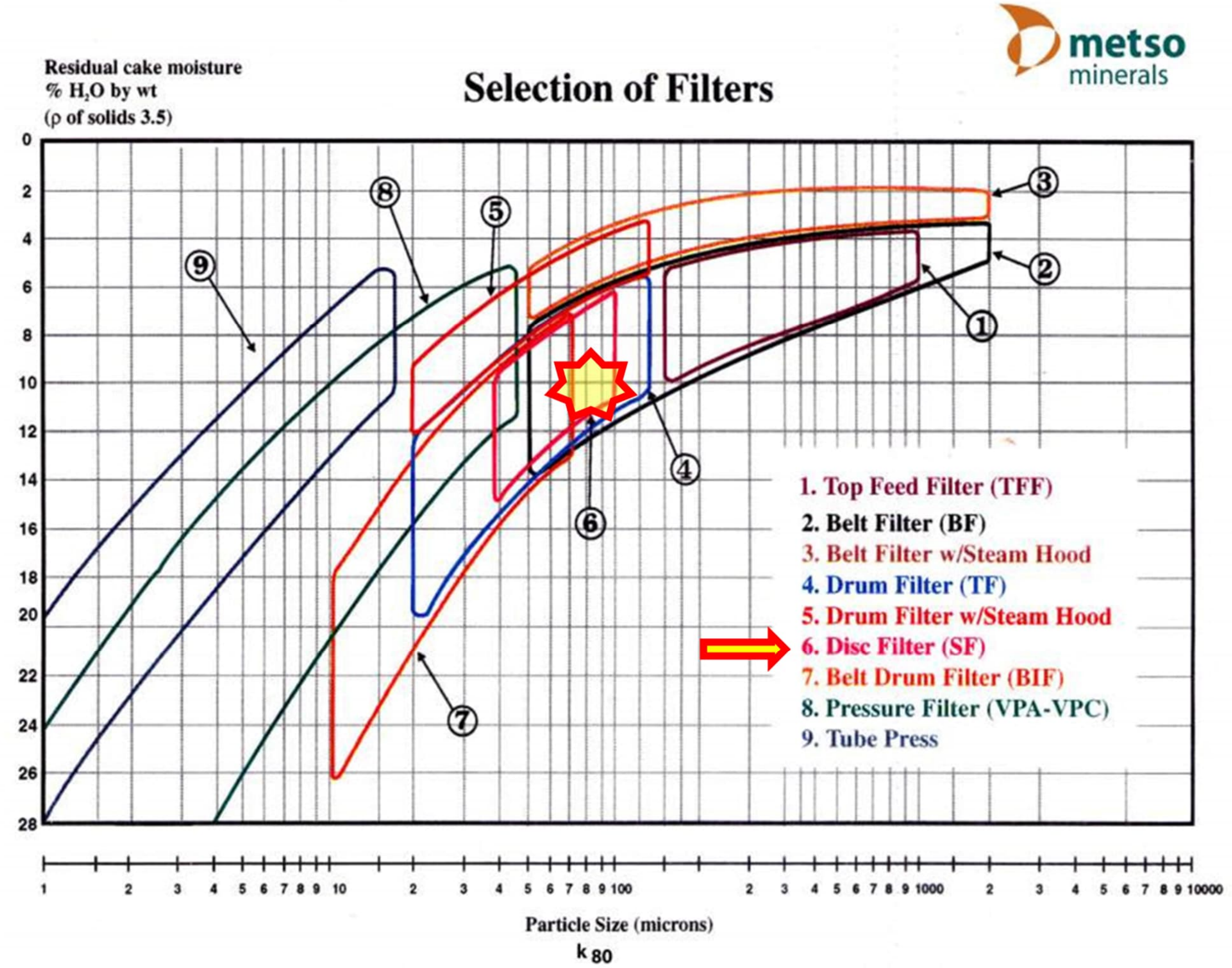
Reference: https://www.aqseptence.com/en/applications-markets/filtration-and-thickening-systems

Figure 4-14: Plate and Frame Pressure Filter Equipment

A disadvantage to pressure filtration is that it is a batch process, whereas the upstream ore processing components are a continuous process. This creates an operational challenge to maintain high production rates through the overall process. These issues can be mitigated through engineering controls with a larger set of filter press equipment.

- *Other Dewatering Equipment* – Other dewatering equipment is available but is considered not effective at achieving target moisture of the filter cake or have inadequate throughput rate necessary for the Tacora tailings operation. Examples of these equipment are hydrocyclones, vibratory screens and centrifugal filters. Thus, these equipment technologies are not considered further in this study.

The pressure filters are typically applicable for fine tailings material (silty/clayey) that require extra mechanical pressures to expel the intrinsic moistures to the target level. Considering the coarse particle size and higher permeability of Tacora tailings, pressures filters are not necessary. Figure 4-15 illustrates general guidelines of applicable filter equipment according to the desired residue moisture and the particle at 80% retained of filter cake (k80). The figure identifies Tacora tailings of k80 approximately 100 microns and target process moistures 10% to 12%, having suitable equipment of either belt (2), drum (4) and disc (6) vacuum filters. The vacuum disc filter equipment is the preferred filtration technology for dewatering of Tacora's tailings based on its size efficiency and Tacora's familiarity with similar equipment currently used for dewatering of the concentrate.



Reference: Metso Filter Equipment Selection Handbook (2005)

Figure 4-15: Dewatering Filter Equipment Selection Criteria Chart

The conceptual design of the dewatering plant considered maintaining the filtration equipment under an enclosed building to avoid winter temperature issues. Associated with the building, there are areas for conveying, stockpiling and handling of filter cake discharged from the filtration, filtrate water tank/pond and a basin for temporary holding of tailings slurry during shut downs or upset events.

4.1.3.2 Material Handling System for Transport and Placement

The filter cake discharged from the dewatering plant (filters, collection conveyors under the filters discharges and transfer stockpile) will require a material handling system for transport to the final disposal area (stacking facility). It should be noted that to maximize the transport efficiency and reduce costs between the process plant and the tailings disposal site, a separate dewatering plant could be constructed near the final disposal site and utilize the lower-cost slurry pipeline transport between the dewatering plant and the process plant. Thus, the discussion for material handling system focuses on the shortened transport segment of filter cake between the local dewatering plant and the disposal site.

Material handling systems of filtered material can be in generally two modes:

- Truck haul and place
- Over-land conveyor and stacking system

Single or multiple combination of these modes are available for the transport and stacking systems and vary depending on processing rates, characteristics of the material, topography of the area to be stacked, and the shape of the final tailings facility. The modes are described further below:

- *Truck Haul and Place Mode* - Truck haul and place mode utilizes a fleet of mobile equipment comprising articulated haul trucks for transporting, dozers for spreading, optional roller compactor, excavators/grader for shaping and watering truck for moisture/dusting control as indicated on Figure 4-16. The size and equipment type will depend on production rate, working fronts and climate conditions. Given that this mobile equipment consumes fossil fuels, considerable greenhouse gases are emitted from the operation. This fleet will require dedicated operators, maintenance shop and routine maintenance. The operator, fuel, and consumable parts will be incorporated into the unit rates.

Figure 4-16: Truck Haul and Place Earthworks Equipment

- *Conveying and Stacking System* - Conveying and stacking equipment are often classified as advance stacking and retreat stacking. The main transport from the output of a dewatering plant to the stacking area can be by permanent overland conveyors for long-distances or series of mobile conveyors for shorter distances as shown on Figure 4-17. A combination of overland and mobile conveyors can be configured to suit the application.

Overland Conveyors Mobile Conveyors (Grasshoppers)

Reference: https://www.takraf.com/expertise/dry-stack-tailings-management/

Figure 4-17: Conveying Equipment

- An advance stacker system would typically consist of a conveying system “walking” on recently placed tailings material and filling in the space in windrows in front of the machine as illustrated on Figure 4-18. Concerns with design of this system include stability/trafficability of recent placed material to support the load of the equipment, and safety issues with stability of slopes with heavy equipment working close to a working edge. If a starter position is available, the unit can fill in highly variable topography in the first lift without impacting the machinery. Because conveyor lengths are relatively fixed compared to a retreat stacker, there is less interruption of the operations as the unit advances.

Reference: https://www.takraf.com/expertise/dry-stack-tailings-management/

Figure 4-18: Stacking Equipment – Advancing System

- A retreat stacking system is accomplished by a linear conveyor with a tripper as in an advance stacker or can be a large radial stacker which sits on the floor and fills in as the machine retreats in steps as its mechanical limitations are reached. Figure 4-19 shows an example of a retreating system.

Reference: https://www.takraf.com/expertise/dry-stack-tailings-management/

Figure 4-19: Stacking Equipment – Retreating System

- A radial stacker lends itself well to irregular shapes but prefers a level working area. Over the life of a stack, working on previous placed fill, a level surface is not a problem, but the initial lift can be problematic on rough topography such as in the region of the existing TIA at Tacora.

System interruptions are much more frequent with conveyor equipment as conveyors need to be removed and repositioned, additionally more manpower is generally required for handling movements. An important concern is upsets in the mechanical conveying process (e.g. frozen conditions and tailings abrasiveness result in breakdowns of conveyor belt, wheels, or motors) will adversely affect upstream process operations. Operating conveyors in extreme cold climate such as Tacora present challenges with likely frequent upset conditions. The milling circuit of the size of Tacora has little buffer to absorb such a system upset on the discharge side.

At points of time, the ore feed to the mill will be variable producing upsets to the filtration process. It is necessary to anticipate the occasional production of “off-spec” filter product. A high moisture content or even tailings sludge may need to be located apart from the general stacking plan to allow drying or special handling conditions. Additionally, an alternative stacking system may allow for continuous operation of the milling circuit and dewatering plant during conveyor movements and maintenance.

4.1.4 Co-Disposal of Filtered Tailings with Waste Rock

Co-disposal when appropriately designed and implemented increases physical and chemical stability of the waste. Mixing or combining of waste rock and fine-grained tailings could increase the physical stability and the risk for liquefaction diminishes. In addition, the permeability of the tailings is usually much lower and thus limits the ingress of oxygen and water (increases the chemical stability) compared to the conventional waste rock deposits, which can reduce the potential for acid generation.

Several ways to accomplish co-disposal exist. The methods can be divided into different categories according to the degree of mixing and placement method of the two components tailings and waste rock. Co-disposal of tailing with waste rock can be achieved in generally two categories of approaches:

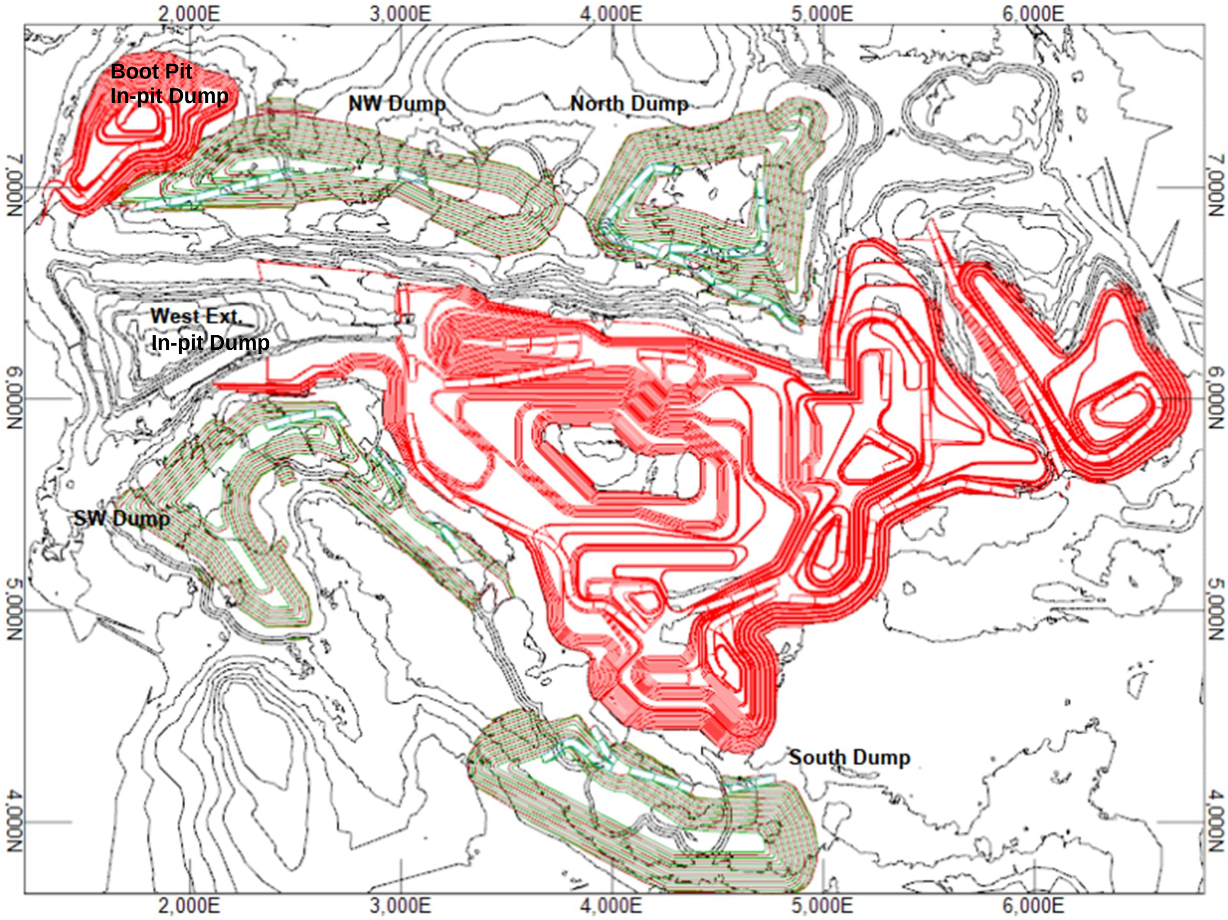
- Co-mingling is for the physical mixing to a targeted ratio of waste rock and tailings to achieve a desired behaviour of the mixed material for physical as well as chemical stabilities. Practically, co-mingling is achieved using only filtered tailings. Additional mechanical mixing equipment would be needed at the dewatering plant to achieve uniform mixture.
- Co-placement is where no mixing of the two materials occurs, and they are only placed in zonation or compartments to gain benefits of the particular arrangement. Any form of tailings can operate with the co-placement approach. A fleet of conventional mobile earthwork equipment can be utilized to achieve this approach.

A total of 391 Mt of waste material will be mined throughout the LoM (refer to Table 2-3). Waste rock storage is planned in depleted pits and in conventional waste storage area (dumps) on surface outside of pits. Dumping has historically already taken place in some of the surface dumps. The historical amount of material already dumped in each waste location is unknown and not included here. In the early years of the project, waste material will be stored to the south of the pits on South Dump, South West Dump, and inside the West Extension In-Pit Dump.

Later, as the pit operation expands to the East, the North Dump will become active. Once the East Pit West is depleted, waste material will be stored in this pit allowing for lower haulage costs and a reduced environmental impact. The North West dump is used for waste rock coming from Center Pit West and Boot Pit in the later years of the Project.

The waste dumps located outside of the pits are mostly designed above historic waste storage locations. The new waste dumps are built in 12 m bench heights with 14 m bench widths allowing for rehabilitation when filled to maximum capacity. A 40 m setback distance was kept from the base of the new waste dumps to the limit of the historic ones upon which they are built. This distance was kept allowing for drainage infrastructure around the new waste dumps.

Waste dump design and locations at Tacora are presented on Figure 4-20. Waste dump metrics on storage capacity and impact surface area are presented in Table 4-1.



Reference: Mine Plan 2021 Feasibility Study Update (Tacora, 2021)

Figure 4-20: Waste Dump Arrangement at End of Mine Life

Table 4-1: Waste Dump Storage Capacities and Surface Areas

Waste Dump	Capacity (Mt)	Capacity (Mm^3)	Surface Area (ha)
South West Dump	82.1	38.1	770.0
South Dump	43.4	20.1	834.6
North Dump	76.6	35.5	760.0
North West Dump	51.5	23.9	703.9
West Extension In-Pit Dump	72.6	33.7	0
Boot Pit In-Pit Dump	92.2	42.8	0
Total	**396.7**	**184.2**	**4,197.2**

To achieve the benefits of co-mingling of filtered tailings with waste rock (maintain steep dump slope angles of waste rock for maximum storage capacity within a defined footprint), the combined material needs to exhibit waste rock dominant strength properties whereby tailings would occupy not more than the void spaces of the waste rock. Table 4-2 shows the general suitability for co-mingling of waste rock and tailings with regards to the waste rock and tailings ratio. Unfortunately, the waste rock quantity is insufficient according to the mine plan which suggests a 1:1 ratio waste rock to tailings mass. Thus, tailings strength will dominate and result in co-mingled pile having a much flatter embankment slope and lower storage capacity within the confines of the available waste dump footprint areas.

Table 4-2: Suitability for Co-Mingling in Relation to Waste Rock : Tailings Ratio

Waste Rock : Tailings Ratio	Suitability for Co-Mingling
More than 8w :1t	Suitable considering waste rock particles contacts can occur with tailings particles confined within the voids of the waste rock. Thus, waste rock behaviour dominates to provide stability benefits.
Between 4w :1t and 8w : 1t	Significant testing and detailed analysis needed to determine suitability.
Less than 4w : 1t	Not suitable. The strength characteristics change, and tailings characteristics begin to affect to the behaviour of coarse waste rock (Leduc et al. 2004, Gowan et al. 2010). It also becomes more difficult to handle these types of mixtures (Gowan et al. 2010).

Reference: Leduc & Smith (2003)

Furthermore, there are impracticality and unreliability aspects to obtain uniform homogenous mixing of filtered tailings with run-of-mine waste rocks (could be >1 m diameter particle size), thus requiring a costlier waste rock crushing and mixing circuit. Sedimentation controls (sedimentation ponds and drainage collection ditches) are required with the introduction and mixing of fine tailings particles which are susceptible to erosion and wash out. Given the undulating topography and limited available waste dump areas surrounding the open pits, the implementation of sedimentation control becomes restrictive and costly. Co-disposal would be technically and financially viable if the opportunity avoids additional crushing and/or transporting of waste rock from their dump sites that are typically nearby operating pits.

In consideration of the challenges mentioned above, co-disposal of tailings with waste rock is not viable for Tacora's Scully Mine operations, regardless of approaches.

4.1.5 Results of the Disposal Technology Identification

Results of the identification for disposal technology and the recommended carry-forward options for the study are summarized in Table 4-3.

Table 4-3: Summary of Possible Technologies for Tacora Tailings Disposal

Technology	Possible Technology for TIA Expansion Project	Principal Justification
Thickened Slurry Impoundment	**Yes**	Existing experience, simple operation, immaterial greenhouse gas emissions and minimal electricity demand but lower storage efficiency results in larger environmental footprint and surface water management impacts. Refer to Section 4.1.1
Paste Tailings Impoundment	No	Cannot sustain slurry in paste form with expected steep rheological curve of Tacora tailings which are relatively coarse grained. This rheological curve makes for an impractical application of this technology. Refer to Section 4.1.2
Filtered Tailings Stack	**Yes**	Reduces environmental footprint impact and better geotechnical stability but complex operation, greater labour resourcing, high greenhouse gas emissions, high electricity demand and challenges, particularly during winter periods (compaction and dust control). Refer to Section 4.1.3
Co-Disposal Stack Filtered Tailings with Waste Rock Dump	No	Waste rock quantity insufficient to achieve benefit of waste rock dominant strength properties (1:1 ratio waste rock to tailings). Unreliability to achieve uniform homogenous mixing filtered tailings with coarse run-of-mine rocks (>1 m diameter particles). Thus, it is unfeasible for the application of this technology. Refer to Section 4.1.4
Off-site markets for commercial re-purposed applications	No	Off-site commercial application examples of tailings can be used as aggregates for paving, concrete and other bulk construction earthworks. Requires dewatering by filter equipment for enabling off-site transport (e.g. rail or dump trucks permitted on public roads). Not feasible considering high tailings production rate, limited local market demand/capitalization in the region, and no means of low-cost bulk transport to make this a viable opportunity.

In consideration of all the information presented above, the possible technological options considered for the Tailings Expansion Project at Tacora Scully Mine operation are:

- Thickened slurry from conventional thickener, transported by centrifugal pumps and deposition in an impoundment – status quo (35 to 50% solids by weight; assumed average 45%)
- Filtered tailings cake using vacuum disc filters, transported by mobile equipment and placed on a stack (>80% solids by weight; assumed average 86%)

4.2 Candidate Tailings Disposal Sites

A high-level alternatives assessment for the siting of the expansion TIA was evaluated in coherence with the possible tailings disposal technologies. The initial exercise was to define and apply a threshold criteria to establish the regional boundaries for selecting candidate sites. Within the suitable regions, a number of candidate sites were identified.

4.2.1 Threshold Criteria for the Identification of Disposal Site

Threshold criteria were used to "establish the regional boundaries for selecting candidate alternatives" (ECCC 2013). The following threshold criteria were developed and applied to the project area for the identification of possible disposal sites:

- Exclusion based on distance - Maximum 15 km radius search from Tacora's process plant. This is a practical distance threshold for a feasible transport of tailings slurry between the plant site and the designated TIA.
- Exclusion based on aviation zone restriction - Aviation zone restrictions of the nearby Wabush Airport on permitted maximum height of constructed structures within the zone.
- Exclusion based on presence of protected areas - Avoid designated Provincial Parks, Communities, and heritage designated areas. Avoid development and impacts within the Wahnahnish Lake Watershed due to its use by the Wabush Community for supply of public drinking water.

The regions considered are shown on Figure 4-21. The description of each region and the suitability for further assessment to identify candidate sites are presented in Table 4-4.

4.2.2 Results of the Disposal Site Identification

In consideration of all the constraints listed in Sections 4.2.1 and 5.2.1, the recommended carry-forward regions which can accommodate candidate disposal sites for the study are summarized in Table 4-4.

Table 4-4: Suitability Assessment of Regions for Accommodating Candidate Disposal Sites

Region	Possible Region for TIA Expansion Project	Principal Justification
Flora Lake Watershed	**Yes**	• Connected with brown field of existing Tacora's tailings disposal operation situated within this watershed • RioTinto's IOC Mine has an existing tailings disposal operation located downstream of the same watercourse system • Potential disposal sites can be defined within portions of the watershed
Moosehead Lake Watershed	**Yes**	• Green field • No mining activities • Presence of residential dwellings and recreational use of area by local community • Potential disposal sites can be defined within portions of the watershed
Long Lake Watershed	**Yes**	• Green field but can be connected with brown field of existing Tacora's waste dump and open pit operations that are situated within this watershed • Significant number of existing land and mineral claims presents limited available area for TIA as well as obstacles to establish easement corridor for tailings slurry pipeline, utilities and access road infrastructure • Presence of residential dwellings and recreational use of area by local community
Wahnahnish Lake Watershed	No	• Not permitted for any disposal of tailings since this watershed is currently used as public water supply for communities of Wabash and Labrador City

Notes:

1. Specific disposal sites within an identified watershed region can be defined to suit requirements as in described in Section 4.3.

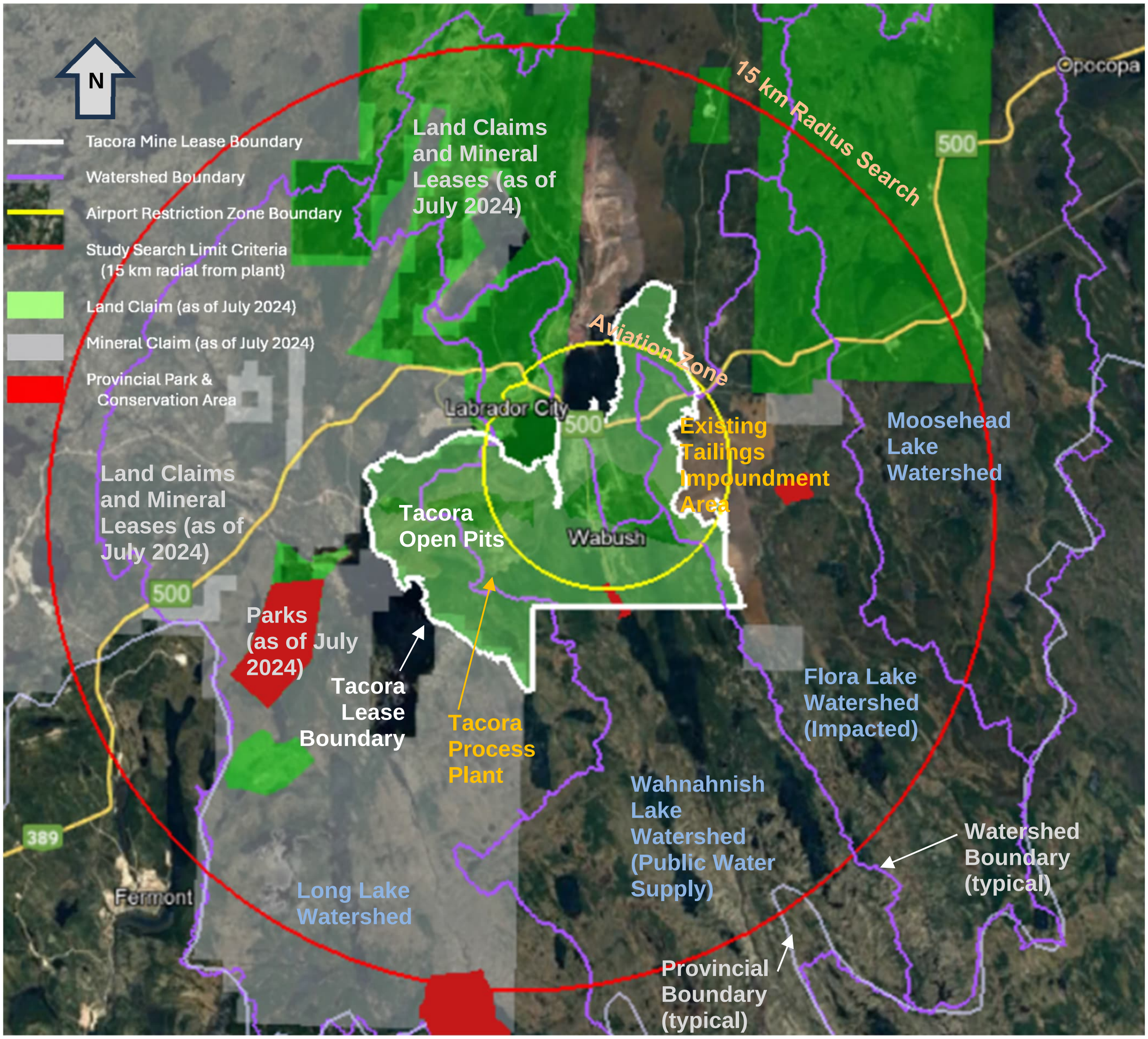


Figure 4-21: General Area of Project with Key Constrains

4.3 Summary of Identified Candidate Alternatives

An identification and evaluation of possible technologies for dewatering, transport and disposal methodology of tailings, as well as, possible disposal sites were described in the previous sections. A consolidation of candidate alternatives, that have been identified with respect to a holistic assessment of possible combinations with dewatering technologies and disposal sites, is summarized in Table 4-5. The locations of the identified candidates are illustrated on Figure 4-22.

Table 4-5: Summary of Identified Candidate Alternatives

Candidate Alternatives	Technology and Transport	Disposal Site	Construction Approach	Operation Approach	Closure Approach
Base Case (Expansion to Existing TIA)	Thickened slurry transported via pumps and pipelines	Upstream dike impoundment in Flora Lake Watershed	Extend slurry pipelines and additional pumpstations; clear dike footprint; construct containment dike on western perimeter; construction diversion channels	Subaerial perimeter deposition with discharge of effluent via single sedimentation pond (North Flora Lake)	Progressive vegetation cover; construct surface drainage ditches
Alternative 1	Thickened slurry transported via pumps and pipelines	Downstream dike Impoundment in Moosehead Lake Watershed	Extend slurry pipelines and additional pumpstations; construct containment dike on low perimeters and main sedimentation pond dike; construction diversion channels	Subaerial cone deposition with discharge of effluent via two sedimentation ponds	Progressive vegetation cover; surface drainage ditches; decommission sedimentation pond dikes
Alternative 2	Filtered tailings transported via haul trucks	Stack in Flora Lake Watershed	Extend slurry pipeline system, construct local filter plant; mobile fleet equipment shop, clear stack footprint	Stacking with mobile fleet; runoff directed to single sedimentation pond (South Flora Lake)	Progressive vegetation cover; surface drainage ditches; demolish all infrastructures
Alternative 3	Filtered tailings transported via haul trucks	Stack in Moosehead Lake Watershed	Extend slurry pipeline system, construct local filter plant; mobile fleet equipment shop, clear stack footprint	Stacking with mobile fleet; runoff directed to two sedimentation ponds	Progressive vegetation cover; surface drainage ditches; demolish all infrastructures
Alternative 4	Thickened slurry transported via pumps and pipelines	Upstream dike full-perimeter impoundment straddles Flora Lake Watershed and Moosehead Lake Watershed; North of Highway 500	Extend slurry pipelines and additional pumpstations; construct containment dike along full perimeter and sedimentation pond dikes; construct diversion channels	Subaerial perimeter deposition with discharge of effluent via two sedimentation ponds	Progressive vegetation cover on dike with tailings beach covered at closure; construction surface drainage ditches; decommission sedimentation pond dikes; demolish all infrastructures
Alternative 5	Filtered tailings transported via haul trucks	Stack in Flora Lake Watershed within subcatchment of Albert Lake; North of Highway 500	Extend slurry pipeline system, construct local filter plant; mobile fleet equipment shop, clear stack footprint	Stacking with mobile fleet; runoff directed to single pond	Progressive vegetation cover; surface drainage ditches; demolish all infrastructures
Alternative 6	Thickened slurry transported via pumps and pipelines	Upstream dike full-perimeter impoundment in Long Lake Watershed	Extend slurry pipelines and additional pumpstations; construct containment dike along full perimeter and sedimentation pond dikes; construct diversion channels	Subaerial perimeter deposition with discharge of effluent via sedimentation ponds	Progressive vegetation cover on dike with tailings beach covered at closure; surface drainage ditches; demolish all infrastructures
Alternative 7	Filtered tailings transported via haul trucks	Stack in Long Lake Watershed	Extend slurry pipeline system, construct local filter plant; mobile fleet equipment shop, clear stack footprint	Stacking with mobile fleet; runoff directed to single sedimentation ponds	Progressive vegetation cover; surface drainage ditches; demolish all infrastructures
Alternative 8	Thickened slurry transported via pumps and pipelines	In-pit disposal within exhausted Scully Mine open pit(s)	Rearrange slurry pipeline system to pits, construct containment dikes to compartmentalize the pit where required to store tailings and enable mining in other pit sections	Subaerial perimeter deposition with discharge of effluent via sedimentation ponds	Tailings mostly submerged in flooded pit; vegetation cover exposed tailings beaches; surface drainage ditches; demolish all infrastructures

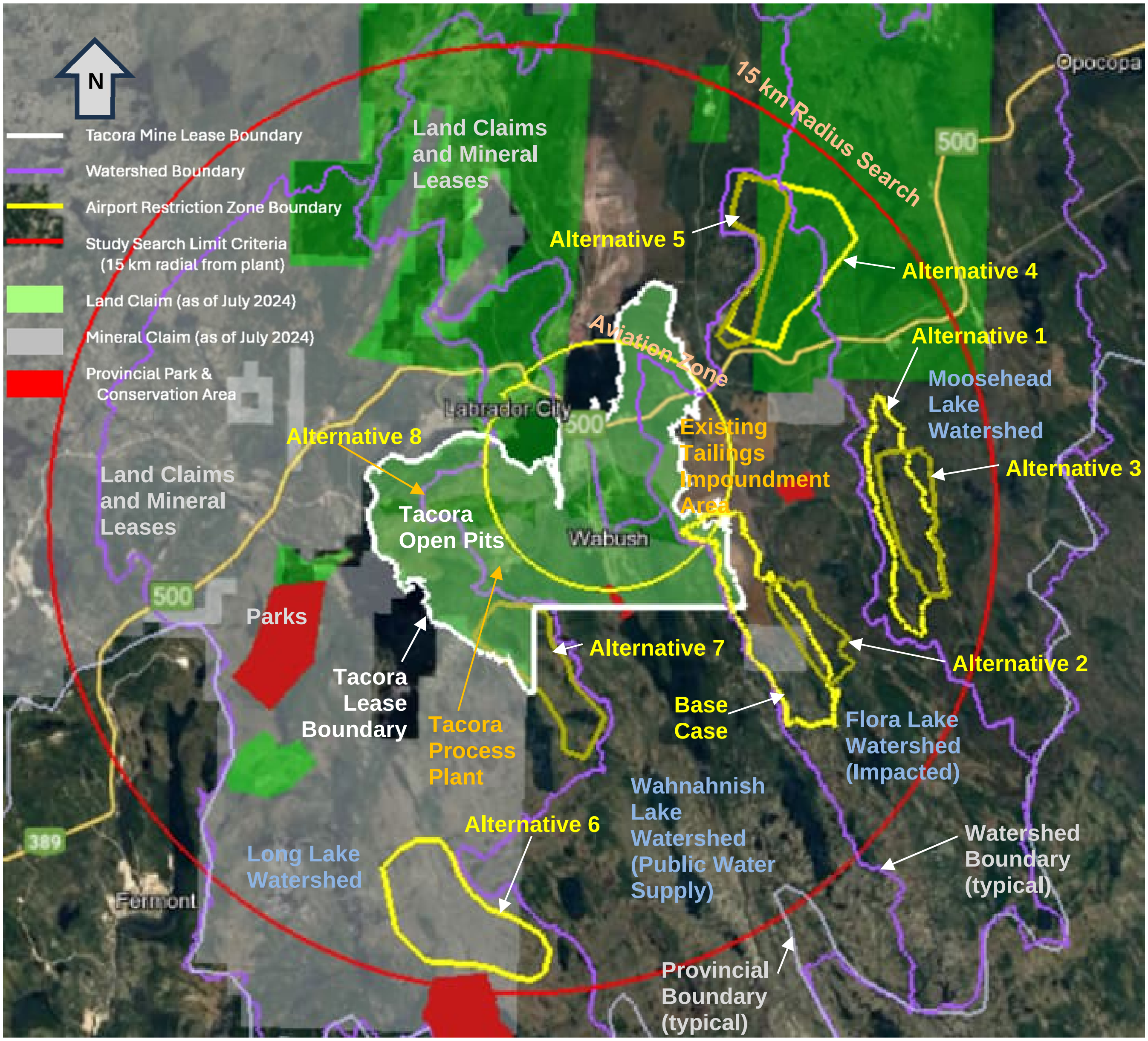


Figure 4-22: Location of Identified Candidate Alternatives and Key Constrains

5. Pre-screening Assessment (Step 2)

Step 2 consists of applying pre-screening criteria to the identified alternatives to exclude alternatives that are "non-compliant with certain unique minimum specifications that have been developed for the project" (ECCC 2013). The Guidelines describe this process as a "fatal-flaw analysis" where fatal flaws are defined as any site characteristic that is "so unfavorable or severe that, if taken singly, it would eliminate that site as a candidate". Pre-screening criteria are defined such that there is a simple "yes" or "no" response to whether or not the alternative complies with the criteria and a "yes" response eliminates the alternative from further evaluation.

5.1 Identification of Pre-Screening Criteria

Five pre-screening criteria were used in the pre-screening process. These pre-screening criteria and their rationale are summarized in the following section. The application of these criteria to the identified candidate alternatives is presented Table 5-1.

Criterion 1 - Would the mine waste disposal method have insufficient capacity for the proposed mine life?

If the mine waste disposal method does not provide sufficient capacity for the proposed life of mine quantity of waste, the method can be removed from further consideration in the assessment.

Criterion 2 - Would the mine waste disposal method result in negative life of mine economics?

If the proposed mine waste disposal method would have significant economic impacts it can be argued that the method should be excluded from further consideration. For example, alternatives which require the relocation of waste dumps, that are displaced by tailings facility, to a farther site will significantly increase mining haulage costs which will result in negative life of mine economics.

Criterion 3 - Would the alternative overlie land or mineral claims held by others?

- Development of a disposal facility including access and utility corridor in an area where land or mineral claims are held by others was considered a fatal flaw as the owners of such claims have prior rights under the Mining Act which would materially impact the ability of Tacora to develop the area for tailings disposal (i.e. requires owner negotiation and financial compensation which are significant schedule and financial risks to the project). Candidates which overlie areas where claims are held by private parties were removed from further consideration.

Criterion 4 – Would the candidate require slurry transport infrastructure crossing the routes of existing public Highway 500 and commercial railway?

There are service interruptions, environmental and public safety risks associated with the crossing (e.g., pipeline leaks/burst, operational staff and public traffic hazards, etc.). Thus, sites north of the existing highway and railway were removed from further consideration.

Criterion 5 – Would the TIA preclude future exploration or mining of a potential resource?

A TIA located over an area where there are proven indicators of mineralization, or a reasonable indication of possible mineralization based on regional trends, may be one possible reason to exclude it from further consideration. Under this scenario, it may not be reasonable to expect the proponent to conduct a lengthy exploration program to prove out whether an economically viable resource does exist in the area.

The region's abundance of natural lakes and water courses frequented by fish significantly limits the identification of alternative footprints for tailings disposal that would not overprint such natural waters. This aspect is further described and considered in Section 5.2.1.

5.2 Application of Pre-Screening Criteria

Table 5-1 presents an assessment of outcomes regarding the application of the pre-screening criteria to the candidate alternatives. Alternatives which do not comply with the pre-screening criteria were removed from further consideration in the assessment.

Table 5-1: Pre-Screening Criteria Summary Table

Pre-Screening Criterion	Base Case	Altern. 1	Altern. 2	Altern. 3	Altern. 4	Altern. 5	Altern. 6	Altern. 7	Altern. 8
Criterion 1 – Would the candidate have insufficient capacity for the proposed mine life?	No	No	No	No	**Yes**	**Yes**	No	No	**Yes**
Criterion 2 – Would the candidate result in negative life of mine economics?	No	No	No	No	No	No	No	No	**Yes**
Criterion 3 – Would the candidate overlie land or mineral claims held by others (including access and utility corridor to a disposal site)?	No	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**	No
Criterion 4 – Would the candidate require slurry transport infrastructure crossing the routes of existing public Highway 500 and commercial railway?	No	No	No	No	**Yes**	**Yes**	No	No	No
Criterion 5 – Would the TIA preclude future exploration or mining of a potential resource?	No	No	No	No	No	No	No	No	**Yes**
Should the candidate be excluded from further assessment?	No	No	No	No	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**

5.2.1 Consideration for Alternatives That Overprint Natural Waters Frequented By Fish

The region's abundance of natural lakes and water courses frequented by fish significantly limits the identification of alternative footprints for tailings disposal that would not overprint such natural waters. As illustrated on Figure 5-1, Candidate Alternative 8 (in-pit disposal) is the only option that avoids impacting these natural waters. However, due to its exclusion based on pre-screening criteria (Table 5-1 and further explanation in Section 5.2.2), the preferred option among the remaining viable candidates will overprint natural waters and thus, necessitate regulatory provisions to designate the affected natural waterbodies as tailings impoundment areas for mine waste management.

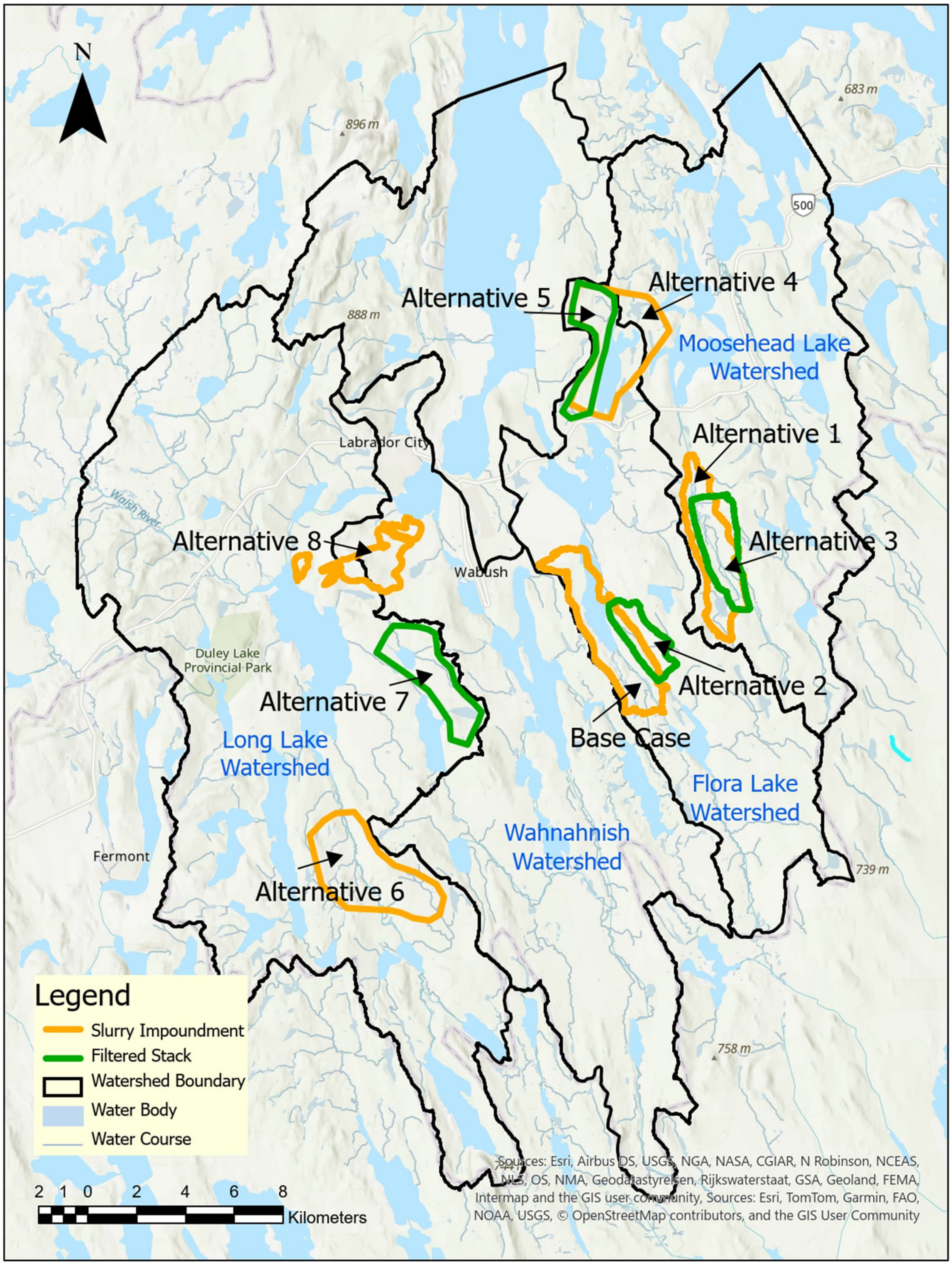


Figure 5-1: Illustration of Candidate Tailings Disposal Sites Concerning Natural Lakes and Water Courses

5.2.2 In-pit Disposal

An opportunity to utilize open pits at Scully Mine for tailings in-pit disposal was assessed based on availability and suitability according to Tacora's mine plan. The in-pit disposal scheme could be implemented using any form of tailings ranging from slurry to filtered, with filtered achieving the greatest storage efficiency by way of compacted placement.

The final pit arrangement at end of mine life is depicted on Figure 5-2, according to the May 2021 mine plan. The final pit is divided into pit sectors according to ore grades and deposit geology. These sectors are subdivided as separate mining phases for subsequent scheduling. The planned pit sectors include the following:

- Boot Pit
- Center Pit West
- Center Pit South
- Center Pit East
- East Pit

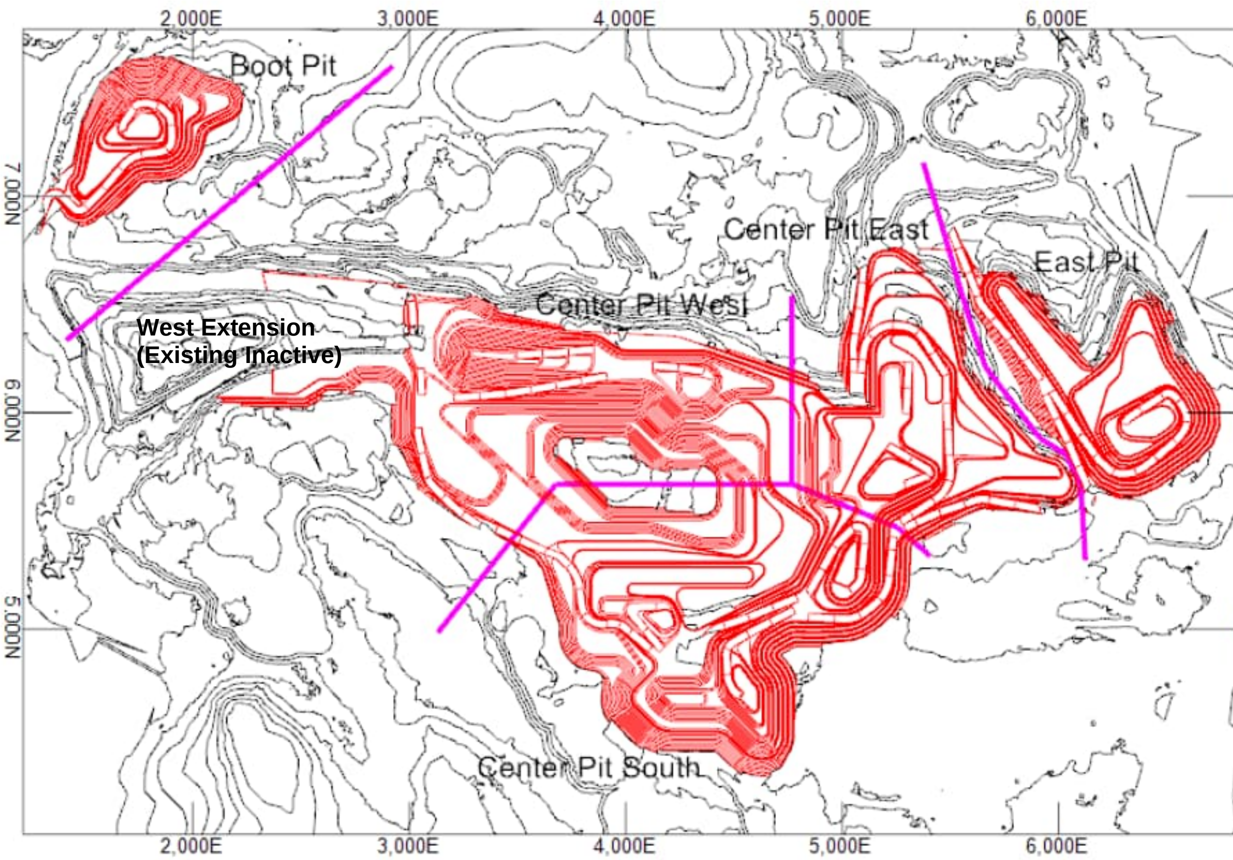
The West Extension Pit is an existing pit but inactive and presently flooded. There is no plan to mine it.

Figure 5-3 illustrates the development schedule and sequencing of each pit over the life of mine according to the May 2021 mine plan. Table 5-2 summarizes the capacity of the pits (planned and existing) and their suitability for tailings in-pit disposal. The pit development schedule limits tailings disposal opportunities within the pit and small usable storage volume do not meet the required storage capacity.

The final pit layout was designed with the current pit status map taken into consideration with respect to ramp entrances and road networks to keep the primary crusher accessible as well as access to waste dump locations.

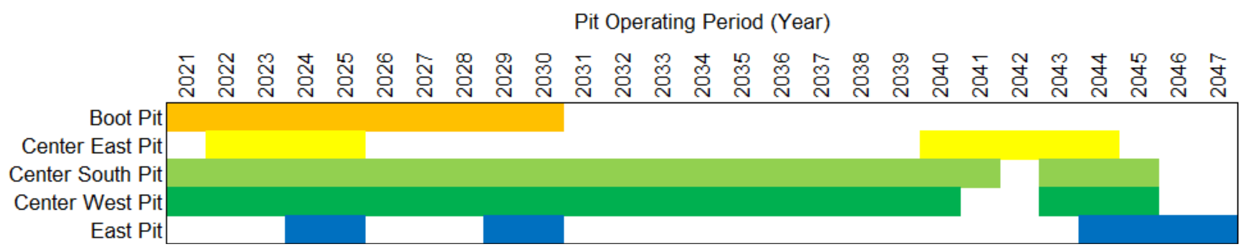
To minimize ore and waste rock haulage costs, Tacora intends to use, upon ore depletion, Boot Pit and West Extension Pit for disposal of waste rock from other operating pits. These two pits once depleted could offer a total volume of 38 Mm^3 or about 20% of required total tailings storage. However, it is realistically not a financially viable alternative option to displace waste rock, identify alternative waste dump site having a longer haulage, and justify capital cost to setup tailings disposal infrastructure for potentially limited tailings storage opportunity.

In consideration of the pit configuration, development plan and waste rock storage requirements, there was no technically feasible opportunity for in-pit tailings disposal option for Tacora without unsafe operation and disruptions. Furthermore, infilling of tailings in depleted pits would effectively sterilize and eliminate the potential economic value for future mining of any underlying low-grade ore based on today's market value defining the cut-of-grade. The evaluation and justifications for this conclusion are summarized in Table 5-2.



Reference: Mine Plan 2021 Feasibility Study Update (Tacora, 2021)

Figure 5-2: Scully Mine Open Pit Arrangement at End of Mine Life



Reference: Mine Plan 2021 Feasibility Study Update (Tacora, 2021)

Figure 5-3: Pit Development Plan Over Life of Mine

Table 5-2: Open Pit Features and Assessment for Suitability of In-Pit Tailings Disposal

Pit Name (Tacora's Scully Mine)	Containment Rim Elevation (m)	Depth (m)	Available Volume up to Pit Rim (Mm^3)	Area Top Rim (ha)	Suitability for In-Pit Tailings Disposal
Boot Pit	540	120	11.8	23.7	• Isolated from other pit area by natural ground and completed in 2031. • Presents the best opportunity for tailings storage. However, it does not offer sufficient capacity for total tailings storage requirement and Tacora has planned for it to be entirely infilled with waste rock generated from other pit areas (1.6 years at 12 Mtpa and 1.6 t/m^3). • Effectively no feasible opportunity for in-pit tailings disposal.
Central Pit West Central Pit South Central Pit East	528	180	164.1	268.8	• No isolation from other sections of the overall Center Pit development. Thus, it requires construction of internal/in-pit tailings containment dams which present a high safety risk for mine workers operating downstream of in-pit tailings dam. • The overall Central Pit is under continual development over life of mine. • No opportunity for in-pit tailings disposal.
East Pit	504	144	30.8	49.6	• Isolated from other pit area by natural ground ridge. • Development occurs in the final years of operation after a long cessation period. It does not offer sufficient capacity for total tailings storage requirement (4.1 years at 12 Mtpa and 1.6 t/m^3). • No opportunity for in-pit tailings disposal.
West Extension Pit	540	97	26.3	65.5	• Isolated from other pits and it is an existing pit but inactive/not mined and flooded. Similar to Boot Pit, it does not offer sufficient capacity for total tailings storage requirement (3.5 years at 12 Mtpa and 1.6 t/m^3) and Tacora has planned for it to be entirely infilled with waste rock generated from other pit areas. Dewatering of the flooded pit would be required if filtered tailings stacking option. • Effectively no feasible opportunity for in-pit tailings disposal.

6. Alternatives Characterization (Step 3)

Through the pre-screening assessment of possible technologies for dewatering, transport and disposal methodology of tailings in coherence with possible disposal sites, a list of tailings disposal alternatives which were carried forward for characterization is presented and described in Table 6-1. Figure 6-1 illustrates the relative locations of each disposal alternative.

The following sub-sections provide a description and features of each disposal option. A SWOT (strengths, weaknesses, opportunities, threats) analysis was completed for each option as a means to provide a qualitative comparison of the options relative to each other. An order of magnitude cost estimate was determined for comparison purposes of each option and is presented in the last sub-section.

Table 6-1: Identified Alternatives for Multiple Account Analysis

Option	Dewatering	Transport	Disposal Site
Base Case (Expansion to Existing TIA)	• Thickened slurry using existing thickener at the Plant Site	• Centrifugal pumps and pipelines	• Expansion slurry impoundment (south of existing TIA) in Flora Lake Basin • Mixed use of available brown-field area of current TIA and green-field area south of South Flora Lake
Alternative 1	• Thickened slurry using existing thickener at the Plant Site	• Centrifugal pumps and pipelines	• New slurry impoundment in Moosehead Lake Basin • Green-field
Alternative 2	• Filtered tailings using new dewatering plant near tailings stack operation	• Centrifugal booster pumps and pipelines to new dewatering plant adjacent the disposal site. • Mobile equipment fleet at disposal stack area	• New stack (south of existing TIA) in Flora Lake Basin • Green-field site connected to brown-field area, since stack footprint on undeveloped land but has surface drainage connected to the developed South Flora Lake
Alternative 3	• Filtered tailings using new dewatering plant near tailings stack operation	• Centrifugal booster pumps and pipelines to new dewatering plant adjacent the disposal site. • Mobile equipment fleet	• New stack in Moosehead Lake Basin • Green-field

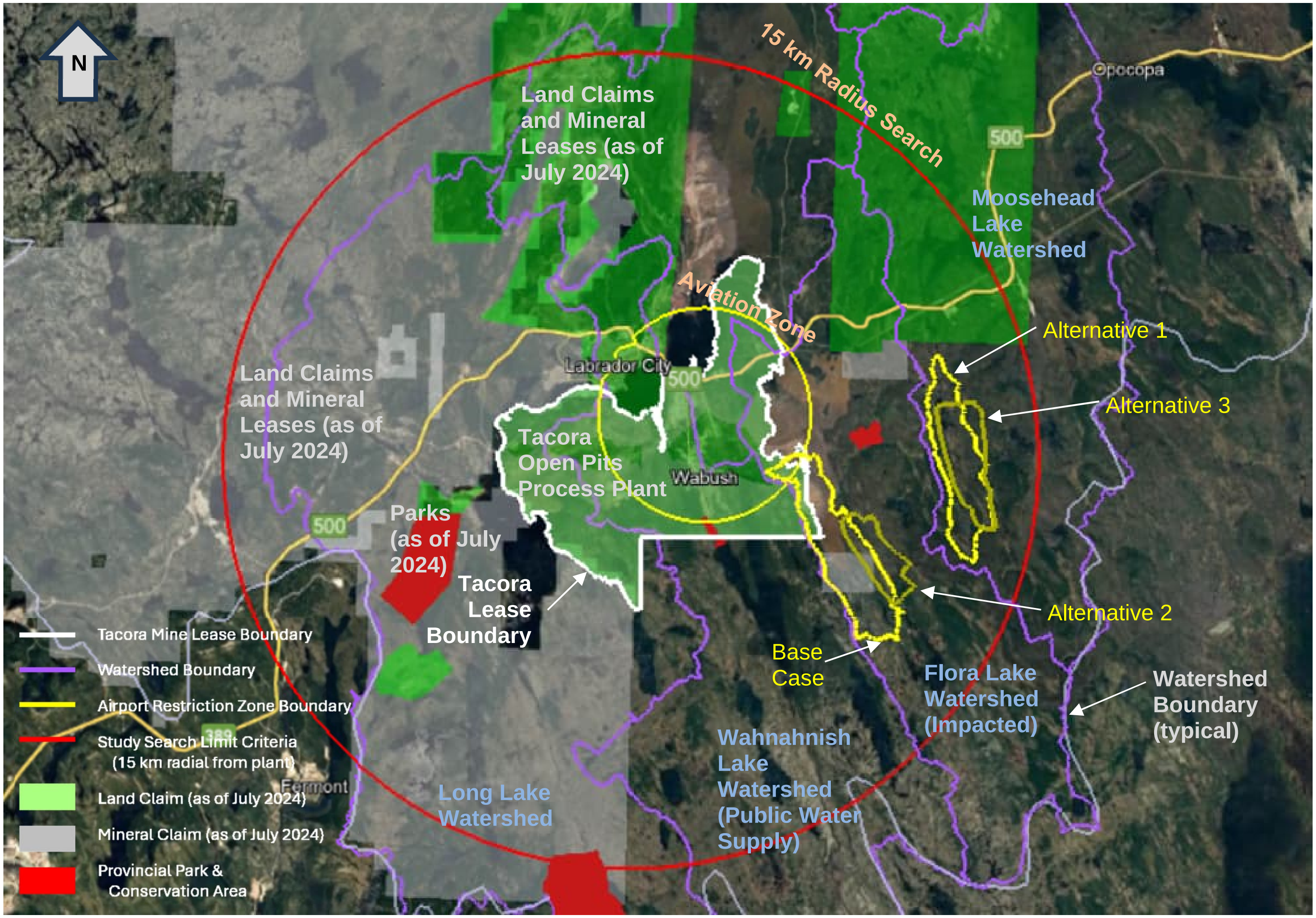


Figure 6-1: Map of Identified Tailings Site Options

6.1 Base Case – Slurry Tailings Expanded Impoundment in Flora Lake Watershed

General arrangement of the Base Case scenario is illustrated on Figure 6-2. A qualitative SWOT assessment for this scenario is presented in Table 6-2.

6.1.1 Tailings Dewatering

The existing tailings thickener tank at the process plant is sufficient and no new dewatering equipment is needed to support this scenario.

6.1.2 Transport

Extension of existing tailings pipelines beyond the existing Pump House #8 to enable slurry tailings discharge at the expansion area of the TIA. The slurry pipeline extension will also require multiple booster pumphouses and associated power, instrumentation, and gland seal water supply. Since access service roads will follow the crest of the perimeter dikes, the access road construction for this utility corridor is expected to be minimal.

A combination of spigots and end-of-pipe discharge arrangement for each of the three delivery pipelines will be installed on the dike crest to facilitate the deposition. A panel of the spigot pipe system will be operated sequentially advancing from the north to south end of the tailings facility. The discharge sequence is repeated from north to south direction for every upstream raise of the dike crest.

6.1.3 Site and Storage Facility

Similar to the existing TIA deposition scheme, the tailings dike will be constructed from borrowing nearby tailings beach material and will be raised in an upstream construction method according to planned stages. The dike extension will follow along the western ridge of the watershed with an approximate 100 m setback buffer from the defined boundaries of the Wahnahnish Lake Projected Public Water Supply Area. The slurry will be discharged from the crest of the west perimeter dikes. North Flora Lake will continue to serve as a polishing pond for the management of suspended solids to meet with the regulatory mine effluent discharge criteria at the compliance point.

A Diversion Channel will be maintained along the eastern valley toe such that the tailings deposit does not block the natural drainage pathway of the upper Flora Lake Watershed. This channel will be formed by careful management of tailings deposition and monitoring. Two diversion dams will be constructed on the southern extents of the tailings deposit to redirect the upper valley runoff to the inlet of the Diversion Channel. Diversion dams will also establish a sedimentation pond for management of tailings solids on the upstream side of the dams.

A progressive reclamation of the tailings beaches will be carried out within the permanently completed sections advancing from the north to the south. Hydroseeding will be applied to establish a vegetation closure cover for managing erosion and fugitive dust emissions. Surficial drainage ditches will be constructed at strategic locations to manage and convey runoff to the Diversion Channel. A permanent Diversion Channel will be constructed for closure. The dike benches will be recontoured to a stable closure condition and allow for establishment of a vegetation cover.

Tacora presently operates in the Flora Lake Watershed, located just upstream of Rio Tinto IOC's tailings disposal site within the same watercourse system. Consequently, impacting separate, undisturbed nearby watersheds would not be environmentally beneficial and would require more capital cost to construct an entirely new tailings facility.

It should be recognized that there are significant benefits for utilizing and developing within the single watershed system that already has two operating tailings facilities: Tacora Scully Mine (Flora Lake Watershed) and RioTinto IOC (Wabush Lake Watershed) operations. These mentionable benefits apply regardless of the tailings technology implemented and include:

- Integration/extension with existing TIA, sedimentation pond, and associated infrastructures for power, slurry pipeline transport and access road corridor.
- All the impacts associated with the development can be confined into a single watershed of the existing tailings facility, that of Flora Lake Watershed which drains to the north into Wabush Lake. This understanding could expedite the environmental impacts assessment, community consultation and permitting processes.

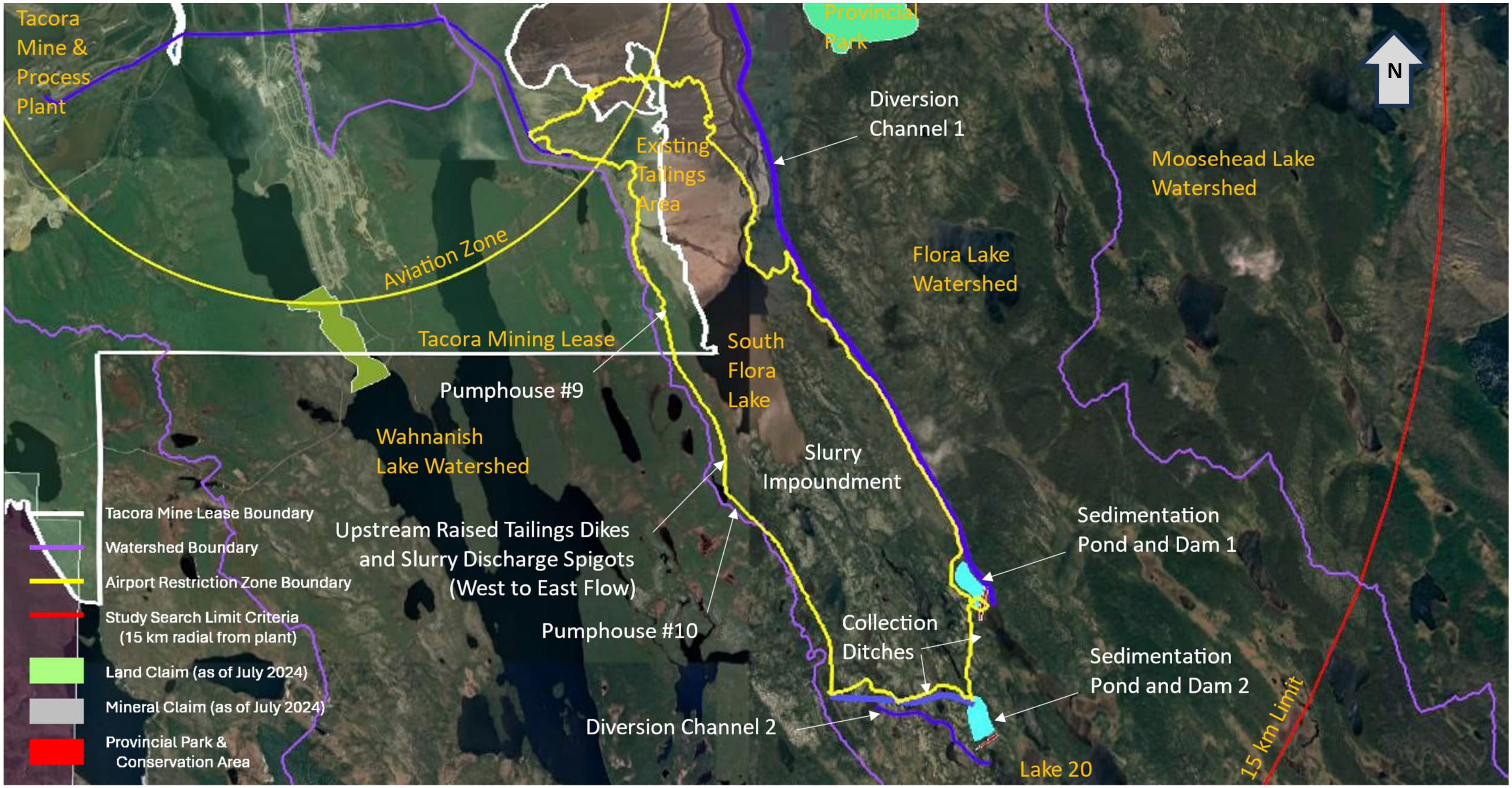


Figure 6-2: Arrangement Plan – Base Case

Table 6-2: SWOT for Base Case - Expansion Thickened Tailings Impoundment in Flora Lake Watershed

STRENGTHS	WEAKNESSES
• Site is a southern expansion of the current Tacora's tailings disposal operation (i.e. connected to brown-field area) that is situated within same impacted watershed. Also, RioTinto's IOC Mine has an existing tailings disposal operation located downstream of the same watercourse system. There will be no disturbance of an entire new watershed. • Less earthwork volumes to upstream raise the dam compared to a downstream raise. • Side valley dike and no impounded water pond directly against dike. • Less labour requirement and lower skill level required to operate the facility compared to the filter stack. • Lowest CAPEX. • Lowest OPEX. • Dusting managed with active saturation of beach or active hydroseeding program. • Minimal greenhouse gas emissions.	• Requires careful tailings deposition and water management to maintain passage of runoff flows from upper reaches of the watershed. • Higher potential for liquefaction of the saturated tailings. Limited rates of rise as upstream raised dams are founded on tailings beach therefore requiring thin lift deposition and need to allow time for beach to consolidate/thaw. This is required to ensure raises are built on competent foundation and thereby protecting the dam's physical stability. • Minimal sustaining capital required for subsequent dam upstream raises using tailings. • Limited ability for progressive rehabilitation. • Dynamic channel for drainage pathway for runoff from upper valley. • Large footprint (low deposit density; higher environmental impacted area and greater habitat compensation requirements). • Higher closure costs due to large area with less flexibility for progressive rehabilitation.
OPPORTUNITIES	**THREATS**
• Over-steepened beach slopes with spigot discharging to maximize vertical storage. • Opportunity to create fish habitat offsetting project within same watershed that is being disturbed, which allows for in-kind offsetting that is preferred by Department of Fisheries and Oceans (DFO).	• Higher technical risk as consolidation of tailings beach in subarctic climate conditions and requires higher degree of control for tailings deposition and supernatant water management. • Risk of potential liquefaction and slump could block drainage pathway upper reaches of the watershed. • Predicted beach slopes are flatter than anticipated could present lower storage capacity and blockage of valley drainage pathway. • Poor public reception with upstream raised tailings dam failures in recent decade.

6.2 Alternative 1 – Slurry Tailings Impoundment in Moosehead Lake Watershed

General arrangement of the Alternative 1 scenario is illustrated on Figure 6-3. A qualitative SWOT assessment for this scenario is presented in Table 6-3.

6.2.1 Tailings Dewatering

The existing tailings thickener tank at the process plant is sufficient and no new dewatering equipment is needed to support this scenario. It may be possible as a future optimization study to adopt a lower range of solids content of the slurry to allow for a more efficient hydraulic pipeline transport of the slurry over a longer distance.

6.2.2 Transport

Extension of existing tailings pipelines beyond the existing Pump House #8 and around the south side of the South Flora Lake to enable slurry tailings discharge at the new TIA site. The slurry pipeline extension will also require multiple booster pumphouses and associated power, instrumentation, and gland seal water supply. A portion of the access service roads will follow the crest of the perimeter dikes on the existing TIA, while the remaining portion will require construction of a new access road and associated culvert crossing at Flora River for this utility corridor.

Additional booster pumps and associated pumphouse infrastructure will be required to extend the slurry pipelines up to the south end (head of the sub-valley) of the proposed impoundment site in the Moosehead Lake Watershed. The three transport pipelines will be combined into a single manifold pipe with distributing spigots that are installed on the deposition face. The deposition will start with the first half of spigots discharging from the southern valley head slope at the highest elevation. Once a sufficient beach deposit forms northwards, the first spigot set will be shutoff, and second half of spigots will be operated while dozers will manipulate the inactive beach tailings to form a platform extension for relocating the non-operation set of spigots northwards. A similar approach would be repeated for the second half of the spigots. Sequencing the deposition discharges in this manner will achieve a deposit ridge flowing northwards along the general slope of the narrow sub valley of the impoundment.

6.2.3 Site and Storage Facility

The tailings containment dikes will be constructed from borrowing suitable native soils within the basin footprint or nearby tailings beach material and where required will be raised in a downstream construction method according to the planned stages. The containment dikes will follow along the western and eastern ridge of the sub-watershed with about 100 m setback buffer from the western ridge. The slurry will be discharged as described in the previous section. A main cross-valley dike with an engineered overflow spillway on the abutment will be constructed at the ultimate northern perimeter of the TIA. This main dike will retain a pond developed by the accumulation of natural catchment runoff and supernatant water from slurry deposition. The pond will serve as a polishing pond for the management of suspended solids to meet with the regulatory mine effluent discharge criteria at the compliance point.

Two main Collection Ditches will be maintained along the western and eastern deposit toes such that the tailings deposit does not block the natural drainage pathway of the Moosehead Lake Watershed. The ditches will be formed by careful management of tailings deposition, maintenance and monitoring.

A progressive reclamation of the tailings beaches will be carried out within the permanently completed sections advancing from the south to the north. Hydroseeding will be applied to establish a vegetation closure cover for managing erosion and fugitive dust emissions. Surficial drainage ditches will be constructed at strategic areas to manage and convey runoff to the Collection Ditches. Upgraded permanent Collection Ditches will be constructed for closure. The dike benches will be regraded to a stable closure condition and allowing for establishing vegetation cover.

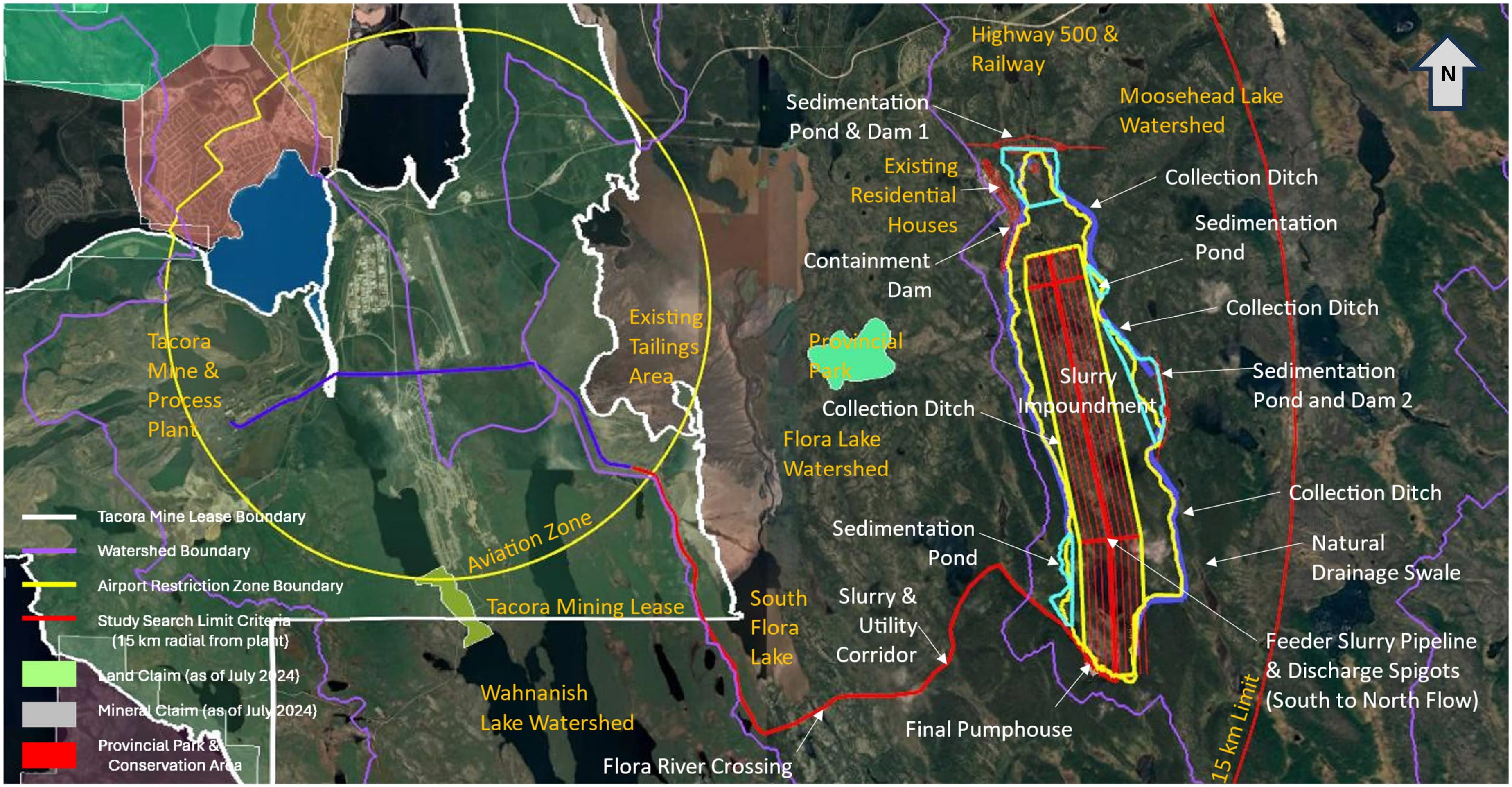


Figure 6-3: Arrangement Plan – Alternative 1

Table 6-3: SWOT for Alternative 1 – New Thickened Tailings Impoundment in Moosehead Lake Watershed

STRENGTHS	WEAKNESSES
• Less earthworks volumes to upstream raise the dike compared to the downstream raise. • Less labour requirement and lower skill level required to operate the facility compared to the filter stack. • Lower CAPEX. • Lower OPEX. • Dusting managed with active saturation of beach or active hydroseeding program. • Minimal greenhouse gas emissions.	• Green-field site in new non-impacted watershed. • Longer tailings slurry delivery pipeline requiring booster station and pipelines (must cross Flora River). • Requires careful tailings deposition and water management. • Higher potential for liquefaction of the saturated tailings. Limited rates of rise as upstream raised dams are founded on tailings beach therefore requiring thin lift deposition and also need to allow time for beach to consolidate/thaw. This is required to ensure raises are built on competent foundation and thereby protecting the dam's physical stability. • Minimal sustaining capital required for subsequent dam upstream raises using tailings • Side valley dam and no impounded water pond. • Limited ability for progressive rehabilitation. • Poor public reception due to recent upstream raised tailings dam failures. • Dynamic channel for drainage pathway for runoff from upper valley. • Large footprint (low deposit density; higher env impacted area and greater habitat compensation requirements). • Higher closure costs due to large area with less flexibility for progressive rehabilitation.
OPPORTUNITIES	**THREATS**
• Over-steepened beach slopes with spigot discharging to maximize vertical storage.	• Green-field site in new watershed not approved by the Regulator. • Potential for pipeline burst over Flora River at crossing lead to enviro spill. • Greater resistance for social license with close proximity of residential dwellings and higher perceived risk to surrounding environment with upstream raised dike. • Higher technical risk as consolidation of tailings beach in subarctic climate conditions and requires higher degree of control for tailings deposition and supernatant water management. • Risk of potential liquefaction and slump could inundate downstream Highway 500 (public safety) and commercial railway (business risk) or block natural valley drainage pathway. • Predicted beach slopes are flatter than anticipated could present lower storage capacity and blockage of valley drainage pathway. • A small north-west section of the proposed footprint clips the boundary of Tacora's mineral lease. A condemnation study of the proposed footprint is planned to confirm the possibility, if any, of sterilizing Tacora's mineral lease due to the minor overprint of the proposal development.

6.3 Alternative 2 – Filtered Tailings Stack in Flora Lake Watershed

General arrangement of the Alternative 2 scenario is illustrated on Figure 6-4. A qualitative SWOT assessment for this scenario is presented in Table 6-4.

6.3.1 Tailings Dewatering

To achieve greater dewatering of tailings to a desired target moisture content that is suitable for placement on a stack and achieve structural stability, additional equipment is required. This equipment is within the dewatering plant complex and includes the following:

- High compression thickener.
- Plate and frame press filter.
- Conveyor system to send filter cake discharged from the press filters on to a three-day temporary storage pile for tailings handling.
- Filtrate water pump and pipeline to return the filtrate back to the process plant for reuse.
- Powerline, transformer substation, electrical and instrumentation panel.
- Plant building with heat and control office.
- Temporary tailings slurry and water holding pond for upset or shut events (i.e. South Flora Lake).
- Filtrate water from the dewatering process will be flocculated and directly discharged into the South Flora Lake. If the water quality is unsuitable for direct discharge, an option can be implemented to pump the filtrate back to the process plant for reuse.
- The dewatering plant will be located on a leveled platform of the east valley hillside and highest elevation of the stack. This elevated position of the dewatering plant will allow for loaded haulage on a downgradient and thereby reduce transport effort and cost.

6.3.2 Transport

The transport of tailings will be achieved in two modes between the process plant and the stack since it is more economical to locate the dewatering plant nearest the stack disposal area and minimize the costlier haul truck transport mode of the filter cake. Thus, the following transport steps are envisaged:

1. Transport of tailings in slurry form from existing Pump House #8 to a new local dewatering plant using extension of pipelines and additional pump houses. An access road for utility corridor and equipment traffic will need to be developed originating from the existing Pump House #8, extending around the southern limits of the South Flora Lake and up to the proposed new dewatering plant on the east valley hillside. Several culvert crossings of existing streams and rivers will be required along the proposed access route.

2. Transport of tailings in dewatered filter cake form from the discharge of the new dewatering plant to the stack location for the placement and final storage using a fleet of haul trucks, dozers, excavator/grader, and watering truck equipment.

A local maintenance shop adjacent to the dewatering plant and stack will be constructed for the maintenance of the fleet of equipment required for the filter cake transport as well as the construction/management of the stack.

6.3.3 Storage Site and Facility

The stack site is located in an area with minimal existing ponds and water courses and a relatively manageable topography of the east valley hillside. The stack will be developed in lifts of a minimum 0.5 m thickness and compacted by a minimum six passes of a CAT D8 dozer. Given the coarseness and free draining characteristics of the tailings, it is anticipated that the desired minimum 95% of standard Proctor maximum dry density of compacted filter cake tailings can be achieved with such construction methodology in order obtain a dilative state of the placed tailings for geotechnical stability of the stack embankment. A watering truck will be employed to manage moistures of placed tailings to achieve compaction targets and for dust control. The stack will have a development and operating plan for the management of off-spec filter cake and for winter operations. The stack will be developed progressively from the south towards the north in staged cells.

Surficial drainage collection ditches will be constructed on the benches and toes of the stack, which will direct all contact water (runoff and seepage) into strategically located sedimentation ponds to manage suspended tailings solids from being carried into the downstream receivers. For this scenario, the existing South Flora Lake and two new ponds with associated water dams will be utilized as a sedimentation pond for the stack operation. Where required, non-contact diversion channels will be constructed to direct natural runoff from the local hillside catchments away from the stack facility.

Completed lifts of the stack will be progressively reclaimed by regrading and hydroseeding the tailings surface to minimize erosion and dust generation.

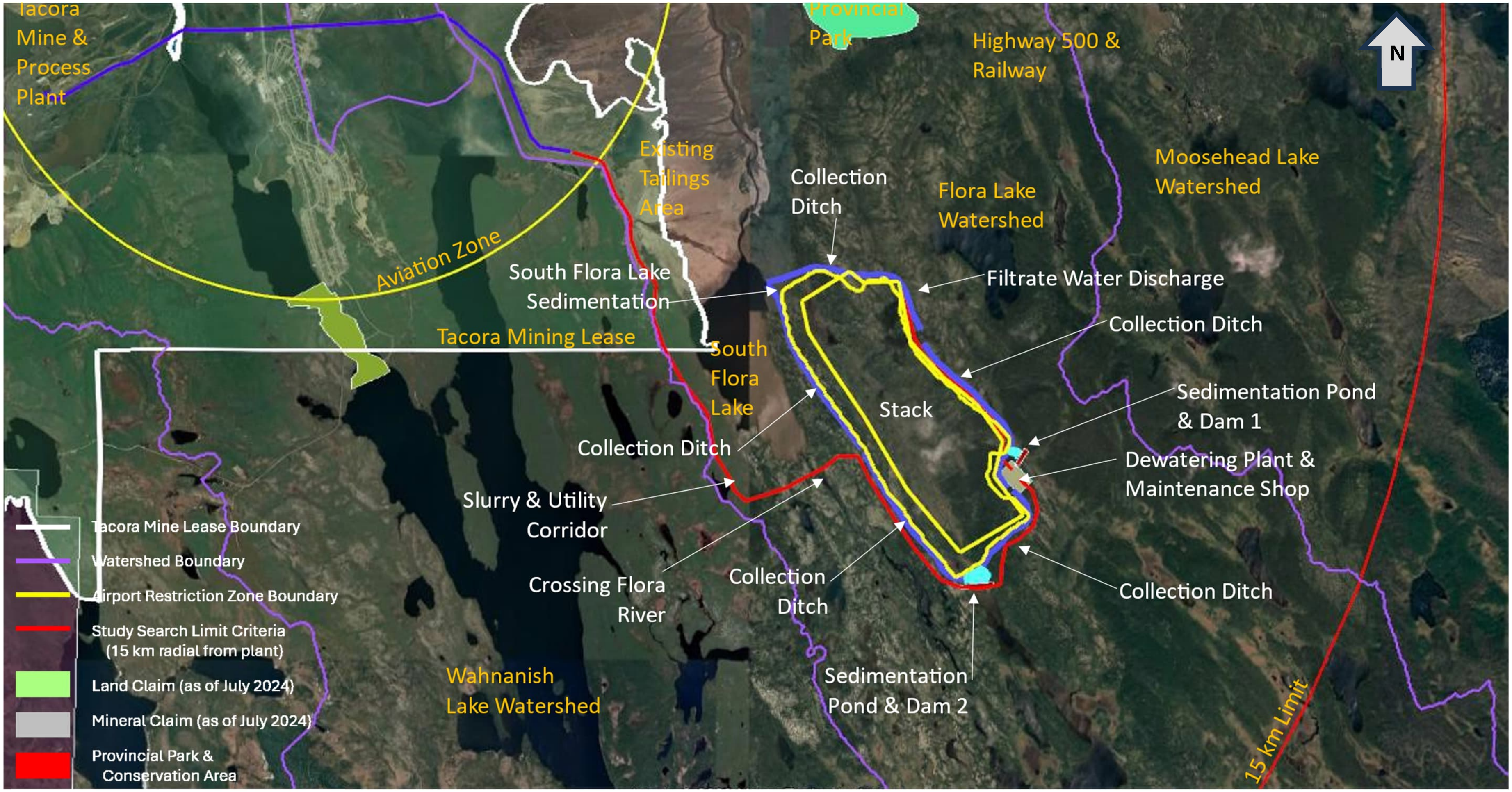


Figure 6-4: Arrangement Plan – Alternative 2

Table 6-4: SWOT for Alternative 2 - New Filtered Tailings Stacking with Vacuum Disc Filters, Mobile Fleet at Flora Lake Watershed

STRENGTHS	WEAKNESSES
• Significantly smaller final footprint with higher stack (needs 418 Ha compared to that of 1,175 Ha for thickened tailings footprint in same watershed). • Typically less long-term instability issues when compared to conventional tailings impoundments. • Significantly reduces risk to downstream impacts with short runout distance potential under hydropathical embankment failure (essentially a slump failure; will not inundate downstream infrastructure). • Allows for flexibility in site water management scheme. • Progressive rehabilitation may be considered during operating phase. • Smaller footprint so closure costs are expected to be lower. • More positive perception from public and regulator.	• New equipment in tailings dewatering plant and maintenance shop therefore higher initial CAPEX and OPEX cost for major mechanical equipment and mobile fleet (capital and maintenance). • Higher OPEX than that of thickened tailings due to the requirement for dedicated operators for equipment spreading of tailings and to maintain dewatering plant. High greenhouse gas emissions from mobile equipment. • Advance planning for stacking operation and higher skill level for stack operation and management. • Heavy rainfall or snowfall may hinder stack operation but can be managed by advanced planning and larger transient stockpile. • Relatively lower solids content of filtered tailings when compared to pressure filter. Disc filter is expected to operate at its upper limits in order to produce suitable filter cake tailings for stacking.
OPPORTUNITIES	**THREATS**
• Configure Stack geometry to enable drainage pathway for runoff from upper valley (avoid need for clean runoff diversion channels). • Dewater South Flora Lake basin initially to utilize storage capacity and reduce stack footprint.	• Clean runoff from upper Flora Lake Watershed is not permitted to be diverted to Wahnahnish Lake Watershed (a public water supply). • Potential for dust generation due to large dry tailings surfaces. Must adopt watering truck and progressive reclamation (risk during winter when watering control not possible). • Cold weather operation for 8 months present challenges to compact tailings in lifts to target densities (therefore stability risk of stack embankment). • Potential disruption in operation if the filtered tailings does not meet specification. • Lower strength properties of filtered tailings and therefore requiring flatter batter slopes and increased footprint. • Regional skilled labour resource and power supply shortages.

6.4 Alternative 3 – Filtered Tailings Stack in Moosehead Lake Watershed

General arrangement of the Alternative 3 scenario is illustrated on Figure 6-5. A qualitative SWOT assessment for this scenario is presented in Table 6-5.

6.4.1 Tailings Dewatering

This alternative will adopt the same dewatering plant arrangement as envisaged for Alternative 2. An existing natural pond south of the proposed dewatering plant site will be utilized as a temporary tailings slurry and water holding pond for upset or shutdown events.

6.4.2 Transport

This alternative will adopt the same dewatering plant arrangement as envisaged for Alternative 2. However, additional pipeline extensions and pump houses will be required to carry the tailings slurry over the topographic rigid and into the Moosehead Lake site.

6.4.3 Storage Site and Facility

This alternative will adopt a similar stack arrangement and development plan as envisaged for Alternative 2. However, at this location, two sedimentation ponds and associated dams will be constructed on the north and east perimeters of the stack to manage contact waters from the stack operation. The existing natural lake will be utilized for the dewatering plant and will also be used for sedimentation purposes from stack runoff and seepage.

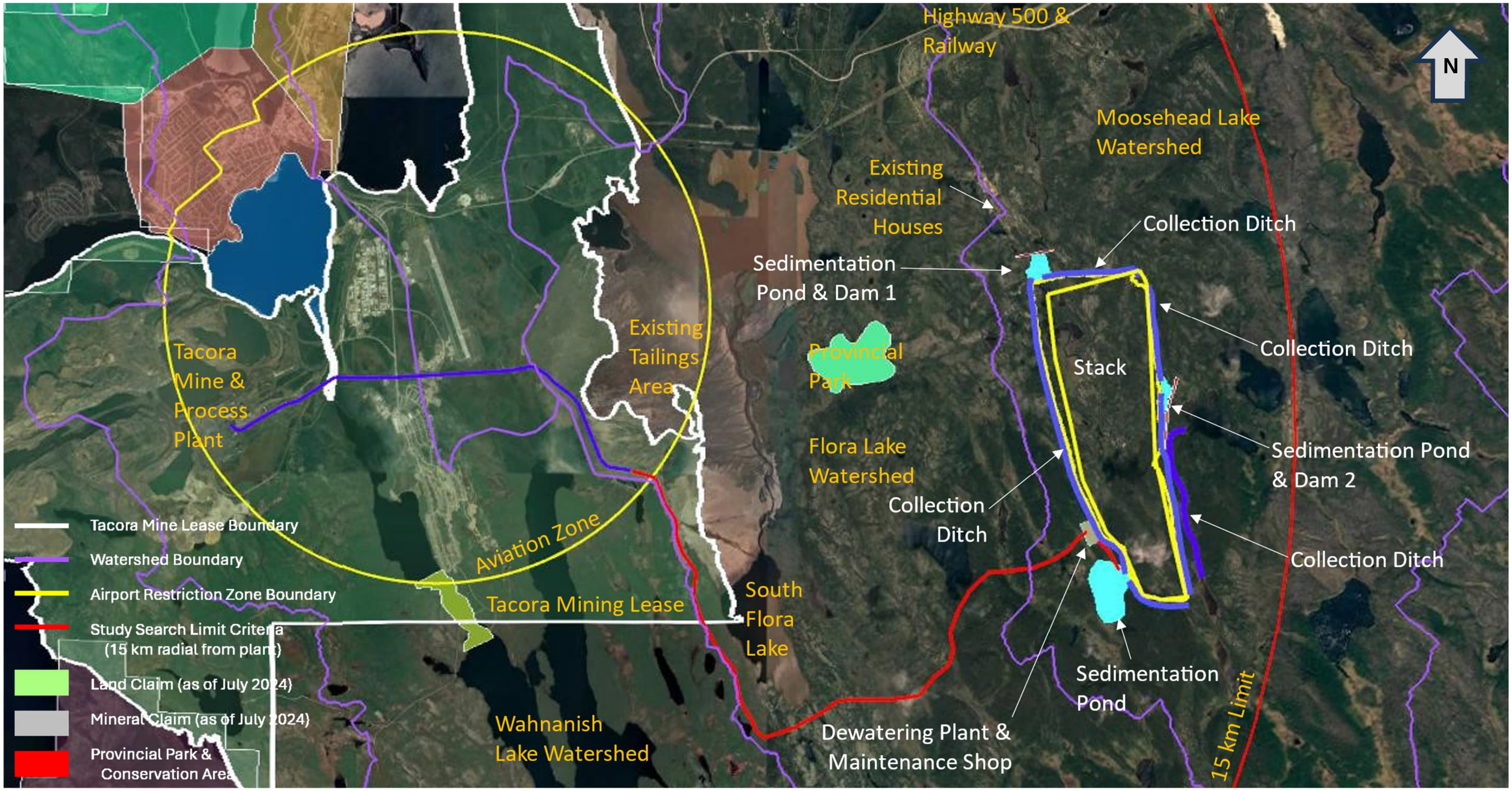


Figure 6-5: Arrangement Plan – Alternative 3

Table 6-5: SWOT for Alternative 3 - New Filtered Tailings Stacking with Vacuum Disc Filters, Mobile Fleet at Moosehead Lake Watershed

STRENGTHS	WEAKNESSES
• Smaller final footprint with higher stack (needs 617 Ha compared to that of 933 Ha for thickened tailings footprint in same watershed). • Typically less long-term instability issues when compared to conventional tailings impoundments. • Significantly reduces risk to downstream impacts with short runout distance potential under hydropathical embankment failure (essentially a slump failure; will not inundate downstream infrastructure). • Allows for flexibility in site water management scheme. • Progressive rehabilitation may be considered during operating phase. • Smaller footprint so closure costs are expected to be lower. • More positive perception from public and regulator.	• Green-field site in new watershed. • Longer tailings slurry delivery pipeline requiring booster station and pipelines (must cross Flora River). • New equipment in tailings dewatering plant and maintenance shop therefore higher initial CAPEX and OPEX cost for major mechanical equipment and mobile fleet (capital and maintenance). • Higher OPEX than that of thickened tailings due to the requirement for dedicated operators for equipment spreading of tailings and to maintain dewatering plant. • High greenhouse gas emissions from mobile equipment. • Advance planning for stacking operation and higher skill level for stack operation and management. • Heavy rainfall or snowfall may hinder stack operation but can be managed by advanced planning and larger transient stockpile. • Relatively lower solids content of filtered tailings when compared to pressure filter. Disc filter is expected to operate at its upper limits in order to produce suitable filter cake tailings for stacking. • Cross-valley infilling with filtered tailings will block natural drainage pathway of upper watershed.
OPPORTUNITIES	**THREATS**
• None identified	• Green-field site in new watershed not approved by the Regulator. • Potential for pipeline burst over Flora River at crossing lead to enviro spill. • Potential for dust generation due to large dry tailings surfaces. Must adopt watering truck and progressive reclamation (risk during winter when watering control not possible) • Winter operation for 7 months present challenges to compact tailings in lifts to target densities (therefore stability risk of stack embankment). • Potential disruption in operation if the filtered tailings does not meet specification. • Lower strength properties of filtered tailings and therefore requiring flatter batter slopes and increased footprint. • Regional skilled labour resource and power supply shortages.

6.5 Capital and Operating Cost Estimates

For each option, an order of magnitude (OoM) estimate of capital costs (CAPEX), sustaining CAPEX, and operating costs (OPEX) were developed for the full project life cycle according to Association for the Advancement of Cost Engineering (AACE) class 5 guidelines at a +65% / -35% accuracy level. The basis, assumptions and exclusions are described in the following sections. Detailed cost estimates for each option are provided in Appendix A.

6.5.1 CAPEX and Sustaining CAPEX

For the tailings process dewatering and transport facilities, the methodology for developing the CAPEX, which includes sustaining CAPEX and closure phases of the project, for each option is summarized below:

- The cost to supply the major equipment was estimated using Hatch's in-house data from recent projects. Prices were adjusted to suit capacity requirements and for inflation as required.
- The cost to install mechanical equipment was factored based on published data and/ or Hatch's in-house data.
- The costs for supply and installation of overland piping were completed by estimating the length and applying unit costs based on Hatch's in-house data.
- Within the dewatering plant areas, costs for all other commodities (such as concrete, structural steel) was factored as a percentage of the mechanical equipment supply and installation costs based on Hatch's in-house data.
- Indirect and owner costs are factored as a percentage of the equipment and material supply costs.
- Contingency is factored as a percentage of direct and indirect costs.
- Major equipment CAPEX included:
    - Booster pumpstations and pipelines (for consistency between options assumed booster station every 1.5 km with 3 slurry pipelines to transport from PH#8 to dewatering plant or final pumphouse)
    - Utility corridor with service road and river culvert crossing where required
    - Powerline, transformer stations and controls
    - For options adopting a filtered tailings technology, the requirements are:
    - Dewatering plant with heated building for vacuum cloth disc equipment, discharge conveyor and loadout
    - Maintenance shop and office for the mobile equipment fleet

For the structures at the TIA, the capital costs were estimated based on the following:

- Civil earthworks CAPEX as well as sustaining CAPEX included:

    - Clearing
    - Foundation preparation
    - Fill materials and riprap
    - Access roads and overpass culverts
    - Excavation and rock blasting for water ditches and channels
    - Rehabilitation and closure including placement of closure cover with vegetation hydroseeding only (lumped as closure sustaining CAPEX)
    - Drainage channels and ponds
- The unit costs for the listed earthworks were estimated from Hatch's in-house data from recent projects. Neat line volumes were estimated using calculated assumed geometries.
- Costs for geotechnical instruments, construction monitoring and engineering supervision for the containment dam were estimated from Hatch's experience on similar projects.

Excluded items in the estimate are as follows:

- Existing thickener at the process plant
- Existing pipelines and pump stations infrastructure (CAPEX and OPEX associated with tailings slurry transport from process plant to existing Pump House #8)
- Operational dust control (assumed progressive closure)
- Tailings area habitat compensation costs for implementation. Specific designs and construction of compensation features as well as related financial bonds have not been determined for this level of study.

A breakdown of CAPEX which includes sustaining CAPEX and closure phases of the project for each alternative is summarized in Table 6-6.

Table 6-6: Summary of OoM CAPEX and Sustaining CAPEX Estimate

Item	CAPEX & Sustaining CAPEX			
	Base Case Thickened Slurry Impoundment at Flora	Alternative 1 Thickened Slurry Impoundment at Moosehead	Alternative 2 Filtered Tailings Stack at Flora	Alternative 3 Filtered Tailings Stack at Moosehead
Directs	$124.8	$319.2	$294.4	$331.0
Dewatering Plant Mechanical Equipment	$0.0	$0.0	$41.6	$41.6
Overland Pumps and Pipelines	$36.5	$80.9	$65.3	$66.6
Mobile Equipment (purchased)	$0.0	$0.0	$33.6	$33.6
Buildings and Other Infrastructure	$2.9	$13.2	$80.9	$80.9
Other Directs	$9.9	$34.3	$40.4	$46.8
Tailings Area Development/Earthworks (incl sustaining CAPEX)	$14.2	$101.2	$10.6	$25.0
Tailings Area Habitat Compensation	Not defined at this level of study.			
Tailings Area Closure (sustaining CAPEX)	$61.2	$89.5	$22.3	$36.6
Indirects	$36.2	$92.6	$90.0	$100.6
Owner's Cost	$5.0	$12.8	$11.8	$13.2
Contingency	$58.1	$148.6	$138.7	$155.7
Total CAPEX	**$165.9**	**$424.5**	**$396.3**	**$444.8**
Total CAPEX incl. Contingency	**$224.0**	**$573.1**	**$535.1**	**$600.5**

Notes:
1. Total installed cost of equipment estimated with Lang Factor of 5.1 (EEA Guide, 2015)
2. CAPEX includes sustaining CAPEX for tailings area earthworks (staged development to be assessed in future engineering).
3. AACE Class 5 Estimate (-35%/+65%).

6.5.2 OPEX

For each option, an OPEX estimate was developed as per the following:

- For the options that include mechanical transport and stacking, the heavy mobile equipment costs (haul trucks, loaders, dozers, etc.) for leasing, operating and maintenance. It was assumed that these mobile fleet were leased rather than purchased.
- Hatch developed the operating quantities (energy, labour, consumables, berm construction, etc.) for each option. Tacora provided the unit cost information such as electrical energy, fuel, labour rates, consumables (flocculant) costs, etc.
- Progressive closure costs were considered as closure sustaining CAPEX and not considered as OPEX for an OoM level of estimate.
- The operating cost estimates were normalized and reported in cost per tonne of tailings.

A breakdown of OPEX for each alternative is summarized in Table 6-7.

Table 6-7: Summary of OoM OPEX Estimate

Item	Annual Cost (million $ per year)			
	Base Case Thickened Slurry Impoundment at Flora	Alternative 1 Thickened Slurry Impoundment at Moosehead	Alternative 2 Filtered Tailings Stack at Flora	Alternative 3 Filtered Tailings Stack at Moosehead
Labor	$0.44	$0.44	$20.53	$20.53
Consumables	$0.00	$0.00	$2.73	$2.73
Power	$3.79	$14.72	$14.84	$14.84
Mobile Equipment (Fuel and Maintenance)	$0.00	$0.00	$14.24	$14.24
Mechanical Equipment and Pipelines	$1.65	$3.92	$6.54	$6.59
Total OPEX	**$5.88**	**$19.08**	**$58.88**	**$58.93**

Notes:
1. AACE Class 5 Estimate (-35%/+65%).
2. Range of OPEX based on available data from Hatch database.

6.5.3 Total Cost Estimates

A summary of the CAPEX and OPEX can be found in Table 6-8. The detailed breakdown of the CAPEX and OPEX can be found in Appendix A.

Table 6-8: Summary of OoM Combined CAPEX and OPEX Estimate

Item	Normalized Cost ($/tonne of tailings)			
	Base Case Thickened Slurry Impoundment at Flora	Alternative 1 Thickened Slurry Impoundment at Moosehead	Alternative 2 Filtered Tailings Stack at Flora	Alternative 3 Filtered Tailings Stack at Moosehead
Total CAPEX (per tonne of solid tailings)	0.7	1.79	1.67	1.88
Total OPEX (per tonne of solid tailings)	0.48	1.55	4.78	4.79
Total Cost (per tonne of solid tailings)	**1.18**	**3.34**	**6.46**	**6.66**

Notes:
1. Total installed cost of equipment estimated with Lang Factor of 5.1 (EEA Guide, 2015)
2. CAPEX includes sustaining CAPEX for tailings area earthworks (staged development to be assessed in future engineering).
3. AACE Class 5 Estimate (-35%/+65%).

7. Multiple Accounts Assessment

A multi-criteria matrix was generated and workshops for scoring of options were conducted over several sessions with stakeholder participations from Tacora, SEM and Hatch.

The first workshop was held to discuss how each criteria impacted the options. A SWOT (strengths, weaknesses, opportunities, threats) analysis was completed for each option as a means to provide a qualitative comparison of the options relative to each other.

Subsequent workshops were held to further discuss and finalize the analysis of the impacts of each criterion on the options. Weighting of each criterion was assigned and scoring the options via the multiple accounts assessment.

A final presentation was held to summarize the study findings and allow all participants to provide feedback on the outcomes and align on the conclusions of the study.

The multiple accounts assessment (MAA) was carried out in accordance with the ECCC Guidelines.

7.1 Multiple Accounts Ledger (Step 4)

In order to evaluate alternatives using the MAA decision making tool, a multiple accounts ledger has been developed. This ledger seeks to identify those elements that differentiate alternatives, and provides the basis for scoring and weighting

A multiple accounts ledger includes a three-level hierarchy comprised of

- Accounts

- Sub-accounts, known as evaluation criteria
- Indicators, known as measurement criteria

Complete definitions accounts, sub-accounts and indicators are described in the following sections. The complete multiple accounts ledger table is presented in Appendix B for all accounts, sub-accounts and their indicators with respect to each alternative.

7.1.1 Accounts

Accounts are intended to separate the effects associated with the alternatives into broad categories and allow for a comparison of the alternatives at this high level.

As prescribed by ECCC Guidelines, the following four accounts were used in this assessment:

1. Environmental impacts
2. Project financial
3. Technical and operational, and
4. Socio-economic impacts.

To allow qualitative or quantitative measurement of the impact (i.e., benefit or loss) associated with each alternative for any given account, the account needs to be measurable and need to be sufficiently decomposed to allow measurability. This decomposition takes the form of indicators grouped by sub-accounts as described in the following.

7.1.2 Sub-Accounts

Each account is further divided into sub-accounts, which are also described as evaluation criteria. The ECCC Guidelines require that sub-accounts be impact driven, differentiating, understandable, non-redundant, and able to be independently judged (i.e., not depend on the value in another sub account).

A summary table was prepared for each account to present the selected sub-accounts and a description of the rationale behind each. These tables are recommended by the Guidelines as a deliverable from Step 4 of the assessment process. The following sections present the sub-account summary tables for each of the four adopted accounts.

7.1.2.1 Environmental Account – Selected Sub-accounts

The Environmental account addresses the anticipated impacts of tailings storage on the environment. The account was broken down into sub-accounts to incorporate impacts on land, water and air, and the wildlife within them.

7.1.2.2 Technical Account – Selected Sub-accounts

The Technical account considers the engineering elements and technical risks associated with each alternative.

7.1.2.3 Financial Account – Selected Sub-accounts

The Financial account addresses the differentiating portions of the lifecycle costs of the alternatives.

7.1.2.4 Socio-Economic Account – Selected Sub-accounts

The Socio-Economic account is divided into sub-accounts which capture the anticipated impacts of tailings storage on local and traditional land users.

7.1.3 Indicators

Each of the sub-accounts are then divided into indicators which allow the impacts associated with each alternative to be measured. The measurements for each indicator are referred to as "indicator quantities". Scoring of each indicator occurs as a part of the next step (Step 5) of the assessment process by applying the quantitative value scale adopted for each indicator to the indicator quantity.

For the purposes of this MAA, each indicator has a six-point scale established that details how an alternative is valued, as suggested in the ECCC Guidelines. Based on consultant experience with other assessments of alternatives, for indicators measured by quantitative data, the six-point scale is set up to reflect and maximize the relative differences between each alternative. A six-point qualitative scale is also set up to cover a wider range of scenarios for added clarity and to ensure that an independent reviewer would also assign the same values.

Refer to Table B.1 in Appendix B for the detailed MAA ledger of accounts, sub-accounts, and indicators with reference scoring scale of each measurable indicator (i.e. measured either as quantitative or qualitative scale) adopted for the study.

Refer to Table B.2 in Appendix B for the detailed MAA reference weighting of each measurable indicator and sub-account adopted for the study.

Refer to Table B.3 in Appendix B for the applied score value and its justification on each measurable indicator (i.e. measured either as quantitative or qualitative scale) for the study.

7.2 Value-Based Decision Process (Step 5)

After developing the multiple accounts ledger, the assessment process shifts to the "value-based decision process" where value judgments are applied through weightings and the alternatives are compared to identify a preferred alternative. The value-based decision process performed in Step 5 consists of scoring and weighting the indicators and applying weightings to the sub-accounts and accounts. Once all scoring and weighting is completed, the quantitative analysis is completed and the preferred alternative is identified.

The MAA follows the scoring and ranking methodology provided in the ECCC Guidelines as described below.

For each indicator, the indicator value (S) of each alternative is listed in one column. The weighting factor (W) is listed in another column and the combined indicator merit score ($S \times W$) is calculated as the product of these values.

Indicator merit scores can be directly compared across alternatives, and likewise account merit scores ($\Sigma\{S \times W\}$) can be directly compared across alternatives. However, to allow comparison of these values against values for other sub-accounts, the scores must be normalized to the same six-point scale used to score each indicator value. This is achieved by dividing the account merit score by the sum of the weightings (ΣW) to yield an sub-account merit rating ($Rs = (\Sigma\{S \times W\}/ \Sigma W)$. This will again be a value between 1 and 6. This normalization is necessary to balance out different numbers of indicators for each sub-account. Without this normalization, the number of indicators associated with each sub-account would have to be identical, otherwise the analysis will be skewed by sub-accounts with more indicators.

The same procedure of weighting and normalization is followed to determine account merit scores ($\Sigma\{Rs \times W\}$), and account merit ratings ($Ra = \Sigma(Rs \times W)/\Sigma W$). This process is repeated one final time, an alternative merit score ($\Sigma\{Ra \times W\}$), and an alternative merit rating ($A = \Sigma(Ra \times W)/\Sigma W$) are determined for each of the alternatives.

Weighting factors allow relative importance of one indicator as compared to another, and this weighting factor is most likely to reflect a particular bias or value basis. Weighting factors range from 1 through 6. This means that any one indicator can be up to 6 times more significant than another.

The results from multiple accounts assessment of the identified alternative options considering the base case scenario of weighting are described in the following sections.

The quantitative analysis is summarized in tables showing calculations for the account merit ratings. These table are presented in the following sub-sections with respect to the four accounts: Environmental impacts, Project financial, Technological and operational, and Socio-economics impacts.

A final procedure of weighting and normalization is completed on the accounts to determine the alternative merit ratings for each of the alternatives. This will allow comparison of alternative merit ratings for all tailings disposal alternatives evaluated and the preferred option will be the one which has the highest merit rating. The results of the alternative merit ratings are presented in the last sub-section.

7.2.1 Environmental Account

A quantitative analysis was carried out for indicators associated with this account. The defined indicators were assigned ranking values by the stakeholders and presented in Table 7-1. Each sub-account merit score and rating were calculated with an assigned indicator weight distribution. The overall account merit score and rating were determined as presented in Table 7-2.

Table 7-1: Environmental Account – Sub-Account Merit Scoring and Rating

Sub-Account ID	Sub-Account Description	Indicator ID	Indicator Description	Indicator Weight Distribution in Sub-Account (%)	Indicator Weight (W) [Note 1]	Basecase Thickened Flora		Alternative 1 Thickened Moosehead		Alternative 2 Stack Flora		Alternative 3 Stack Moosehead	
						Indicator Value (S) [Note 1]	*Indicator Merit Score (S x W)*	*Indicator Value (S) [Note 1]*	*Indicator Merit Score (S x W)*	*Indicator Value (S) [Note 1]*	*Indicator Merit Score (S x W)*	*Indicator Value (S) [Note 1]*	*Indicator Merit Score (S x W)*
E.01	Water Quality	E.01.a	Water Polishing/Treatment Requirements	100%	3	3	9	1	3	4	12	2	6
					Sub-account merit score (Σ{S x W})		9		3		12		6
					Sub-account merit rating (Ra = Σ{S x W} / ΣW)		3.00		1.00		4.00		2.00
E.02	Aquatic Life and Habitat Impacts (can be compensated)	E.02.a	Waterbody Losses During Operations	50%	4	3	12	3	12	5	20	3	12
		E.02.b	Watercourse Losses During Operations	50%	4	3	12	1	4	4	16	2	8
					Sub-account merit score (Σ{S x W})		24		16		36		20
					Sub-account merit rating (Ra = Σ{S x W} / ΣW)		3.00		2.00		4.50		2.50
E.03	Groundwater Impacts	E.03.a	Groundwater Impacts by Seepage Risks from TIA	100%	3	2	6	1	3	4	12	3	9
					Sub-account merit score (Σ{S x W})		6		3		12		9
					Sub-account merit rating (Ra = Σ{S x W} / ΣW)		2.00		1.00		4.00		3.00
E.04	Terrestrial Life and Habitat Impacts	E.04.a	Forested Land Losses (wildlife, species at risk)	25%	2	1	2	1	2	4	8	3	6
		E.04.b	Habitat Fragmentation due to pipeline/utility corridors, access roads and haul roads.	13%	1	3	3	1	1	2	2	1	1
		E.04.c	Percentage usage of Existing Disturbed Land	63%	5	5	25	1	5	2	10	1	5
					Sub-account merit score (Σ{S x W})		30		8		20		12
					Sub-account merit rating (Ra = Σ{S x W} / ΣW)		3.75		1.00		2.50		1.50
E.05	Air Quality and Noise Impacts	E.05.a	Dusting Impacts from Operations	83%	5	5	25	3	15	1	5	1	5
		E.05.b	Noise Impacts from Operations	17%	1	5	5	3	3	1	1	1	1
					Sub-account merit score (Σ{S x W})		30		18		6		6
					Sub-account merit rating (Ra = Σ{S x W} / ΣW)		5.00		3.00		1.00		1.00
E.06	Climate Change	E.06.a	Greenhouse Gas Emissions	100%	3	5	15	5	15	1	3	1	3
					Sub-account merit score (Σ{S x W})		15		15		3		3
					Sub-account merit rating (Ra = Σ{S x W} / ΣW)		5.00		5.00		1.00		1.00

Notes:
1. Scale system of 1 to 6 where 1 is low and 6 is high.

Table 7-2: Environmental Account – Account Merit Scoring and Rating

Sub-Account ID	Sub-Account Description	Sub-Acct Weight Distribution in Account (%)	Sub-Acct Weight (W) *[Note 1]*	Basecase Thickened Flora		Alternative 1 Thickened Moosehead		Alternative 2 Stack Flora		Alternative 3 Stack Moosehead	
				Sub-Acct Value (S) [Note 1]	*Sub-Acct Merit Score (S x W)*	*Sub-Acct Value (S) [Note 1]*	*Sub-Acct Merit Score (S x W)*	*Sub-Acct Value (S) [Note 1]*	*Sub-Acct Merit Score (S x W)*	*Sub-Acct Value (S) [Note 1]*	*Sub-Acct Merit Score (S x W)*
E.01	Water Quality	28%	5	3.00	15	1.00	5	4.00	20	2.00	10
E.02	Aquatic Life and Habitat Impacts (can be compensated)	6%	1	3.00	3	2.00	2	4.50	4.5	2.50	2.5
E.03	Groundwater Impacts	6%	1	2.00	2	1.00	1	4.00	4	3.00	3
E.04	Terrestrial Life and Habitat Impacts	22%	4	3.75	15	1.00	4	2.50	10	1.50	6
E.05	Air Quality and Noise Impacts	22%	4	5.00	20	3.00	12	1.00	4	1.00	4
E.06	Climate Change	17%	3	5.00	15	5.00	15	1.00	3	1.00	3
			Account merit score (Σ{S x W})		70		39		45.5		28.5
			Account merit rating (Ra = Σ{S x W} / ΣW)		3.89		2.17		2.53		1.58

Notes:

1. Scale system of 1 to 6 where 1 is low and 6 is high.

7.2.2 Financial Account

A quantitative analysis was carried out for indicators associated with this account. The defined indicators were assigned ranking values by the stakeholders and presented in Table 7-3. Each sub-account merit score and rating were calculated with an assigned indicator weight distribution. The overall account merit score and rating were determined as presented in Table 7-4.

Table 7-3: Financial Account – Sub-Account Merit Scoring and Rating

Sub-Account ID	Sub-Account Description	Indicator ID	Indicator Description	Indicator Weight Distribution in Sub-Account (%)	Indicator Weight (W) *[Note 1]*	Basecase Thickened Flora		Alternative 1 Thickened Moosehead		Alternative 2 Stack Flora		Alternative 3 Stack Moosehead	
						Indicator Value (S) [Note 1]	*Indicator Merit Score (S x W)*	*Indicator Value (S) [Note 1]*	*Indicator Merit Score (S x W)*	*Indicator Value (S) [Note 1]*	*Indicator Merit Score (S x W)*	*Indicator Value (S) [Note 1]*	*Indicator Merit Score (S x W)*
F.01	Capital Cost	F.01.a	Initial CAPEX (startup ~2 years operation)	60%	6	6	36	5	30	1	6	1	6
		F.01.b	Sustaining CAPEX (Year 3 to end of life)	40%	4	5	20	3	12	6	24	6	24
					Sub-account merit score (Σ{S x W})		56		42		30		30
					Sub-account merit rating (Ra = Σ{S x W} / ΣW)		5.60		4.20		3.00		3.00
F.02	Operating Cost	F.02.a	Operating Cost - Labour, maintenance, repairs, etc	100%	3	5	15	4	12	1	3	1	3
					Sub-account merit score (Σ{S x W})		15		12		3		3
					Sub-account merit rating (Ra = Σ{S x W} / ΣW)		5.00		4.00		1.00		1.00
F.03	Closure Cost	F.03.a	Closure Cost	100%	3	1	3	1	3	5	15	4	12
					Sub-account merit score (Σ{S x W})		3		3		15		12
					Sub-account merit rating (Ra = Σ{S x W} / ΣW)		1.00		1.00		5.00		4.00
F.04	Env. Compensation and Monitoring Cost	F.04.a	Environmental Compensation & Monitoring Cost (not determined but qualitative assessment presented)	100%	3	2	6	1	3	6	18	1	3
					Sub-account merit score (Σ{S x W})		6		3		18		3
					Sub-account merit rating (Ra = Σ{S x W} / ΣW)		2.00		1.00		6.00		1.00
F.05	Permitting Process Impacts	F.05.a	Permitting Risks / Obstacles	67%	4	5	20	1	4	5	20	1	4
		F.05.b	Permitting Schedule Duration	33%	2	6	12	1	2	4	8	1	2
					Sub-account merit score (Σ{S x W})		32		6		28		6
					Sub-account merit rating (Ra = Σ{S x W} / ΣW)		5.33		1.00		4.67		1.00

Notes:

1. Scale system of 1 to 6 where 1 is low and 6 is high.

Table 7-4: Financial Account – Account Merit Scoring and Rating

Sub-Account ID	Sub-Account Description	Sub-Acct Weight Distribution in Account (%)	Sub-Acct Weight (W) *[Note 1]*	Basecase Thickened Flora		Alternative 1 Thickened Moosehead		Alternative 2 Stack Flora		Alternative 3 Stack Moosehead	
				Sub-Acct Value (S) [Note 1]	*Sub-Acct Merit Score (S x W)*	*Sub-Acct Value (S) [Note 1]*	*Sub-Acct Merit Score (S x W)*	*Sub-Acct Value (S) [Note 1]*	*Sub-Acct Merit Score (S x W)*	*Sub-Acct Value (S) [Note 1]*	*Sub-Acct Merit Score (S x W)*
F.01	Capital Cost	24%	6	5.60	33.6	4.2	25.2	3.00	18	3	18
F.02	Operating Cost	24%	6	5	30	4	24	1	6	1	6
F.03	Closure Cost	16%	4	1	4	1	4	5	20	4	16
F.04	Env. Compensation and Monitoring Cost	12%	3	2	6	1	3	6	18	1	3
F.05	Permitting Process Impacts	24%	6	5.33	32	1	6	4.67	28	1	6
			Account merit score (Σ{S x W})		105.6		62.2		90		49
			Account merit rating (Ra = Σ{S x W} / ΣW)		4.22		2.49		3.60		1.96

Notes:
1. Scale system of 1 to 6 where 1 is low and 6 is high.

7.2.3 Technical and Operational Account

A quantitative analysis was carried out for indicators associated with this account. The defined indicators were assigned ranking values by the stakeholders and presented in Table 7-5. Each sub-account merit score and rating were calculated with an assigned indicator weight distribution. The overall account merit score and rating were determined as presented in Table 7-6.

Table 7-5: Technical and Operational Account – Sub-Account Merit Scoring and Rating

Sub-Account ID	Sub-Account Description	Indicator ID	Indicator Description	Indicator Weight Distribution in Sub-Account (%)	Indicator Weight (W) *[Note 1]*	Basecase Thickened Flora		Alternative 1 Thickened Moosehead		Alternative 2 Stack Flora		Alternative 3 Stack Moosehead	
						Indicator Value (S) [Note 1]	*Indicator Merit Score (S x W)*	*Indicator Value (S) [Note 1]*	*Indicator Merit Score (S x W)*	*Indicator Value (S) [Note 1]*	*Indicator Merit Score (S x W)*	*Indicator Value (S) [Note 1]*	*Indicator Merit Score (S x W)*
T.01	Tailings Dewatering and Transport Equipment	T.01.a	Proven dewatering technology for similar ore type and production	32%	6	6	36	5	30	2	12	2	12
		T.01.b	Complexity of equipment operation	16%	3	6	18	4	12	1	3	1	3
		T.01.c	Maintenance requirements for equipment	16%	3	6	18	5	15	1	3	1	3
		T.01.d	Tailings Transport Distance and Complexity	16%	3	4	12	3	9	2	6	2	6
		T.01.e	Power Demands	21%	4	6	24	5	20	1	4	1	4
			Sub-account merit score (Σ{S x W})				108		86		28		28
			Sub-account merit rating (Ra = Σ{S x W} / ΣW)				5.68		4.53		1.47		1.47
T.02	Tailings Storage Design Complexity	T.02.a	Topographic Relief or Feature Obstacles	20%	4	6	24	1	4	5	20	2	8
		T.02.b	Water Management and Operational Monitoring of Internal/Impacted Ponds	30%	6	4	24	1	6	6	36	4	24
		T.02.c	Upstream Catchment Diversion and External Ponds Requirements/Complexity Compliance with Regulatory Approvals	20%	4	2	8	1	4	5	20	4	16
		T.02.d	Dike Stability and Foundation Risks	30%	6	3	18	2	12	1	6	2	12
			Sub-account merit score (Σ{S x W})				74		26		82		60
			Sub-account merit rating (Ra = Σ{S x W} / ΣW)				3.70		1.30		4.10		3.00
T.03	Constructability	T.03.a	Quantity of components required for construction and operations (dewatering plant, access roads, diversion dams, channel and foundation preparations)	67%	4	5	20	4	16	2	8	2	8
		T.03.b	Water dam volume for construction	33%	2	6	12	3	6	6	12	6	12
			Sub-account merit score (Σ{S x W})				32		22		20		20
			Sub-account merit rating (Ra = Σ{S x W} / ΣW)				5.33		3.67		3.33		3.33
T.04	Closure	T.04.a	Closure Reclaim Tailings Surface Area (hydroseeding and vegetation cover)	43%	6	1	6	2	12	4	24	3	18
		T.04.b	Closure Dike/Embankment Regrading (earthworks)	40%	4	6	24	1	4	6	24	5	20
		T.04.c	Closure Water Management (upgrades or modifications to hydraulic structures)	29%	4	3	12	2	8	5	20	4	16
			Sub-account merit score (Σ{S x W})				42		24		68		54
			Sub-account merit rating (Ra = Σ{S x W} / ΣW)				3.00		1.71		4.86		3.86

Notes:
1. Scale system of 1 to 6 where 1 is low and 6 is high.

Table 7-6: Technical and Operational Account – Account Merit Scoring and Rating

Sub-Account ID	Sub-Account Description	Sub-Acct Weight Distribution in Account (%)	Sub-Acct Weight (W) *[Note 1]*	Basecase Thickened Flora		Alternative 1 Thickened Moosehead		Alternative 2 Stack Flora		Alternative 3 Stack Moosehead	
				Sub-Acct Value (S) [Note 1]	*Sub-Acct Merit Score (S x W)*	*Sub-Acct Value (S) [Note 1]*	*Sub-Acct Merit Score (S x W)*	*Sub-Acct Value (S) [Note 1]*	*Sub-Acct Merit Score (S x W)*	*Sub-Acct Value (S) [Note 1]*	*Sub-Acct Merit Score (S x W)*
T.01	Tailings Dewatering and Transport Equipment	30%	6	5.68	34.11	4.53	27.16	1.47	8.84	1.47	8.84
T.02	Tailings Storage Design Complexity	20%	4	3.70	14.80	1.30	5.20	4.10	16.40	3.00	12.00
T.03	Constructability	30%	6	5.33	32.00	3.67	22.00	3.33	20.00	3.33	20.00
T.04	Closure	20%	4	3.00	12.00	1.71	6.86	4.86	19.43	3.86	15.43
			Account merit score (Σ{S x W})		92.91		61.22		64.67		56.27
			Account merit rating (Ra = Σ{S x W} / ΣW)		4.65		3.06		3.23		2.81

Notes:
1. Scale system of 1 to 6 where 1 is low and 6 is high.

7.2.4 Socio-Economic Account

A quantitative analysis was carried out for indicators associated with this account. The defined indicators were assigned ranking values by the stakeholders and presented in Table 7-7. Each sub-account merit score and rating were calculated with an assigned indicator weight distribution. The overall account merit score and rating were determined as presented in Table 7-8.

Table 7-7: Socio-Economic Account – Sub-Account Merit Scoring and Rating

Sub-Account ID	Sub-Account Description	Indicator ID	Indicator Description	Indicator Weight Distribution in Sub-Account (%)	Indicator Weight (W) *[Note 1]*	Basecase Thickened Flora		Alternative 1 Thickened Moosehead		Alternative 2 Stack Flora		Alternative 3 Stack Moosehead	
						Indicator Value (S) [Note 1]	*Indicator Merit Score (S x W)*	*Indicator Value (S) [Note 1]*	*Indicator Merit Score (S x W)*	*Indicator Value (S) [Note 1]*	*Indicator Merit Score (S x W)*	*Indicator Value (S) [Note 1]*	*Indicator Merit Score (S x W)*
S.01	Employment	S.01.a	Employment Opportunities	40%	4	2	8	2	8	6	24	6	24
		S.01.b	Requirements of Skilled Resourcing in Region	60%	6	6	36	6	36	1	6	1	6
					Sub-account merit score (Σ{S x W})		44		44		30		30
					Sub-account merit rating (Ra = Σ{S x W} / ΣW)		4.40		4.40		3.00		3.00
S.02	Land and Resource Use	S.02.a	Land-ownership / claims of residents	67%	6	5	30	1	6	6	36	2	12
		S.02.b	Recreational, Cultural and Resource Use	33%	3	5	15	1	3	6	18	1	3
					Sub-account merit score (Σ{S x W})		45		9		54		15
					Sub-account merit rating (Ra = Σ{S x W} / ΣW)		5.00		1.00		6.00		1.67
S.03	Impacts on community and reputation	S.03.a	Impact on community and reputation	100%	3	5	15	1	3	6	18	2	6
					Sub-account merit score (Σ{S x W})		15		3		18		6
					Sub-account merit rating (Ra = Σ{S x W} / ΣW)		5.00		1.00		6.00		2.00
S.04	Human Health and Public Safety	S.04.a	Hazard Potential to the Public	100%	6	5	30	2	12	6	36	3	18
		S.04.b	Health and Safety Hazards in Operations	33%	3	5	15	4	12	2	6	1	3
					Sub-account merit score (Σ{S x W})		45		24		42		21
					Sub-account merit rating (Ra = Σ{S x W} / ΣW)		5.00		2.67		4.67		2.33

Notes:
1. Scale system of 1 to 6 where 1 is low and 6 is high.

Table 7-8: Socio-Economic Account – Account Merit Scoring and Rating

Sub-Account ID	Sub-Account Description	Sub-Acct Weight Distribution in Account (%)	Sub-Acct Weight (W) *[Note 1]*	Basecase Thickened Flora		Alternative 1 Thickened Moosehead		Alternative 2 Stack Flora		Alternative 3 Stack Moosehead	
				Sub-Acct Value (S) [Note 1]	*Sub-Acct Merit Score (S x W)*	*Sub-Acct Value (S) [Note 1]*	*Sub-Acct Merit Score (S x W)*	*Sub-Acct Value (S) [Note 1]*	*Sub-Acct Merit Score (S x W)*	*Sub-Acct Value (S) [Note 1]*	*Sub-Acct Merit Score (S x W)*
S.01	Employment	12%	2	4.40	8.80	4.40	8.80	3.00	6.00	3.00	6.00
S.02	Land and Resource Use	29%	5	5.00	25.00	1.00	5.00	6.00	30.00	1.67	8.33
S.03	Impacts on community and reputation	24%	4	5.00	20.00	1.00	4.00	6.00	24.00	2.00	8.00
S.04	Human Health and Public Safety	35%	6	5.00	30.00	2.67	16.00	4.67	28.00	2.33	14.00
			Account merit score (Σ{S x W})		83.80		33.80		88.00		36.33
			Account merit rating (Ra = Σ{S x W} / ΣW)		4.93		1.99		5.18		2.14

Notes:

1. Scale system of 1 to 6 where 1 is low and 6 is high.

7.3 Summary of Account Merit Ratings

The account merit ratings calculated for each alternative are summarized in Table 7-9 and plotted on Figure 7-1. It should be noted that these account merit ratings are unweighted against each account.

Table 7-9: Summary of Account Merit Ratings (Unweighted)

Account	Account Merit Rating (Ra)			
	Base Case Thickened Flora	Alternative 1 Thickened Moosehead	Alternative 2 Stack Flora	Alternative 3 Stack Moosehead
Environmental	3.89	2.17	2.53	1.58
Financial	4.22	2.49	3.60	1.96
Technical and Operational	4.65	3.06	3.23	2.81
Socio-Economic	4.93	1.99	5.18	2.14

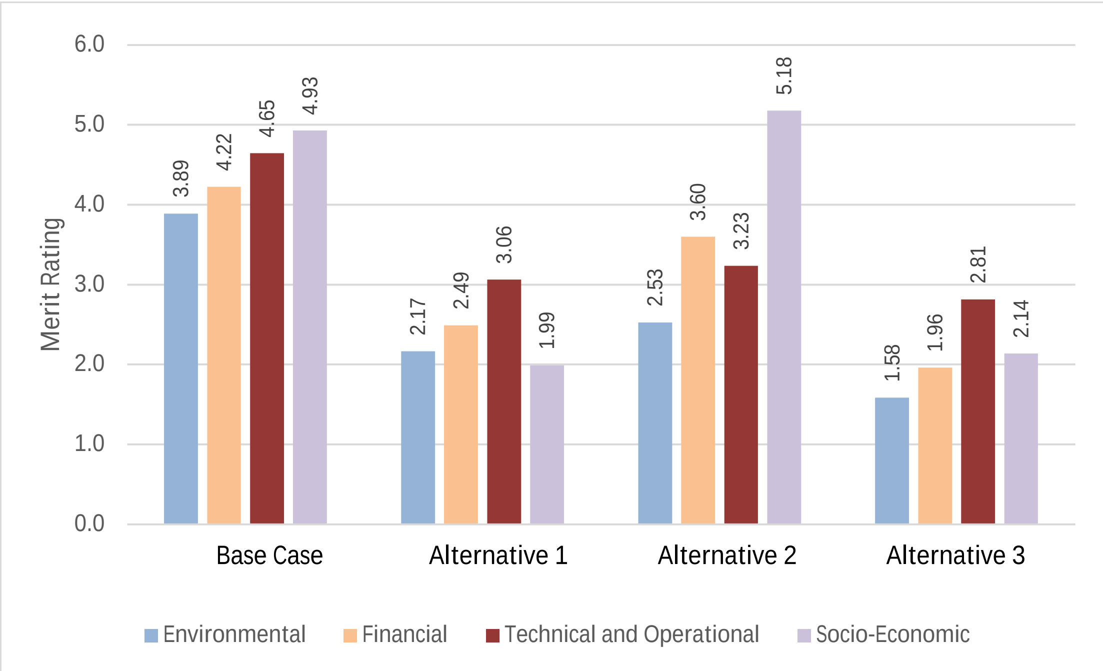


Figure 7-1: Summary Plot of Account Merit Ratings (Unweighted)

The base case scenario of account weights (Figure 7-2) as suggested in Section 2.6.2 of the ECCC Guidelines are as follows:

- Environment impacts = 6
- Project financial = 1.5
- Technical and operational = 3, and
- Socio-economic impacts = 3.

As provided in the ECCC Guidelines, the base case scenario includes weighting the environment account twice as important as the technical and socio-economic accounts, which in turn are weighted twice as important as the project economics account.

The alternative merit ratings calculated for each alternative are summarized in Table 7-10. The findings suggest the preferred option and consider the best available technology for the tailings disposal of Tacora's Tailings Expansion Project is the Base Case with an alternative merit rating of 4.33 out of a maximum of 6.00. The runner-up option of Alternative 2 has an alternative merit rating of 3.39 which was marginally higher than Alternative 1 (rating of 2.36).

Table 7-10: Summary of Alternative Merit Rating (Weighted)

Sub-Account ID	Account Description	Acct Weight Distribution (%)	Weight Acct (W) *[Note 1]*	Basecase Thickened Flora		Alternative 1 Thickened Moosehead		Alternative 2 Stack Flora		Alternative 3 Stack Moosehead	
				Acct Value (S) [Note 1]	*Acct Merit Score (S x W)*	*Acct Value (S) [Note 1]*	*Acct Merit Score (S x W)*	*Acct Value (S) [Note 1]*	*Acct Merit Score (S x W)*	*Acct Value (S) [Note 1]*	*Acct Merit Score (S x W)*
E.00	Environmental	45%	6	3.89	23.33	2.17	13.00	2.53	15.17	1.58	9.50
F.00	Financial	11%	1.5	4.22	6.34	2.49	3.73	3.60	5.40	1.96	2.94
T.00	Technical and Operational	22%	3	4.65	13.94	3.06	9.18	3.23	9.70	2.81	8.44
S.00	Socio-Economic	22%	3	4.93	14.79	1.99	5.96	5.18	15.53	2.14	6.41
			Alternative merit score (Σ{Rs x W})		58.39		31.88		45.80		27.29
			Alternative merit rating (Ra = Σ{RsxW} / ΣW)		4.33		2.36		3.39		2.02

Note:
1. Score (S) value is taken from the account merit ratings (Ra) in Table 7-9 for each account.

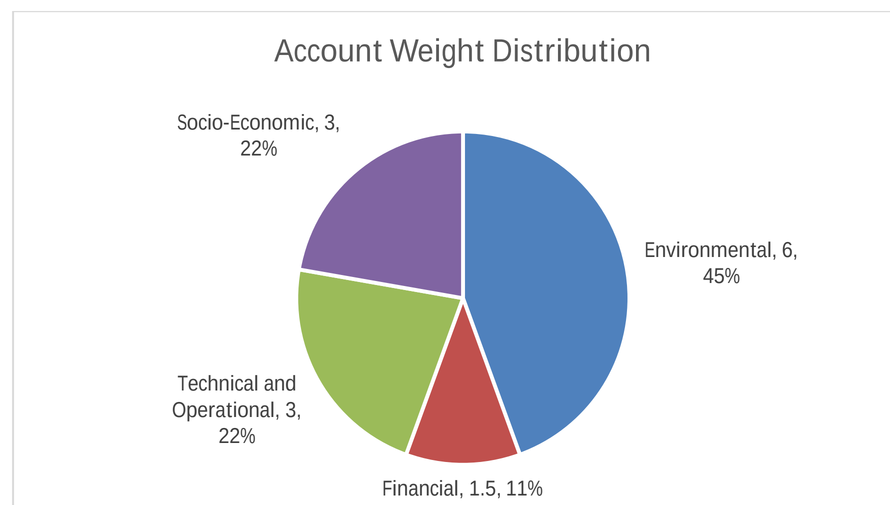


Figure 7-2: Weight Distribution of Accounts

8. Sensitivity Analysis of Accounts (Step 6)

A sensitivity analysis was carried out to evaluate the robustness of the analytical process, to manage bias and subjectivity, and to determine the degree to which various options are influenced by the choice of weightings.

This process is recommended by the ECCC Guidelines as a way to test the impacts of variations in weightings on the assessment outcomes and provide stakeholders with a further understanding of the implications of the various value judgments used in the assessment process. The guidelines describe each set of varied weightings as a "scenario". The ECCC Guidelines note that the sensitivity analyses are not prescriptive and should be project-specific and consider feedback received from stakeholders throughout the assessment process.

Five scenarios were given consideration, including the "Base Case" account weighting factors required by the ECCC Guidelines:

- Scenario 1: Base scenario using account weight distribution as per Section 2.6.2 of ECCC Guidelines
- Scenario 2: All accounts weighted equally as per Section 2.6.2 of ECCC Guidelines;
- Scenario 3: Increase weight distribution (scoring) importance on CAPEX due to risk of obtaining capital investment changed weighting on all accounts to bias financial: Env=25% (4); Fin=38% (6); Tech=25% (4); Socio=13% (2)
- Scenario 4: Increase weight distribution (scoring) importance on Tech & Ops risks for dike stability and safety: Env=22% (3); Fin=22% (3); Tech=45% (6); Socio=11% (1.5)
- Scenario 5: Increase weight distribution (scoring) importance on socio-economic account: Env=22% (3); Fin=11% (1.5); Tech=22% (3); Socio=45% (6)

The results of the sensitivity analyses are documented in Table 8-1. The sensitivity analyses found that the result of the MAA is robust and not sensitive to change. For all scenarios, the relative order of preference did change somewhat between Alternatives 1, 2 and 3; however, the Base Case remained distinctly the preferred option in all scenarios considered.

Table 8-1: Sensitivity Analysis of Alternative Merit Rating (Weighted)

Analysis Scenario	Scenario Description	Alternative Merit Rating			
		Base Case Thickened Flora	Alternative 1 Thickened Moosehead	Alternative 2 Stack Flora	Alternative 3 Stack Moosehead
1	Base scenario (as per Section 2.6.2 of ECCC Guidelines); Env=45% (6); Fin=11% (1.5); Tech=22% (3); Socio=22% (3)	**4.33**	2.36	3.39	2.02
2	Equal weighting on all accounts (as per Section 2.6.2 of ECCC Guidelines)	**4.42**	2.43	3.63	2.12
3	Increase weight importance on CAPEX due to risk of obtaining capital investment changed weighting on all accounts to bias financial: Env=25% (4); Fin=38% (6); Tech=25% (4); Socio=13% (2)	**4.33**	2.49	3.44	2.10
4	Increase weight importance on Tech & Ops risks for dike stability and safety: Env=22% (3); Fin=22% (3); Tech=45% (6); Socio=11% (1.5)	**4.42**	2.62	3.37	2.28
5	Increase weight importance on socio-economic account: Env=22% (3); Fin=11% (1.5); Tech=22% (3); Socio=45% (6)	**4.56**	2.32	3.98	2.14

9. Conclusions and Recommendations

Using the methodology and the MAA decision making tool as outlined in the Guidelines on The Assessment of Alternatives for Mine Waste Disposal (ECCC, 2016), the preferred option and considered best available technology for the tailings disposal of the Tacora's Tailings Expansion Project is the Base Case with an alternative merit rating of 4.33 out of a maximum of 6.00 (refer to Table 8-1). The general arrangement of the Base Case option is shown on Figure 6-2. The runner-up option of Alternative 2 has an alternative merit rating of 3.39 which was marginally higher than Alternative 1 (rating of 2.36). Some major constraints on the Alternative 2 filtered tailings stack are the availability of power supply in the region to meet the demands from the increased equipment associated with the new dewatering plant (estimated average 820,000 kwh per day) and the increased emissions of greenhouse gas from the operation of 42 additional mobile equipment.

A sensitivity analysis comprising of four additional scenarios was carried out to evaluate the robustness of the analytical process and to determine the degree to which distinct options are influenced by the choice of weightings. The sensitivity analysis found that the MAA is robust and not sensitive to change. For all scenarios, the Base Case remained distinctly the preferred option (refer to Table 8-1).

In conclusion, the Base Case of thickened slurry tailings disposal in the expansion facility at the Flora Lake Watershed is the preferred option based on the balance obtained through the environmental, financial, technical and socio-economic project risks as summarized in Table 7-10. The storage of thickened tailings in earthen impoundments has increased environmental and perceived social implications compared to filtered tailings in a stack but for Tacora, the thickened tailings technology remains the preferable option. The use of upstream raised containment dikes as the earthen impoundment would still be required for this option, but these are considered low consequence structures with a rare probability risk of instability. Short runout distances from a hypothetic dam breach (i.e. limited to a slump failure) would be expected given there would be no direct retaining of a pond immediately upstream of the dikes to otherwise cause a fluidized, long runout distance that is typical of other thickened tailings impoundments.

The following are recommendations to further advance the Base Case option:

- Develop permitting roadmap and schedule for obtaining necessary permit approvals for the proposed site
- Review and implement strategic land acquisition planning to acquire appropriate surface rights for the proposed site
- Conduct a condemnation study to ensure the proposed site for tailings disposal does not sterilize economically minable minerals, if any exists beneath.
- Rheological, geochemical and geotechnical laboratory testing program on representative tailings material
- Environmental impacts assessment and technical field investigations to characterise the proposal site
- Develop a habitat compensation plan development
- Carry out the next level of engineering study on the proposed conceptual level design of the tailings facility for the life of mine storage of tailings

10. References

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Appendix A:
Cost Estimate Calculations

Project No:
Date:
Prepared:
Rev:

Tacora - Scully Mine
Alternative Tailings Disposal Study
AACE Class 5 at -35%/+65%
Base Case; Alternative 1; Alternative 2 and Alternative 3

	Equipment Description	Equipment Size	Quantity	Unit	Unit Cost	Base Case Thickened Tailings Slurry Impoundment at Flora	Alternative 1 Thickened Tailings Slurry Impoundment at Moosehead	Alternative 2 Dewatered Tailings Stack at Flora	Alternative 3 Dewatered Tailings Stack at Moosehead
	1) DEWATERING PLANT MECHANICAL EQUIPMENT (SUPPLY + INSTALL)								
	Base Case: Thickened Tailings at Flora Lake Basin								
	Status Quo Option *(No additional dewatering equipment required)*					$0			
	Alternative 1: Thickened Tailings at Moosehead Lake Basin								
	Status Quo Option *(No additional dewatering equipment required)*						$0		
	Alternative 2: Filtered Tailings at Flora Lake Basin								
ME	High Compression Thickener (HCT) incl. insulation	d = 49 m; 65 wt. % u/f; 20 HP	2	ea	$7,000,000			$14,000,000	
ME	Flocculant System incl. mixing, dosing and pumping	flocc dosage = 40 g/ton; floc solids = 0.5 wt. %; floc conc. = 0.05%; 15 HP	2	ea	$720,000			$1,440,000	
ME	Thickener U/F Pump	100 HP [2 op + 2 stby]	4	ea	$60,000			$240,000	
ME	Filter Feed Tank	d = 10.5 m x h = 12.4 m; tank vol = 1080 m3; live vol = 810 m3 [2 op + 0 stby]	102	t	$12,000			$1,224,000	
ME	Filter Feed Tank Tank Double Agitator	dual impeller; 15 HP	2	ea	$11,000			$22,000	
ME	Filter Feed Pump	200 HP [2 op + 2 stby]	4	ea	$165,000			$660,000	
ME	Filter Feed Distrubution Box	d = 2.5 m x h = 4 m; tank vol = 20 m3; live vol = 16 m3	1	ea	$50,000			$50,000	
ME	Vacuum Cloth Disc Filters Units	FLSmidth 3.8Mx15 DISC; 3.8 m discs; 15 discs; 25 HP [9 op + 1 stby]	14	ea	$1,400,000			$19,600,000	
ME	Vacuum Cloth Disc Filters Accessories	vacuum pumps, snap air tanks, filtrate recievers, snap blow systems included with filter units	0	ea	incl.			incl.	
ME	Filter Conveyor	w = 1220 mm (48") x l = 90 m; 60 HP	2	ea	$567,000			$1,134,000	
ME	Collecting Conveyor (reversinble)	w = 1220 mm (48") x l = 45 m; 20 HP	1	ea	$321,000			$321,000	
ME	Trasnfer Conveyor	w = 1220 mm (48") x l = 45 m; 20 HP	1	ea	$321,000			$321,000	
ME	Emergency Stockpile Stacking Conveyor (adjustable)	w = 1220 mm (48") x l = 50 m; 21 deg inclined; 60 HP	1	ea	$675,000			$675,000	
ME	Return Water Tank (Thickener O/F + Filtrate Water)	d = 12.5 m x h = 13.8 m; tank vol = 1700 m3; live vol = 1250 m3 [2 op + 0 stby]	116	t	$12,000			$1,392,000	
ME	Process Water Tank	d = 5.0 m x h = 6.8 m; tank vol = 135 m3; live vol = 100 m3	11	t	$12,000			$132,000	
ME	Process Water Pump	5 HP [2 op + 2 stdby]	4	ea	$15,000			$60,000	
ME	Gland Seal Water Tank	d = 3.0 m x h = 4.8 m; tank vol = 35 m3; live vol = 25 m3	4	t	$12,000			$48,000	
ME	Gland Seal Water Pumps	gland seal for slurry pumps (mechanical seal for water pumps); 15 HP [3 op + 3 stby]	6	ea	$20,000			$120,000	
ME	Fire Water Tank	d = 4.0 m x h = 5.2 m; tank vol = 65 m3; live vol = 50 m3	7	t	$12,000			$84,000	
ME	Fire Water Pump	15 HP [0 op + 2 stby]	2	ea	$20,000			$40,000	
	Alternative 3: Filtered Tailings at Moosehead Lake Basin								
ME	High Compression Thickener (HCT) incl. insulation	d = 49 m; 65 wt. % u/f; 20 HP	2	ea	$7,000,000				$14,000,000
ME	Flocculant System incl. mixing, dosing and pumping	flocc dosage = 40 g/ton; floc solids = 0.5 wt. %; floc conc. = 0.05%; 15 HP	2	ea	$720,000				$1,440,000
ME	Thickener U/F Pump	100 HP [2 op + 2 stby]	4	ea	$60,000				$240,000
ME	Filter Feed Tank	d = 10.5 m x h = 12.4 m; tank vol = 1080 m3; live vol = 810 m3 [2 op + 0 stby]	102	t	$12,000				$1,224,000
ME	Filter Feed Tank Tank Double Agitator	dual impeller; 15 HP	2	ea	$11,000				$22,000
ME	Filter Feed Pump	200 HP [2 op + 2 stby]	4	ea	$165,000				$660,000
ME	Filter Feed Distrubution Box	d = 2.5 m x h = 4 m; tank vol = 20 m3; live vol = 16 m3	1	ea	$50,000				$50,000
ME	Vacuum Cloth Disc Filters Units	FLSmidth 3.8Mx15 DISC; 3.8 m discs; 15 discs; 25 HP [13 op + 1 stby]	14	ea	$1,400,000				$19,600,000
ME	Vacuum Cloth Disc Filters Accessories	vacuum pumps, snap air tanks, filtrate recievers, snap blow systems included with filter units	0	ea	incl.				incl.
ME	Filter Conveyor	w = 1220 mm (48") x l = 90 m; 20 HP	2	ea	$567,000				$1,134,000
ME	Collecting Conveyor (reversinble)	w = 1220 mm (48") x l = 45 m; 20 HP	1	ea	$321,000				$321,000
ME	Trasnfer Conveyor	w = 1220 mm (48") x l = 45 m; 20 HP	1	ea	$321,000				$321,000
ME	Emergency Stockpile Stacking Conveyor (adjustable)	w = 1220 mm (48") x l = 50 m; 21 deg inclined; 120 HP	1	ea	$675,000				$675,000
ME	Return Water Tank (Thickener O/F + Filtrate Water)	d = 12.5 m x h = 13.8 m; tank vol = 1700 m3; live vol = 1250 m3 [2 op + 0 stby]	116	t	$12,000				$1,392,000
ME	Process Water Tank	d = 5.0 m x h = 6.8 m; tank vol = 135 m3; live vol = 100 m3	11	t	$12,000				$132,000
ME	Process Water Pump	5 HP [2 op + 2 stdby]	4	ea	$15,000				$60,000
ME	Gland Seal Water Tank	d = 3.0 m x h = 4.8 m; tank vol = 35 m3; live vol = 25 m3	4	t	$12,000				$48,000
ME	Gland Seal Water Pumps	gland seal for slurry pumps (mechanical seal for water pumps); 15 HP [3 op + 3 stby]	6	ea	$20,000				$120,000
ME	Fire Water Tank	d = 4.0 m x h = 5.2 m; tank vol = 65 m3; live vol = 50 m3	7	t	$12,000				$84,000
ME	Fire Water Pump	15 HP [0 op + 2 stby]	2	ea	$20,000				$40,000
					TOTAL DEWATERING PLANT MECHANICAL EQUIPMENT COST	$0	$0	$41,563,000	$41,563,000
	2) OVERLAND PUMPS AND PIPELINES (SUPPLY + INSTALL)								
	Base Case: Thickened Tailings at Flora Lake Basin								
ME	Slurry Pump (PH#8)	Warman AH 10 x 12; 600 HP - new pump to match existing equipment for line 1	2	ea	$220,000.00	$440,000			
ME	Slurry Pumps (PH#9 and PH #10)	Warman AH 10 x 12; 600 HP - 4 pumps per line per pumphouse	24	ea	$165,000	$3,960,000			
ME	Gland Seal Water Pump (PH#9 and PH#10)	progressive cavity pump 10 m3/h; 5 HP - 2 pumps per pump house [1 op + 1 stby]	4	ea	$5,500	$22,000			
ME	Gland Seal Water Pump (PH#9 and PH#10)	progressive cavity pump 10 m3/h; 10 HP - 2 pumps per pump house [1 op + 1 stby]	4	ea	$8,500	$34,000			
ME	Gland Seal Water Supply Booster Pump	150 HP [1 op + 1 stdby]	2	ea	$60,000	$120,000			
ME	Spigots	incl. tee reducers, couplings, supports and valves; allowance for 10 spigots per line [7 +1]; total spigots = 3 x 10 = 30	30	ea	$5,000	$150,000			
PL	Slurry Pipeline	CS NPS 12" Std Sch (ASTM A53B) incl. 1/4" rubber lining; 19.80 km + 10% = 21.78 km; [2 op + 1 stdby]	21,780	m	$1,175	$25,591,500			
PL	Slurry Pumphouse Piping (PH#9 and PH #10)	CS NPS 12" Std Sch (ASTM A53B) incl. 1/4" rubber lining; 0.09 km + 10% = 0.10 km	100	m	$1,175	$117,500			
PL	Gland Seal Water Pipeline	CS NPS 3" Sch 40 (A53 B) incl. 2"calcium silicate insulation and, fittings and couplings; 4.00 km + 10% = 4.40 km	4,400	m	$455.00	$2,002,000			
PL	Slurry Pipe Fittings	allowance for pipe fittings	$25,709,000	*Allowance*	10%	$2,570,900			
PL	Gland Sewal Water Pipe Heat Tracing	allowance for heat tracing	$2,002,000	*Allowance*	10%	$200,200			
PL	Spigot Discharge Slurry Pipeline	HDPE 6" SDR 17 (PE4710); 15 km (each spigot panel 50 m); piping to be discarded after use	15000	m	$85	$1,275,000			
	Alternative 1: Thickened Tailings at Moosehead Lake Basin								
ME	Slurry Pump (PH#8)	Warman AH 10 x 12; 600 HP - new pump to match existing equipment for line 1	2	ea	$220,000.00		$440,000		
ME	Slurry Pumps (8 Pumphouses)	Warman AH 10 x 12; 600 HP - 4 pumps per line per pumphouse	96	ea	$165,000.00		$15,840,000		
ME	Gland Seal Water Pump (8 Pumphouses)	progressive cavity pump 10 m3/h; 5 HP - 2 pumps per pump house [1 op + 1 stby]	16	ea	$5,500.00		$88,000		
ME	Gland Seal Water Pump (8 Pumphouses)	progressive cavity pump 10 m3/h; 10 HP - 2 pumps per pump house [1 op + 1 stby]	16	ea	$8,500.00		$136,000		
ME	Gland Seal Water Supply Booster Pump	150 HP [4 op + 4 stdby]	8	ea	$60,000.00		$480,000		
ME	Spigots	incl. valves and piping	20	ea	$185.00		$3,700		
PL	Slurry Pipeline	CS NPS 12" Std Sch (ASTM A53B) incl. 1/4" rubber lining; 34.20 km + 10% = 37.62 km; [2 op + 1 stdby]	37,620	m	$1,175		$44,203,500		
PL	Slurry Pumphouse Piping (8 Pumphouses)	CS NPS 12" Std Sch (ASTM A53B) incl. 1/4" rubber lining; 0.36 km + 10% = 0.40 km	400	m	$1,175		$470,000		
PL	Gland Seal Water Pipeline	CS NPS 3" Sch 40 (A53 B) incl. 2"calcium silicate insulation and, fittings and couplings; 10.50 km + 10% = 11.55 km	11,550	m	$455.00		$5,255,250		
PL	Spigot Discharge Slurry Pipeline	HDPE 24" SDR 17 (PE4710); 13.64 km + 20% = 15.00 km [1 op + 1 stdby]	15000	m	$515		$7,725,000		
PL	Pipe Fittings	allowance for pipe fittings	$57,653,750	*Allowance*	10%		$5,765,375		
PL	Water Pipe Heat Tracing	allowance for heat tracing	$5,255,250	*Allowance*	10%		$525,525		
	Alternative 2: Filtered Tailings at Flora Lake Basin								
ME	Slurry Pump (PH#8)	Warman AH 10 x 12; 600 HP - new pump to match existing equipment for line 1	2	ea	$220,000			$440,000	
ME	Slurry Pumps (7 Pumphouses)	Warman AH 10 x 12; 600 HP - 4 pumps per line per pumphouse	84	ea	$165,000			$13,860,000	
ME	Gland Seal Water Pump (7 Pumphouses)	progressive cavity pump 10 m3/h; 5 HP - 2 pumps per pump house [1 op + 1 stby]	14	ea	$5,500			$77,000	
ME	Gland Seal Water Pump (7 Pumphouses)	progressive cavity pump 10 m3/h; 10 HP - 2 pumps per pump house [1 op + 1 stby]	14	ea	$8,500			$119,000	
ME	Gland Seal Water Supply Booster Pump	150 HP [3 op + 3 stdby]	6	ea	$60,000			$360,000	
ME	Return Water Pump	500 HP [1 op + 1 stby]	2	ea	$120,000			$240,000	
PL	Slurry Pipeline	CS NPS 12" Std Sch (ASTM A53B) incl. 1/4" rubber lining; 28.95 km + 10% = 31.85 km; [2 op + 1 stdby]	31,850	m	$1,175			$37,423,750	
PL	Slurry Pumphouse Piping (7 Pumphouses)	CS NPS 12" Std Sch (ASTM A53B) incl. 1/4" rubber lining; 0.32 km + 10% = 0.35 km	350	m	$1,175			$411,250	
PL	Gland Seal Water Pipeline	CS NPS 3" Sch 40 (A53 B) incl. 2"calcium silicate insulation and, fittings and couplings; 9.00 km + 10% = 9.90 km	9,900	m	$455			$4,504,500	
PL	Return Water Pipe	HDPE 36" SDR 11 (PE4710); 2.00 km + 20% = 2.20 km	2,200	m	$1,200			$2,640,000	
PL	Pipe Fittings	allowance for pipe fittings	$44,979,500	*Allowance*	10%			$4,497,950	
PL	Water Pipe Heat Tracing	allowance for heat tracing	$7,144,500	*Allowance*	10%			$714,450	
	Alternative 3: Filtered Tailings at Moosehead Lake Basin								
ME	Slurry Pump (PH#8)	Warman AH 10 x 12; 600 HP - new pump to match existing equipment for line 1	2	ea	$220,000				$440,000
ME	Slurry Pumps (7 Pumphouses)	Warman AH 10 x 12; 600 HP - 4 pumps per line per pumphouse	84	ea	$165,000				$13,860,000
ME	Gland Seal Water Pump (7 Pumphouses)	progressive cavity pump 10 m3/h; 5 HP - 2 pumps per pump house [1 op + 1 stby]	14	ea	$5,500				$77,000
ME	Gland Seal Water Pump (7 Pumphouses)	progressive cavity pump 10 m3/h; 10 HP - 2 pumps per pump house [1 op + 1 stby]	14	ea	$8,500				$119,000
ME	Gland Seal Water Supply Booster Pump	150 HP [3 op + 3 stdby]	6	ea	$60,000				$360,000
ME	Return Water Pump	75 HP [1 op + 1 stby]	2	ea	$30,000				$60,000
PL	Slurry Pipeline	CS NPS 12" Std Sch (ASTM A53B) incl. 1/4" rubber lining; 31.65 km + 10% = 34.82 km; [2 op + 1 stdby]	34,820	m	$1,175				$40,913,500
PL	Slurry Pumphouse Piping (7 Pumphouses)	CS NPS 12" Std Sch (ASTM A53B) incl. 1/4" rubber lining; 0.32 km + 10% = 0.35 km	350	m	$1,175				$411,250
PL	Gland Seal Water Pipeline	CS NPS 3" Sch 40 (A53 B) incl. 2"calcium silicate insulation and, fittings and couplings; 9.00 km + 10% = 9.90 km	9,900	m	$455.00				$4,504,500
PL	Return Water Pipe	HDPE 36" SDR 11 (PE4710); 0.50 km + 20% = 0.55 km	550	m	$1,200				$660,000
PL	Pipe Fittings	allowance for pipe fittings	$46,489,250	*Allowance*	10%				$4,648,925
PL	Water Pipe Heat Tracing	allowance for heat tracing	$5,164,500	*Allowance*	10%				$516,450
					TOTAL OVERLAND PUMPING PIPING COST	$36,484,000	$80,933,000	$65,288,000	$66,571,000
	3) MOBILE EQUIPMENT (SUPPLY + INSTALLED)								
	Base Case: Thickened Tailings at Flora Lake Basin								
	Status Quo Option *(No mobile equipment required)*					$0			
	Alternative 1: Thickened Tailings at Moosehead Lake Basin								
	Status Quo Option *(No mobile equipment required)*						$0		
	Alternative 2: Filtered Tailings at Flora Lake Basin								
	Truck Loadout System	incl. conveyors, feeder, chutes and scale	1	ea	$2,050,000			$2,050,000	
	Truck	CAT 740; 40 t truck [26 op + 4 stdby]	30	ea	$725,000			$21,750,000	
	Dozer	CAT D9; [7 op + 1 stby]	8	ea	$800,000			$6,400,000	
	Compactor	CAT CP74B; [4 op + 0 stdby]	4	ea	$150,000			$600,000	
	Grader	CAT 140H; [4 op + 0 stdby]	4	ea	$375,000			$1,500,000	
	Emergency Loader	CAT 972; 13 m3 loader [2 op + 0 stby]	2	ea	$625,000			$1,250,000	
	Alternative 3: Filtered Tailings at Moosehead Lake Basin								
	Truck Loadout System	incl. conveyors, feeder, chutes and scale	1	ea	$2,050,000				$2,050,000
	Truck	CAT 740; 40 t truck [26 op + 4 stdby]	30	ea	$725,000				$21,750,000
	Dozer	CAT D9; [7 op + 1 stby]	8	ea	$800,000				$6,400,000
	Compactor	CAT CP74B; [4 op + 0 stdby]	4	ea	$150,000				$600,000
	Grader	CAT 140H	4	ea	$375,000				$1,500,000
	Emergency Loader	CAT 972; 13 m3 loader [2 op + 0 stby]	2	ea	$625,000				$1,250,000
					TOTAL TRANSPORT EQUIPMENT COST	$0	$0	$33,550,000	$33,550,000
	4) BUILDINGS AND OTHER INFRASTRUCTURE (SUPPLY + INSTALLED)								
	Base Case: Thickened Tailings at Flora Lake Basin							$0	$0
	Pumphouses	incl. concrete, steel and arhitectural; 35 m x 10 m x 10 m	2	ea	$1,468,000	$2,936,000			
	Alternative 1: Thickened Tailings at Moosehead Lake Basin								
	Pumphouses	incl. concrete, steel and arhitectural; 35 m x 10 m x 10 m	9	ea	$1,468,000		$13,212,000		
	Alternative 2: Filtered Tailings at Flora Lake Basin								
	Pumphouses	incl. concrete, steel and arhitectural; 35 m x 10 m x 10 m	7	ea	$1,468,000			$10,276,000	
	Dewatering Plant Building	incl. concrete, steel and arhitectural; 100 m x 100 m x 25 m	1	ea	$59,973,000			$59,973,000	
	Truck Loadout	incl. concrete, steel and arhitectural; 30 m x 20 m x 10 m	1	ea	$2,260,000			$2,260,000	
	Truckshop Building incl. Wash Station	incl. concrete, steel and arhitectural; 50 m x 50 m x 10 m	1	ea	$8,360,000			$8,360,000	
	Alternative 3: Filtered Tailings at Moosehead Lake Basin								
	Pumphouses	incl. concrete, steel and arhitectural; 35 m x 10 m x 10 m	7	ea	$1,468,000				$10,276,000
	Dewatering Plant Building	incl. concrete, steel and arhitectural; 100 m x 100 m x 25 m	1	ea	$59,973,000				$59,973,000
	Truck Loadout	incl. concrete, steel and arhitectural; 30 m x 20 m x 10 m	1	ea	$2,260,000				$2,260,000
	Truckshop Building incl. Wash Station	incl. concrete, steel and arhitectural; 50 m x 50 m x 10 m	1	ea	$8,360,000				$8,360,000
					TOTAL PLANT BUILDING AND OTHER INFRASTRUCTURE COST	$2,936,000	$13,212,000	$80,869,000	$80,869,000
	5) OTHER DIRECTS								
	1.0 Siteworks								
	Pipeline Corridor and Access Roads			$/m	$50	$200,000	$570,000	$482,500	$527,500
	Pumphouses			4%	*Allowance*	$189,040	$679,508	$603,840	$596,640
	Dewatering Plant Area			4%	*Allowance*	$0	$0	$1,662,520	$1,662,520
	2.0 Earthworks								
	Pipeline Corridor and Access Roads			$/m	$1,000	$4,000,000	$11,400,000	$9,650,000	$10,550,000
	Culvert Crossing Existing Flora River			ea	$200,000	$0	$200,000	$200,000	$200,000
	Pumphouses			10%	*Allowance*	$472,600	$1,698,770	$1,509,600	$1,491,600
	Dewatering Plant Area			10%	*Allowance*	$0	$0	$4,156,300	$4,156,300
	3.0 Concrete			0%	*Allowance*	$0	$0	$0	$0
	4.0 Steel (support steel for equipment)			2%	*Allowance*	$94,520	$339,754	$1,133,180	$1,129,580
	5.0 Architectural			0%	*Allowance*	$0	$0	$0	$0
	6.0 Piping (plant piping for equipment)			12%	*Allowance*	$567,120	$2,038,524	$6,799,080	$6,777,480
	7.0 Intrumentation			8%	*Allowance*	$378,080	$1,359,016	$4,532,720	$4,518,320
	8.0 Electrical (supply + install)								
	Overhead Power Lines (with poles)			$/m	$1,000	$4,000,000	$11,400,000	$9,650,000	$10,550,000
	Transformers			ea	$150,000	$0	$300,000.0	$0	$300,000
	E-house incl. medium and low voltage switchgear (fire suppression)			ea	$4,000,000	$0	$4,000,000	$0	$4,000,000
	9.0 Emergency Power (diesel generator, storage and pumps)			ea	$350,000	$0	$350,000	$0	$350,000
					DIRECT COST	$9,902,000	$34,336,000	$40,380,000	$46,810,000
	6) TAILINGS IMPOUNDMENT AREA EARTHWORKS								
	1.0 Development Earthworks								
	Clearing			$/ha	*$1,000*	$1,001,101	$1,040,791	$436,930	$641,865
	Grubbing & Stripping Dam Foundation (avg 1m depth)			$/m3	*$20*	$731,360	$8,094,060	$771,480	$2,527,920
	Dam Fill (incl stripping)			$/m3	*$25*	$5,007,175	$81,528,913	$3,322,475	$12,819,150
	Excavation Ditch (cut-fill avg 1.5m depth)			$/m3	*$25*	$0	$4,160,400	$2,279,325	$2,911,238
	Excavation Ditch (geotextile; riprap)			$/m2	*$40*	$0	$6,392,280	$3,794,416	$4,606,994
	Excavation Diversion Channel (cut-fill avg 1.5m depth)			$/m3	*$20*	$2,617,890	$0	$0	$504,840
	Excavation Diversion Channel (geotextile; riprap)			$/m2	*$40*	$4,854,694	$0	$0	$1,029,701
	2.0 Compensation								
	??								
	3.0 Closure								
	Vegetation Cover (hydroseeding & planting, drainage ditch improve)			$/m2	*$5*	$58,764,682	$46,633,500	$20,886,480	$30,832,020
				$/m3	*$15*	$2,455,785	$42,846,803	$1,414,875	$5,795,550
					DIRECT COST	$75,433,000	$190,697,000	$32,906,000	$61,670,000
					TOTAL DIRECT COST (TDC)	$124,755,000	$319,178,000	$294,556,000	$331,033,000
	INDIRECTS								
	Indirect on Mechanical Equipment								
	1.0 Frieght Transport			8%	*Allowance*	$0	$0	$3,325,040	$3,325,040
	2.0 Spare Parts			2%	*Allowance*	$0	$0	$831,260	$831,260
	3.0 Vendor Commissioining			1%	*Allowance*	$0	$0	$415,630	$415,630
	Indirect on Total Directs								
	4.0 Engineering, Procurement and Construction Manangement (EPCM)			24%	*Allowance*	$29,941,200	$76,602,720	$70,693,440	$79,447,920
	5.0 3rd Party Engineering (incl. geotech investigations, field testing etc.)			1%	*Allowance*	$1,247,550	$3,191,780	$2,945,560	$3,310,330
	6.0 Temporary Site Facilities and Services			4%	*Allowance*	$4,990,200	$12,767,120	$11,782,240	$13,241,320
					TOTAL INDIRECT COST (TIC)	$36,179,000	$92,562,000	$89,994,000	$100,572,000
	Owner's Costs			4%	*4% of directs*	$4,991,000	$12,768,000	$11,783,000	$13,242,000
	Contingency			35%	*35% of directs + indirects + owner's*	$58,074,000	$148,578,000	$138,717,000	$155,697,000
				TOTAL CAPEX		$165,925,000	$424,508,000	$396,333,000	$444,847,000
				TOTAL CAPEX incl. 35% CONTINGENCY		$223,999,000	$573,086,000	$535,050,000	$600,544,000

Project No: H369921
Date: December 15, 2022
Prepared: Betty Lin; Udoy Mirdha
Rev: A

Tacora - Scully Mine
Alternative Tailings Disposal Study
AACE Class 5 at -35%/+65%
Base Case; Alternative 1; Alternative 2 and Alternative 3

HATCH

Equipment Description						Base Case Thickened Tailings Slurry Impoundment at Flora	Alternative 1 Thickened Tailings Slurry Impoundment at Moosehead	Alternative 2 Dewatered Tailings Stack at Flora	Alternative 3 Dewatered Tailings Stack at Moosehead
1) LABOR	shifts	quantity/shift	hours/shift	hours	$CAD/h				
Base Case: Thickened Tailings at Flora Lake Basin / Alternative 1: Thickened Tailings at Moosehead Lake Basin									
Status Quo Option *(1 site inspector labor required)*	3	1	8	2912	$50.00	$436,800	$436,800		
Alternative 2: Filtered Tailings at Flora Lake Basin / Alternative 3: Filtered Tailings at Moosehead Lake Basin									
Plant Operator	3	2	8	2912	$50.00			$873,600	$873,600
Truck Loadout Operator	3	1	8	2912	$50.00			$436,800	$436,800
Plant and Truck Loadout Maintenance	3	1	8	2912	$50.00			$436,800	$436,800
Truck Operator	3	26	8	2912	$50.00			$11,356,800	$11,356,800
Dozer Operator	3	8	8	2912	$50.00			$3,494,400	$3,494,400
Compactor Operator	3	4	8	2912	$50.00			$1,747,200	$1,747,200
Grader Operator	3	4	8	2912	$50.00			$1,747,200	$1,747,200
Stack Maintenance	3	1	8	2912	$50.00			$436,800	$436,800
Subtotal						$437,000	$437,000	$20,530,000	$20,530,000
2) CONSUMABLES				kg/year	$CAD/kg				
Thickener Flocculant				656,500	$4.00	$0	$0	$2,626,000	$2,626,000
Other (Hidden) Consumables - Allowance for Dewatering Plant						$0	$0	$100,000	$100,000
Subtotal						$0	$0	$2,726,000	$2,726,000
3) POWER	plant kWh/year	pump kWh/year	$CAD/kWh	plant $CAD/year	pump $CAD/year				
Base Case: Thickened Tailings at Flora Lake Basin	0	75,859,000	$0.05	$0	$3,792,950	$3,792,950			
Alternative 1: Thickened Tailings at Moosehead Lake Basin	0	294,438,000	$0.05	$0	$14,721,900		$14,721,900		
Alternative 2: Filtered Tailings at Flora Lake Basin	39,229,000	257,633,000	$0.05	$1,961,450	$12,881,650			$14,843,100	
Alternative 3: Filtered Tailings at Moosehead Lake Basin	39,229,000	257,633,000	$0.05	$1,961,450	$12,881,650				$14,843,100
Subtotal						$3,793,000	$14,722,000	$14,844,000	$14,844,000
4) MOBILE EQUIPMENT (FUEL AND MAINTENANCE)	quantity	hours	availability	utilization	$CAD/h				
Truck	26	8760	80%	80%	$50			$7,288,320	$7,288,320
Dozer	8	8760	80%	80%	$110			$4,933,632	$4,933,632
Compactor	4	8760	80%	80%	$45			$1,009,152	$1,009,152
Grader	4	8760	80%	80%	$45			$1,009,152	$1,009,152
Subotal						$0	$0	$14,241,000	$14,241,000
5) MECHANICAL EQUIPMENT AND PIPELINE (MAINTENANCE)	mech CAPEX	pipe CAPEX	allowance %	mech $CAD/year	pipe $CAD/year				
Base Case: Thickened Tailings at Flora Lake Basin	$4,726,000	$31,757,100	8% + 4%	$378,080	$1,270,284	$1,648,364			
Alternative 1: Thickened Tailings at Moosehead Lake Basin	$16,987,700	$63,944,650	8% + 4%	$1,359,016	$2,557,786		$3,916,802		
Alternative 2: Filtered Tailings at Flora Lake Basin	$56,659,000	$50,191,900	8% + 4%	$4,532,720	$2,007,676			$6,540,396	
Alternative 3: Filtered Tailings at Moosehead Lake Basin	$56,479,000	$51,654,625	8% + 4%	$4,518,320	$2,066,185				$6,584,505
Subtotal						$1,649,000	$3,917,000	$6,541,000	$6,585,000
					TOTAL OPEX (per year)	$5,879,000	$19,076,000	$58,882,000	$58,926,000

Map of Impacted Water Bodies and Water Courses

Base Case – Slurry Tailings Expanded Impoundment in Flora Lake Watershed

Base Case	
Impacted Water Pond	Area (m^2)
Pond 1 (South Flora Lake)	1,395,646
Pond 2	8,119
Pond 3	24,310
Pond 4	1,199
Pond 5	5,329
Pond 6	44,069
Pond 7	5,812
Pond 8	1,901
Pond 9	21,058
Pond 10	91,192
Pond 11	109,761
Pond 12	1,430
Pond 13	1,127
Pond 14	1,333
Pond 15	2,979
Pond 16	38,198
Pond 17	67,024
Pond 18	39,698
Pond 19	41,778
Pond 20	31,898
Pond 21	27,408
Pond 22	2,421
Pond 23 (Lake 20)	-
Combined Total Area	1,963,691

Base Case	
Impacted Water Course	Length (m)
Water Course 1	3,586
Water Course 2	1,234
Water Course 3	515
Water Course 4	507
Water Course 5	155
Water Course 6	1,135
Combined Total Length	7,132

Map of Impacted Water Bodies and Water Courses

Alternative 1 – Slurry Tailings Impoundment in Moosehead Lake Watershed

Alternative 1	
Impacted Water Pond	**Area (m^2)**
Pond 1	115,774
Pond 2	15,339
Pond 3	2,194
Pond 4	115,375
Pond 5	796
Pond 6	2,201
Pond 7	3,609
Pond 8	855
Pond 9	355,939
Pond 10	18,777
Pond 11	9,115
Pond 12	12,685
Pond 13	4,941
Pond 14	1,546
Pond 15	4,803
Pond 16	
Pond 17	
Pond 18	
Pond 19	
Pond 20	
Pond 21	
Pond 22	
Pond 23 (Lake 20)	
Combined Total Area	663,950

Alternative 1	
Impacted Water Course	**Length (m)**
Water Course 1	194
Water Course 2	643
Water Course 3	2,194
Water Course 4	392
Water Course 5	894
Water Course 6	2,131
Water Course 7	2,205
Water Course 8	1,152
Water Course 9	863
Water Course 10	1,813
Combined Total Length	12,482

Map of Impacted Water Bodies and Water Courses

Alternative 2 – Filtered Tailings Stack in Flora Lake Watershed

Alternative 2	
Impacted Water Pond	**Area (m^2)**
Pond 1 (South Flora Lake)	Not directly impacted
Pond 2	8,119
Pond 3	1,199
Pond 4	1,333
Pond 5	2,979
Pond 6	
Pond 7	
Pond 8	
Pond 9	
Pond 10	
Pond 11	
Pond 12	
Pond 13	
Pond 14	
Pond 15	
Pond 16	
Pond 17	
Pond 18	
Pond 19	
Pond 20	
Pond 21	
Pond 22	
Pond 23 (Lake 20)	
Combined Total Area	13,630

Alternative 2	
Impacted Water Course	**Length (m)**
Water Course 1	340
Water Course 2	2,263
Water Course 3	988
Water Course 4	584
Water Course 5	1,323
Combined Total Length	5,497

Map of Impacted Water Bodies and Water Courses

Alternative 3 – Filtered Tailings Stack in Moosehead Lake Watershed

Alternative 3

Impacted Water Pond	Area (m^2)
Pond 1	115,774
Pond 2	15,339
Pond 3	32,479
Pond 4	115,375
Pond 5	796
Pond 6	2,201
Pond 7	3,609
Pond 8	855
Pond 9	355,939
Pond 10	
Pond 11	
Pond 12	
Pond 13	
Pond 14	
Pond 15	
Pond 16	
Pond 17	
Pond 18	
Pond 19	
Pond 20	
Pond 21	
Pond 22	
Pond 23 (Lake 20)	
Combined Total Area	642,368

Alternative 3

Impacted Water Course	Length (m)
Water Course 1	194
Water Course 2	643
Water Course 3	185
Water Course 4	392
Water Course 5	894
Water Course 6	2,131
Water Course 7	2,205
Water Course 8	1,152
Water Course 9	863
Combined Total Length	8,659

Appendix B:
Multiple Accounts Scoring Reference Scale

TABLE B.1: MULTIPLE ACCOUNT ASSESSMENT LEDGER AND INDICATOR SCALE

		Sub-Account Weight				Indicator Weight		Unit of Measure	Indicator Value (S) [Rating system of 1-6; 1 is low and 6 is high]						
Sub-Account Item	Sub-Account Description	1 to 6	Percentage	Indicator Item	Indicator Description	1 to 6	Percentage		1	2	3	4	5	6	Description / Indicator Rational
Environmental															
E.01	Water Quality	5	28%	E.01.a	Water Polishing/Treatment Requirements	3	100%	Qualitative (Dependent on complexity, size of receiving waterbodies, water storage capacity, number of water mgnt settling ponds)	Very High	High	Moderate to High	Low to Moderate	Low	Very Low	Tacora tailings are considered inert with potentially no acid generation and no metal leaching. Water treatment (i.e. limited to settling of suspended solids) for alternatives will occur within tailings impoundments or within separate settling basins. Alternatives may require complex water treatment arrangements to ensure that effluent is discharged in compliance with MDMER (multiple effluent discharge pathways). Facilities having greater impacted water to manage or treat pose a greater environmental impact.
E.02	Aquatic Life and Habitat Impacts (can be compensated)	1	6%	E.02.a	Waterbody Losses During Operations	4	50%	Quantitative (area of waterbodies within footprint, ha)	>99 ha	75 to 99 ha	50 to 74 ha	25 to 49 ha	1 to 24 ha	<1 ha	Although one of the primary objective for the TIA was to avoid waters frequented by fish, the large quantity of surface water in the area would necessitate the TIA overprinting waterbodies which are habitat for fish. Losses from directly within the TIA footprint development are considered and not downstream/surrounding impacts. Assumed effective sedimentation control implemented on effluent from TIA; assumed no water treatment plant required and water quality meets effluent discharge regulatory criteria. Assumed TIA can be rehabilitated post closure reclamation. The impacted waterbodies are assumed to be compensated in equivalency. Facilities overlying more aquatic habitat and impacting more sensitive aquatic habitats and spawning areas pose a greater environmental impact.
				E.02.b	Watercourse Losses During Operations	4	50%	Quantitative (length of watercourses within footprint, km)	>10 km	8 to 9.9 km	6 to 7.9 km	3 to 5.9 km	1 to 2.9 km	<1 km	Although one of the primary objective for the TIA was to avoid waters frequented by fish, the large quantity of surface water in the area would necessitate the TIA overprinting watercourses in the form of tributaries and creeks which are habitat for fish. Losses from directly within the TIA footprint development are considered and not downstream/surrounding impacts. Assumed effective sedimentation control implemented on effluent from TIA; assumed no water treatment plant required and water quality meets effluent discharge regulatory criteria. Assumed TIA can be rehabilitated post closure reclamation. The impacted watercourses are assumed to be compensated in equivalency. Facilities overlying more aquatic habitat and impacting more sensitive aquatic habitats and spawning areas pose a greater environmental impact.
E.03	Groundwater Impacts	1	6%	E.03.a	Groundwater Impacts by Seepage Risks from TIA	3	100%	Qualitative (combination of footprint area, presence of supernatant pond, permeability of foundation soils)	Very High Underlain by pervious soils with no hydraulic containment; Significant hydraulic gradient driving seepage into ground	High Poor hydraulic containment; difficult to control	Moderate to High Moderate permeability; controllable with containment structures	Low to Moderate	Low Low permeability Little required to achieve assured containment	Very Low Good hydraulic containment; defined flow path; no aquifer; isolated from water body; minimal pore water migration potential; Low hydraulic gradient driving seepage into ground.	Generally, sites underlain with pervious soils are less favorable while those with low permeability provide good hydraulic containment. Areas with "competent and intact" rock (absence of cracks fissures or faults) and other favorable features are ranked as favorable. A qualitative evaluation was completed for each site since limited or no hydrogeological data was available for areas beyond the existing TIA footprint. Tacora tailings are considered inert with potentially no acid generation and no metal leaching. No seepage barrier system is implemented for the TIA. Impacts are principally on hydraulic gradients groundwater table (increased heads) and elevated suspended solids if unfiltered by native soils. Facilities with deeper retained pond and larger footprint pose a greater hydraulic impacts on the groundwater regime.
E.04	Terrestrial Life and Habitat Impacts	4	22%	E.04.a	Forested Land Losses (wildlife , species at risk)	2	25%	Quantitative (area, ha)	>1000 ha	750 to 999	500 to 749	250 to 499	100 to 249	<100	Loss of habitat for several species of wildlife and plants due to the development of the TIA footprint. Generally, sites with more pristine natural habitats, or more specialized habitats (e.g., wetlands, old growth forest) should be left intact if possible. Facilities overlying more terrestrial habitat pose a greater environmental impact.
				E.04.b	Habitat Fragmentation due to pipeline/utility corridors, access roads and haul roads.	1	13%	Quantitative (measured in terms of length of corridor road from existing PH8)	>10 km	8 - 9.9 km	6 - 7.9 km	4 - 5.9 km	2 - 3.9 km	< 2 km	Alternatives which require the construction of greater lengths of new haul roads or pipeline alignments through forests or wetlands result in additional environmental impacts due to the disturbance of additional land and will impact the behaviour of terrestrial life and will serve to fragment populations that lie on either side of the haul road (i.e. connectivity of natural habitats will likely decrease). Habitat fragmentation represents an environmental impact. Alternatives with shorter distances of roads or pipelines through forested areas and wetlands are preferred in this indicator.
				E.04.c	Percentage usage of Existing Disturbed Land	5	63%	Quantitative (Area of existing disturbed land expressed as a percentage)	0 - 9%	10 - 19%	20 - 29%	30 - 39%	40 - 49%	>50%	The use of existing brownfield sites should be favoured over the alteration/removal of greenfield natural habitats.
E.05	Air Quality and Noise Impacts	4	22%	E.05.a	Dusting Impacts from Operations	5	83%	Qualitative (combination of exposed tailings surface, equipment traffic and protrusion of facility above surrounding natural topography)	Very High	High	Moderate to High	Low to Moderate	Low	Very Low	Residual dusting after controls are implemented (e.g. for slurry deposition: hydroseeding / abatement spread annually on exposed tailings breach while for dry stacking: water truck spray moisture control; both methods will implement progressive reclamation of finished areas). Dust particles leads to inhalation health risks for receptors (operators and nearby residents) when exposed long-term. Alternatives which result in lower residual dust emissions are preferred in this indicator.

TABLE B.1: MULTIPLE ACCOUNT ASSESSMENT LEDGER AND INDICATOR SCALE

Sub-Account Item	Sub-Account Description	Sub-Account Weight		Indicator Item	Indicator Description	Indicator Weight		Unit of Measure	Indicator Value (S) [Rating system of 1-6; 1 is low and 6 is high]						Description / Indicator Rational
		1 to 6	Percentage			1 to 6	Percentage		1	2	3	4	5	6	
				E.05.b	Noise Impacts from Operations	1	17%	Quantitative (number of operating equipment; bias where equipment is close proximity to receptors such as dwellings)	> 25 mobile equipment operating at same time	20-24	15-19	10-14	5-9	0-4	Noise emissions are associated with the number of mobile equipment and mechanical equipment (pumps) required for operation of the TIA. Where receptors exists nearby, the score can be biased negatively based on proximity to the TIA operations. Alternatives which result in lower noise emissions are preferred in this indicator.
E.06	Climate Change	3	17%	E.06.a	Greenhouse Gas Emissions	3	100%	Quantitative (Dependent on number of mobile equipment/complexity of tailings deposition method)	> 25 mobile equipment operating at same time	20-24	15-19	10-14	5-9	0-4	Gas exhausts produced from number of mobile equipment or other fossil fuel equipment that are required to operate the TIA. Greenhouse gas emissions are contributor to climate change. Alternatives which result in lower green house gas emissions are preferred in this indicator.
Financial															
F.01	Capital Cost	6	24%	F.01.a	Initial CAPEX (startup ~2 years operation)	6	60%	Quantitative ($ million dollars)	>$500M	$400M - $499M	$300M - $399M	$200M - $299M	$50M - $199M	< $50M	Initial capital investment to start up tailings operation. Capital costs have a significant impact on the ability to successfully commission a new tailings disposal technology versus continuation of existing disposal technology. Alternatives which result in lower initial capital expenditures are preferred in this indicator.
				F.01.b	Sustaining CAPEX (Year 3 to end of life)	4	40%	Quantitative ($ million dollars)	>$500M	$400M - $499M	$300M - $399M	$200M - $299M	$50M - $199M	< $50M	On-going capital investment to continue operation over duration of mine life (e.g. dike raises). Sustaining capital costs impact at discrete periods and/or annual basis for life of mine economics. Alternatives which result in lower sustaining capital expenditures are preferred in this indicator.
F.02	Operating Cost	6	24%	F.02.a	Operating Cost - Labour, maintenance, repairs, etc.	3	100%	Quantitative ($ / tonne of dry tailings)	>$40 / tonnes tails	$30 - $39 / tonnes tails	$20 - $29 / tonnes tails	$10 - $19 / tonnes tails	$1 - $9 / tonnes tails	< $1 / tonnes tails	Operating expenses to support operations, maintenance and replacement (e.g. fuel, electricity, filter cloths, etc.). Alternatives which result in lower operating expenditures are preferred in this indicator.
F.03	Closure Cost	4	16%	F.03.a	Closure Cost	3	100%	Quantitative ($ million dollars)	>$60M	$50M - $59M	$40M - $49M	$30M - $39M	$20M - $29M	< $20M	Capital investment to rehabilitate the TIA for closure (e.g. regrading steep slopes, permanent vegetation cover, ditches and channels for surface water management). Alternatives which result in lower closure expenditures are preferred in this indicator.
F.04	Env. Compensation and Monitoring Cost	3	12%	F.04.a	Environmental Compensation & Monitoring Cost (not determined but qualitative assessment presented)	3	100%	Qualitative	Very High	High	Moderate to High	Low to Moderate	Low	Very Low	Capital investment to develop and implement approved habitat compensation plan. Note that the compensation plan was not conceptualized at this stage for each alternative and thus its costing was based on correlation with impacted water courses and bodies. Alternatives which result in smaller compensation and thus lower development expenditures including reclamation security bond are preferred in this indicator.
F.05	Permitting Process Impacts	6	24%	F.05.a	Permitting Risks / Obstacles	4	67%	Qualitative	Very high risk / Very low probability of approval	High risk	Moderate to high risk	Low to moderate risk	Low risk	Very low risk / Very high certainty of approval	Complexity and resistance from community and regulators pose greater risks to obtain permits. These factors may impose greater financial risks for environmental studies and engineering to support the option. Alternatives utilizing existing brown field area, favored by the communities, and minimal impacts on existing dwellings/receptors are preferred.
				F.05.b	Permitting Schedule Duration	2	33%	Qualitative	Major delays (> 3yrs)	Significant delays (1 to 3 yrs)	Moderate to significant delays (1 -to 2 yrs)	Minor to Moderate delays	Minor delays	Insignificant delays (<2 months)	The permitting process requiring extended duration/potential delays to carry out environmental assessment, community consultation, and new Schedule 2 approval. Alternatives with minimal delays leveraging on progressed studies and are associated with amendment of existing Schedule 2 are preferred.
Technical and Operational															
T.01	Tailings Dewatering and Transport Equipment	6	30%	T.01.a	Proven dewatering technology for similar ore type and production	6	32%	Qualitative	Very high uncertainties / Unproven	High uncertainties	Moderate to high uncertainties	Low to moderate uncertainties	Low uncertainties	Proven / Existing Operation	Alternatives using dewatering technologies that are proven within iron ore mineral processing industry and have familiarity/experience by Tacora operators are preferred.
				T.01.b	Complexity of equipment operation	3	16%	Qualitative	Complex requiring skilled labour and/or training	High complexity	Moderate to high complexity	Low to moderate complexity	Low complexity	Simple / No training	Alternatives with less complex and fewer equipment require less skilled labour and occupy smaller building footprint to operate are preferred.
				T.01.c	Maintenance requirements for equipment	3	16%	Qualitative	Highest / Has many components requiring downtime	High complexity	Moderate to high complexity	Low to moderate complexity	Low complexity	Low / Common maintenance works	Alternatives with less complex and fewer equipment require less maintenance, disposal of consumables, and requirements of spare parts to operate are preferred.
				T.01.d	Tailings Transport Distance and Complexity	3	16%	Quantitative (length, km)	>50 km	40-49 km	30-39km	20-29 km	10-19 km	< 10 km	Alternatives with longer transport distance requires greater material/equipment, have greater wear on equipment and greater energy consumption. Shorter transport distances are preferred in this indicator.
				T.01.e	Power Demands	4	21%	Qualitative	Very high power demand with many plant equipment (very high risk for electricity supply to meet demand)	High power demand	Moderate to high power demand	Low to moderate power demand	Low power demand	Very low power demand with few plant equipment (low risk for electricity supply to meet demand)	Power demands are dependent on the type, capacity and number of equipment required for dewatering and transport. The regional power supply is near capacity. Thus, alternatives with low demands of the operation that would strain the limited supply of electricity in region are preferred in this indicator.
T.02	Tailings Storage Design Complexity	4	20%	T.02.a	Topographic Relief or Feature Obstacles	4	20%	Qualitative	Very high relief/complexity for containment	High relief/complexity for containment	Moderate to high relief/complexity for containment	Low to moderate relief/complexity for containment	Low relief/complexity for containment	Ideal for containment	Complex and large topographic relief in disposal area presents difficulty with pipeline routing, requirements of emergency drain basins for shutdown, need for containment dikes, and pumping/trucking demands. Ideal valley containment (slurry) or relatively flat (stacking) topography are preferred in this indicator.
				T.02.b	Water Management and Operational Monitoring of Internal/Impacted Ponds	6	30%	Qualitative	Very high complexity/full reclaim water circuit	High complexity	Moderate to high complexity	Low to moderate complexity	Low complexity	Simple/no reclaim water circuit	Complexity is related to the number of internal/impacted water pond dams and seepage collection ditches to manage and monitor. Alternatives that are basic, less susceptible to sudden change site conditions and require less operational controls and monitoring effort are preferred in this indicator.

TABLE B.1: MULTIPLE ACCOUNT ASSESSMENT LEDGER AND INDICATOR SCALE

		Sub-Account Weight				Indicator Weight		Unit of Measure	Indicator Value (S) [Rating system of 1-6; 1 is low and 6 is high]						
Sub-Account Item	Sub-Account Description	1 to 6	Percentage	Indicator Item	Indicator Description	1 to 6	Percentage		1	2	3	4	5	6	Description / Indicator Rational
				T.02.c	Upstream Catchment Diversion and External Ponds Requirements/Complexity Compliance with Regulatory Approvals	4	20%	Qualitative	Very high complexity	High complexity	Moderate to high complexity	Low to moderate complexity	Low complexity	Simple	Complex is related to the number of water diversion dams and channels necessary for redirection of external non-impacted surface water to manage and monitor. Fewer and simple water diversion features are preferred in this indicator.
				T.02.d	Dike or Stack Embankment Stability and Foundation Risks	6	30%	Quantitative	>60m height / Very High Risk Dike	50m to 59m height / High risk	40m to 49m height / Moderate to high risk	30m to 39m height / Low to moderate risk	10m to 29m height / Low risk dike	<10m height / Very low risk	Taller containment dike or stack embankment heights may require more complex designs including foundation preparation and construction. Larger or more complex containment or embankment structures are generally less desirable due to uncertainty associated with long term integrity particularly if the tailings are liquefiable and poor foundation exists. Alternatives with lower embankment heights are preferred in this indicator.
T.03	Constructability	6	30%	T.03.a	Quantity of components required for construction and operations (dewatering plant, access roads, diversion dams, channel and foundation preparations)	4	67%	Qualitative	Very High Complexity / Schedule Constrain	High complexity	Moderate to high complexity	Low to moderate complexity	Low complexity	Simple/No Schedule Constraints	More components and equipment's associated with the option, the more requirements, complexity and schedule constraints exist for the construction execution. Winter weather and vendor supply lead times are major schedule constraints and uncertainties. Alternatives with fewer components and short lead times are preferred in this indicator.
				T.03.b	Water dam volume for construction	2	33%	Quantitative (fill volume, Mm3)	>4 Mm3	3.0-3.9 Mm3	2-2.9 Mm3	1-1.9 Mm3	0.5-0.9 Mm3	<0.5 Mm3	Dike volumes associated with water management will require native borrow material (excludes tailings dikes or filter stack embankment volumes). Smaller volumes are preferred alternatives in this indicator since low permeability soils and natural aggregates can be sparse to source in the project vicinity.
T.04	Closure	4	20%	T.04.a	Closure Reclaim Tailings Surface Area (hydroseeding and vegetation cover)	6	43%	Quantitative	>1000 ha	800-900 ha	600-700 ha	400-500 ha	200-300 ha	< 200 ha	Placement and establishment of vegetation cover on exposed surface areas of the tailings deposit to minimize dusting and runoff erosion at closure. Progress closure will be adopted during operation. Alternatives with smaller surface area requiring rehabilitation is preferred in this indicator.
				T.04.b	Closure Dike/Embankment Regrading (earthworks volume)	4	29%	Quantitative	>1.0 km3	0.8-0.99 km3	0.6-0.79 km3	0.4-0.59 km3	0.2-0.39 km3	< 0.2 km3	Over steepened dike bench slopes constructed during operations will require regrading earthworks to a stable flatter slope at closure for placement and establishment of vegetation cover and minimize erosion gullies. Progressive closure will be adopted during operation. Alternatives with smaller dike surfaces requiring less regrading/reclamation works for closure are preferred in this indicator.
				T.04.c	Closure Water Management (upgrades or modifications to hydraulic structures)	4	29%	Qualitative	Very high complexity/Large area with long term monitoring	High complexity	Moderate to high complexity	Low to moderate complexity	Low complexity	Simple/Small area with short term monitoring	Number of features requiring upgrades/modification at closure such as hydraulic overflow spillway channel of ponds and diversion channels are indicative of level of effort and complexity. Less complex water management and fewer components to modify at closure and manage in post-closure are preferred in this indicator.
Socio-Economic															
S.01	Employment	2	12%	S.01.a	Employment Opportunities	4	40%	Quantitative	<5 dedicated staff; Least number of labour employment to operate	5 to 19	20 to 49	50 to 79	80 to 99	>100 dedicated staff; Greatest number of labour employment to operate	Larger staffing resources are needed to support systems with more components and equipment that require operators and maintenance technicians. This offers greater employment and economic opportunities in the local communities and thus are the preferred alternatives in this indicator from a social community benefit perspective.
				S.01.b	Requirements of Skilled Resourcing in Region	6	60%	Qualitative	Very high employment resourcing and difficult to find skilled workers (high risk)	High	Moderate to High	Low to Moderate	Low	Very low/minimal employment resourcing and easy to find workers (low risk)	Alternatives with complex equipment and processes will require skilled and specialized workers. If no skilled resources are available in the region, it may be possible to source from outside of the region. While training is a possible long-term investment, it is not feasible. Given the shortage/scarcity of skilled workers within the local communities under the present economic prosperity of the region, alternatives requiring fewer skilled/specialized workers are the preferred alternatives in this indicator from a social community benefit perspective.
S.02	Land and Resource Use	5	29%	S.02.a	Land-ownership / claims	6	67%	Quantitative	>15 land claims / Many interference	11 to 15 land claims	6 to 10 land claims	3 to 5 land claims	1 to 2 land claims	No interference	Land claims (small residental private properties) held by private owners may present legal obstacles, financial risks and project schedule delays. The interferences presented by pre-existing claims could impact not only the proposed site of the tailings facility but also the associated infrastructure, access roads and utility corridors. Alternatives with few to no interferences of private-party residential claims within the proposed development are the preferred in this indicator. These land claims are not minerals claims or large areas held by companies that have already been eliminated alternatives under the pre-screening Criteria 3.
				S.02.b	Recreational, Cultural and Resource Use	3	33%	Qualitative	Existing use	High	Moderate to High	Low to Moderate	Low	No interference	Interferences presented by recreational, cultural and resource use of the land could have financial risks and project schedule delays. The pre-existing interferences could impact not only the proposed footprint site of the tailings facility but also the associated infrastructure, access roads and utility corridors. Alternatives with few to no interferences within the proposed development are the preferred in this indicator.
S.03	Impacts on community and reputation	4	24%	S.03.a	Impact on community and reputation	3	100%	Qualitative	High impacts/ high visibility	High	Moderate to High	Low to Moderate	Low	Very low impacts/no visibility	Facilities with a higher risk of impacts to the community and reputation of Tacora are associated with a higher risk of losing the social license to operate resulting from potential physical failures or environmental incidents during mining. Alternatives with lower impacts and visibility are the preferred in this indicator.

TABLE B.1: MULTIPLE ACCOUNT ASSESSMENT LEDGER AND INDICATOR SCALE

Sub-Account Item	Sub-Account Description	Sub-Account Weight		Indicator Item	Indicator Description	Indicator Weight		Unit of Measure	Indicator Value (S) [Rating system of 1-6; 1 is low and 6 is high]						Description / Indicator Rational
		1 to 6	Percentage			1 to 6	Percentage		1	2	3	4	5	6	
S.04	Human Health and Public Safety	6	35%	S.04.a	Hazard Potential to the Public	6	67%	Qualitative	Very high hazard	High	Moderate to High	Low to Moderate	Low	Very low hazard	The tailings facility and its associated infrastructures have various degree of hazards/impacts to public safety and health. For example, hazard potential and consequence of a hypothetical dike breach and inundation downstream of TIA are qualitatively assessed considering engineering judgement on the embankment construction methodology, maximum height, retention of a pond, and locality to population at risk. Alternatives with the lower hazard potential for public safety are the preferred in this indicator.
				S.04.b	Health and Safety Hazards in Operations	3	33%	Qualitative	Very high health and safety hazards	High	Moderate to High	Low to Moderate	Low	Very low health and safety hazards	The operation of the tailings facility and its associated infrastructures could present health and safety hazards to the operators such as safety around mobile fleet, dewatering plant equipment, dust inhalation, etc. Alternatives with the lower health/safety hazard potential for operators are the preferred in this indicator.

TABLE B.2: SUB-ACCOUNT AND INDICATOR WEIGHTING RATIONAL

Sub-Account Item	Sub-Account Description	Sub-Account Weight 1 to 6	Sub-Account Weight Percentage	Sub-Account Weight Weighting Rationale	Indicator Item	Indicator Description	Indicator Weight 1 to 6	Indicator Weight Percentage	Indicator Weight Weighting Rationale
Environmental									
E.01	Water Quality	5	28%	An overriding environmental concern when designing a TIA is to ensure the deposition of tailings does not does not significantly and adversely affect local surface and ground water quality. Tailings effluent requires management to meet discharge criteria and minimize impacts to receiving waters. A weight of 5 was assigned. Water treatment needs of Tacora tailings are only for total suspended solids via settling basin (e.g. North Flora Lake) since there are no exceedance of criteria for other chemical parameters in the effluent discharge.	E.01.a	Water Polishing/Treatment Requirements	3	100%	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment.
E.02	Aquatic Life and Habitat Impacts (can be compensated)	1	6%	A low weight of 1 was assigned to the Aquatic Life and Habitat Impacts sub-account. This reflects the fact that the compensation plan will offset the aquatic life and habitat losses. Thus, effects of a compensation plan presents a neutral impacts as compared to other sub-accounts in the Environmental account.	E.02.a	Waterbody Losses During Operations	4	50%	This indicator was given a weight of 4 to reflect the equal importance of waterbodies relative to the waterbodies for the aquatic life (e.g. refuse during winter) and habitat compensation.
					E.02.b	Watercourse Losses During Operations	4	50%	This indicator was given a weight of 4 to reflect the equal importance of watercourses relative to the waterbodies for the aquatic life (e.g. spawning area) and habitat compensation.
E.03	Groundwater Impacts	1	6%	A low weight of 1 was assigned to the Groundwater Impacts sub-account. This reflects the fact that Tacora tailings are benign and do not materially impact the groundwater quality and regional hydrogeological conditions. Thus, effects of compensation plan presents a neutral impacts as compared to other sub-accounts in the Environmental account.	E.03.a	Groundwater Impacts by Seepage Risks from TIA	3	100%	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment.
E.04	Terrestrial Life and Habitat Impacts	4	22%	A weight of 4 was assigned to the terrestrial habitat sub-account. This reflects the importance of forests as a habitat in the local ecosystem. Terrestrial life can adjust to the impacted/lost area and return upon area rehabilitation in post-closure.	E.04.a	Forested Land Losses (wildlife , species at risk)	2	25%	Forests represent good quality habitat for many native terrestrial fauna and flora and have a high ecological value. However, due to the overall abundance of forest habitat in the area and the migration ability of terrestrial life, a low weight of 2 has been assigned.
					E.04.b	Habitat Fragmentation due to pipeline/utility corridors, access roads and haul roads.	1	13%	Considering there will be no fencing or significant physical barriers installed beyond the overland pipelines and low-use access roadway, the fragmentation impacts would be minor for the migration of terrestrial life and thus a lowest weight of 1 has been assigned.
					E.04.c	Percentage usage of Existing Disturbed Land	5	63%	The importance of utilizing existing disturbed land area to minimize impacts to natural undisturbed area justifies a high weight of 5 assigned to this indicator.
E.05	Air Quality and Noise Impacts	4	22%	During construction and operations of the TIA, the alternatives will vary in their air quality and noise emissions to the surrounding environment and receptors. From an environmental perspective, the effects of air quality and noise will expect a greater public sensitivity, in comparison to some of the other sub-accounts, since the current dust emissions with the existing TIA operation. However, based on the importance of these effects to a local receptors, a moderate weight of 4 has been assigned.	E.05.a	Dusting Impacts from Operations	5	83%	There is a risk that the area around the TIA could exceed the human health-based criteria for fugitive dust (i.e. long-term exposure resulting in silicosis) and these areas would have public access restrictions. A high weight of 5 has been assigned to this indicator.

TABLE B.2: SUB-ACCOUNT AND INDICATOR WEIGHTING RATIONAL

Sub-Account Item	Sub-Account Description	Sub-Account Weight			Indicator Item	Indicator Description	Indicator Weight		
		1 to 6	Percentage	Weighting Rationale			1 to 6	Percentage	Weighting Rationale
					E.05.b	Noise Impacts from Operations	1	17%	Noise from the TIA alternatives will be audible at nearby few receptor locations, as well as in the general vicinity of the TIA. This noise could be considered a nuisance to stakeholders and land users around the Project. Furthermore, the temporal period over which noise and vibration effects are expected to occur is relatively short (i.e. only during operating life of the facility and a short period during reclamation) with respect to dusting impacts from the Project and the need to meet regulatory criteria, a low weight of 1 has been assigned.
E.06	Climate Change	3	17%	A weight of 3 was assigned to this sub-account as the impacts relative to the other sub-accounts in this account (such as terrestrial habit) are considered important to current governmental carbon emission policies.	E.06.a	Greenhouse Gas Emissions	3	100%	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment.
Financial									
F.01	Capital Cost	6	24%	Capital costs typically have the highest impact on mine financial calculations as they represent a significant portion of the estimated net present value costs (which apply discounting to account for the time value of money) for a proposed project. Accordingly, the highest possible weight of 6 was assigned to this sub-account as it is considered to have a higher impact on overall project economics than closure cost.	F.01.a	Initial CAPEX (startup ~2 years operation)	6	60%	Initial capital costs to construct the Expansion TIA alternatives are expected to be the most sensitive costs as these expenses cannot be deferred to revenue and have a disproportionate influence on the net present value of the Project. Although each alternative is potentially economically viable, alternatives with greater capex costs incur substantial risk to Project economics. A highest weight of 6 has been assigned to reflect the importance of controlling initial capital costs.
					F.01.b	Sustaining CAPEX (Year 3 to end of life)	4	40%	Sustaining capital costs are generally one of the greatest costs associated with alternatives that employ conventional slurry tailings deposition technologies. Impoundment dikes for these alternatives will undergo continuous raises during operations until the ultimate heights are reached at the end of operation. However as these dike raise construction can be leveraged through revenue and are less economically sensitive, a slightly lower weight of 4 has been assigned compared to initial capital costs.
F.02	Operating Cost	6	24%	A weight of 6 was assigned to this sub-account to represent the fact that operating costs are a significant component of the overall mine costs even though they are discounted over the life of the mine.	F.02.a	Operating Cost - Labour, maintenance, repairs, etc.	3	100%	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment.
F.03	Closure Cost	4	16%	Closure costs associated with the TIA are anticipated to be a relatively smaller component of the overall cost associated with the TIA. As a result, a weight of 4 was assigned to this sub-account.	F.03.a	Closure Cost	3	100%	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment.
F.04	Env. Compensation and Monitoring Cost	3	12%	Environmental compensation and monitoring costs associated with the TIA are anticipated to be a relatively smaller component of the overall cost associated with the TIA. As a result, a weight of 3 was assigned to this sub-account.	F.04.a	Environmental Compensation & Monitoring Cost (not determined but qualitative assessment presented)	3	100%	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment.
F.05	Permitting Process Impacts	6	24%	Permitting process impacts has important impacts to the continual operation of the mine; delays beyond existing storage life could shut down the mine. As a result, a high weight of 6 was assigned to this sub-account.	F.05.a	Permitting Risks / Obstacles	4	67%	Alternatives that could result in the rejection of environmental approvals, would delay Project construction and operations, and thus have a significant cost to Tacora by impacting the overall feasibility of the Project. This risk is significant enough that a moderate weight of 4 has been assigned.

TABLE B.2: SUB-ACCOUNT AND INDICATOR WEIGHTING RATIONAL

Sub-Account Item	Sub-Account Description	Sub-Account Weight 1 to 6	Percentage	Weighting Rationale	Indicator Item	Indicator Description	Indicator Weight 1 to 6	Percentage	Weighting Rationale
					F.05.b	Permitting Schedule Duration	2	33%	Appropriate permit planning and available contingency storage capacity for continuation of tailings disposal in existing facility are in place to mitigate schedule delays in the approval process. This risk is low enough that a low weight of 2 has been assigned.
Technical and Operational									
T.01	Tailings Dewatering and Transport Equipment	6	30%	Alternatives that use a design that is unconventional or unprecedented at the required Project scale are inherently more complex to operate and require more equipment. This may result in unforeseen problems and significant intervention during operations. A highest weight of 6 has been assigned to reflect the inherent challenges with different technologies.	T.01.a	Proven dewatering technology for similar ore type and production	6	32%	The highest possible weight of 6 was assigned to this indicator to reflect the importance of familiar/unknown technology for Tacora operational staff.
					T.01.b	Complexity of equipment operation	3	16%	The indicators of equipment complexity, maintenance requirements and transport distance have equal weight of 3 relatively to the other indicators.
					T.01.c	Maintenance requirements for equipment	3	16%	The indicators of equipment complexity, maintenance requirements and transport distance have equal weight relatively to the other indicators.
					T.01.d	Tailings Transport Distance and Complexity	3	16%	The indicators of equipment complexity, maintenance requirements and transport distance have equal weight of 3 relatively to the other indicators.
					T.01.e	Power Demands	4	21%	Given the regional power supply is near capacity, the importance of the required power demands of the alternative is important relative to the other indicators of equipment complexity, maintenance requirements and transport distance. A weight of 4 has been assigned to this indicator.
T.02	Tailings Storage Design Complexity	4	20%	Safety and integrity are a primary concern when designing the TIA storage facility and each alternative can be engineered and constructed to the necessary factor of safety. However, some technical factors have the potential to increase the risk or consequence of failure and can therefore be mitigated through design and operating controls. As a result, a moderate weight of 4 has been assigned.	T.02.a	Topographic Relief or Feature Obstacles	4	20%	A moderate weight of 4 was assigned to this indicator to reflect the topographic relief influence on the overall design and construction complexities for the tailings impoundment/stack.
					T.02.b	Water Management and Operational Monitoring of Internal/Impacted Ponds	6	30%	The highest possible weight of 6 was assigned to this indicator to reflect the importance of pond dike stability and consequences associated with its failure. Operational phase and post-closure phase water quality monitoring to meet regulatory discharge compliance would .
					T.02.c	Upstream Catchment Diversion and External Ponds Requirements/Complexity Compliance with Regulatory Approvals	4	20%	A moderate weight of 4 was assigned to this indicator to reflect relatively lessor importance to the internal/impacted ponds and water management features.
					T.02.d	Dike or Stack Embankment Stability and Foundation Risks	6	30%	The highest possible weight of 6 was assigned to this indicator to reflect the importance of dike stability and high consequences associated with its failure.
T.03	Constructability	6	30%	The primary considerations when designing a TIA is the construction suitability. Alternatives that are difficult to construct in a cold climate region will have much greater impacts to the Project schedule and can cascade into effects to other accounts and subaccounts. The high weight of 6 has been assigned.	T.03.a	Quantity of components required for construction and operations (dewatering plant, access roads, diversion dams, channel and foundation preparations)	4	67%	This indicator refers to the ease of acquiring the materials, equipment and contractor resources needed to construct the whole project. Some of the alternatives may require long-lead equipment supply, and securing or manufacturing borrow fills for earthworks. A moderate weight of 4 was assigned.

TABLE B.2: SUB-ACCOUNT AND INDICATOR WEIGHTING RATIONAL

Sub-Account Item	Sub-Account Description	Sub-Account Weight			Indicator Item	Indicator Description	Indicator Weight		
		1 to 6	Percentage	Weighting Rationale			1 to 6	Percentage	Weighting Rationale
					T.03.b	Water dam volume for construction	2	33%	During the construction phase, seepage collection infrastructure including temporary construction water management structures would be required around the TIA for compliance with MDMER and would include collection ditching and seepage collection/sedimentation ponds. The greater the number of ponds and the length of the collection ditching, the greater the complexity of capturing all the seepage/suspended solids from the TIA or construction activities. Engineering and good construction practices can be implemented to minimize impacts. A low weight of 2 has been assigned.
T.04	Closure	4	20%	Closure are an important equally to the design of the TIA given their impacts on long-term environmental performance and construction/maintenance costs. The weight of 4 has been assigned.	T.04.a	Closure Reclaim Tailings Surface Area (hydroseeding and vegetation cover)	6	43%	Given the significant quantity of tailings surface area (effort and costs) required for closure reclamation works relative to the other indicators, the highest possible weight of 6 was assigned to this indicator.
					T.04.b	Closure Dike/Embankment Regrading (earthworks volume)	4	29%	Stabilization of dike/embankment for long-term closure performance is important and equally with water management features. The design of the operational structures can incorporate closure aspects to minimize effort later in closure phase (i.e. progressive closure). Thus, a weight of 4 was assigned to this indicator.
					T.04.c	Closure Water Management (upgrades or modifications to hydraulic structures)	4	29%	Stabilization of water management features for long-term closure performance is important and equally with dike/embankment. Thus, a weight of 4 was assigned to this indicator.
Socio-Economic									
S.01	Employment	2	12%	Due to the small size of the surrounding population, employment and business opportunities could impact the local economy. Should the Project enter a period of care and maintenance or early closure, these economic opportunities could be lost and could impact the local employment. A low weight of 2 has been assigned.	S.01.a	Employment Opportunities	4	40%	Alternatives that are more sensitive to fluctuations in iron price and the Canadian dollar have a higher risk of shutting down the project during these fluctuations. If the Project is placed in care and maintenance local employment and business opportunities would be significantly affected. A high weight of 4 was assigned
					S.01.b	Requirements of Skilled Resourcing in Region	6	60%	Alternatives that involve operation or maintenance of mechanical equipment (e.g. filtration plant, pumps, mobile equipment) will require more skilled labour in the region. Recognizing the recent economic prosperity in the region, there is a shortage of skilled labours. A high weight of 6 was assigned to consider the importance of this aspect.
S.02	Land and Resource Use	5	29%	Tacora is committed to minimizing or avoiding potential effects to Indigenous and the public's values as an integral part of Project development, along with balancing these values with the need for regional economic development. A moderately higher weight of 5 has been assigned relative to other sub-accounts.	S.02.a	Land-ownership / claims	6	67%	Some of the lands in the area adjacent to the Project site are privately owned, and alternatives that overprint or encroach on these lands could result in a loss of private land ownership. However, due to the inability of Tacora to compensate or encounter negotiation delays for this land, a higher weight of 6 was assigned.
					S.02.b	Recreational, Cultural and Resource Use	3	33%	No cultural heritage sites were identified within the region of the alternative sites based on the environmental assessment registration (Tacora, 2021). Several ATV trails runs through the Project area which provide access to valued areas but can be realigned. Also, local residents may fish in waterbodies surrounding and throughout the Project area. Although fishing opportunities or ATV trails may be lost, habitat offsetting would replace these areas or trail realignment, and thus a low weight of 3 was assigned.

TABLE B.2: SUB-ACCOUNT AND INDICATOR WEIGHTING RATIONAL

Sub-Account Item	Sub-Account Description	Sub-Account Weight			Indicator Item	Indicator Description	Indicator Weight		
		1 to 6	Percentage	Weighting Rationale			1 to 6	Percentage	Weighting Rationale
S.03	Impacts on community and reputation	4	24%	Facilities with a higher risk of impacts to the community and reputation of Tacora are associated with a higher risk of losing the social license to operate resulting from incidents during mining. A moderate weight of 4 has been assigned since Tacora maintains public relations through proactive community engagement and public consultations on project developments.	S.03.a	Impact on community and reputation	3	100%	As there is only one indicator within this sub-account, the assigned weighting does not impact the alternatives assessment.
S.04	Human Health and Public Safety	6	35%	Tacora recognizes that it is the utmost importance of avoiding the potential to harm human health and public safety. A potential loss of life or infringement to public safety is unacceptable and a high weight of 6 has been assigned.	S.04.a	Hazard Potential to the Public	6	67%	The TIA will be constructed to meet the necessary factors of safety and a TIA failure is highly unlikely. That said, the hazard potential of the TIA was assessed to be the potential to affect infrastructure (e.g. public Highway 500, railway and public water supply) in the unlikely event a TIA failure did occur. As a result, a maximum weight of 6 has been assigned.
					S.04.b	Health and Safety Hazards in Operations	3	33%	TIA alternatives have the potential to increase the risk to worker health and safety from exposure to fugitive dust coming off the TIA. This risk could affect large areas and large numbers of personnel working around the TIA and be more difficult to manage due to the spatial extent of the effect. Further, there is a risk of worker injury during construction or operation of the TIA (e.g. equipment traffic). Considering the number of people a workplace incident could affect is much smaller than the hazard to the public and the worker training along with protective equipment mitigations in place, the likelihood of incident occurrence would be much lower. As a result, a lower weight of 3 has been assigned.

TABLE B.3: INDICATOR SCORING

Sub-Account	Indicator Item	Indicator	Measurement	Base Case Thickened Flora	Alternative 1 Thickened Moosehead	Alternative 2 Stack Flora	Alternative 3 Stack Moosehead
Environmental Account							
Water Quality	E.01.a	Water Polishing/Treatment Requirements	Qualitative (Dependent on complexity, size of receiving waterbodies, water storage capacity, number of water mgnt settling ponds)	Significant solids released with slurry discharges. Single polishing pond and single compliance monitoring point	Significant solids released with slurry discharges. Multiple polishing ponds with two compliance monitoring points	Single polishing pond and single compliance monitoring point. Same level of complexity expected as Base Case but with expected lower TSS from stacking operations.	Two polishing ponds and two compliance monitoring point. Same level of complexity expected as Alternative 1 but with expected lower TSS from stacking operations.
				Score = 3	Score = 1	Score = 4	Score = 2
Aquatic Life and Habitat Impacts (can be compensated)	E.02.a	Waterbody Losses During Operations	Quantitative (area of waterbodies within footprint, ha)	56.8 ha of waterbody (excl. S Flora Lake since already compensated for lake)	66.4 ha of waterbody	1.4 ha of waterbody (excl. S Flora Lake since already compensated for lake)	64.2 ha of waterbody
				Score = 3	Score = 3	Score = 5	Score = 3
	E.02.b	Watercourse Losses During Operations	Quantitative (length of watercourses within footprint, km)	7.1 km of watercourses	12.5 km of watercourses	5.5 km of watercourses	8.7 km of watercourses
				Score = 3	Score = 1	Score = 4	Score = 2
Groundwater Impacts	E.03.a	Groundwater Impacts by Seepage Risks from TIA	Qualitative (combination of footprint area, presence of supernatant pond, permeability of foundation soils)	1,175 ha footprint area with 2 supernatant ponds as seepage source	933 ha footprint area as with +4 supernatant ponds as seepage sources	418 ha footprint area with 1 sediment pond as seepage source	617 ha footprint area with 3 sediment ponds as seepage source
				Score = 2	Score = 1	Score = 4	Score = 3
Terrestrial Life and Habitat Impacts	E.04.a	Forested Land Losses (wildlife , species at risk)	Quantitative (area, ha)	1,001 ha but utilizing existing disturbed lake and surrounding areas	1,041 ha but land in new watershed with mostly forested area; least favorable	437 ha on entirely forested area but impacts least relative to other alternatives	642 ha but land in new watershed; less favorable
				Score = 1	Score = 1	Score = 4	Score = 3
	E.04.b	Habitat Fragmentation due to pipeline/utility corridors, access roads and haul roads.	Quantitative (measured in terms of length of corridor road from existing PH8)	6 km	11.4 km	9.6 km	10.5 km
				Score = 3	Score = 1	Score = 2	Score = 1
	E.04.c	Percentage usage of Existing Disturbed Land	Quantitative (Area of existing disturbed land expressed as a percentage)	40% of 1,140.6 ha but most favorable since utilizing existing disturbed lake and surrounding areas	0% 1,040.8 ha but all undisturbed land in new watershed	10% as settling basin that is existing disturbed lake downstream of 436.9 ha all undisturbed land	0% 641.9 ha but all undisturbed land in new watershed
				Score = 5	Score = 1	Score = 2	Score = 1
Air Quality and Noise Impacts	E.05.a	Dusting Impacts from Operations	Qualitative (combination of exposed tailings surface, equipment traffic and protrusion of facility above surrounding natural topography)	Low dust since few mobile equipment but large active exposed beach area and away from any dwelling receptors	Lowest dust since few mobile equipment (dozer and perimeter dike construction) and progressive reclamation possible, but nearby ~50 m dwelling receptors	Very high dust from large fleet of mobile equipment; prominent high stack on topography that could be exposed to greater wind generated dusting even though TIA has no nearby dwelling receptors	Very high dust from large fleet of mobile equipment, but nearby ~200 m dwelling receptors
				Score = 5	Score = 3	Score = 1	Score = 1
	E.05.b	Noise Impacts from Operations	Quantitative (number of operating equipment; bias where equipment is close proximity to receptors such as dwellings)	Lowest noise generated since approx. 5 to 9 mobile equipment (dozer and dike stage raises; pumphouses) and away from any dwelling receptors	Low noise generated similar to Base Case with approx. 5 to 9 mobile equipment (dozer construction and pumphouses), but nearby ~50 m dwelling receptors	High noise generated from large fleet of mobile equipment (>25) and away from any dwelling receptors	High noise generated from large fleet of mobile equipment (>25), but there are nearby ~200 m dwelling receptors
				Score = 5	Score = 3	Score = 1	Score = 1
Climate Change	E.06.a	Greenhouse Gas Emissions	Quantitative (Dependent on number of mobile equipment/complexity of tailings deposition method)	Requires 5 to 9 mobile equipment with periodic dam construction	Requires 5 to 9 mobile equipment with periodic dam construction	Requires >25 fleet of mobile equipment	Requires >25 fleet of mobile equipment
				Score = 5	Score = 5	Score = 1	Score = 1
Financial Account							
Capital Cost	F.01.a	Initial CAPEX (startup ~2 years operation)	Quantitative ($ million dollars)	$40.70	$161.20	$505.73	$547.23
				Score = 6	Score = 5	Score = 1	Score = 1
	F.01.b	Sustaining CAPEX (Year 3 to end of life)	Quantitative ($ million dollars)	$122.10	$322.40	$7.07	$16.67
				Score = 5	Score = 3	Score = 6	Score = 6
Operating Cost	F.02.a	Operating Cost - Labour, maintenance, repairs, etc.	Quantitative ($ / tonne of dry tailings)	$5.88	$19.08	$58.88	$58.93
				Score = 5	Score = 4	Score = 1	Score = 1
Closure Cost	F.03.a	Closure Cost	Quantitative ($ million dollars)	$61.20	$89.50	$22.30	$36.60
				Score = 1	Score = 1	Score = 5	Score = 4
Env. Compensation and Monitoring Cost	F.04.a	Environmental Compensation & Monitoring Cost (not determined but qualitative assessment presented)	Qualitative	Compensation for impacts: 56.8 ha of waterbody (excl. historically compensated S Flora Lake 139.5 ha)	Compensation for impacts: 66.4 ha of waterbody	Compensation for impacts: 1.4 ha of waterbody (excl. historically compensated S Flora Lake)	Compensation for impacts: 64.2 ha of waterbody; similar to Alternative 2

TABLE B.3: INDICATOR SCORING

Sub-Account	Indicator Item	Indicator	Measurement	Base Case Thickened Flora	Alternative 1 Thickened Moosehead	Alternative 2 Stack Flora	Alternative 3 Stack Moosehead
				7.1 km of watercourses	12.5 km of watercourses	5.5 km of watercourses	8.7 km of watercourses
				Score = 2	Score = 1	Score = 6	Score = 1
Permitting Process Impacts	F.05.a	Permitting Risks / Obstacles	Qualitative	Low risk since site located in impacted watershed	High risk since site in new undisturbed watershed with nearby ~500m dwellings; Existing dwellings	Low risk since site located in impacted watershed	High risk since location in new undisturbed watershed with nearby ~500m dwellings
				Score = 5	Score = 1	Score = 5	Score = 1
	F.05.b	Permitting Schedule Duration	Qualitative	Completed and approved environmental assessment of option as well as association with existing Schedule 2 approved Flora Lake area.	New EA required +2 yrs added to schedule for new watershed area	Modified existing EA preparation and resubmission; potential up to 1 yr added to schedule for modified TIA design and location	New EA required +2 yrs added to schedule for new watershed area
				Score = 6	Score = 1	Score = 4	Score = 1
Technical and Operational Account							
Tailings Dewatering and Transport Equipment	T.01.a	Proven dewatering technology for similar ore type and production	Qualitative	Proven from existing TIA operation	Proven similar slurry disposal as existing TIA operation but uncertain about performance of beach angles	Unproven of filter presses and winter stacking operation	Unproven of filter presses and winter stacking operation
				Score = 6	Score = 5	Score = 2	Score = 2
	T.01.b	Complexity of equipment operation	Qualitative	Experienced with slurry pipeline and pumpstation with minimal mobile equipment	New slurry spigot pipeline system and pumpstation with minimal mobile equipment	New filter press plant operation and large fleet of mobile equipment	New filter press plant operation and large fleet of mobile equipment
				Score = 6	Score = 4	Score = 1	Score = 1
	T.01.c	Maintenance requirements for equipment	Qualitative	Slurry pipeline and pumpstation with minimal mobile equipment	Longer slurry spigot pipeline system and pumpstation with minimal mobile equipment	Additional filter press operation and large fleet of mobile equipment requires significant maintenance and spares	Additional filter press operation and large fleet of mobile equipment requires significant maintenance and spares
				Score = 6	Score = 5	Score = 1	Score = 1
	T.01.d	Tailings Transport Distance and Complexity	Quantitative (length, km)	21.8 km from PH#8	37.6 km from PH#8	31.9 km from PH#8 plus. haulage on stack	34.8 km from PH#8 plus truck haulage on stack
				Score = 4	Score = 3	Score = 2	Score = 2
	T.01.e	Power Demands	Qualitative	Least few new pump stations requiring electricity	Relatively more new pump stations for longer pipeline distance, requiring more electricity	New filter plant demands large electricity	New filter plant demands large electricity
				Score = 6	Score = 5	Score = 1	Score = 1
Tailings Storage Design Complexity	T.02.a	Topographic Relief or Feature Obstacles	Qualitative	Favorable utilizing valley ridge for low dikes and existing natural North Flora Lake	Least favorable impoundment operation in sub valley with 4 sediment large dams required	Favorable stack operation on valley hill side but use S Flora Lake for sedimentation	Stack operation in sub valley with 3 sediment dams required
				Score = 6	Score = 1	Score = 5	Score = 2
	T.02.b	Water Management and Operational Monitoring of Internal/Impacted Ponds	Qualitative	Slurry supernatant water losses to environment but in impact watershed; Utilize existing N Flora Lake for sediment mgt	Least favorable with slurry supernatant water losses to environment in new watershed; requires large 4 sediment ponds	Water recycled mostly from filter plant minimal losses; small stack footprint requiring sediment control; can use existing impacted S Flora Lake	Water recycled mostly from filter plant minimal losses; larger stack footprint requiring sediment control in new watershed
				Score = 4	Score = 1	Score = 6	Score = 4
	T.02.c	Upstream Catchment Diversion and External Ponds Requirements/Complexity Compliance with Regulatory Approvals	Qualitative	Long diversion channel and a new south sedimentation pond	5 sedimentation ponds and 1 long diversion channel	2 small sedimentation ponds and no diversion channel	3 small sedimentation ponds and 1 diversion channel
				Score = 2	Score = 1	Score = 5	Score = 4
	T.02.d	Dike or Stack Embankment Stability and Foundation Risks	Quantitative	Max. 42 m high dike; two 10 m water sedimentation dams	Max. 42 m high dike but has 20 m water sedimentation dam	Max. 88 m high stack	Max. 57 m high stack
				Score = 3	Score = 2	Score = 1	Score = 2
Constructability	T.03.a	Quantity of components required for construction and operations (dewatering plant, access roads, diversion dams, channel and foundation preparations)	Qualitative	Slurry pipeline extensions, relocation, and operation of spigot valves. Construct pumphouse and maintenance of slurry pumps	Slurry pipeline extensions, relocation, and operation of spigot valves. Construct pumphouse and maintenance of slurry pumps	Challenge to operate large mobile fleet in small footprint, particularly during winter	Challenge to operate large mobile fleet in small footprint, particularly during winter
				Score = 5	Score = 4	Score = 2	Score = 2
	T.03.b	Water dam volume for construction	Quantitative (fill volume, Mm3)	0.16	2.86	0.09	0.39
				Score = 6	Score = 3	Score = 6	Score = 6
Closure	T.04.a	Closure Reclaim Tailings Surface Area (hydroseeding and vegetation cover)	Quantitative	1175 ha reclaim area;	933 ha reclaim area;	418 ha reclaim area;	617 ha reclaim area;
				Score = 1	Score = 2	Score = 4	Score = 3

TABLE B.3: INDICATOR SCORING

Sub-Account	Indicator Item	Indicator	Measurement	Base Case Thickened Flora	Alternative 1 Thickened Moosehead	Alternative 2 Stack Flora	Alternative 3 Stack Moosehead
	T.04.b	Closure Dike/Embankment Regrading (earthworks volume)	Quantitative	0.16 km3 dam volume decommissioning (excludes tailings dikes)	2.86 km3 dam volume decommissioning (excludes tailings dikes)	0.09 km3 dam volume decommissioning (excludes tailings dikes)	0.39 km3 dam volume decommissioning (excludes tailings dikes)
				Score = 6	**Score = 1**	**Score = 6**	**Score = 5**
	T.04.c	Closure Water Management (upgrades or modifications to hydraulic structures)	Qualitative	2 pond dams demolished and 1 major diversion channel upgraded	1 major pond dams and 4 diversion dams demolished	1 pond dam demolished	4 pond dams demolished
				Score = 3	**Score = 2**	**Score = 5**	**Score = 4**
Socio-Economic Account							
Employment	S.01.a	Employment Opportunities	Quantitative	Limited recruitment and training for operation (8)	Limited recruitment and training for operation (8)	Recruitment and training of large staff for plant (10) and mobile fleet operation (113)	Recruitment and training of large staff for plant (10) and mobile fleet operation (113)
				Score = 2	**Score = 2**	**Score = 6**	**Score = 6**
	S.01.b	Requirements of Skilled Resourcing in Region	Qualitative	Limited number of skilled labour required (10)	Limited number of skilled labour required (10)	Large number of skilled labour required (+25)	Large number of skilled labour required (+25)
				Score = 6	**Score = 6**	**Score = 1**	**Score = 1**
Land and Resource Use	S.02.a	Land-ownership / claims	Quantitative	Existing 2 land claims within development footprint	Existing 7 land claims within development footprint and +10 land claims within 500 m downstream of TIA	No existing land claims within development footprint	Existing 3 land claims within development footprint and 11 land claims within 500 m downstream of TIA
				Score = 5	**Score = 1**	**Score = 6**	**Score = 2**
	S.02.b	Recreational, Cultural and Resource Use	Qualitative	Low - Utilize portion of existing disturbed land (north section of existing TIA)	Existing use by local cottagers - High land and lake use on new watershed	No interference - Land use in new undisturbed area	Existing use by local cottagers - High land and lake use on new watershed
				Score = 5	**Score = 1**	**Score = 6**	**Score = 1**
Impacts on community and reputation	S.03.a	Impact on community and reputation	Qualitative	Low impacts - Community familiar with existing TIA and impacts confined within disturbed watershed	High risk for resistance from Community and local residences within largest footprint impacting new undisturbed watershed	Very low impacts - Community familiar with existing TIA and impacts confined to smaller footprint within disturbed watershed	High risk for resistance from Community and local residences with a larger footprint impacting new undisturbed watershed
				Score = 5	**Score = 1**	**Score = 6**	**Score = 2**