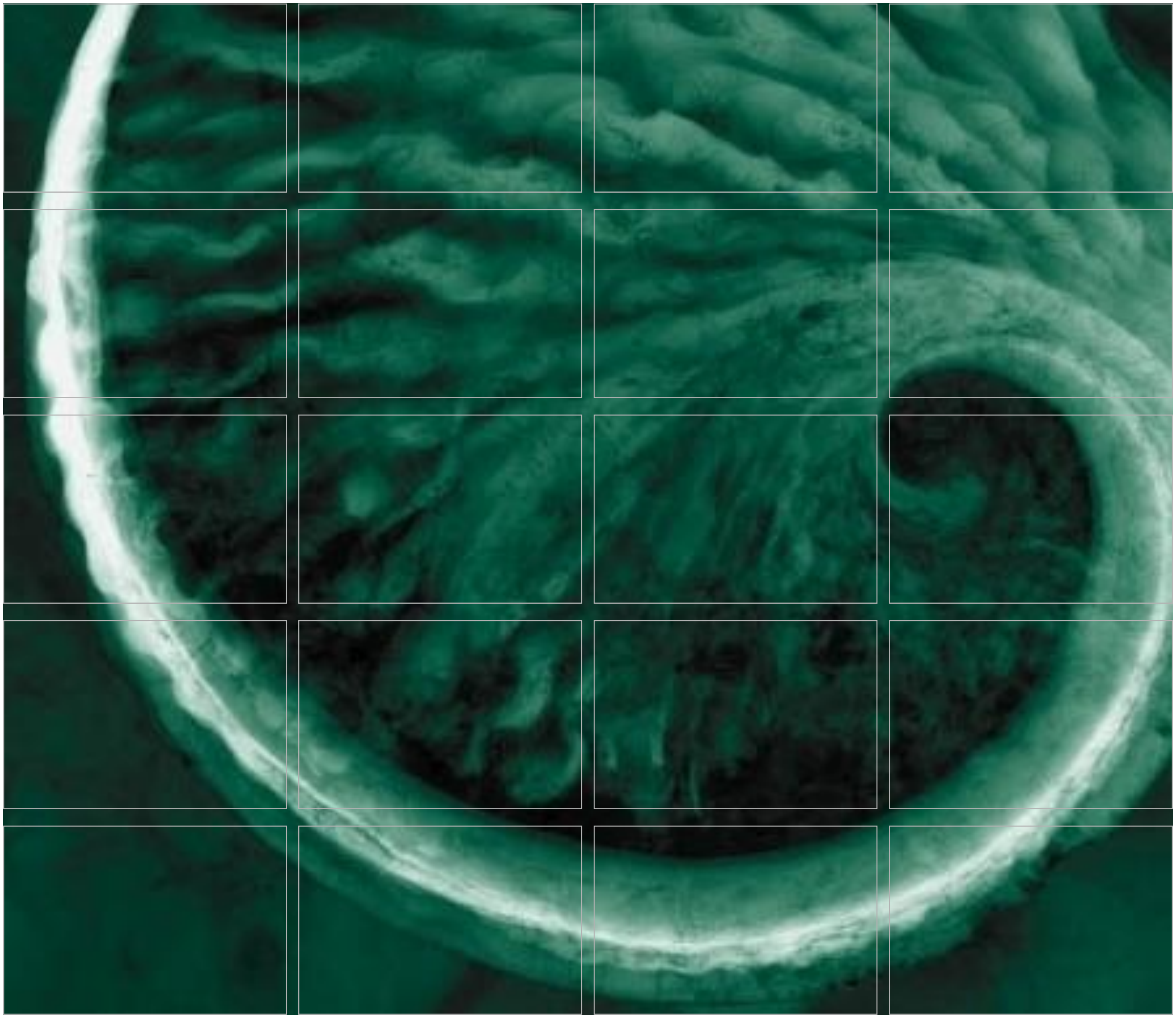
2-E: Multiple Accounts Analysis (MAA)



Prepared for:

AGNICO EAGLE

WHALE TAIL PIT EXPANSION PROJECT

Attenuation Pond Alternatives Assessment Report

November 2018

ERM

The business of sustainability

Agnico Eagle Mines Limited

WHALE TAIL PIT EXPANSION PROJECT

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November 2018

Project #0459286

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EXECUTIVE SUMMARY

This report presents the results of the assessment of attenuation pond alternatives undertaken by Agnico Eagle Mines Ltd for the proposed Whale Tail Pit Expansion Project. An attenuation pond is required to annually store up to 750,000 m^3 of contact water between October and May, prior to water treatment and discharge into the receiving environment during ice-free conditions. The stored water would include deleterious substances (i.e., mine contact water containing suspended solids and arsenic).

While fish-bearing waterbodies are normally avoided, it is challenging to find feasible sites that would meet Agnico Eagle's objective to locate the attenuation pond within sub-watersheds that contain approved mine infrastructure for the Whale Tail Pit Project and proposed infrastructure for the Whale Tail Pit Expansion Project. Therefore fish-bearing waterbodies are being considered to meet this objective.

An amendment to Schedule 2 of the Metal and Diamond Effluent Regulations (MDMER) is required to list a fish-bearing water body on Schedule 2 to authorize its use as an attenuation pond for mine-contact water. To support an application for a Schedule 2 Amendment, proponents must demonstrate that mine waste disposal in water frequented by fish is the most appropriate option based on environmental, technical and socio-economic considerations. This assessment of alternatives for the Whale Tail Pit Expansion Project has followed the transparent and standardized process described in Environment and Climate Change Canada's Guidelines for the Assessment of Alternatives for Mine Waste Disposal (ECCC 2016).

The initial step in the assessment process identified eight potential alternatives that met four threshold criteria: must align with existing water management strategy; must be confined within the area already proposed to be affected by the Whale Tail Pit Expansion Project; must provide sufficient storage capacity; must not contradict the mine development plan. Following a critical flaw assessment, that included screening against criteria such as engineering and safety risks, and avoiding areas of high environmental, cultural and/or archeological value, five alternatives were carried through to the characterization stage and a Multiple Accounts Analysis (MAA). The five alternatives were: I. New attenuation pond at Lake A53 (fish-bearing); II. New attenuation pond at Lake A53 and expand existing Whale Tail Attenuation Pond; III. New attenuation pond at Lake 54 (non-fish-bearing); IV. New attenuation pond at Mammoth Lake (fish-bearing); and V. Expansion of existing Whale Tail Attenuation Pond (land-based).

The characterization criteria for each of the alternatives were considered in the development of relevant, meaningful, and differentiating sub-accounts and indicators, which were used to create the multiple accounts ledger for the assessment. Ten (10) project-specific sub-accounts were identified for the assessment, under the following Accounts: Technical; Biophysical Environment; Human Environment; Project Economics. A multiple accounts ledger was completed for each alternative, including indicators, measurement parameter, six-point scale and score. A weighting component was used to account for the fact that some indicators and accounts are more important to the decision-making process than others, and the rationale for each weighting is outlined in the report, and follows the recommendations provided in the ECCC Guidelines. The biophysical environment account was afforded the highest weight.

Inuit Qaujimajatuqangit was incorporated throughout the alternatives assessment, including in the baseline setting description, critical flaw assessment, characterization of alternatives, in the development of meaningful indicators for the MAA, and in the determination of value-based weightings. Consultation with Elders and community members in Baker Lake and Chesterfield Inlet also highlighted traditional values, areas of use, and concerns related to the water attenuation alternative, that were incorporated in the assessment of alternatives.

The results of the MAA indicate that Alternative I: A53 has the highest merit rating, followed by Alternative V: Expansion of the existing Whale Tail Attenuation Pond. Alternative IV: Mammoth Lake is the lowest rated alternative. The results of the MAA were tested using a sensitivity analysis, designed to identify areas where a change in weightings may significantly influence the results. A total of 10 sensitivity scenarios were considered. Overall, Alternative I (use of Lake A53) was maintained as either the highest or second-highest alternative across all scenarios.

Based on the outcomes of the MAA, it is clear that the preferred alternative is Lake A53. This alternative proposes to store contact water for the Whale Tail Pit Expansion Project in a new IVR attenuation pond, with a storage capacity of 646,638 m^3, supplemented by the existing Whale Tail Attenuation Pond with a storage capacity of 133,232 m^3. The advantages of this alternative include a relatively small footprint, reduced need for surface water management infrastructure, reduced complexity over the life of the pond, and reduced consequences in the event of dam failure or overtopping.

Lake A53 is a fish-bearing waterbody and its use as an attenuation pond will require an amendment to Schedule 2 of the MDMER to list this water body. Pursuant to ECCC's '*Streamlining the Approvals Process for Metal Mines with Tailings Impoundment Areas*', Agnico Eagle has taken the following steps to support a streamlined Schedule 2 amendment process:

- Conducted an assessment of attenuation pond alternatives, including the costs and benefits of alternatives, as part of its Environmental Impact Statement (EIS) for the Nunavut Impact Review Board (NIRB);
- Proposed a fish habitat compensation plan associated with the attenuation pond, which outlines the habitat losses and gains in relation to the use of Lake A53; and
- Presented the attenuation pond alternatives to the communities of Baker Lake and Chesterfield Inlet in July 2018 and described the alternatives assessment process and how input from participants would be incorporated.

During NIRB's review of the EIS, Agnico Eagle will continue with Indigenous and public consultations, and address any Information Requests on the alternatives assessment and provide a final fish habitat compensation plan.

WHALE TAIL PIT EXPANSION PROJECT

Attenuation Pond Alternatives Assessment Report

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GLOSSARY AND ABBREVIATIONS

Terminology used in this document is defined where it is first used. The following list will assist readers who may choose to review only portions of the document.

Agnico Eagle	Agnico Eagle Mines Ltd.
accounts	Broad categories providing the foundation for the multiple accounts analysis. The ECCC Guidelines recommend four accounts: environment, technical, socio-economic, and project economics.
approved project	The approved Whale Tail Pit Project, as defined in the Whale Tail Pit Project Proposal (NIRB File No.: 16MN056), Project Certificate 008 and NWB Type A Water Licence 2AM-WTP1826.
CCME	Canadian Council of Ministers of the Environment
characterization criteria	Project-specific criteria used to describe and compare alternatives.
critical flaw	A characteristic that is so unfavourable or severe that, if taken singly, it would be sufficient to eliminate an alternative.
ECCC Guidelines	*Guidelines for the Assessment of Alternatives for Mine Waste Disposal*, published by Environment and Climate Change Canada, 2016.
expanded project / the expansion	The proposed expansion of the Whale Tail Pit Project.
feasible	Constructible and operable within precedents of existing designs and prudent engineering practice guidelines, considering technical, risk, and economic factors.
FEIS	Final Environmental Impact Statement
indicator	Allows for the qualitative or quantitative measurement of an impact (i.e., benefit or loss) or other element of a sub-account. Sub-accounts by nature are often not directly measurable, and need to be sufficiently decomposed to allow measurability; this decomposition takes the form of indicators.
IQ	Inuit Qaujimajatuqangit
MAA	Multiple Accounts Analysis – This is a multi-criteria decision making tool used to conduct assessments of alternatives for mine waste disposal and other mining related decision processes.
masl	metres above sea level

MDMER	Metal and Diamond Mining Effluent Regulations: Under the MDMER, the use of a natural body of water frequented by fish is only possible by obtaining an amendment to Schedule 2 of the Regulation. The MDMER impose limits on the releases of arsenic, copper, cyanide, lead, nickel, zinc, suspended solids and radium-226, and prohibit discharge into waterbodies of effluent that is acutely lethal to fish.
mine site, the	Whale Tail Pit mine site (site of the Whale Tail Pit Project)
screening criteria	Yes-or-no questions designed to identify critical flaws.
sensitivity analysis	Analysis designed to test the degree to which results may change based on the weightings assigned in the value-based decision-making process, to improve transparency of the assessment. Different weightings are assigned to accounts, sub-accounts, and/or indicators, and results are compared. Significant differences in results can indicate areas of bias and subjectivity and show how conclusions may be representative of different value systems.
sub-account	Sub-accounts, also referred to as evaluation criteria, consider the material impact (i.e., benefit or loss) associated with any of the alternatives being evaluated. Sub-accounts should be impact-driven, differentiating, relevant, understandable, non-redundant, and judgementally independent.
threshold criteria	Basic conditions that must be met by any alternative for inclusion in the MAA. These criteria are project-specific, should be as broad as possible, and must be fully described and rationalized to ensure transparency.
weighting	Applies a weighting factor to each indicator, subaccount, and account based on its relative importance to the overall decision-making process.
WRSF	Waste Rock Storage Facility
WTAP	Whale Tail Attenuation Pond

1. INTRODUCTION

1.1 REPORT PURPOSE

This purpose of this document is to report on the assessment of attenuation pond alternatives undertaken by Agnico Eagle Mines Ltd. (Agnico Eagle) for the proposed Whale Tail Pit Expansion Project, and to identify the most suitable alternative. For the purposes of evaluating water management options through multiple accounts analysis (MAA), the proposed expansion of the Whale Tail Pit Project requires an attenuation pond to annually store up to 750,000 m^3 of water between October and May so that water can be treated and discharged during ice-free conditions between June and September.

In Canada, the *Fisheries Act* applies to any development project with potential impacts to a natural body of water frequented by fish and prohibits the deposit of any deleterious substance into natural fish-bearing waterbodies. Under the Act, a deleterious substance is defined as a substance that alters or degrades water quality to the point where it becomes harmful to fish, fish habitat, or human use of fish. The regulatory context governing the Whale Tail Pit Expansion Project alternatives assessment process is briefly outlined below and described further in Section 1.3.

Amendments to Schedule 2 of the Metal and Diamond Effluent Regulations (MDMER) authorize the use of water frequented by fish for mine waste disposal. Before an amendment can be recommended by the Minister of the Environment, proponents must demonstrate that mine waste disposal in water frequented by fish is the most appropriate option based on environmental, technical and socio-economic considerations by conducting an assessment of alternatives for mine waste disposal for review by Environment and Climate Change Canada (ECCC). The assessment of alternatives should be prepared in accordance with ECCC's *Guidelines for the Assessment of Alternatives for Mine Waste Disposal*, and the alternatives assessment should take into consideration concerns raised by local communities, Indigenous peoples and stakeholders. Based on an environmental assessment (EA), adverse environmental effects resulting from the deposit of mine waste (i.e., a loss of fish habitat) are offset by the implementation of a fish habitat compensation plan.

Agnico Eagle is undertaking all of the steps above to develop the proposed expansion of the Whale Tail Pit Project. This report presents the results of the assessment of alternatives for siting the attenuation pond. Agnico Eagle has followed the transparent and standardized process described in Environment and Climate Change Canada *Guidelines for the Assessment of Alternatives for Mine Waste Disposal* (the ECCC Guidelines; ECCC 2016). These Guidelines delineate the alternatives assessment process required to identify, assess, evaluate, rank, and select the best overall location for an attenuation pond.

1.2 PROJECT PROPONENT

Agnico Eagle is a publically-traded (Toronto stock exchange, TSE:AME) Canadian-based gold producer with operating mines in Canada, Finland and Mexico and exploration and development activities extending to the United States.

1.3 REGULATORY CONTEXT

The proposed Whale Tail Pit Project Expansion is subject to an environmental assessment (EA) by the Nunavut Impact Review Board (NIRB) pursuant to Part 5 of the Nunavut Agreement. The proposed expansion requires an attenuation pond to annually store up to 750,000 m^3 of water between October and May so that water can be treated and discharged during ice-free conditions between June and September. The stored water would include deleterious substances (i.e., mine contact water containing suspended solids and arsenic).

While fish-bearing waterbodies are normally avoided, it is challenging to find feasible sites that would meet Agnico Eagle's objective to locate the attenuation pond within sub-watersheds that contain approved mine infrastructure for the Whale Tail Pit Project and proposed infrastructure for the Whale Tail Pit Expansion Project. Therefore fish-bearing waterbodies are being considered to meet this objective.

The Whale Tail Pit Expansion Project is subject to the *Fisheries Act*. Subsection 36(3) of the *Fisheries Act* prohibits *"….the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water"*, unless authorised by an amendment to Schedule 2 of the MDMER of the *Fisheries Act*.

Under subsection 34(1) of the *Fisheries Act*, a deleterious substance means:

(a) any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water, or

(b) any water that contains a substance in such quantity or concentration, or that has been so treated, processed or changed, by heat or other means, from a natural state that it would, if added to any other water, degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water,

and without limiting the generality of the foregoing includes

(c) any substance or class of substances prescribed pursuant to paragraph (2)(a),

(d) any water that contains any substance or class of substances in a quantity or concentration that is equal to or in excess of a quantity or concentration prescribed in respect of that substance or class of substances pursuant to paragraph (2)(b), and

(e) (any water that has been subjected to a treatment, process or change prescribed pursuant to paragraph (2)(c); (substance nocive).

Section 3 of the MDMER provides:

For the purpose of the definition deleterious substance in subsection 34(1) of the Act, the following substances or classes of substances are prescribed as deleterious substances: (a) arsenic; (b) copper; (c) cyanide; (d) lead; (e) nickel; (f) zinc; (g) suspended solids; and (h) radium 226.

Any effluent discharged from the proposed attenuation pond would be required to meet effluent discharge limits in Agnico Eagle's Type A Water Licence 2AM-WTP1826, as well as, environmental effects monitoring downstream from the proposed attenuation pond would be conducted to determine if there are any effects on fish or fish habitat..

1.3.1 Streamlined Schedule 2 Amendment Approvals Process

The ECCC document *Streamlining the Approvals Process for Metal Mines with Tailings Impoundment Areas* (ECCC, 2012) describes the approach to streamline timelines for Governor in Council decisions for authorizing the deposition of mine waste into water bodies frequented by fish. The streamlined process shortens the approval time to 5-6 months by exempting pre-publication of the Schedule 2 amendment in *Canada Gazette*, Part 1, which makes public the text of the proposed regulations and the associated regulatory impact statement.

This approach does not diminish environmental protection as a Schedule 2 amendment consists only of the name of the water body to be listed, there is no regulatory text to be reviewed by the public. Further, the costs and benefits of the alternatives, typically addressed in Part 1, are included in an Environmental Impact Statement, and the public are provided with an opportunity to comment on the alternatives assessment.

Pursuant to ECCC's Streamline Schedule 2 Process, Agnico Eagle has taken the following steps to support a request for a Part 1 exemption and go directly to *Canada Gazette*, Part 2 publication:

- Conducted an assessment of attenuation pond alternatives, including the costs and benefits of the alternatives, as part of its FEIS submitted to NIRB;
- Proposed a fish habitat compensation plan associated with the attenuation pond, which outlines the habitat losses and gains in relation to the use of Lake A53; and
- Conducted consultations on the attenuation pond alternatives as described in Section 1.4.2.

As part of the NIRB review of the FEIS, Indigenous groups and the public will have further opportunities to comment on the alternatives assessment and proposed fish habitat compensation plan pertaining to Lake A53.

1.3.2 ECCC Guidelines for the Assessment of Alternatives for Mine Waste Disposal

The ECCC Guidelines describe the process that must be undertaken when a proponent is proposing to deposit a deleterious substance into a natural waterbody frequented by fish. The process is designed to be robust, transparent, and replicable, and address issues of bias and subjectivity in decision-making. **Appendix A** includes a Table of Concordance which provides cross references to identify where the requirements in the ECCC Guidelines have been addressed in this report.

Section 2 of the ECCC Guidelines sets out a seven-step process by which to identify, screen, and evaluate alternatives for mine waste disposal, including options relating to location selection, design, and other factors. The Guidelines include multiple accounts analysis (MAA), which is the decision-making method used to identify the most suitable or advantageous alternative from a list of alternatives by weighing the relative advantages and disadvantages of each. The ECCC Guidelines advise that the assessment include at least one alternative that does not impact a natural waterbody that is frequented by fish.

Consistent with the ECCC's seven-step process, this alternatives assessment: identifies reasonable, conceivable, and realistic alternatives for the attenuation pond at the Whale Tail Pit Project (Steps 1 and 2); characterizes the alternatives and identifies relevant indicators by which to compare and contrast them (Steps 3 and 4); systematically evaluates the alternatives using quantitative and qualitative factors (Steps 5 and 6); and transparently documents the results (Step 7). Figure 1-1 illustrates the seven-steps, each of which is described in further detail below.

Figure 1-1. Seven Steps of Alternatives Assessment

<u>Step 1: Identification of Alternatives</u>

This step identifies a long-list of possible attenuation pond alternatives. Possible alternatives are identified at a conceptual level with no initial judgments of their feasibility. For each alternative, specific locations and conceptual designs are described. Threshold criteria are used to identify those alternatives that are reasonable, conceivable, and realistic, but this step is not intended to evaluate feasibility in detail. Alternatives that meet the threshold criteria are carried forward to Step 2.

<u>Step 2: Critical Flaw Assessment</u>

At this step, the alternatives are screened to identify and eliminate alternatives with critical flaws. A critical flaw is a flaw that is so unfavourable that it alone is sufficient to eliminate an alternative from further consideration as it would render the attenuation pond, or other aspects of the Whale Tail Pit Project inoperable or unachievable.

Screening criteria are yes-or-no questions designed to identify critical flaws. Screening question are defined to reflect the specific context of a project; there is no standard set of questions. If a critical flaw is identified, the alternative is not considered further and the rationale for elimination is documented. Alternatives without critical flaws are carried forward to the characterization of alternatives in Step 3.

<u>Step 3: Characterization</u>

This step involves characterizing each remaining alternative within four broad categories, or *accounts*, based on technical design and execution (*technical account*), potential biophysical effects (*biophysical environment account*), potential effects on people (*human environment account*), and financial costs (*project economics account*). This characterization is based on the candidate design concepts and the environmental and social baseline information relevant to each candidate.

Step 4: Multiple Accounts Ledger

Based on the characterization in the previous step, relevant and differentiating sub-accounts and indicators are identified in Step 4. A multiple accounts ledger is prepared to describe the indicators. Rating scales are developed for each indicator, using a scale of one to six, against which each alternative is scored.

Step 5: Value-based Weighting

The value-based weighting step acknowledges that some accounts, sub-accounts, or indicators are more or less important to the decision-making process than others, and provides an opportunity to weight them accordingly. Weightings are assigned on a scale of one (less important) to six (more important).

Step 6: Quantitative Analysis

This step uses the calculations stipulated in the ECCC Guidelines to calculate the weighted merit rating of each candidate based on the scores and weightings identified for each indicator in the preceding step. The results are compared, and alternatives with a higher weighted merit rating are preferred. A sensitivity analysis is then conducted to explore the influence of the weighting regime and identify potential areas of bias and subjectivity.

Step 7: Documentation and Reporting

In this step, the alternatives assessment process is summarized and the results are described. Input from communities, indigenous groups, and other stakeholders is highlighted, and the sensitivity of the results is discussed. A thorough and transparent description of the process and results is a fundamental requirement of the ECCC Guidelines.

1.4 INCORPORATING INUIT QAUJIMAJATUQANGIT AND CONSULTATION

Agnico Eagle makes efforts to incorporate IQ (*Inuit Qaujimajatuqangit*) in all aspects of planning and developing the Whale Tail Pit Project and the Whale Tail Pit Expansion Project, and to engage and consult with potentially affected communities (including Baker Lake, Nunavut) and land users to seek their feedback and answer questions. The following sections describe how IQ has been considered in the alternatives assessment.

1.4.1 Inuit Qaujimajatuqangit

Inuit Qaujimajatuqangit encompasses not only traditional knowledge (TK) about land and resources, but also the skills to apply this knowledge to livelihoods, and a value system that is founded upon respect, sharing, collaboration, collective decision-making, skills development, and the responsible use of resources.

Agnico Eagle has considered TK and IQ in this alternatives assessment. Existing information—including the *Inuit Qaujimajatuqangit Baseline Report* compiled for the Whale Tail Pit Project[1]—has been reviewed and incorporated in the baseline setting description (Section 3), in the critical flaw assessment (Section 5), in the characterization of alternatives (Section 6), in the development of meaningful indicators for the MAA (Section 7), and in the determination of value-based weightings (Section 8). Consultation with Elders and community members in Baker Lake and Chesterfield Inlet also highlighted traditional values, areas of use, and concerns related to the water attenuation alternative, and these have likewise been incorporated in relevant sections of this report.

In addition to reviewing TK and IQ as related to the understanding of the baseline biophysical and human environment, and potential impacts on the environment and land users, the principles of IQ is also integrated into the methodology of this alternatives assessment.

Finally, the alternatives assessment process is designed to be aligned with IQ guiding principles, including:

- **Fostering good spirit by being open, welcoming and inclusive**: Agnico Eagle welcomes, and has sought, input to the alternatives assessment through consultation with a number of stakeholder groups in Baker Lake and Chesterfield Inlet.
- **Decision-making through discussion and consensus**: Agnico Eagle facilitated discussion about the alternatives, and the balance of impacts and benefits, in consultation with stakeholders in Baker Lake and Chesterfield Inlet. Further discussion and dialogue will include subject matter experts, and—as a decision-making process—MAA is transparent and reproducible.
- **Working together for a common cause**: Through consultation with community stakeholders including Elders, land users, youth, women, and local government, Agnico Eagle has endeavoured to work collaboratively with stakeholders in order to identify the best possible alternative.
- **Respect and care for the land, animals and the environment**: Agnico Eagle is committed to developing the Whale Tail Pit Project in a way that will minimize impacts on land, animals, and the environment.

1.4.2 Consultation

Agnico Eagle presented the attenuation pond alternatives to the communities of Baker Lake and Chesterfield Inlet in July 2018 (Table 1-1), and described the alternatives assessment process and how input from participants would be incorporated. Agnico Eagle also provided other information about the Whale Tail Pit Project, including project updates and possible projects for fish habitat compensation, and answered questions from participants.

[1] *Inuit Qaujimajatuqangit Baseline Report*. June 2016. Included as Appendix 7-A of the Whale Tail Pit Project: Final Environmental Impact Statement (FEIS).

Table 1-1. July 2018 Consultation Program

Event	Baker Lake	Chesterfield Inlet
Community meetings	• Presentation and open house at Baker Lake community hall	• Presentation and open house at Chesterfield Inlet Hamlet Chambers
Focus Groups	• Women • Youth • Elders	
Meetings	• Hamlet of Baker Lake • Baker Lake Hunters and Trappers Organization (HTO) • Kivalliq Inuit Association	• Hamlet of Chesterfield Inlet • Chesterfield Inlet HTO

The outcomes of July 2018 consultations are summarized in Section 6.5.5. In addition, more broadly relating to the Amaruq mine site, feedback provided in the final hearing for the Whale Tail Pit Project (NIRB 2017) included concern for potential adverse impacts (from the mine and haul road) on caribou, as well as other wildlife, fish, water quality, and the aquatic environment. The hearing also highlighted support for training, employment, and economic opportunities, and a recognition that the Whale Tail Pit Project will enable the continuation of these opportunities after Meadowbank mine production ceases.

1.5 STRUCTURE OF THIS REPORT

An introduction to the Whale Tail Pit Project is provided in Section 2, with a focus on relevant water management infrastructure and processes. Section 3 describes the baseline setting of the physical environment, biological environment, and human environment as it relates to the Whale Tail Pit Project.

Sections 4 through 10 of this report describe each step of the alternatives assessment process, as established by the ECCC Guidelines and described in Section 1.3:

- Section 4: Identification of Alternatives (Step 1);
- Section 5: Critical Flaw Assessment (Step 2);
- Section 6: Characterization of Alternatives (Step 3);
- Section 7: Multiple Accounts Ledger (Step 4);
- Section 8: Value-based Weighting (Step 5);
- Section 9: Quantitative Analysis (Step 6); and
- Section 10: Conclusions.

The report as a whole represents Step 7: Documentation of Results.

2. PROJECT DESCRIPTION AND LOCATION

2.1 CONTEXT

Agnico Eagle operates the Meadowbank Gold Mine, located on Inuit-owned lands approximately 70 km north of the hamlet of Baker Lake in the Kivalliq Region of Nunavut (Figure 2-1). The Meadowbank mine began commercial production in 2010 and has been producing gold from open pits at the Meadowbank site, which is scheduled to cease operations in 2019.

Agnico Eagle is constructing and preparing to mine a satellite mineral property (the Amaruq property) located approximately 50 km northwest of the Meadowbank Mine and 150 km north of Baker Lake (Figure 2-1). The development of the Amaruq property has commenced with 2018 approval[2] of the Whale Tail Pit Project. Construction of the Whale Tail Pit Project began in 2018, and mining is scheduled to begin in 2019.

The Whale Tail Pit Expansion Project includes plans to expand mining operations at the Whale Tail Pit mine site. The approved Whale Tail Pit Project and the proposed Expansion Project are summarized below, with a focus on water management plans and infrastructure. Figure 2-2 provides a timeline of the development.

2.2 MINE ACTIVITIES AND COMPONENTS

2.2.1 Whale Tail Pit Project (Approved Project)

Ore will be extracted from the Whale Tail Pit and transported by truck via a 65 km haul road to the Meadowbank mine site for processing using the existing mill. The project will also use the Meadowbank tailings management infrastructure, worker accommodations, all-weather access road connecting Baker Lake and the Meadowbank site, and existing marine shipping/resupply infrastructure in Baker Lake.

The major mine components and facilities of the approved Whale Tail Pit Project mine site are shown in Figure 2-3, and include:

- Open pit (Whale Tail Pit);
- Waste rock storage facility (WRSF);
- Overburden storage facilities;
- Ore stockpiles;
- Crusher;

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[2] Positive decision received from NIRB on November 6, 2017. Ministerial Decision received on February 15, 2018. Nunavut Water Board Type A Licence received July 11, 2018.

- Landfill;
- Haul road and access roads;
- Industrial area (including accommodation camp and garage); and
- Water management infrastructure.

Development of the Whale Tail Pit Project will produce an estimated 8.3 million tonnes (Mt) of ore, 61.3 Mt of waste rock and 6.0 Mt of overburden. Construction is expected to employ up to 500 people, and 931 workers are expected to be employed on rotation during operations.

2.2.2 Whale Tail Pit Expansion Project

The Whale Tail Pit Expansion Project proposes to extend the mine life of the Whale Tail Pit Project by:

- expanding the Whale Tail Pit;
- expanding the Whale Tail WRSF;
- developing an additional pit (the IVR Pit);
- developing an underground mine;
- developing an additional WRSF (the IVR WRSF); and
- developing an additional water attenuation pond (the IVR Attenuation Pond).

The above infrastructure, also illustrated in Figure 2-3, will expand and extend mining at the Whale Tail Pit mine site by up to four years.[3] The proposed amendment is designed to provide a compact site footprint within and around the approved infrastructure, and to allow for potential future growth and expansion. As in the approved project, ore from the expanded Whale Tail Pit Project will continue to be transported to the Meadowbank mine site for processing.

2.3 SCHEDULE

Construction of the Whale Tail Pit Project began in 2018 (Figure 2-2). Dewatering of Whale Tail Lake is planned to occur in 2019. Operations are approved to commence in 2019 and continue until 2023, with closure until 2030.

Construction of the Whale Tail Pit Expansion Project will occur concurrently with operation of the approved project and is planned to begin in 2020 (or upon project approval), including dewatering activities to support the development of the IVR Pit and other infrastructure. Mining of the expanded pits and underground works is expected to commence by the end of 2020 and continue until 2026. At the end of operations, closure activities would occur until approximately 2040, followed by post-closure monitoring.

[3] The total gold resource for the Whale Tail Pit Expansion Project will extend the life of mine for 3 to 4 years (i.e. operation of expanded Whale Tail Pit, IVR Pit, and for underground operations to 2025 to 2026).

Figure 2-1
Location of Meadowbank Gold Mine and Whale Tail Pit Project

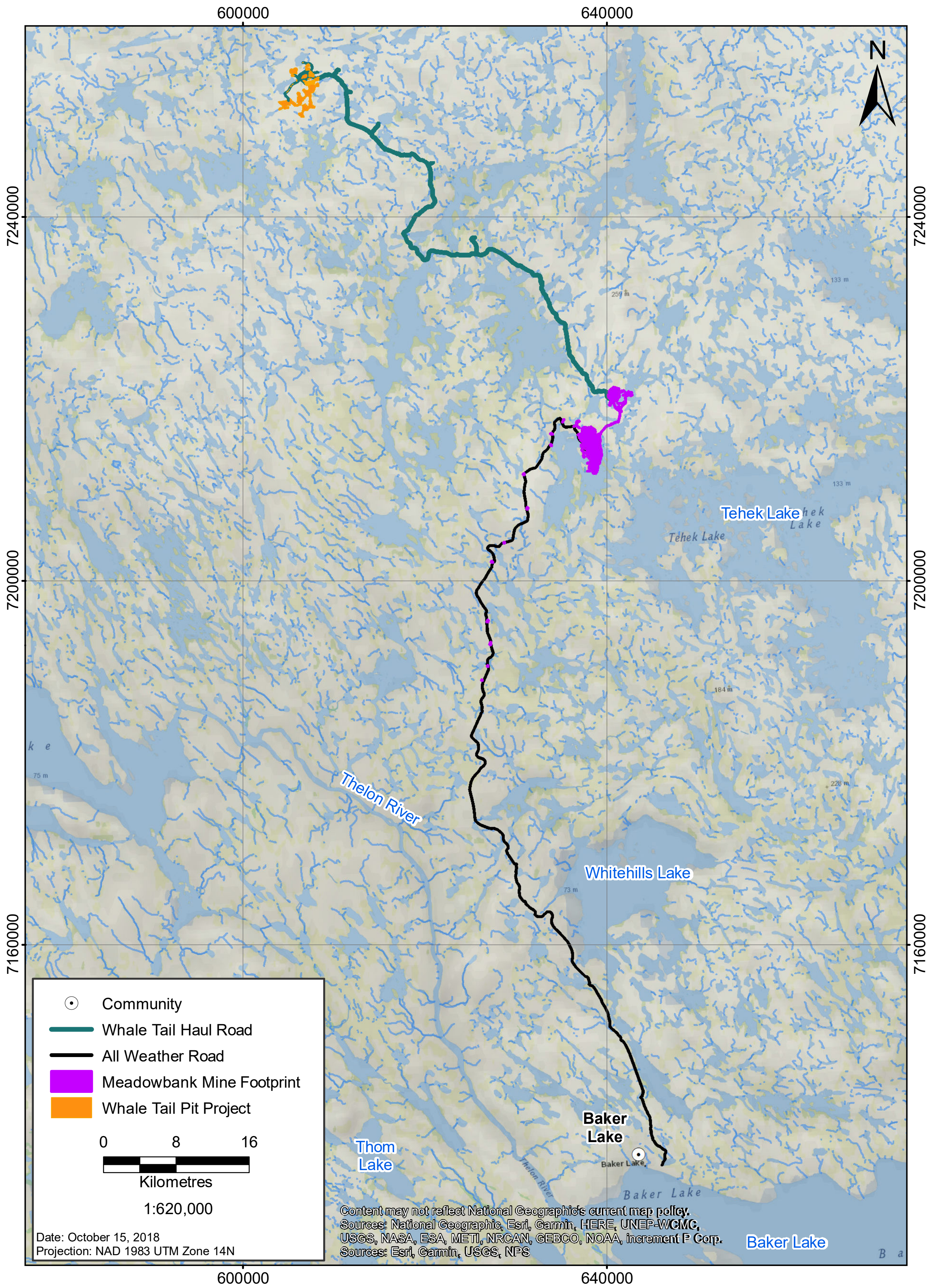
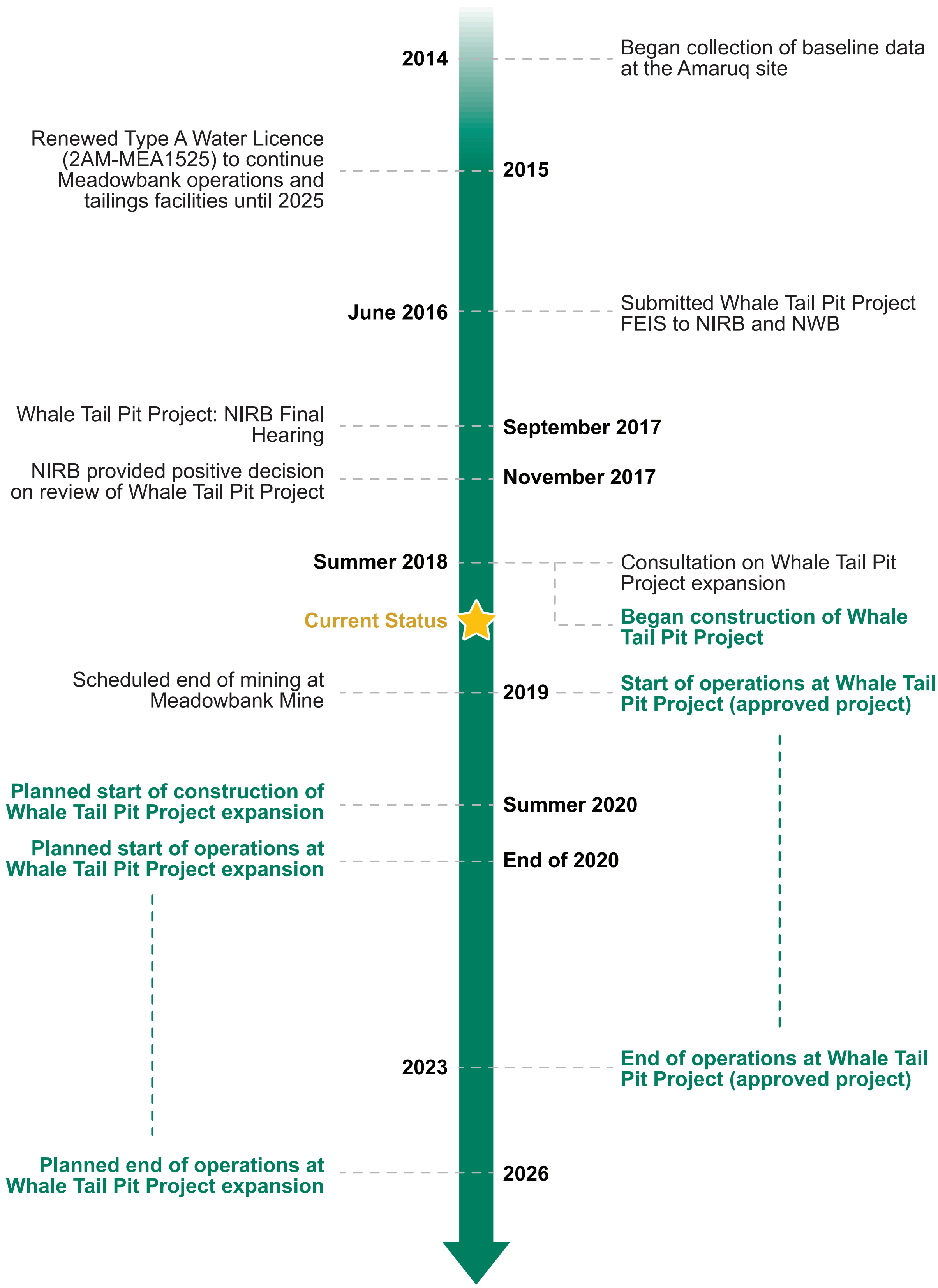
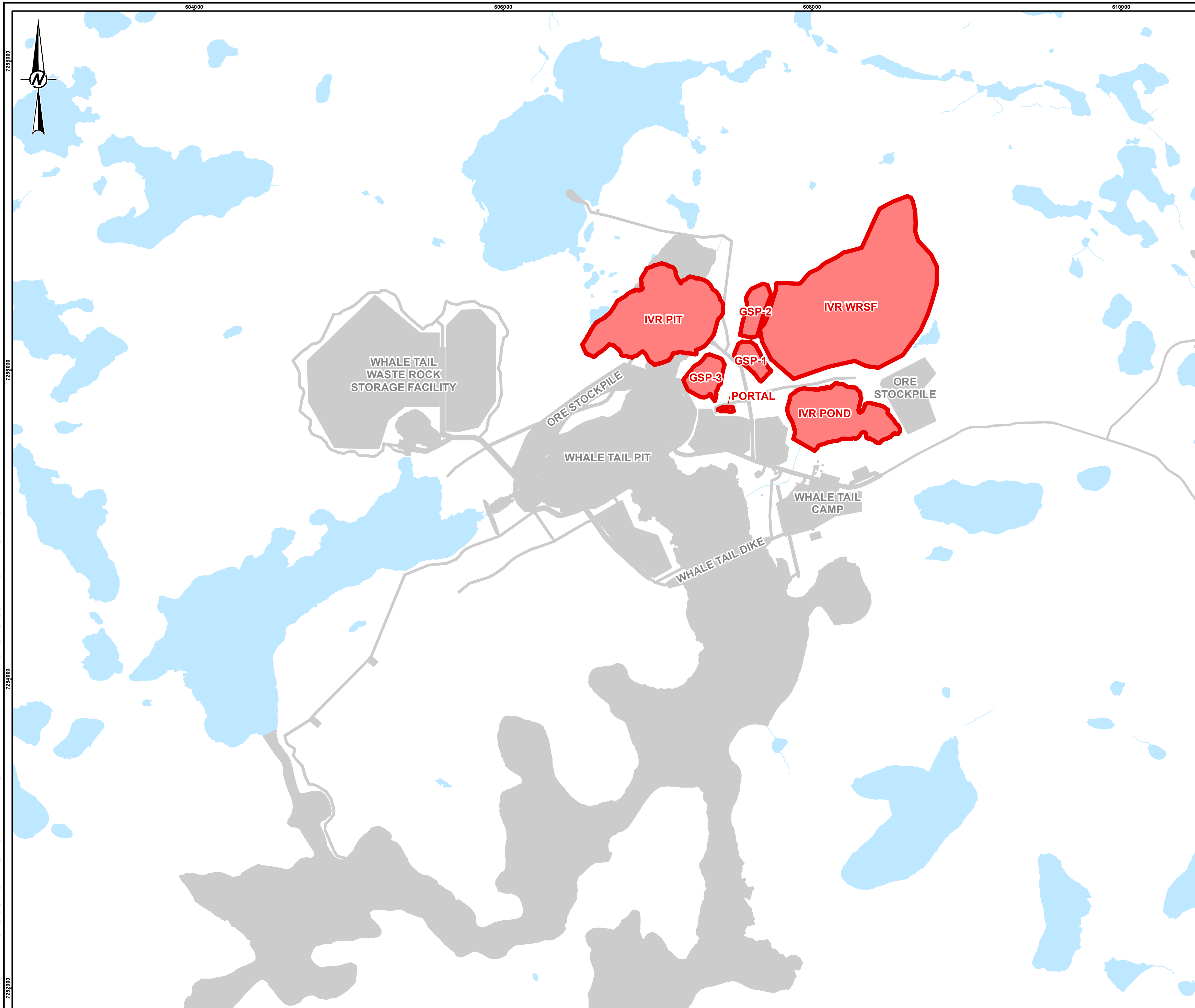


Figure 2-2
Whale Tail Pit Project Timeline

ERM





LEGEND

- EXPANSION INFRASTRUCTURE
- APPROVED INFRASTRUCTURE

0 500 1,000

1:25,000 METRES

REFERENCE(S)

1. INFRASTRUCTURE OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. WATERCOURSE AND WATERBODY DATA OBTAINED FROM NATURAL RESOURCES CANADA.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

CLIENT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED: MEADOWBANK DIVISION

PROJECT

WHALE TAIL PIT - EXPANSION PROJECT

TITLE

APPROVED PROJECT AND EXPANSION PROJECT INFRASTRUCTURE

CONSULTANT

GOLDER

YYYY-MM-DD	2018-10-31
DESIGNED	DF
PREPARED	CDB
REVIEWED	
APPROVED	

PROJECT NO.	CONTROL	REV.	FIGURE
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2.4 WATER MANAGEMENT

The information in these sections is derived from the Water Management Plan for the approved Whale Tail Pit Project (Agnico Eagle 2017; 2018), the project description as part of the FEIS, and an updated mean annual water balance for the expansion (Golder 2018). These sections focus on water management related to the attenuation, treatment, and discharge of water at the approved Whale Tail Pit Project (Section 2.4.2) and the proposed Project expansion (Section 2.4.3).

2.4.1 Water Management Strategy

Water management at the Whale Tail Pit Project is designed to limit and/or avoid surface water run-off into the pit. Agnico Eagle's guiding principles for water management include:

- minimizing the amount of contact water[4] by diverting clean water around the site, and containing contact water within the site;
- separating contact water, non-contact water, and freshwater to the extent practicable;
- minimizing freshwater consumption by recycling and reusing contact water to the extent practical; and
- treating contact water and meeting discharge criteria before treated water is released to the downstream environment.

Based on the above principles, Agnico Eagle has developed the water management plan for the approved Project (Agnico Eagle 2018) around the core strategies described in Table 2-1.

Table 2-1. Key Water Management Strategies

Strategy	Description
Limit catchment disturbance	Two levels of catchment disturbance have been defined for the mine site, namely undisturbed and disturbed. Areas that have been disturbed by mine development are considered disturbed catchments, while areas that are unaffected by mine development are considered undisturbed catchments.
Minimize contact water	Non-contact water will be intercepted and directed away from disturbed areas by means of natural catchment boundaries and/or man-made diversion structures and will be allowed to flow to neighbouring waterbodies. For the purpose of mine water management, run-off from undisturbed areas is considered non-contact water, while run-off from disturbed catchment areas is considered contact water. Surface water that is diverted around mine facilities, or groundwater that does not emerge into a mine facility, is considered non-contact water. Any non-contact water that mixes with contact water becomes contact water.
Contain contact water	Conveyance and storage of contact water will be controlled by channels and containment structures (i.e., sumps and ponds). Sumps will be installed in the open pit and in low points surrounding the open pit. Contact water will be diverted and collected in various sumps and water collection ponds and conveyed to the attenuation pond.

[4] Water that has been in contact with mining, including components such as open pit, underground works, waste rock storage facilities, or other infrastructure.

Strategy	Description
Treat contact water	Collected water will be treated if the water quality does not meet discharge criteria in the Type A Water Licence 2AM-WTP1826.
Minimize use of freshwater	Treated water will be reused as much as possible to minimize the freshwater requirements. The excess treated water will be discharged into Mammoth Lake through a submerged diffuser.

Source: Agnico Eagle (2018)

2.4.2 Approved Whale Tail Pit Project

Water management and water treatment infrastructure for the approved mine operations is summarized in this section. Further detail about water management infrastructure is provided in the approved Whale Tail Pit Water Management Plan (Agnico Eagle 2017) and Type A Water Licence 2AM WTP1826 (NWB 2018). Water balance calculations and resulting infrastructure are based on conservative assumptions about climatic conditions, summer runoff levels, and surface hydrology.

Freshwater for camp drinking water will be obtained from Nemo Lake, in the watershed north of the mine site. The site footprint is designed so that run-off from the mine site is would be contained within the disturbed catchments (as described in Table 2-1). Non-contact water will be diverted from the site through channels and dikes.

Contact Water Management

Contact water, including water from surface run-off and groundwater infiltration, will be collected at various locations around the mine site, contained in an attenuation pond, and treated before it is discharged to the environment. Water from all sectors ultimately reports to the Whale Tail Attenuation Pond, which is located in a deep section of the drained North Basin of Whale Tail Lake. The design basis of the approved attenuation pond is to store a mean annual volume of 455,000 m^3 of water.

Water Treatment and Discharge

During operations, the contact water treatment plant will be located approximately 250 m west of the Whale Tail Attenuation Pond. Treated water will be piped from the water treatment plant along the south side of the Whale Tail Pit to a submerged diffuser at Mammoth Lake. Treatment and discharge of water will occur annually between June and September; for the rest of the year (i.e., in freezing conditions), water will be held in the attenuation pond pending treatment and discharge in the summer. The mean annual volume of contact water to be treated and discharged in the approved Whale Tail Pit Project is approximately 420,000 m^3.

Whale Tail Dike Construction

To allow for development of the Whale Tail Pit, a dike will be constructed across the north end of Whale Tail Lake. The North Basin of the lake (i.e., north of the dike) will be dewatered in the first year of operations; prior to dewatering, a fish-out program was completed in September 2018. Once dike construction is completed, water from the North Basin will be either pumped directly to the South Basin of Whale Tail Lake (if it meets discharge criteria), or pumped to the water treatment plant prior to discharging to Mammoth Lake. The Whale Tail Dike will also raise the water level of Whale Tail

Lake (South Basin), and a diversion channel will be constructed at the south end of the lake so that the lake will discharge into Mammoth Lake.

Mammoth Dike Construction

A dike will be constructed across the small northeast arm of Mammoth Lake. This dike is required for dewatering the Whale Tail Pit area and to limit the flow of water from Mammoth Lake into the pit during storm events.

2.4.3 Whale Tail Pit Expansion Project

Contact Water Management

In addition to the sources of contact water described in Section 2.4.2, sources of contact water associated with the Whale Tail Pit Expansion Project will include:

- expanded Whale Tail Pit;
- expanded Whale Tail WRSF;
- underground mine works;
- IVR Pit; and
- IVR WRSF.

Water management for the Whale Tail Pit Expansion Project will align with the approved water management plans described in Section 2.4.2 in that contact water will be collected, treated, and discharged. Contact water from across the site will be collected and pumped (or diverted) to an attenuation pond. Water from the attenuation pond will be reused for mine operations and treated at the contact water treatment plant. Treated water will be pumped via the discharge pipeline for discharge during the open water season.

The proposed Whale Tail Pit Expansion Project will increase the surface area (and therefore catchment area) of the mine site, and the expanded pits and underground works will increase the volume of groundwater infiltration. As a result, the expansion will require a greater volume of contact water to be stored over winter: for the purposes of the MAA, this is expected to total up to 750,000 m^3. The expanded Whale Tail Pit perimeter will also constrain the Whale Tail Attenuation Pond, reducing its storage capacity from 455,000 m^3 to 133,000 m^3. Thus, an additional attenuation pond is required to accommodate at least 617,000 m^3 (providing a cumulative 750,000 m^3 storage capacity required for the Whale Tail Pit expansion). The location and design of the attenuation pond for the expansion is the subject of this alternatives assessment.

Water Management Infrastructure

In the current Whale Tail Pit Expansion Project design, Agnico Eagle proposes to use Lake A53 (south of the IVR WRSF) as an attenuation pond, referred to as the IVR Attenuation Pond. Following the fish-out and dewatering of Lake A53 in 2021, and dike construction thereafter, the IVR Attenuation Pond is planned to be operational by no later than spring of 2022. The IVR Attenuation Pond will receive all contact water from other sectors of the site, with the exception of the local catchment area for the Whale Tail Attenuation Pond which will continue to report to that pond.

The IVR Attenuation Pond will discharge to the water treatment plant during the summer. The approved water treatment plant will continue to be used. The point of discharge for treated water from the water treatment plan will change under the expansion project. Treated effluent will be discharged to Whale Tail Lake (South Basin) and an alternative discharge location (Lake D1 and D5), and discharge to Mammoth Lake will cease.

Table 2-2 explains the planned management of contact water at the site during the expansion project. Further detail is provided in the mean annual water balance for the Whale Tail Pit Expansion Project (Golder 2018). Contact water from the underground mine will be collected, stored, and treated separately; as underground contact water will not report to the Whale Tail or IVR attenuation ponds, it is not subject to this alternatives assessment.[5]

Table 2-2. Management of Contact Water – Expansion Project

Sector	Description	Destination (Approved Project)	Destination (Expansion Project)[1]
Mine Sectors and Components			
Whale Tail WRSF	• Contact water from the WRSF sector (including WRSF and landfill) will be collected at the Whale Tail WRSF Pond, which will report to the IVR Attenuation Pond.	Whale Tail Attenuation Pond	IVR Attenuation Pond[2]
Industrial Sector	• The industrial sector and crushing area will be graded to direct surface run-off water towards a collection channel. • Run-off from the industrial sector as well as from the ore stockpile, overburden material, and other areas within the local catchment area for the Whale Tail Attenuation Pond will continue to report to the Whale Tail Attenuation Pond. • Surface run-off from the camp will continue to be directed to the Whale Tail Attenuation Pond.	Whale Tail Attenuation Pond	Whale Tail Attenuation Pond
Sewage	• Treated sewage effluent will report to the IVR Attenuation Pond.	Whale Tail Attenuation Pond	IVR Attenuation Pond[2]
Whale Tail Pit and North Sector	• Surface run-off and groundwater infiltration will be directed to the IVR Attenuation Pond.	Whale Tail Attenuation Pond	IVR Attenuation Pond[2]
IVR Pit	• Surface run-off and groundwater infiltration at the IVR Pit will be directed to the IVR Attenuation Pond.	n/a	IVR Attenuation Pond[2]
IVR WRSF	• Contact water from the IVR WRSF will be collected at the IVR WRSF Pond, which will report to the IVR Attenuation Pond.	n/a	IVR Attenuation Pond[2]

[5] Saline water from the underground mine will be collected within the ground-water storage ponds. Treated water from the plant will be discharged to Whale Tail Lake (South Basin), while brine will be directed to the Stormwater Storage Pond. Water from the underground mine will be managed and treated separately from that of surface mine infrastructure.

Sector	Description	Destination (Approved Project)	Destination (Expansion Project)[1]
Water Attenuation and Treatment			
Whale Tail Attenuation Pond	• In the approved project, the Whale Tail Attenuation Pond will receive contact water from other sectors. Water from the pond will be pumped to the water treatment plant. • In the expansion project, most sectors will report to the IVR Attenuation Pond. The Whale Tail Attenuation Pond will continue to receive water from its own catchment including the main camp, industrial sector, ore stockpiles, and seepage from Whale Tail Dike. • In the expansion project, water from the Whale Tail Attenuation Pond will be pumped to the IVR Attenuation Pond prior to treatment and discharge.	Treatment and discharge to Mammoth Lake	IVR Attenuation Pond[2]
IVR Attenuation Pond[2]	• The IVR Attenuation Pond will be constructed as part of the expansion. It will receive contact water from most sectors (other than the direct catchment of Whale Tail Attenuation Pond). • Water from the IVR Attenuation Pond will be pumped to water treatment plant for treatment, piped to the Mammoth Lake diffuser, and discharged to Mammoth Lake.	n/a	Treatment and discharge to Whale Tail Lake (South Basin)
Discharge of Treated Water			
Discharge	• In the approved project, treated water is discharged via submerged diffuser to Mammoth Lake during the open water season. • In the expansion project, treated water will be discharged to Whale Tail Lake (South Basin) and an alternative discharge location (Lake D1 and D5). Discharge will continue to occur via submerged diffuser during the open water season.	Mammoth Lake	Whale Tail Lake (South Basin) and Alternative Discharge Location (Lake D1 and D5)

Source: Golder (2018)

[1] Destination for the expansion project is provided for the period of May 2022 until the end of operations; the IVR Attenuation Pond is planned to be operational in May 2022. Prior to this time, contact water will be directed to the Whale Tail Attenuation Pond.

[2] The IVR Attenuation Pond is included in the current design for the proposed expansion of the Whale Tail Pit Project.

Alternatives Assessment

The current design for the Whale Tail Pit Expansion Project presents the IVR Attenuation Pond to be located at Lake A53, south of the IVR WRSF. Lake A53 is a fish-bearing waterbody and use of this lake as an attenuation pond would require a Schedule 2 amendment[6], and a robust evaluation of alternatives to show how other options have been considered.

Agnico Eagle is committed to conduct its operations, including the Whale Tail Pit Project, in an environmentally and socially responsible manner and to avoid significant adverse effects on the

[6] Lake A53 is frequented by fish, and therefore would require an amendment to Schedule 2 of MDMER, as discussed in Section 1.3, in order to use this waterbody as an attenuation pond.

environment and people who use the land and resources. As such, this alternatives assessment evaluates alternative locations and design concepts for the IVR Attenuation Pond.

2.4.4 Water Quality and Discharge Criteria

Table 2-3 summarizes water quality discharge criteria established in the Type A Water Licence 2AM-WTP1826, as well as other parameters included in Agnico Eagle's water monitoring program. For reference, the Canadian Council of Ministers of the Environment (CCME) water quality guidelines for the protection of aquatic life (long-term; CCME 1999) are provided where applicable.

Table 2-3. Discharge Criteria in Water Licence 2AM-WTP1826 and Water Quality Monitoring Parameters

Parameter	Unit	Maximum Concentration (Whale Tail Pit Project)[1]	CCME 1999 Guidelines (long-term)
Conventional Constituents			
Acidity (pH)	n/a	6.0 to 9.5	-
Total suspended solids (TSS)	mg/L	15	-
Total dissolved solids (TDS)	mg/L	1400	-
Nutrients			
Total ammonia (NH_3-N)	mg-N/L	16	-
Total nitrate (NO_3)	mg-N/L	-	2.93
Total phosphorus (P)	mg-P/L	0.3	0.01
Metals			
Aluminum (Al)	mg/L	0.5	0.1
Arsenic (As)	mg/L	0.1	0.025
Boron (B)	mg/L	-	1.5
Cadmium (Cd)	mg/L	0.002	0.000040
Chromium (Cr)	mg/L	0.02	0.001
Copper (Cu)	mg/L	0.1	0.002
Iron (Fe)	mg/L	1.0	0.3
Lead (Pb)	mg/L	0.05	0.001
Mercury (Hg)	mg/L	0.004	0.000026
Nickel (Ni)	mg/L	0.25	0.038
Selenium (Se)	mg/L	-	0.001
Silver (Ag)	mg/L	-	0.0001
Thallium (Tl)	mg/L	-	0.0008
Uranium (U)	mg/L	-	0.015
Zinc (Zn)	mg/L	0.1	0.03
Other			
Total petroleum hydrocarbons (TPH)	mg/L	3.0	
Chloride (Cl)	mg/L	-	120
Fluoride (F)	mg/L	-	0.12

[1] *Maximum monthly mean concentrations authorized for discharge to Mammoth Lake, as defined in Water Licence No. 2AM-WTP1826.*

Agnico Eagle has modelled the anticipated water quality for all water collection, attenuation, and discharge components of the Whale Tail Pit expansion, and full details are available as part of the FEIS. The relevant results are highlighted below:

- **Whale Tail WRSF**: exceeds discharge criteria for arsenic after July 2019, with predicted concentrations ranging up to 3.8 mg/L; short-term exceedances of chromium and phosphorus are also identified.
- **IVR WRSF**: exceeds discharge criteria for arsenic in July and August 2020, and from July 2021 and later, with predicted concentrations ranging up to 4.1 mg/L; short-term exceedances of chromium and phosphorus are also identified.
- **Stormwater storage pond (AP-5)**: exceeds discharge criteria for a number of parameters:
  - TDS after June 2020, with concentrations peaking at 78,475 mg/L;
  - Arsenic in November and December 2020, and from July 2021 and later, with predicted concentrations ranging up to 0.53 mg/L;
  - Phosphorus from December 2020, with predicted concentrations up to 0.6 mg/L;
  - Nickel from July 2024, with predicted concentrations up to 0.32 mg/L;
  - Zinc from July 2020, with predicted concentrations up to 1.7 mg/L; and
  - Ammonia from July 2020, with predicted concentrations up to 649 mg-N/L.
- **Whale Tail Pit**: exceeds discharge criteria for arsenic annually from 2019, between June/July and September/October (three to five months per year), with predicted concentrations up to 0.86 mg/L.
- **IVR Pit**: exceeds discharge criteria for arsenic in August 2020, August to October 2021, and June to October from 2022 to 2025, with predicted concentrations up to 2.2 mg/L.
- **Whale Tail Attenuation Pond**: exceeds discharge criteria for arsenic between July and September 2019 and 2020, and between June and September/October from 2022 to 2025. Also exceeds CEQG concentrations for a number of parameters including chloride
- **IVR Attenuation Pond**: exceeds discharge criteria for arsenic between July and October annually, from 2022 to 2025.

The predicted quality of effluent from the water treatment plant, and of Mammoth Lake (i.e., the receiving environment) and Whale Tail Lake (South Basin), will be below authorized discharge criteria for all parameters.

The water quality predictions outlined above confirm that the quality of water to be collected and contained at the Whale Tail Pit mine site is deleterious and must be treated before it can be discharged to the environment. With the seasonal restrictions on treatment and discharge (i.e., limited to ice-free conditions), the need for a suitable contact water attenuation pond is also confirmed.

3. SETTING

The following sections describe the general setting of the Amaruq property and Whale Tail Pit Project, including the physical environment (Section 3.1), biological environment (Section 3.2), and human environment (Section 3.3).

The information in these sections is derived from the Water Management Plan (Agnico Eagle 2017) for the approved Whale Tail Pit Project, Water Licence 2AM WTP1826 (NWB 2018), and relevant sections of the FEIS for the Whale Tail Pit Project (Agnico Eagle 2016). Baseline studies at the Amaruq property began in 2014 and detailed reports were included in the FEIS. The incorporation of IQ and traditional land use information has been obtained from the *Inuit Qaujimajatuqangit Baseline Report*[7] unless otherwise indicated.

3.1 Physical Environment

The following sections are based on baseline site conditions described in the Water Management Plan for the approved Whale Tail Pit Project.

Climate

The mine site is located at the southern limit of the Northern Arctic ecozone, in an arid Arctic environment that experiences extreme winter conditions. Monthly mean temperatures range between -31.3°C in January, and 11.6°C in June. Mean temperatures are above freezing in June, July, August, and September. During this short summer season, ice on lakes usually breaks up in mid- to late-June and begins to form again in October. The property receives 249 mm annual mean precipitation (59% rain, 41% snow).

Climate change in the Arctic is occurring more rapidly than at mid-latitudes, and recent models predict that spring and autumn temperatures could increase by 3 to 5°C and 7 to 13°C, respectively, by 2100. IQ from land users indicates that weather patterns have changed in the past two decades, including alterations to the length and timing of traditional Inuktitut seasons. The effects of these climate changes to terrestrial, aquatic and marine ecosystems and the social and economic systems of the Arctic are an active area of research, but are likely to be negligible within the life of the Whale Tail Pit Project.

Terrain and Geology

The regional landscape is typified by an abundance of waterbodies surrounded by vegetated uplands. Open water includes rivers, streams, lakes and ponds. The Whale Tail Pit Project is located within the Rae domain of the Western Churchill geological province of the Canadian Shield. The local geology

[7] *Inuit Qaujimajatuqangit Baseline Report*. June 2016. Included as Appendix 7-A of the Whale Tail Pit Project: Final Environmental Impact Statement (FEIS).

is characterized by Archean-age volcanic and sedimentary rocks, including mafic volcanic rocks and felsic intrusive rocks.

The general topographic landscape has a flat relief and elevations varying between 150 m and 200 m above sea level. Land features are typical of glaciated areas, with a permafrost terrain characterized by the presence of low, gently rolling hills, a few large boulder field areas, and numerous lakes and rivers.

Overburden thickness in the vicinity of Whale Tail Lake can be up to 10 m thick overlying bedrock, and moraine/till is the predominant material. The till comprises a silty sand matrix with clasts varying in size from granule gravel to large boulders. Stones are found both within the till and on the surface. There are glaciofluvial and bedrock surfaces north and east of Nemo Lake.

The area has a relatively low seismic risk.

Permafrost

The Whale Tail Pit Project is located in an area of continuous permafrost, although taliks[8] are expected to exist under lakes greater than 2 m depth. Permafrost underlies more than 90% of the landscape, at a depth of 450 to 550 m depending on proximity to lakes. The active layer (i.e., seasonally thawed) is typically within 1.0 and 1.5 m of the surface.

Groundwater Hydrology

Two groundwater regimes are identified at the site: there is a deep flow regime beneath the base of the permafrost, and a shallow flow regime located within the active layer close to the surface. Within the active layer, the water table generally parallels the surface topography, flowing to local depressions and ponds that drain to larger lakes. Flow velocities range from 0.004 m/day to 0.080 m/day.

Surface Hydrology

Surface waterbodies around the Whale Tail Pit Project are nominally denoted by watershed, each with an alpha-numeric indicator. The Whale Tail Pit Project is located is located between Whale Tail Lake (Lake A17, in Watershed "A"), Mammoth Lake (Lake A16, in Watershed "A"), and Nemo Lake (Lake C38, in Watershed "C"). Watersheds A and C both drain north into Watershed D, which drains to the Meadowbank River, Back River, and to the Arctic Ocean southwest of the Boothia Peninsula.

The region comprises an extensive network of lakes, ponds, and interconnecting streams. Lakes make up 16% of the total surface area of Watershed A. Shorelines are typical of morainal terrain, with boulder gardens mixed with cobble. Surface soils or organic materials are limited. There are also limited areas of bedrock and some sandy shorelines. Between lakes, water typically flows through areas of large boulders or below the surface, making flow measurements difficult.

[8] Taliks are areas of unfrozen ground that exist year-round within permafrost areas. They often occur beneath lakes and rivers.

The depth of lakes in Watershed A ranges from around 2 to 25 m. Whale Tail and Mammoth lakes are some of the deeper lakes in the watershed. Whale Tail Lake has a maximum baseline depth of 18.3 m (mean 5.1 m), and Mammoth Lake has a maximum depth of 17.2 m (mean 3.9 m).

Snowmelt typically peaks from late-May to mid-June, and rapidly declines in July. There is a secondary peak resulting from rainfall events in September, but otherwise surface discharges remain low until freezing in October/November. All watercourses are frozen over the winter.

Surface Water Quality

Conventional water quality parameters (pH, major ions, nutrients, metal concentrations, etc.) indicate that the surface water quality of at the Whale Tail Pit Project study area, prior to any influence of mineral exploration, is pristine with low levels of contaminants. The majority of water chemistry parameters were below the analytical detection limit, and thus well below water quality guidelines for the protection of aquatic life[9] and drinking water[10]. IQ indicates that drinking water is good quality based on temperature, clarity, and other factors. Consultation with youth in Baker Lake indicated that dust deposition and colour changes to water can lead to concerns about water quality.

Lake waters are characteristic of low productivity headwater lakes in the Arctic, with soft water, low alkalinity, low turbidity, and low total suspended solids. There is a minor thermal stratification in some deeper lakes; water columns are generally well oxygenated, and pH is neutral-to-slightly acidic. Tributaries are also well oxygenated, with low conductivity and neutral-to-slightly alkaline pH.

3.2 BIOLOGICAL ENVIRONMENT

Fish and Aquatic Habitat

Both IQ and western scientific baseline[11] studies indicate the presence of three fish species—lake trout (*Salvelinus namaycush)*, Arctic char (*Salvelinus alpinus*), and round whitefish *Prosopium cylindraceum)* in the Whale Tail Pit study area, which includes Whale Tail, Mammoth, and Nemo lakes. The latter baseline studies also found burbot (*Lota lota)*, slimy sculpin (*Cottus cognatus*), and ninespine stickleback (*Pungitius pungitius*). Arctic grayling (*Thymallus arcticus*) is also present downstream from these waterbodies, but migration barriers prevent them from moving upstream. Arctic char in the system are land-locked. Consultation with Elders and community members in Baker Lake, and IQ, indicates that Arctic char and lake trout are the preferred fish species harvested for food.

Of the larger fish species, lake trout is the most abundant and widely distributed species found in Whale Tail Lake and Mammoth Lake, followed by round whitefish and Arctic char. Low numbers of juvenile Arctic char and lake trout are found in some of the tributaries of Whale Tail Lake. The smaller fish species (ninespine stickleback and slimy sculpin) are widely distributed in larger lakes and in

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[9] Canadian Council of Ministers of the Environment (CCME). 1999. Canadian Environmental Quality Guidelines. Updated 2016.
[10] Health Canada. 2017. Guidelines for Canadian Drinking Water Quality.
[11] Summary derived from Volume 6 (Freshwater Environment) of *Whale Tail Pit Project: Final Environmental Impact Statement (FEIS)*. Agnico Eagle, June 2016.

tributaries. There are several isolated (or nearly isolated) ponds and small lakes in which no fish were captured during the baseline studies.

Channels or streams connecting lakes are characterized as wide and flat, with shallow (or subsurface) flows and extensive boulder gardens. These features may prevent fish from accessing headwater lakes. Movements of large-bodied fish (including adult Arctic char and lake trout) between lakes may therefore be limited to the spring freshet period. However, juveniles may use stream connections for foraging and migration habitat. In consultation with Baker Lake Elders in June 2018, they noted that Arctic char run from the middle to the end of August, and spawn later in October after the ice forms.

Phytoplankton, benthic invertebrate, and water quality characteristics in the vicinity of the mine site, during the open water season, are typical of water in subarctic regions:

- Phytoplankton taxonomic richness is variable, and generally ranges from 30 to 40. Phytoplankton density is typically greater than 1.5 million individuals per litre, with total biomass ranging from 100 mg/m^3 to 440 mg/m^3.
- Benthic invertebrate abundance and richness is typically low.
- Periphyton growth is generally sparse-to-moderate (July), low-to-moderate (August), and moderate-to-high (September).

Terrestrial Ecology

IQ specifically identifies moss, lichen, Arctic cotton, willow, heather, liquorice root, lousewort, mountain sorrel, purple mountain saxifrage, crowberry, blueberry, blackberry, red berry, and cloudberries as occurring in the area of the Whale Tail Pit Project. In addition to these plants, field studies indicate that the vegetation of the area is typical of the Arctic environment, including dwarf shrubs, sedges, and grasses. Habitats are primarily lichen and rock in the uplands and wet graminoid-dominated lowlands, with tundra of varying moisture regimes in between. A variety of flowers are seen during the short summer, including fireweed and wintergreen.[12]

Ecological land classifications within the local study area (1.5 km of the Whale Tail Pit Project) are typical of upland tundra habitat, including Lichen/Rock Complex (27%), Heath Upland (19%), Health Tundra (12%), Boulder/Gravel (7%), Lichen/Tundra (5%), and Water (21%). All other classification types represented less than 2% of the area. High-quality caribou habitat include Lichen/Rock Complex and Health Upland units, which together comprise nearly half of the local study area. During consultation for the Meadowbank Mine, Elders also highlighted the importance of lichen and other plants for the diet of caribou.[13]

The majority of land is typified by low-diversity vascular plant communities, dominated by fewer than ten species. The most common and widespread vascular plant species is the northern Labrador-tea (*Rhododendron tomentosum*) and mountain cranberry (*Vaccinium vitis-idea*). Poorly drained areas are

[12] Summary derived from Volume 5 (Terrestrial Environment) of *Whale Tail Pit Project: Final Environmental Impact Statement (FEIS)*. Agnico Eagle, June 2016.
[13] *Ib id*.

predominantly characterized by graminoid tussock-hummock communities, with low shrub communities occurring along riparian areas adjacent to stream, ponds, and lakes.

Two federally listed plant species have been identified in Nunavut[14], and neither of these species—or suitable habitat—has been identified at the Whale Tail Pit Project. No sensitive, rare, or endangered species or communities have been identified during baseline studies in the area.

Wildlife[15]

Barren-ground caribou, Arctic ground squirrel, and muskox are the most commonly observed mammals in the vicinity of the Whale Tail Pit Project, while the most commonly observed birds are the Lapland longspur, horned lark, redpolls (common and hoary), and snow goose.

Caribou are a valued species throughout the Arctic, and are an important part of Nunavut's traditional economy and culture. Five migratory barren-ground caribou herds (Beverly, Ahiak, Wager Bay, Lorillard, and Qamanirjuaq) are identified throughout the Kivalliq Region. Inuit Elders have expressed concerns that there are fewer caribou in the region than in the past.

Collar data for the five herds indicates that all herds spend time in the regional study area (including Meadowbank and Amaruq properties and connecting road, with a 25 km buffer), although the amount of time is relatively small (less than 1% of total time is spent within the area annually). Caribou were most commonly recorded in the area in the winter and fall rut. No calving activity or calving ground locations have been identified in the regional study area; traditional knowledge and IQ has also indicated that there are no caribou calving grounds near the Whale Tail Pit Project, and that the nearest calving ground is over 100 km away.

The mine site is in the vicinity of caribou migration corridors in spring and fall. The spring corridor is quite clearly delineated as caribou move towards calving grounds west of the mine site. The fall migration to wintering grounds is more diffuse and widely distributed. IQ indicates that the spring migration typically travels north of the mine site (west to east), whereas the fall migration travels east to west, generally south of the mine site although it may cross in proximity to the Meadowbank mine and the Amaruq (Whale Tail) haul road.

All esker features are considered to have high suitability for mammal denning (including Arctic wolf and fox), as well as bird nesting and wildlife movements. Wolves and wolf dens have been identified in the vicinity of the mine site, and wolves can be expected to be present alongside caribou during seasonal migrations. IQ also indicates that the occurrence of grizzly bears has increased in the area between Baker Lake and Back River. Wolverine are also observed in the vicinity of the mine site.

Five species of raptors (short-eared owl, snowy owl, rough-legged hawk, peregrine falcon, and gyrfalcon) are believed to be present in the regional study area. Peregrine falcon are known to nest in cliffs created by quarries. Water birds include ducks, geese, swans, and loons, and are generally not

[14] Porsild's bryum (*haplodontium macrocarpum*) and felt-leaf willow (*Salix siliciola*)
[15] Summary derived from Volume 5 (Terrestrial Environment) of *Whale Tail Pit Project: Final Environmental Impact Statement (FEIS)*. Agnico Eagle, June 2016.

common in the area. Various species of upland breeding birds are present and utilize a wide range of land types including heath upland, heath tundra, and rockier landscapes such as eskers and lichen/ rock complex.

There are five wildlife species of concern with breeding or wintering ranges overlapping the Whale Tail Pit Project, including grizzly bear, wolverine, red-necked phalarope (water bird), and peregrine falcon and short-eared owl (raptors). Both raptors are listed on Schedule 1 of the federal *Species at Risk Act*.

3.3 HUMAN ENVIRONMENT

Socio-Economics[16]

The hamlet of Baker Lake is the nearest community to the Whale Tail Pit Project. The hamlet is located on the north shore of Baker Lake near the mouth of the Thelon River, approximately 150 km south of the Whale Tail Pit Project. The next closest communities are Rankin Inlet, Whale Cove, and Chesterfield Inlet.

The population of Baker Lake in 2016 was 2,069, the majority of whom (92%) identify as Inuit[17]. There are approximately 580 households, and the population grew by 10.5% between 2011 and 2016. Traditionally, the Inuit of Baker Lake were highly nomadic, moving seasonally with caribou.

Nunavummiut represent approximately one-third of the workforce at the existing Meadowbank mine, and over half of these workers reside in Baker Lake. Employment incomes for these positions are relatively high compared to local and regional averages, and the median income in Baker Lake has risen 59% since the beginning of mine operations. Residents report that employment income from the mine has enhanced quality of life by improving financial access to food, hunting equipment, and consumer goods, and enabling workers to assist their extended families.

Land and Resource Use[18]

Traditional land use studies confirm the importance of caribou, fur bearers, birds, fish, and plants/berries in the traditional Inuit land use and way-of-life. Cultural and spiritual areas—including historic trails, camps, caches, and graves—are also highlighted for their importance in the transfer of traditional knowledge and IQ between generations. Traditional land use activities including fishing and hunting also have importance for subsistence livelihoods, retention of traditional skills, values, and language, and other elements of IQ.[19]

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[16] Summary derived from Volume 7 (Human Environment) of *Whale Tail Pit Project: Final Environmental Impact Statement (FEIS)*. Agnico Eagle, June 2016.
[17] Statistics Canada, 2017. *Baker Lake (Hamlet): Census Profile*. 2016 Census of Canada.
[18] Summary derived from Volume 7 (Human Environment) of *Whale Tail Pit Project: Final Environmental Impact Statement (FEIS)*. Agnico Eagle, June 2016.
[19] *Inuit Qaujimajatuqangit Baseline Report*. June 2016. Included as Appendix 7-A of the Whale Tail Pit Project: Final Environmental Impact Statement (FEIS).

The practice of subsistence land use activities—including hunting, trapping, fishing, and gathering—is an important component of livelihoods and the household economy, and is also tied to retention of traditional skills, values, and language. Harvest study data indicate low harvest rates from hunting and trapping in the vicinity of the Whale Tail Pit Project, likely as a result of limited access and the long distance from the hamlet of Baker Lake.[20] There is also a relatively low abundance of harvest species, although caribou herds migrate through the region.

Elders and hunters from Baker Lake have reported traditional caribou hunting areas in the vicinity of the Whale Tail Pit Project. Since the development of the all-weather road connecting Baker Lake with the Meadowbank mine, hunting within 50 km of the road has increased. Inuit elders have indicated that they may travel beyond Meadowbank to hunt caribou, as the caribou in these areas are considered to be in better health.

Trapping (furbearers) has generally declined in recent years due to the low price of furs, and generally occurs in areas closer to Baker Lake. Fish are an important subsistence food source, after caribou, and fishing occurs year-round. Preferred fishing grounds include several lakes and rivers close to Baker Lake, and preferred catch includes Arctic char and lake trout.

A traditional travel corridor passes in proximity to the Whale Tail Pit Project, used by Inuit travelling overland between Baker Lake in the south, and the Back River and Gjoa Haven in the north. Opportunistic hunting, fishing and other harvesting is reported to occur during travel.[21] Camping areas and food caches were identified in proximity to the Whale Tail haul road, but are relatively distant from the mine site.

Cultural and Heritage Resources[22]

The presence of archaeological sites in the vicinity of the Whale Tail Pit Project highlights the long history of land use in the region by Inuit peoples. One known grave site (including burial cairn and other artefacts) is identified, located approximately 1.5 km south of the Whale Tail Dike on a hill on the east shore of Whale Tail Lake. A historic campsite is also identified north of Nemo Lake. Agnico Eagle has committed to avoiding impacts on these sites.

[20] *Terrestrial Baseline Characterization Report*. November 2015. Included as Appendix 5-C of the Whale Tail Pit Project: Final Environmental Impact Statement (FEIS).

[21] Feedback from community consultation in Baker Lake, July 2018. Also reported in Volume 7 (Human Environment), Section 7.3 (Traditional Land and Resource Use / *Inuit Qaujimajatuqangit*) of *Whale Tail Pit Project: Final Environmental Impact Statement (FEIS)*. Agnico Eagle, June 2016.

[22] Summary derived from Volume 7 (Human Environment), of *Whale Tail Pit Project: Final Environmental Impact Statement (FEIS)*. Agnico Eagle, June 2016.

4. IDENTIFICATION OF ALTERNATIVES (STEP 1)

4.1 OBJECTIVE

Based on the methodology described in Section 1.3.2, and the process established by the ECCC Guidelines, the first step of the alternatives assessment involves identification of reasonable, conceivable, and realistic options for water attenuation at the Whale Tail Pit Project to accommodate the increased volume of contact water associated with the proposed expansion. Threshold criteria are established to frame the basic requirements that must be met for an alternative to be viable and considered further. Evaluation of feasibility is not considered at this stage; rather, alternatives are considered in terms of their capacity to address the basic needs of the project.

4.2 THRESHOLD CRITERIA

Threshold criteria define the minimum standards that must be met in order to consider an alternative further. Four threshold criteria are identified and described below.

1. Must align with existing water management strategy

Agnico Eagle has an approved and permitted water management strategy for the Whale Tail Pit Project. This strategy is based on minimizing the volume of contact water, storing water over the winter (October through May), and treatment and discharge in the open water season (June to September). To ensure consistency with Type A Water Licence 2AM WTP1826, and reduce operational risks to the downstream environment, and human health and safety, the attenuation pond must align with the existing water management strategy.

2. Must be confined within the area already affected by the Whale Tail Pit Expansion Project

Agnico Eagle is committed to minimizing the footprint of the Whale Tail Pit Project in order to minimize and confine environmental impacts. To avoid extending potential environmental impacts to areas otherwise undisturbed by physical infrastructure, the attenuation pond must be located within the sub-watersheds that will contain the approved and planned mine infrastructure. The approved and proposed expansion of the Whale Tail Pit Project overlap with the sub-watersheds of Mammoth Lake, Whale Tail Lake (North Basin), Lake A53, Lake A54, and other waterbodies within the expanded mine site (including A46, A47, A59, A50).

To contain impacts within (or near to) the existing area of disturbance, alternatives must not unnecessarily expand the geographic extent of the footprint. The current mine site, and proposed expansion, is approximately 4 km wide from the west side of the Whale Tail WRSF to the east side of the IVR WRSF. To keep within this scale, a 2 km buffer (i.e., 50% of the width of the mine site) was drawn around the Whale Tail and IVR pits (i.e., the primary source of water over winter), defining the maximum distance at which the attenuation pond could be located.

Both the watershed boundaries and the 2 km buffer is shown in Figure 4-1. The area shaded in green is both within 2 km of the open pits and within the affected sub-watersheds, and marks the study area in which alternatives must be located.

3. Must provide sufficient storage capacity

For the purposes of the MAA, the Whale Tail Pit Expansion Project will require storage of up to 750,000 m^3 of contact water. Therefore, the attenuation pond (or combination of ponds) must have the capacity to store 750,000 m^3 of water. The current water management plan includes storage of approximately 133,000 m^3 of water in the Whale Tail Attenuation Pond; therefore, an additional attenuation pond is required to store at least 617,000 m^3.

4. Must not contradict the mine development plan

Development of the Whale Tail Pit Expansion Project is based on extraction of ore from both pits (Whale Tail Pit and IVR Pit) simultaneously. The selection of attenuation pond must align with this development plan.

4.3 IDENTIFICATION OF ALTERNATIVES

4.3.1 Water Management Strategies

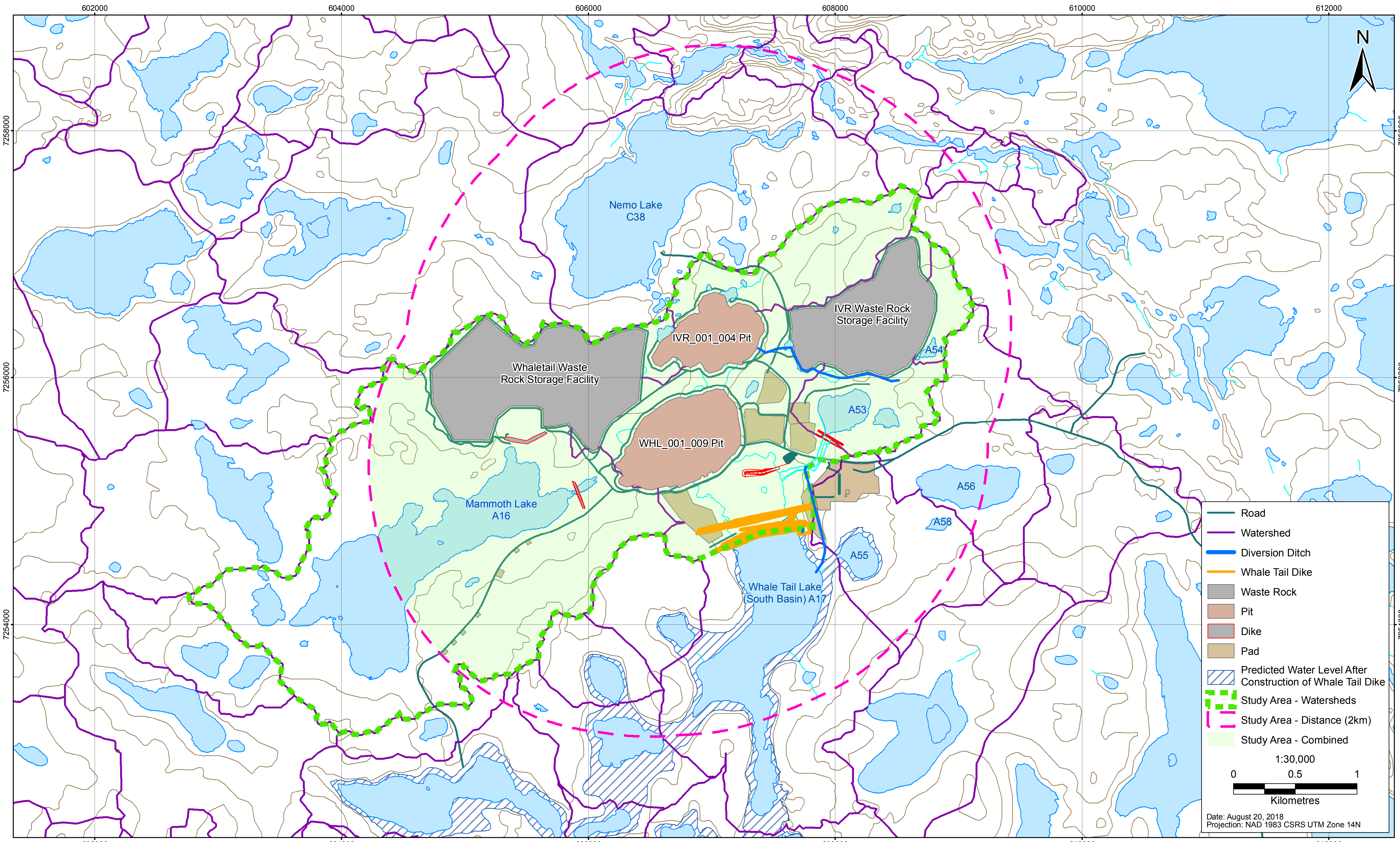
Consistent with the Type A Water Licence No. 2AM WTP1628, in the development of alternative water management strategies, Agnico Eagle considered three general approaches to water management:

- **Reduce**: the volume of contact water could be reduced so there is less water to manage.
- **Treat and Discharge:** contact water could be collected, treated, and discharged to the environment.
- **Contain:** contact water could be collected and contained for later treatment and discharge.

Agnico Eagle's guiding principles for water management (described in Section 2.4.1) include minimizing freshwater consumption through water recycling and reuse and diverting non-contact water away from the site. Reducing the volume of contact water is therefore inherent in the site's design and water management strategy.

Treatment and discharge of contact water is already included in the approved and permitted project, including a water treatment plant located east of the Whale Tail Attenuation Pond, a discharge pipeline running east-west along the south perimeter of the Whale Tail Pit, and a submerged discharge diffuser at Mammoth Lake. Due to seasonal constraints, water will be collected and contained year-round for treatment and discharge during ice-free conditions (June to September).

Figure 4-1
Alternatives Assessment Study Area



Therefore, the assessment only considers attenuation pond(s) alternatives in which contact water will be contained until it can be treated and discharged. Further efforts to reduce the volume of contact water or to improve water treatment could apply to any alternative and are not the focus of this study.

4.3.2 Identification of Alternative Attenuation Ponds

Within the study area defined in Figure 4-1, Agnico Eagle identified eight potential alternatives for the water attenuation pond (Table 4-1). In accordance with the ECCC Guidelines, this list includes alternatives that would not impact natural waterbodies frequented by fish, including alternatives using man-made structures located within, or are adjacent to, existing mine components; as well as alternatives located in non-fish-bearing waterbodies.

4.4 THRESHOLD ANALYSIS

The threshold analysis considered the eight alternatives identified in Table 4-1 against the threshold criteria listed in Section 4.2. The results of the threshold analysis are summarized in Table 4-2. Three of the preliminary alternatives do not meet the threshold criteria, and are eliminated from further assessment:

- **Alternative C: Enlarging the existing WRSF Pond** by raising the water level to store water within the WRSF does not align with the existing water management strategy. This alterative presents geochemical risks—namely, a higher quantity of arsenic during closure and post-closure—and this may not allow closure in accordance with the Type A Water Licence 2AM WTP1826. There may also be increased geotechnical and physical instability risks during operation (Agnico Eagle 2017b).
- **Alternative D: Expand the existing Whale Tail WRSF Pond *and* existing Whale Tail Attenuation Pond** does not provide sufficient capacity. The Whale Tail WRSF Pond can only be enlarged to a small degree without flooding the WRSF. As such, the vast majority of water volume would be contained with the expanded Whale Tail Attenuation Pond. This alternative is eliminated as it is not significantly different from Alternative B.
- **Alternative I: Sequential mining and/or quarry development** is not aligned with Agnico Eagle's mine plan as it would prevent simultaneous extraction from the Whale Tail and IVR pits.

Six of the alternatives (Alternatives A, B, E, F, G and H) meet the threshold criteria. These alternatives are considered further in the critical flaw assessment in Section 5.

Table 4-1. Preliminary Water Attenuation Alternatives

Alternative	Description	Minimum Capacity	Fish-bearing Waterbodies
A. Expand existing Whale Tail Attenuation Pond (adjust Whale Tail Dike)	The Whale Tail Dike would be moved south, or a second dike constructed, to increase the available area within the North Basin.	• Whale Tail Attenuation Pond would be expanded from 133,000 m^3 to at least 750,000 m^3	None
B. Expand existing Whale Tail Attenuation Pond (northern containment feature)	A containment feature would be constructed along the north side of the Whale Tail Attenuation Pond, which would be enlarged within the drained North Basin of Whale Tail Lake.	• Whale Tail Attenuation Pond would be expanded from 133,000 m^3 to at least 750,000 m^3	None
C. Expand existing Whale Tail WRSF Pond	The WRSF Dike would be elevated to increase the capacity of the Whale Tail WRSF Pond and provide storage within the footprint of a flooded WRSF.	• Whale Tail Attenuation Pond would provide capacity for 133,000 m^3 • Whale Tail WRSF Pond will be expanded from 11,600 m^3 to at least 617,000 m^3	None
D. Expand existing Whale Tail WRSF Pond *and* existing Whale Tail Attenuation Pond	The Whale Tail WRSF Dike would be elevated to increase the capacity of the Whale Tail WRSF Pond; however, the pond would not be increased to a level where waste rock would be in contact with the pond. In addition, a containment feature would be constructed along the north side of the Whale Tail Attenuation Pond, which would be enlarged within the drained North Basin of Whale Tail Lake.	• The combined capacity of Whale Tail Attenuation Pond and Whale Tail WRSF Pond would be expanded from 144,600 m^3 to at least 750,000 m^3	None
E. New attenuation pond at Lake A53	Containment feature(s) would be constructed at Lake A53 to enlarge the existing waterbody.	• Whale Tail Attenuation Pond would provide capacity for 133,000 m^3 • Lake A53 will be expanded to at least 617,000 m^3	Yes – Lake A53
F. New attenuation pond at Lake A54	Containment feature(s) would be constructed at Lake A54 to enlarge the existing waterbody.	• Whale Tail Attenuation Pond would provide capacity for 133,000 m^3 • Lake A54 will be expanded to at least 617,000 m^3	None
G. New attenuation pond at Mammoth Lake	A dam would be constructed to isolate the northern section of Mammoth Lake.	• Whale Tail Attenuation Pond would provide capacity for 133,000 m^3 • The north portion of Mammoth Lake would be isolated to provide capacity for at least 617,000 m^3	Yes – Mammoth Lake

Alternative	Description	Minimum Capacity	Fish-bearing Waterbodies
H. New attenuation pond at Lake A53 *and* expand existing Whale Tail Attenuation Pond	Containment feature(s) would be constructed at Lake A53 to enlarge the existing waterbody. In addition, a containment feature would be constructed along the north side of the Whale Tail Attenuation Pond, which would be enlarged within the drained North Basin of Whale Tail Lake.	• The combined capacity of Whale Tail Attenuation Pond and Lake A53 would be expanded to at least 750,000 m^3	Yes – Lake A53
I. Sequential mining and/or quarry development	The sequence of mining the pits and quarries would be sequenced in order to use pits and quarries at temporary attenuation ponds. For example, water would be stored in the Whale Tail Pit while ore is extracted from the IVR Pit, and then pumped to the IVR Pit while the Whale Tail Pit is enlarged.	• The combined capacity of the Whale Tail Attenuation Pond and sequential use of pits and quarries would provide capacity for at least 750,000 m^3	None

Note:
Volume estimates derived from the mean annual water balance for the Whale Tail Pit Expansion Project (Golder 2018): Whale Tail Attenuation Pond – 133,232 m^3; Whale Tail WRSF Pond – 11,631 m^3.

Table 4-2. Contact Water Storage Concepts

Alternative	Threshold Criteria: Must align with existing water management strategy	Threshold Criteria: Must be located within the study area	Threshold Criteria: Must provide sufficient storage capacity	Threshold Criteria: Must not contradict the mine development plan
A. Expand existing Whale Tail Attenuation Pond (adjust Whale Tail Dike)	Yes	Yes	Yes	Yes
B. Expand existing Whale Tail Attenuation Pond (northern containment feature)	Yes	Yes	Yes	Yes
C. Expand existing Whale Tail WRSF Pond	No – this alternative does not minimize contact water and does not meet the approved water management strategy	Yes	Yes	Yes
D. Expand existing Whale Tail WRSF Pond *and* existing Whale Tail Attenuation Pond	Yes	Yes	No – expanding the WRSF Pond without flooding the WRSF does not provide sufficient storage capacity	Yes
E. New attenuation pond at Lake A53	Yes	Yes	Yes	Yes
F. New attenuation pond at Lake A54	Yes	Yes	Yes	Yes
G. New attenuation pond at Mammoth Lake	Yes	Yes	Yes	Yes
H. New attenuation pond at Lake A53 *and* expand existing Whale Tail Attenuation Pond	Yes	Yes	Yes	Yes
I. Sequential mining and/or quarry development	Yes	Yes	Yes	No – this alternative would prevent simultaneous extraction from the Whale Tail and IVR Pits, and does not meet the Whale Tail Pit Project mine plan

5. CRITICAL FLAW ASSESSMENT (STEP 2)

5.1 OBJECTIVE

The second step of the alternatives assessment screens the remaining alternatives to identify and eliminate those with critical flaws. Critical flaws are defined as un-mitigatable and unavoidable issues that are so unfavourable as to eliminate an alternative as a viable option. This step ensures that the decision-making process is focused on realistic and sufficiently detailed alternatives, each of which could conceivably be implemented as a preferred alternative.

5.2 SCREENING CRITERIA

Screening criteria are defined as a list of yes-or-no questions designed to identify critical flaws. A candidate with one or more critical flaws (i.e., answering *yes* to any of the screening questions) will be eliminated from further study.

There is no universal list of screening criteria, and they are developed on a project-specific basis to reflect the needs, constraints, and priorities of the project and proponent. The following screening criteria are identified in regard to the attenuation pond for the Whale Tail Pit Expansion Project:

1. **Engineering and Safety Risks:** Would the design, construction, operation, or closure of the attenuation pond introduce material engineering and/or safety risks?
2. **Sterilization of Mineral Resources or Areas with High Mineral Potential:** Would the attenuation pond sterilize mineral resources or areas with high mineral potential?
3. **Overlap with Areas of High Value:** Would the attenuation pond overlap with lands or waters designated as having high environmental, cultural, and/or archeological value?
   - High environmental value: includes important areas for caribou (calving and post-calving areas, and water crossings) and other areas determined to be of high importance to wildlife, protected plant and animal species, or otherwise critical for ecosystem function.
   - High cultural value: includes culturally or spiritually important places as identified through consultation, traditional knowledge, and/or IQ.
   - High archaeological value: includes known archaeological sites such as burial sites.
4. **Economic Feasibility:** Would construction, operation, or closure of the attenuation pond render the Whale Tail Pit Expansion Project economically infeasible?

5.3 CRITICAL FLAW ASSESSMENT

5.3.1 Analysis

Engineering and Safety Risks

Engineering or safety risks that cannot be mitigated, and create unreasonable risks for the environment and/or personnel, are not acceptable to Agnico Eagle and are unlikely to be permitted by regulators.

No material engineering or safety risks are identified for any of the remaining five candidates, although some candidates are noted to have higher risks than others.[23] In particular, alternatives B and H involve the development of an expanded attenuation pond in the drained North Basin of Whale Tail Lake. This waterbody would be adjacent to the south wall of the Whale Tail Pit and ramp, as well as workers and equipment operating in the pit. However, comparable water retaining features have been successfully maintained at other operating mines, and the risk is not considered to be material.

Sterilization of Mineral Resources or Areas with High Mineral Potential

Sterilization of mineral resources, such that an alternative would preclude future mineral exploration or development is considered to be a critical flaw. The project is located on Inuit Owned Land (IOL); under the Nunavut Agreement, and Nunavut Tunngavik Incorporated (NTI) holds title to subsurface resources on IOL, on behalf of the Inuit. Agnico Eagle is afforded the right to explore and extract minerals from the property though a mineral exploration agreement with NTI. Sterilization of mineral resources or areas with high mineral potential would effectively remove these resources from future use by, and/or for the benefit of, the Inuit.

Based on Agnico Eagle's understanding of the proven and inferred mineral resources at the Whale Tail Pit Project, none of the alternatives would sterilize mineral resources or areas with high mineral potential.

Overlap with Areas of High Value

The remaining alternatives are located in close proximity to the approved Whale Tail Pit Project mine site to minimize the footprint of the proposed expansion and avoid impacts on areas of high environmental, cultural, or archaeological values. Previous baseline studies have investigated areas of high value within and around the mine site:

- **Important areas for caribou:** Animals on designated calving grounds are protected from May 15 to July 15, and cows and calves are sensitive to disturbance for three weeks after calving. The Whale Tail Pit Project will not affect calving or post-calving areas, which are located at a considerable distance from the RSA. Water crossings are also important in the annual migration of caribou as they follow natural landscape features and concentrate at water

[23] Alternative C (eliminated in Section 4.4 as it contradicts the approved water management strategy) would also present material engineering and safety risks in regard to the flooding of the Whale Tail WRSF and the resulting geochemical and physical stability risks.

crossings; activities within 5 km of designated water crossings are prohibited from May 15 to September 1. No designated water crossings will be affected by the Whale Tail Pit Project. [24]

- **Protected plant and animal species:** No sensitive, rare, or endangered species or communities have been identified during baseline studies in the vicinity of the alternatives.
- **Archaeological sites:** Two indigenous historic sites are identified in the vicinity of the Whale Tail Pit Project, each designated as having a perceived 'high' significance. One site is a historic campsite approximately 600 m north of the freshwater intake at Nemo Lake, and the other is a burial cairn (with human remains) over 1.5 km south of the Whale Tail Dike on the east bank of Whale Tail Lake. [25]
- **Areas of cultural or spiritual value**: The protection of trails, camps, cabins, caching sites, gravesites, and other culturally important sites, and the maintenance of traditional travel routes, is important to the Elders of Baker Lake as these areas are valued for transferring knowledge to future generations and to educate youth.[26] No historic sites or travel routes are identified in relation to any of the remaining alternatives.

Therefore, no areas of high environmental, cultural, or archaeological value are expected to be overlapped or otherwise affected by any of the alternatives.

Economic feasibility

The cost of an alternative may be a critical flaw if it renders the Whale Tail Pit Expansion Project economically infeasible. Construction of the Whale Tail Dike began in the summer of 2018 and delaying construction to redesign the dike is not possible. Based on the cost of the planned Whale Tail Dike (approximately $40 million), the construction of a second dike would render the Whale Tail Pit Expansion Project economically infeasible.

5.3.2 Results

Table 5-1 summarizes the results of the critical flaw assessment. A critical flaw is identified for one alternative:

- **Alternative A: Enlarging the existing Whale Tail Attenuation Pond** by moving the Whale Tail Dike further south or constructing a second dike south of the existing dike would be economically infeasible.

Therefore, Alternative A is eliminated from the alternatives assessment. The remaining five alternatives (B, E, F, G, and H) are further characterized in Step 3.

[24] *Terrestrial Baseline Characterization Report*. November 2015. Included as Appendix 5-C of the Whale Tail Pit Project: Final Environmental Impact Statement (FEIS).

[25] Volume 7 (Human Environment), Section 7.2 (Heritage Resources) of *Whale Tail Pit Project: Final Environmental Impact Statement (FEIS)*. Agnico Eagle. June 2016.

[26] Volume 7 (Human Environment), Section 7.4 (Socio-Economics) of *Whale Tail Pit Project: Final Environmental Impact Statement (FEIS)*. Agnico Eagle. June 2016.

Table 5-1. Critical Flaw Assessment

Alternative	Screening Criteria			
	Would the design, construction, operation, or closure of the attenuation pond introduce material engineering and/or safety risks?	Would the attenuation pond sterilize ore, or areas of known or high potential mineralization?	Would the attenuation pond overlap with lands or waters designated as having high environmental, cultural, and/or archeological value?	Would construction, operation, or closure of the attenuation pond render the Whale Tail Pit Project economically infeasible?
A. Expand existing Whale Tail Attenuation Pond (adjust Whale Tail Dike)	No	No	No	Yes – the cost of constructing another dike across Whale Tail Lake would render the project economically infeasible
B. Expand existing Whale Tail Attenuation Pond (northern containment feature)	No	No	No	No
E. New attenuation pond at Lake A53	No	No	No	No
F. New attenuation pond at Lake A54	No	No	No	No
G. New attenuation pond at Mammoth Lake	No	No	No	No
H. New attenuation pond at Lake A53 *and* expand existing Whale Tail Attenuation Pond	No	No	No	No

6. CHARACTERIZATION OF ALTERNATIVES (STEP 3)

6.1 OBJECTIVE

This step characterizes the remaining alternatives to prepare for the MAA, which compares the alternatives at a detailed level and ensures that the necessary information is available to support this comparison.

6.2 NOMENCLATURE

At this stage, the remaining alternatives are developed in further detail. To support a clear and concise comparison of the remaining alternatives. Table 6-1 provides revised nomenclature for each alternative.

Table 6-1. Naming of Remaining Alternatives

No.	Name	Former Name	Description
I.	**A53**	Alternative E: New attenuation pond at Lake A53	Storage provided by the existing Whale Tail Attenuation Pond and a new pond at Lake A53.
II.	**A53/WT-Ex**	Alternative H: New attenuation pond at Lake A53 and expand existing Whale Tail Attenuation Pond	Storage provided by an expanded Whale Tail Attenuation Pond and a new pond at Lake A53.
III.	**A54**	Alternative F: New attenuation pond at Lake A54	Storage provided by the existing Whale Tail Attenuation Pond and a new pond at Lake A54.
IV.	**MAM**	Alternative G: New attenuation pond at Mammoth Lake	Storage provided by the existing Whale Tail Attenuation Pond and a new pond created by isolating the northern section of Mammoth Lake.
V.	**WT-Ex**	Alternative B: Expansion of existing Whale Tail Attenuation Pond (northern containment feature)	Storage provided by expanding the existing Whale Tail Attenuation Pond.

6.3 APPROACH

Based on the ECCC Guidelines, characterization is conducted for the following four categories (referred to as "accounts"):

- **Technical Account**, including considerations relating to design, engineering, construction, operation and closure;
- **Biophysical Environment Account**, including valued components of the physical and biological environment;

- **Human Environment Account**, including valued components related to socio-economic, land use, and community and Inuit well-being; and
- **Project Economics Account**, including project costs relating to the design, construction, operation, and closure of the attenuation pond alternatives.

The five remaining alternatives are described and characterized for each of the four accounts, based on the available baseline data and/or design information, in Section 6.5. As noted previously and illustrated in Figure 6-1, Agnico Eagle has also looked to traditional knowledge and IQ to inform the characterization of the biophysical environment and human environment. Within the four accounts, Section 6.6 identifies and describes specific criteria that characterize each of the alternatives.

Agnico Eagle included the attenuation pond alternatives in consultation activities in Baker Lake and Chesterfield Inlet in July 2018. At this time, four of the five remaining alternatives were presented,[27] along with an explanation of the alternatives assessment process and how inputs from the communities would be incorporated into the assessment. The outcomes of these consultations are summarized in Section 6.5.5.

6.4 SCOPE

The characterization of the alternatives assumes that the following water management processes will apply:

- an identical volume and quality of contact water will be stored in the winter for each of the alternatives, and the sources of the contact water will be the same;
- the existing Whale Tail Attenuation Pond will continue to be utilized, either at its design capacity of 133,232 m^3, or enlarged (depending on the alternative); and
- contact water will be transported from the attenuation pond to the water treatment plant (as for the approved project) and treated water will be discharged via the discharge pipeline and diffuser to Whale Tail Lake (South Basin) for all alternatives.

As these processes apply to all alternatives, the conceptual design and technical characterization of the alternatives is limited to (1) the storage of water in the attenuation pond(s), and (2) the transport of contact water to and from the attenuation pond (from source to attenuation pond, and from attenuation pond to water treatment plant).

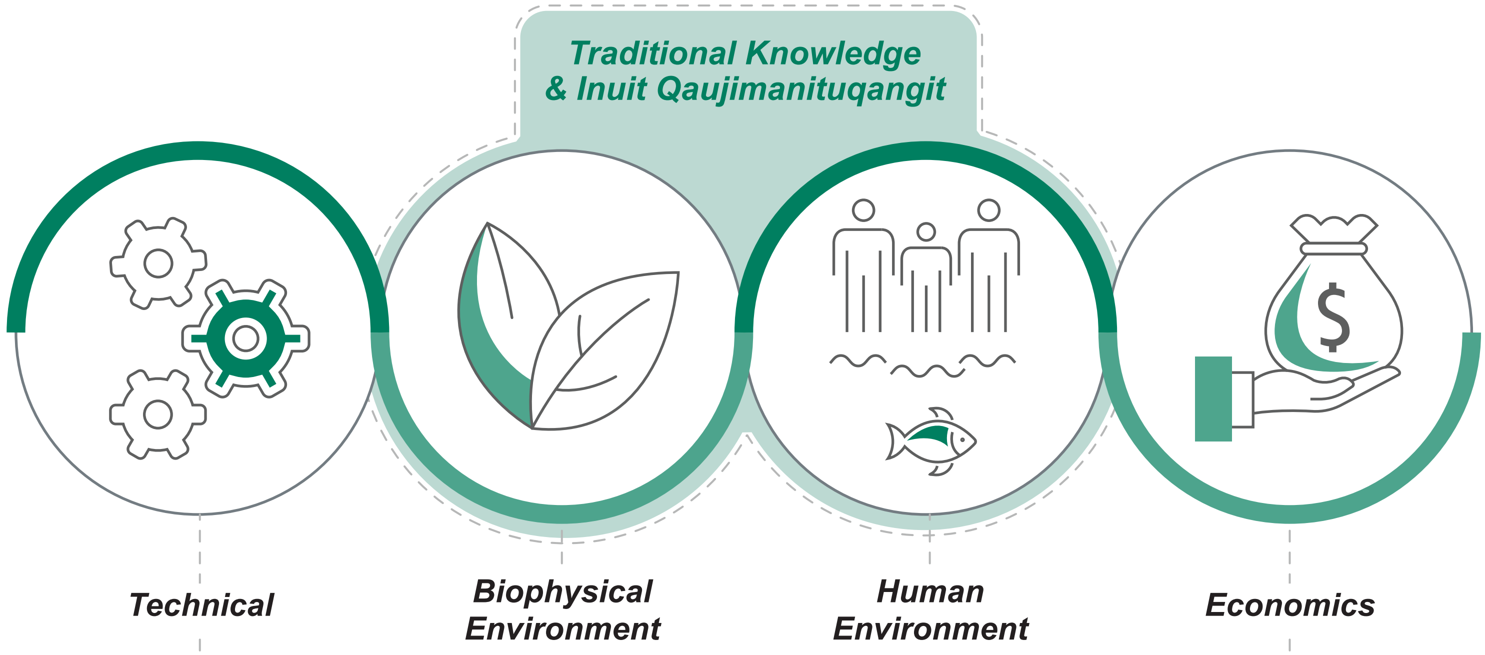
6.5 CHARACTERIZATION OF ALTERNATIVES

The five remaining alternatives are summarized in Table 6-2, and design concepts are illustrated in Figure 6-2 through Figure 6-6.

[27] Alternative II (A53/WT-Ex) was developed as a possible optimization of Alternative I (A53) following consultations in July 2018. Although this alternative was not included in the July 2018 consultations, both components (use of Lake A53 and expansion of the Whale Tail Attenuation Pond) were addressed.

Figure 6-1

Incorporation of Traditional Knowledge and IQ in Characterization of Alternatives



Technical	Biophysical Environment	Human Environment	Economics
Pond design	Climate	Archaeology	Capital costs
Containment infrastructure	Terrain	Cultural heritage	Operating (sustaining) costs
Pipelines	Groundwater	Land use	Closure and post-closure costs.
Roads	Surface water	Communities	
Power	Fish	Economy	
Complexity	Vegetation		
	Wildlife		

Table 6-2. Attenuation Pond Alternatives: Design Concept

Alternative	Description	Fish-Bearing
I. A53	• Three (3) dams would be constructed at Lake A53 to enlarge the existing waterbody to a maximum storage capacity of 646,638 m^3. One dam would cross the southwest channel (formerly connecting Lake A53 to the North Basin of Mammoth Lake). Smaller dams would be constructed at the northwest and southeast sections of the lake. • The existing Whale Tail Attenuation Pond would be utilized as currently designed, with a maximum storage capacity of 133,232 m^3.	Yes
II. A53/WT-Ex	• Two (2) dams would be constructed at Lake A53 to enlarge the existing waterbody to store a maximum volume of 473,300 m^3. • One dam would be constructed at the Whale Tail Attenuation pond to enlarge this pond to a maximum storage capacity of 288,666 m^3.	Yes
III. A54	• Two (2) dams would be constructed at Lake A54 to enlarge the surface area of the existing waterbody by approximately 2,000%, to a maximum storage capacity of 622,040 m^3. The primary dam would be U-shaped, containing the waterbody on the east, west, and south sides. The pond would abut the east side of the IVR WRSF. • The existing Whale Tail Attenuation Pond would be utilized as currently designed, with a maximum storage capacity of 133,232 m^3.	No
IV. MAM	• One (1) dam would be constructed across the northwest arm of Mammoth Lake. The northwest section of the lake would be isolated from the rest of the lake for use as the attenuation pond, with a maximum storage capacity of 762,942 m^3. • The existing Whale Tail Attenuation Pond would be utilized as currently designed, with a maximum storage capacity of 133,232 m^3.	Yes
V. WT-Ex	• One (1) dam would be constructed adjacent to the south wall of the Whale Tail Pit (set back by 85 m) to enlarge the Whale Tail Attenuation Pond, with a maximum storage capacity of 758,870 m^3.	No

At this stage, each standalone design concept would provide the required capacity of at least 750,000 m^3. The following sections describe the five remaining alternatives in terms of their technical, biophysical, human, and project economic aspects. As recommended in the ECCC Guidelines, two of the alternatives would not impact natural fish-bearing waterbodies.

6.5.1 Technical Account

Table 6-3 summarizes the basic design and technical elements of each alternative. A brief description of each alternative is provided below.

<u>Alternative I: A53</u>

Alternative I, locating the attenuation pond at Lake A53, is the base case design for the Whale Tail Pit Expansion Project. The design and operation of this alternative is the closest to that which is presented in the current expansion plans.

Figure 6-2
Attenuation Pond Alternative I: A53

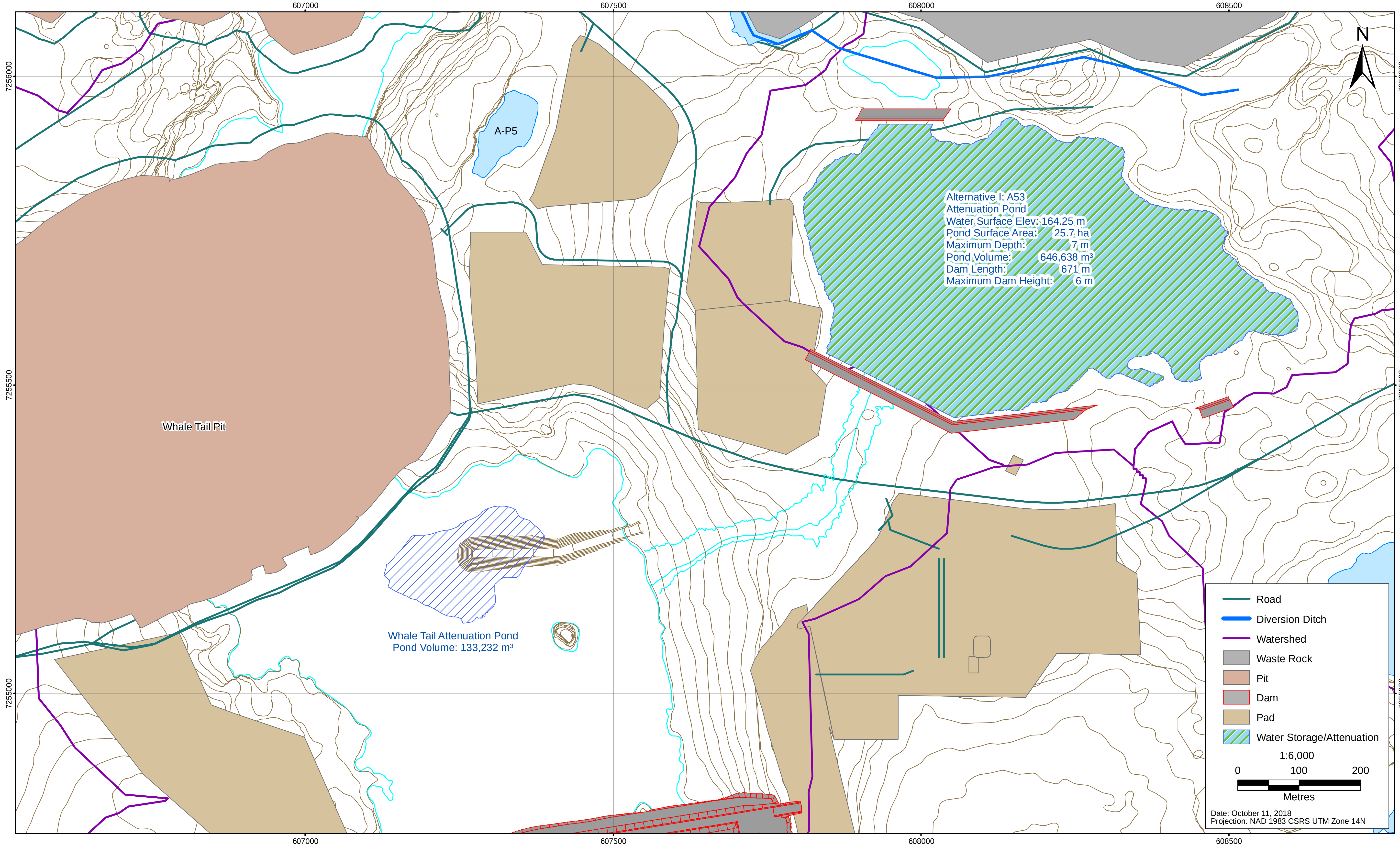


Figure 6-3
Attenuation Pond Alternative II: A53/WT-Ex

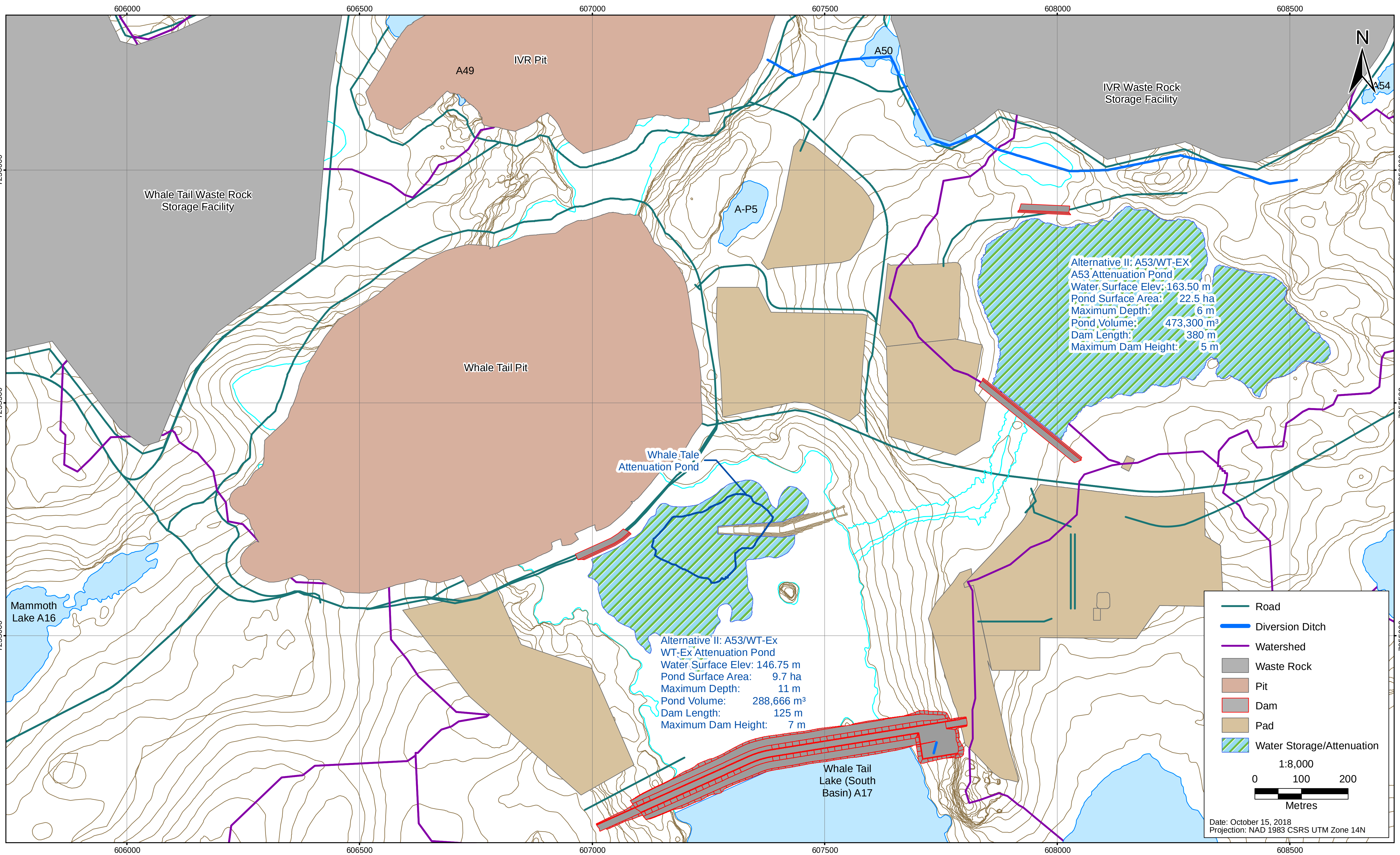


Figure 6-4
Attenuation Pond Alternative III: A54

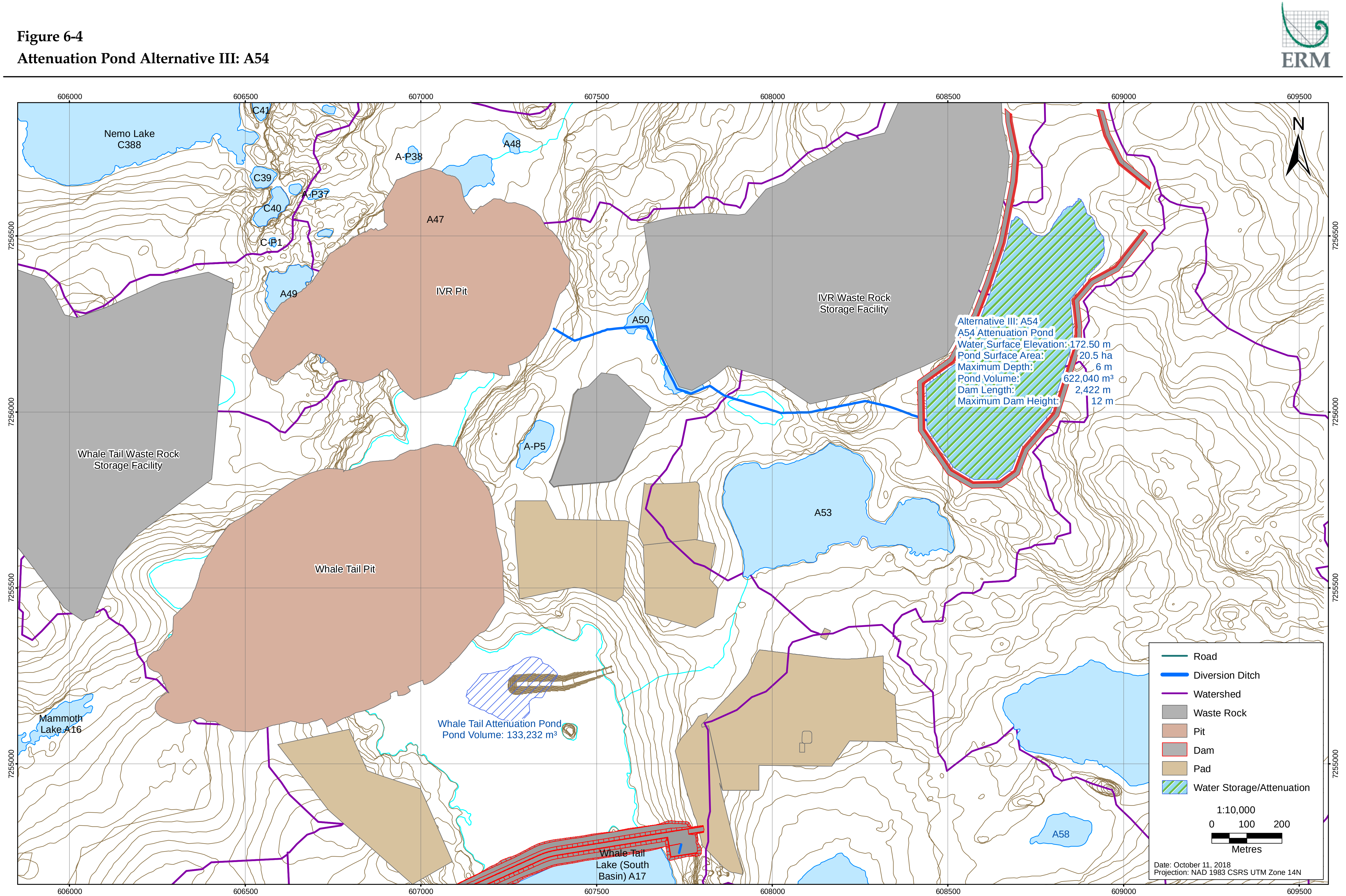


Figure 6-5
Attenuation Pond Alternative IV: MAM

ERM

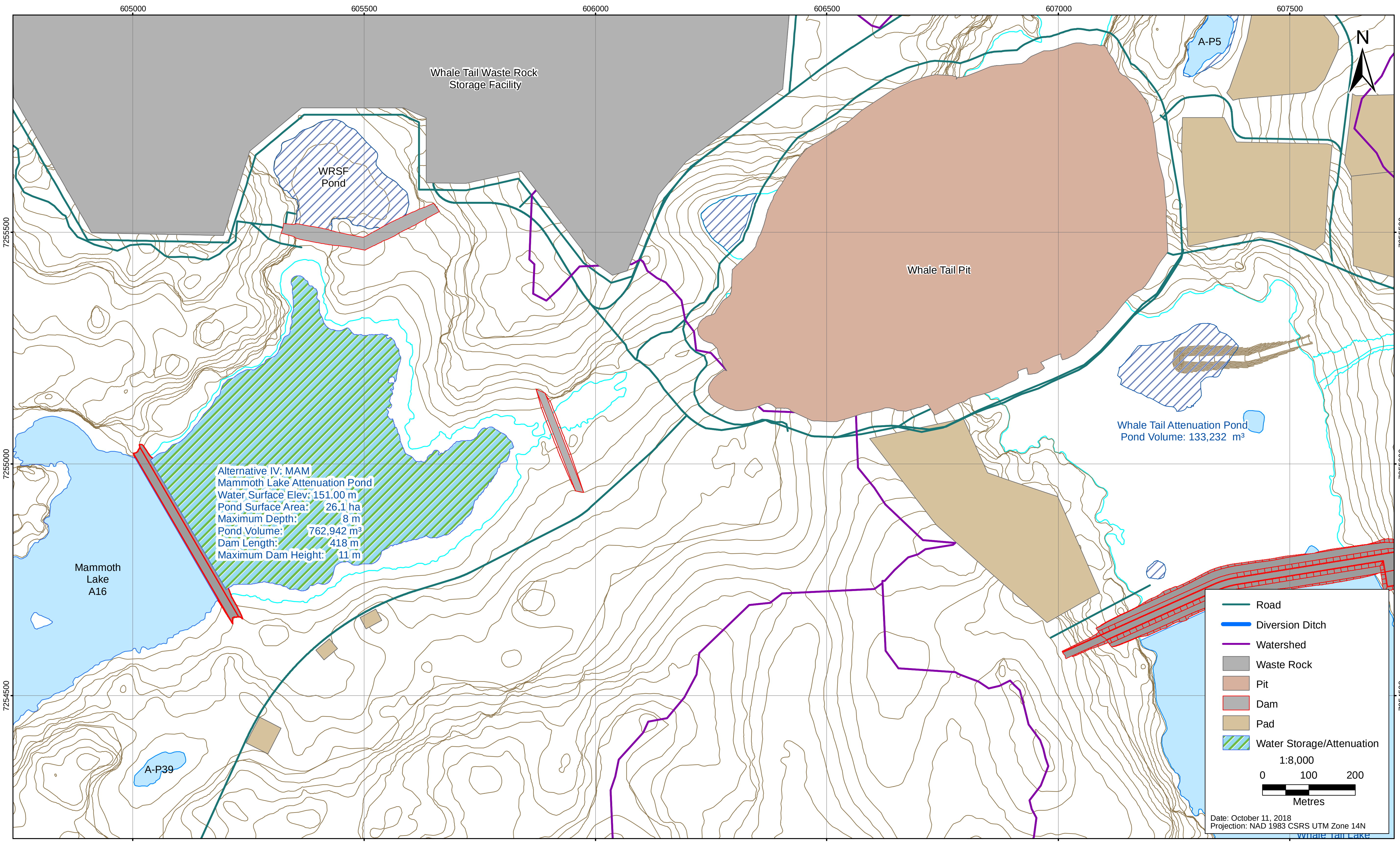


Figure 6-6

Attenuation Pond Alternative V: WT-Ex

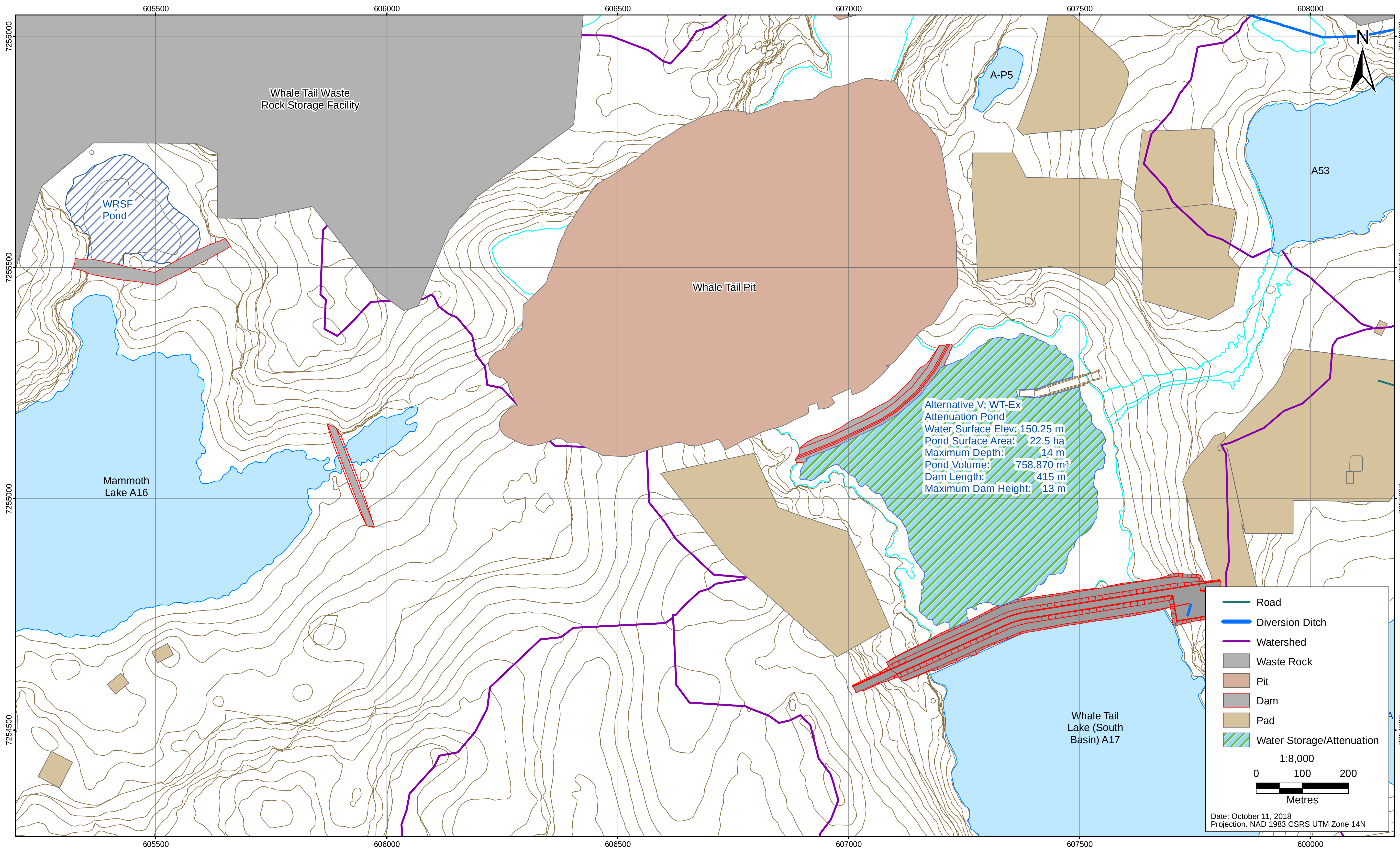


Table 6-3. Technical Account Comparison of Alternatives

	I. A53	II. A53/WT-Ex	III. A54	IV. MAM	V. WT-Ex
Attenuation Pond Characteristics					
Maximum storage capacity[1]	646,638 m^3	473,300 m^3 (A53) 288,666 m^3 (WT-Ex)	622,040 m^3	762,942 m^3	758,870 m^3
Maximum water depth	7 m	6 m (A53) 11 m (WT-EX)	6 m	8 m	14 m
Water surface elevation	164.25	163.50 masl (A53) 146.75 masl (WT-Ex)	172.50 masl	151.00 masl	150.25 masl
Water surface area	25.7 ha	22.5 ha (A53) 9.7 ha (WT-EX)	20.5 ha	26.1 ha	22.5 ha
Catchment area	2.9 km^2	4.1 km^2	0.4 km^2	2.7 km^2	2.9 km^2
Containment Characteristics					
Number of dams	3	2 (A53) / 1 (WT-Ex)	2	1	1
Total dam length	671 m	380 m (A53) 125 m (WT-Ex)	2,422 m	418 m	415 m
Dam height (max.)	6 m	5 m (A53) 7 m (WT-Ex)	12 m	11 m	13 m
Elevation at top of dam[2]	165.25 masl	164.50 masl (A53) 149.75 masl (WT-Ex)	175.50 masl	154.00 masl	153.25 masl
Freeboard	1.0 m	1.0 m (A53) 3.0 m (WT-Ex)	3.0 m	3.0 m	3.0 m
Typical dam top width	18.8 m	18.8 m	18.8 m	18.8 m	18.8 m
Estimated dam fill quantity[3]	29,423 m^3	14,495 m^3 (A53) 10,789 m^3 (WT-Ex)	322,029 m^3	80,144 m^3	97,646 m^3
Dam foundation conditions	On land	On land (A53) Lake bed (WT-Ex)	On land	Lake bed	Lake bed

	I. A53	II. A53/WT-Ex	III. A54	IV. MAM	V. WT-Ex
Ancillary Infrastructure					
Length of pipeline transporting contact water from source to attenuation pond	8,221 m	8,221 m	13,164 m	12,416 m	5,388 m
Length of pipeline from attenuation pond to water treatment plant	411 m	411 m	1,943 m	2,497 m	398 m
Overall length of pipeline (estimated)	10,642 m	10,642 m	17,117 m	18,669 m	7,796 m
Cumulative elevation head differential between contact water sources and attenuation pond	461 m	457 m	511 m	382 m	377 m
Other					
Availability of required construction material	IVR Pit and Mammoth Pit	IVR Pit and Mammoth Pit	IVR Pit and Mammoth Pit	IVR Pit and Mammoth Pit	IVR Pit and Mammoth Pit

Notes:

[1] *All alternatives include use of the existing Whale Tail Attenuation Pond at a volume of 133,232 m*^{3} *unless otherwise specified.*

[2] *Elevation at the top of dam assumes 3 m of freeboard.*

[3] *Conceptual estimate only. Fill quantity does not account for dam fill side slopes; actual dam fill quantity will be greater.*

Alternative I would require three frozen core dams to be constructed to the north and south of the pond. The largest of the dams would be 6 m high and approximately 500 m long. The foundation of the dams is expected to be competent and frozen. The water level[28] would be raised from 162 masl to 164 masl, increasing the surface area of the lake from 10 ha to 26 ha; and the volume of the waterbody would increase from approximately 140,000 to 646,638 m^3. In addition, 133,232 m^3 of capacity would be provided by the Whale Tail Attenuation Pond.

Lake A53 is situated within the site layout of the Whale Tail Pit Expansion Project, with the IVR WRSF located to the north; the haul road, mine camp and industrial area to the south; and the Whale Tail and IVR open pits to the west. Thus, the lake is surrounded on three sides by mine infrastructure. Lake A53 is a fish-bearing waterbody. Therefore, fish would need to be removed prior to construction of the attenuation pond.

Alternative I would require no additional surface water management infrastructure as the design relies on natural drainage to convey water from the IVR WRSF to the attenuation pond. Seepage from the attenuation pond at A53 would be directed to the Whale Tail Attenuation Pond; no new infrastructure would be required. Compared to the approved Whale Tail Pit Project, there would be a reduction in the volume of water inflow to the Whale Tail Pit.

<u>Alternative II: A53/WT-Ex</u>

Alternative II would result in a smaller increase in the size of Lake A53 (compared to Alternative I), complemented by an increase in the planned capacity of the Whale Tail Attenuation Pond.

At Lake A53, two frozen core dams would be constructed to the north and south of the pond. The largest of the dams would be approximately 5 m high and 280 m long. The foundation of the dams is expected to be competent and frozen. The water level would be raised from 162 masl to 163.5 masl, increasing the surface area of the lake from 10 ha to 22.5 ha; and the volume of the waterbody would increase from approximately 140,000 to 473,300 m^3.

Alongside development of the attenuation pond at Lake A53, the capacity of the Whale Tail Attenuation Pond would be increased to 288,666 m^3. This would require construction of a 7 m high, 125 m long dam at the north end of the pond. This concrete secant pile dam, with grouting, would be set back 85 m from the south wall of the Whale Tail Pit. The foundation provided by the drained lake bed (i.e., Whale Tail Lake [North Basin]) is expected to be unfrozen and highly fractured.

Lake A53 is situated within the site layout of the proposed Whale Tail Pit Expansion Project, as described for Alternative I. Lake A53 is a fish-bearing waterbody, and fish would need to be removed prior to construction of the attenuation pond.

Alternative II would require no additional surface water management infrastructure as the design relies on natural drainage to convey water from the IVR WRSF to the attenuation pond. Seepage from the attenuation pond at A53 would be directed to the Whale Tail Attenuation Pond; no new infrastructure

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[28] *2015 Hydrology Baseline Report*. January 2016. Included as Appendix 6-C of the Whale Tail Pit Project: Final Environmental Impact Statement (FEIS).

would be required. Compared to the approved Whale Tail Pit Project, there would be increased volume of water inflow to the Whale Tail Pit due to increased hydraulic head created by the expanded Whale Tail Attenuation Pond, and additional in-pit pumping would be required to manage this inflow.

Alternative III: A54

Alternative III involves the use of Lake A54 as the attenuation pond and would require construction of a large, U-shaped dam around the east, south, and west sides of the pond, plus a smaller dam to the north of the pond. The water level would be raised from 167 masl to 172.5 masl, increasing the surface area from approximately 1 ha to 20.5 ha. The volume of the waterbody would increase from 4,040 to 622,040 m^3. In addition, 133,232 m^3 of storage capacity would be provided by the Whale Tail Attenuation Pond.

Alternative III would require two high-volume frozen core dams to be constructed, almost fully enclosing the attenuation pond. The largest of the dams would be 12 m high and approximately 2,040 m long. The foundation of the dams is assumed to be competent and frozen. The attenuation pond would abut the IVR WRSF for approximately 750 m along the northwestern edge of the pond.

Lake A54 is a natural waterbody that is not fish-bearing. The lake is located on the eastern edge of the mine site, adjacent to the IVR WRSF.

Alternative III would require additional surface water management infrastructure to convey contact water from the IVR WRSF to the attenuation pond (approximately 1 km distance). This would likely be accomplished through large excavation of a channel, and pumping would be required. Similarly, seepage from the large dam A54 would need to be collected. Compared to the approved Whale Tail Pit Project, there would be a reduction in the volume of water inflow to the Whale Tail Pit.

Alternative IV: MAM

Alternative IV involves construction of a dam across the northeastern arm of Mammoth Lake so that the area north of the dam can be isolated for use as an attenuation pond. The attenuation pond would be built within the natural high water line. The water level would be roughly maintained at 152 masl, with a surface area of 26 ha and pond volume of 762,942 m^3. In addition, 133,232 m^3 of capacity would be provided by the Whale Tail Attenuation Pond.

A linear, concrete secant pile dam (no grouting) would be constructed across the lake, with a length of 418 m and maximum height of 11 m. The dam placement would be located to minimize the distance and volume of required material by taking advantage of the lake's contours and bathymetry. Foundation conditions on the lake bed are expected to be unfrozen and uncertain.

Mammoth Lake is a fish-bearing lake. Therefore, fish would need to be removed from the north section of the lake prior establishing the lake as an attenuation pond for mine contact water.

Alternative IV would require additional surface water management infrastructure, including an approximately 1.5 km bermed road designed to redirect non-contact water away from the attenuation pond. Seepage collection infrastructure would be required around the dam. Compared to the approved Whale Tail Pit Project, there would be a reduction in the volume of water inflow to the Whale Tail Pit.

Alternative V: WT-Ex

Alternative V involves enlarging the Whale Tail Attenuation Pond, which would require construction of a dam at the north end of the Whale Tail Attenuation Pond (i.e., between the pond and the south wall of the Whale Tail Pit). The Whale Tail Attenuation Pond is a man-made waterbody used for storage of mine contact water.

A 13 m high and 415 m long dam would contain the water on the north side of the pond, with an 85 m setback from the south wall of the pit. The dam would be constructed on the unfrozen lake bed (previously drained for the approved Whale Tail Pit Project), and foundation conditions are expected to be highly fractured. The structure would be very complex construction of concrete secant pile with grouting.

A large area of the North Basin would be flooded, raising the water level from 144 masl (for the Whale Tail Attenuation Pond as currently designed) to 150 masl. The volume of the pond would increase from 133,232 to 758,870 m^3. The increased volume of water at the surface is expected to increase the hydraulic gradient and significantly increase groundwater infiltration to the Whale Tail Pit.

Alternative V would require no additional surface water management infrastructure as the design relies on natural drainage to convey water from the IVR WRSF to the attenuation pond. However, compared to the approved Whale Tail Pit Project, there would be a significant increase in the volume of water inflow to the Whale Tail Pit due to increased hydraulic head at the Whale Tail Attenuation Pond.

6.5.2 Biophysical Environment Account

Alternative I: A53

Lake A53 is a natural, fish-bearing waterbody with a mean depth of 1.3 m and maximum depth of 3.8 m.[29] Lake A53 currently discharges to Whale Tail Lake (North Basin). After dewatering, outflow from Lake A53 would be diverted to the South Basin. The existing outlet channel is well-defined and vegetated (grasses) with a high width to depth ratio. The outlet bed comprises cobbles, silt, sand, and organics, while the bank of the outlet comprises grass, sand, silt, and organics.[30]

Lake A53 is connected to two other waterbodies: upstream to Lake A54 and downstream to Whale Tail Lake (Lake A17). The stream connecting Whale Tail Lake and Lake A53 (Stream A53-A17) is 577 m long, and has surface flow (i.e., is passable by fish) during the open water season. The stream connecting Lake A54 and Lake A53 (Stream A54-A53) is of similar length but it is characterized by interstitial flow through boulder and cobbles. It is not passable by fish.

Baseline sampling conducted in 2015, 2016 and 2018 determined that the waterbody supports the following fish species: Arctic char; ninespine stickleback; lake trout, and burbot. The Arctic char and lake trout captured were juveniles only, and in low abundance. In 2018, sampling of the shoreline of A53

[29] *Bathymetry Baseline Report*. 2015. Included as Appendix 6-M of the Whale Tail Pit Project: Final Environmental Impact Statement (FEIS).

[30] *2015 Hydrology Baseline Report*. January 2016. Included as Appendix 6-C of the Whale Tail Pit Project: Final Environmental Impact Statement (FEIS).

found slimy sculpin and one juvenile burbot. Under-ice water quality (field parameters) were taken in 2018 and found that water was not frozen to the bottom, and that dissolved oxygen was sufficient to support aquatic life. The waterbody may therefore support juvenile rearing throughout the year.

The terrain surrounding Lake A53 comprises morainal/till surficial material.[31] The summary for the Whale Tail Pit Project study area provided in Section 3.2 outlines the terrestrial environment surrounding Lake A53. This alternative would not affect rare plant species or habitat types, and it is not located near caribou calving grounds or other areas known to be important for caribou.

With the proposed Whale Tail Pit Expansion Project, Lake A53 would be surrounded by the mine site on the north, west, and south sides. Adjacent infrastructure would include various roads and surface infrastructure, the IVR WRSF (north), Whale Tail open pit (west), and the Whale Tail Camp (south).

Alternative II: A53/WT-Ex

The biophysical environment baseline description provided for Alternative I also applies to this alternative in regard to the environment of Lake A53.

Alternative III: A54

Site-specific biophysical data for Lake A54 is limited. The waterbody is isolated, approximately 500 m northeast of its nearest neighbour (Lake A53). Hydrological studies assume that the pond freezes to the bottom in the winter. During baseline sampling in 2015 and 2016, no fish were caught in A54 (C. Portt & Associates 2018). The dominant substrate is boulder, and the flow characteristics are interstitial, with no defined channel visible.

The terrain surrounding Lake A54 comprises morainal/till surficial material[32]. The summary for the Amaruq property provided in Section 3.2 applies to Lake A54. This alternative would not affect rare plant species or habitat types, and is not located near caribou calving grounds or other areas known to be important for caribou.

With the proposed Whale Tail Pit Expansion Project, Lake A54 would be adjacent to the eastern edge of the IVR WRSF.

Alternative IV: MAM

Mammoth Lake is a large fish-bearing lake southwest of the mine site. It has a mean depth of 3.9 m, and a maximum depth of 17.2 m. The lake outlet is at the southwest corner of the lake where the water flows to Lake A15. The lake was previously fed by the North Basin of Whale Tail Lake; however, construction of the Whale Tail Dike will remove this inflow and raise the water level of the South Basin so that Whale Tail Lake will drain into Mammoth Lake via the South Whale Tail diversion channel.

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[31] *Terrain, Permafrost and Soils Baseline Report*. May 2016. Included as Appendix 5-A of the Whale Tail Pit Project: Final Environmental Impact Statement (FEIS).

[32] *Terrain, Permafrost and Soils Baseline Report*. May 2016. Included as Appendix 5-A of the Whale Tail Pit Project: Final Environmental Impact Statement (FEIS).

The outlet channel of Mammoth Lake is a poorly defined channel, approximately 45 m wide and comprising large boulders. Water flows through or under the boulders. The bank is made up of large boulders and cobbles, and vegetation (grasses) is very limited.[33]

Mammoth Lake supports all six species that are found in the WhaleTail Pit Project area: four large-bodied fish (lake trout, Arctic char, round whitefish, burbot); and two small-bodied fish: slimy sculpin, and ninespine stickleback.

As outlined in the approved Whale Tail Pit Project Fish Habitat Offsetting Plan (C. Portt 2018), small habitat changes will occur in Mammoth Lake during operations of the approved Whale Tail Pit Project as a result of diking and dewatering. Fish habitat losses from the Project will be offset by installing a sill in the connection between Mammoth Lake and Whale Tail Lake, which will increase elevation and create new habitat through flooding of terrestrial areas around the periphery of Whale Tail Lake, the connecting channel between Whale Tail Lake and Mammoth Lake, as well as around the portion of Mammoth Lake that is east of the sill.

The terrain surrounding Mammoth Lake comprises morainal/till surficial material.[34] The rocky shoreline of Mammoth Lake has lower densities of waterfowl and other wildlife, compared to some of the surrounding lakes. This alternative would not affect rare species or habitat types, and is not located near caribou calving grounds or other areas known to be important for caribou.

With the proposed Whale Tail Pit Expansion Project, Mammoth Lake would continue to be the receiving environment for the discharge of treated contact water. The northern section of Mammoth Lake is located south of the expanded Whale Tail WRSF and the WRSF Pond, and west of the Whale Tail Pit.

<u>Alternative V: WT-Ex</u>

The Whale Tail Attenuation Pond is a man-made contact water collection pond designed and constructed as part of the approved Whale Tail Pit Project. This pond is enclosed by mine infrastructure (including the Whale Tail Pit and Whale Tail Dike), and has no natural hydrological, fisheries, or aquatic values.

The baseline for this alternatives assessment assumes that the approved project is fully constructed in accordance with Figure 2-3, the expanded footprint is within the area of mine disturbance. This alternative would not affect rare species or habitat types, and is not located near caribou calving grounds or other areas known to be important for caribou.

6.5.3 Human Environment Account

In terms of the human environment—including socio-economics, land and resource use, and cultural heritage—the four alternatives do not differ substantially. The amount of labour required during construction may vary depending on the size and complexity of structure(s) to be constructed, but as

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[33] *2015 Hydrology Baseline Report*. January 2016. Included as Appendix 6-C of the Whale Tail Pit Project: Final Environmental Impact Statement (FEIS).
[34] *Terrain, Permafrost and Soils Baseline Report*. May 2016. Included as Appendix 5-A of the Whale Tail Pit Project: Final Environmental Impact Statement (FEIS).

these jobs would be short-term they are not considered to be a material factor. Potential employment during operations is assumed to be the same for all alternatives as the same quantity and quality of water will be managed regardless of the location of the attenuation pond. As socio-economic factors do not differentiate the alternatives, the following sections highlight any site-specific information about land and resource use and/or cultural heritage resources.

The IQ baseline study[35] compiled for the Whale Tail Pit Project provides general information about the area, including:

- Lake trout and Arctic char are the preferred fish species harvested for food, and these species can be found in several lakes in vicinity of the Whale Tail Pit Project.
- Although fish are found throughout the region, the lakes near Whale Tail Pit are not commonly fished as there are other preferred lakes.

Information about land use and cultural heritage resources was also informed by consultation with community members and Elders in Baker Lake and Chesterfield Inlet (as described in Section 6.5.5) as well as IQ and traditional land use information presented in the FEIS.

Alternative I: A53

Traditional use of the area between Baker Lake and Back River is known to encompass hunting, fishing, and other harvests, as well as travel routes, all of which have importance for Inuit well-being and IQ. The area around Lake A53 is included in this regional understanding, although no specific sites or activities are identified in relation to this waterbody.

Lake A53 is a fish-bearing waterbody, and supports Arctic char and lake trout; the lake could therefore be fished. However, based on available IQ and consultation outcomes, the lake does not appear to be distinguished from the many other small lakes and ponds that are prevalent throughout the landscape, and fishing from this lake is believed to be unlikely. Information from Elders and residents of Baker Lake (Section 6.5.5) and IQ reports indicate that Lake A53 and other small lakes are not likely destinations for fishing or harvesting as there are many other preferred lakes in the region.

Alternative II: A53/WT-Ex

The baseline description provided for Alternative I, regarding the use of Lake A53, also applies to this alternative.

Alternative III: A54

Traditional use of the area between Baker Lake and Back River is known to encompass hunting, fishing, and other harvests, as well as travel routes, all of which have importance for Inuit well-being and IQ. The area around Lake A54 is included in this regional understanding, although no specific sites or activities are identified.

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[35] *Inuit Qaujimajatuqangit Baseline Report*. June 2016. Included as Appendix 7-A of the Whale Tail Pit Project: Final Environmental Impact Statement (FEIS).

As Lake A54 is naturally non-fish-bearing, there is no fishing activity at this lake. Based on available IQ and consultation outcomes, the lake does not appear to be distinguished from the many other small lakes and ponds that are prevalent throughout the landscape.

Alternative IV: MAM

Traditional use of the area between Baker Lake and Back River is known to encompass hunting, fishing, and other harvests, as well as travel routes, all of which have importance for Inuit well-being and IQ. The area around the Mammoth Lake is included in this regional understanding, although no specific sites or activities are identified in relation to this waterbody.

Mammoth is a moderately sized fish-bearing lake containing lake trout, Arctic char, round whitefish, and burbot. Based on available IQ and consultation outcomes, no fishing activity has been reported, and the lake does not appear to be distinguished from the many other lakes and ponds that are prevalent throughout the landscape. Fishing from this lake may occur opportunistically but is believed to be unlikely as there are other preferred lakes.

Alternative V: WT-Ex

A grave site has been identified on the east shore of Whale Tail Lake, more than 1.5 km south of the existing Whale Tail Attenuation Pond. The Whale Tail Attenuation Pond comprises man-made infrastructure within the mine site, and no other archaeological or historic resources have been identified[36].

Traditional use of the area between Baker Lake and Back River is known to encompass hunting, fishing, and other harvests, as well as travel routes, all of which have importance for Inuit well-being and IQ. The areas around the Whale Tail Pit Project (including WRSF Pond and Whale Tail Attenuation Pond) are included in this regional understanding, although no specific sites or activities are identified.

6.5.4 Project Economics Account

Capital costs for the development of the attenuation pond are based on costs associated with comparable infrastructure for the Whale Tail Pit Project, estimated at $0.7 million per 100 m of frozen core dam, and $3.6 million per 100 m of secant pile dam. Based on these assumptions, the estimated capital costs are summarized in Table 6-4.

Other costs associated with the attenuation pond are estimated qualitatively, relative to each other to costs for the approved Whale Tail Pit Project.

[36] As these and other facilities at the mine site are constructed, and ongoing exploration is underway, Agnico Eagle is committed to avoiding archaeological sites in this area. If known or suspected archaeological sites are identified, acceptable mitigation measures will be formulated in consultation with Agnico Eagle, their archaeological consultants, the Department of Culture and Heritage (Government of Nunavut [GN]), and the community of Baker Lake (specifically elders and the HTO Members).

Table 6-4. Estimated Capital Costs

Alternative	Dam Type	Length	Total Estimated Cost
I. A53	Frozen core	671 m	$4.7 million
II. A53/WT-Ex	Frozen core Secant pile	380 m 125 m	$7.2 million
III. A54	Frozen core	2,422 m	$17.0 million
IV. MAM	Secant pile	418 m	$15.0 million
V. WT-Ex	Secant pile	415 m	$14.9 million

Expected fish offsetting costs would vary between the alternatives based on the extent of fish habitat loss. Alternatives I and II would result in loss of Lake A53 as a fish-bearing waterbody, requiring compensation for the loss of 14 ha of fish habitat. Alternative IV would require a larger compensation for nearly double this area to compensate for the loss of 26 ha of fish habitat. Alternatives III and V would not affect fish-bearing waterbodies and therefore no fish habitat offsetting costs would be incurred.

Operating costs that differentiate the alternatives include the need for additional pumping and monitoring. Alternatives II and V, each of which would expand the Whale Tail Attenuation Pond, are expected to incur the highest operating costs due to the need for pumping to address a significant increase in seepage to Whale Tail Pit, along with high monitoring costs. Alternative III has the longest dam (over 2 km) and would therefore require a larger monitoring effort and associated cost.

Closure cost estimates assume that the closure concept for the approved Whale Tail Pit Project will be applied to the Whale Tail Pit Expansion Project; this assumes that accumulated solids in the Whale Tail Attenuation Pond would not require additional mitigation at closure. Alternatives I and II would entail a relatively small incremental cost (less than 10% of total closure costs) for the closure of Lake A53 and connection with the reclaimed Whale Tail/Mammoth Lake watershed. Alternative III has the largest dam and would require extensive reclamation of this feature to ensure positive drainage and to divert water flows from the IVR WRSF to avoid Lake A53; the incremental cost increase would be high (more than 20% of total closure costs). Alternatives IV and V are expected to have a moderate incremental cost increase to address the need to breach dams on incompetent ground.

Post-closure costs estimates consider the need for long-term water management and monitoring. Alternatives IV and V would effectively form part of the reclaimed Whale Tail/Mammoth Lake watershed after closure; no active water management is expected although monitoring may be required for up to 10 years. Closure of the A53 portions of alternatives I and II may require active water treatment for up to 10 years. Alternative III has the highest expected post-closure cost as a drainage system will need to be maintained to divert contact water from the IVR WRSF, and active water treatment may be required for up to 20 years.

6.5.5 Consultation on Attenuation Pond Alternatives

Agnico Eagle presented Alternatives I, III, IV, and V to the communities of Baker Lake and Chesterfield Inlet in July 2018, as described in Section 1.4. There were diverse opinions about the benefits and drawbacks of each attenuation pond alternative,[37] as follows:

- Alternative III (Lake A54) involves a large containment dam. Some people expressed concern that this would be a significant obstruction in the landscape due to the enlarged lake and a 10 m-high dam, which could interfere with caribou migration and the movements of other wildlife.
- Elders and community members generally agreed that the attenuation pond should avoid impacting fish and fish habitat if possible. Three of the alternatives (Alternatives I, II and IV) would result in loss of fish habitat and would require fish to be relocated prior to construction.
- Elders generally did not support relocating fish (which would be required for Alternatives I, II and IV), and indicated that moving a fish from one waterbody to another would change the fundamental nature (i.e., being or spirit) as well as the taste of the fish. They were also concerned that it would be hard to capture all fish, as they can hide to avoid being caught.
- Using an area already affected by the mine (i.e., Alternative V) was generally viewed as favourable as it would avoid impacts on other waterbodies, whether they are fish-bearing or not.
- Alternative IV (Mammoth Lake) was generally viewed as unfavourable as it would impact a large, fish-bearing lake. However, some people also identified a benefit in that this lake is at the lowest elevation compared to the other alternatives, so it might be easier to contain the water compared to the alternatives at higher elevations.

Many of the participants (especially Elders) were familiar with the Whale Tail Pit Project site in general, as it is in the region between Baker Lake and the Back River and hamlet of Gjoa Haven. Inuit from Baker Lake have traditionally travelled to Back River and Gjoa Haven in the winter for hunting and to visit family, and continue to do so today. Although many participants had spent time on the land in the vicinity of the project, they were not familiar with (or did not recall details of) the mine site specifically. They noted that the smaller waterbodies are plentiful and not particularly memorable, and that it is difficult to recall areas from maps (rather than experiencing a place in person).

Participants described various routes of travel between Baker Lake and the Back River, and noted that travel typically occurs in the winter as the frozen landscape provides easier access along lakes and rivers. Two travel corridors are described in the IQ baseline for the Whale Tail Pit Project[38], and align with routes discussed in the consultations:

- The primary route heads north from Baker Lake along Uiguklik Lake (west of the Meadowbank Mine) and Nutipilik Lake (north and west of the Amaruq haul road); from here, it either follows an esker northeast of the Amaruq haul road, or travels east and north along Tahinajuk Lake, Piqunaniup Tasigik Isua Lake, and north along other lakes to the Back River.

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[37] Notes from Whale Tail Pit Amendment Consultation, July 2018.

[38] *Inuit Qaujimajatuqangit Baseline Report*. June 2016. Included as Appendix 7-A of the Whale Tail Pit Project: Final Environmental Impact Statement (FEIS).

- The second route is located further east, and travels along the west side of the Meadowbank Mine, through Tasirjuaraajuk Lake, Qugiilik Lake, Haninajuq Lake, Kivgajulik Lake, and Hiatuuq Lake.

Participants noted that routes vary depending on snow and weather conditions.

6.5.6 Comparison of Alternatives

Table 6-5 compares the advantages and disadvantages of each alternative.

Table 6-5. High-Level Comparison of Alternatives

Alternative	Advantages	Disadvantages
I. A53	• Lake is located within the drainage of the approved mine site • Design utilizes natural drainage to collect and convey contact water and seepage	• Impacts to fish and fish habitat • Need to relocate fish prior to construction
II. A53/WT-Ex	• Lake is located within the drainage of the approved mine site • Design utilizes natural drainage to collect and convey contact water and seepage • Slightly smaller footprint compared to Alternative I	• Impacts to fish and fish habitat • Need to relocate fish prior to construction • High construction and operational complexity due to presence of dam and pond above open pit, and increase seepage of groundwater into pit
III. A54	• No impacts to fish or fish habitat	• Requires construction of large U-shaped dam, approximately 2 km in length • Requires large area of land to be flooded (more than 20x the size of the natural waterbody) • Consultation indicated concern that the dam/pond would be an obstruction on the landscape, and could adversely affect caribou and other wildlife species as they travel through the area • Pumping requirements to convey water to attenuation pond at A54, and from attenuation pond to water treatment plant • Challenges to divert contact water from Lake A53
IV. MAM	• Landscape and water level would be largely the same as baseline (with addition of dam across the lake)	• Requires construction of dam across lake • High construction and operational complexity • Challenges to divert contact water from Lake A53 • Impacts to fish and fish habitat • Need to relocate fish prior to construction • Alteration of large lake may challenge public acceptance
V. WT-Ex	• No impacts to fish or fish habitat • Generally supported in community consultation as attenuation pond is within affected footprint of approved mine site	• High construction and operational complexity due to presence of dam and pond above open pit, and increase seepage of groundwater into pit • Challenges to divert contact water from Lake A53 • May require change to closure plan for North Basin

6.6 CHARACTERIZATION CRITERIA

The ECCC Guidelines note that every project is unique and the characterization criteria must be developed with consideration to the impacts, concerns, and Indigenous, stakeholder and regulatory interests relevant to the project.

Based on the information presented in Section 6.5, Table 6-6 identifies characterization criteria to describe the alternatives, and summarizes each alternative in regard to these characterization criteria. Criteria were determined with consideration of the reasonable questions that could be asked (by regulators and/or stakeholders) to compare or differentiate the alternatives. Some of the characterization criteria may overlap, may not differentiate the alternatives, or may not be relevant to the decision-making process; these issues will be addressed in Step 4.

Table 6-6. Characterization of Alternatives

Criteria	Rationale	I. A53	II. A53/WT-Ex	III. A54	IV. MAM	V. WT-Ex
Technical Account						
Number of dams	More dams are more complex to manage and pose greater risks for construction and operation/maintenance.	3	3	2	1	1
Maximum height of dam(s)	Higher dams are more complex, pose greater risks, and require a larger footprint.	6 m	7 m	12 m	11 m	13 m
Length of dam(s)	Longer dams are more complex, pose greater risks, and require a larger footprint.	671 m	505 m	2,422 m	418 m	415 m
Estimated dam fill quantity	Dams requiring larger volumes of material require more construction effort.	29,423 m^3	25,284 m^3	322,029 m^3	80,144 m^3	97,646 m^3
Source of construction materials	The required volume and type of construction materials may be a limiting factor for construction.	Local borrow materials are available				
Complexity of containment infrastructure	Alternatives with fewer dams and/or dams of lower technical complexity have lower operational risk and require less effort for monitoring and maintenance.	Requires 3 dams to contain water within one pond, with a maximum dam height of 6 m and a combined length of 671 m.	Requires 3 dams to contain water within 2 ponds, with a maximum dam height of 7 m and a combined dam length of 505 m. One dam (7 m high and 125 m long) adjacent to the south wall of the Whale Tail Pit.	Requires 2 dams to contain water within one pond, with a maximum dam height of 12 m and combined length of 2,422 m. Largest dam over 2 km long, horseshoe-shaped, and adjacent to the IVR WRSF.	Requires 1 dam to contain water within one pond. Dam would transect Mammoth Lake at a narrow point, with a total length of 418 m and maximum height of 11 m.	Requires 1 dam to contain water within one pond. Dam adjacent to the south side of the Whale Tail Open Pit, with a total length of 415 m and maximum height of 13 m.
Maximum water volume (combined)	Maximum water storage capacity may provide flexibility for future growth.	799,870 m^3	761,966 m^3	755,272 m^3	896,174 m^3	758,870 m^3
Maximum water depth	Deeper attenuation ponds may pose greater risk in the event of dam failure.	7 m	11 m	6	8 m	14 m
Pond surface area (combined)	Larger surface areas have a larger overall physical footprint, and larger area to be reclaimed at closure.	25.7 ha	32.2 ha	20.5 ha	26.1 ha	22.5 ha
Type of dam	Type of dam is influenced by location and foundation conditions, which influences design and constructability.	On land, frozen core dam	On land (A53), frozen core dam Drained lake bed (WT-Ex), highly fractured foundation conditions, complex structure with concrete secant pile and grouting	On land, frozen core dam, very large volumes	Uncertain foundation conditions. Complex structure with concrete secant pile (no grouting)	Drained lake bed, highly fractured foundation conditions, complex structure with concrete secant pile and grouting
Length of pipeline (source to attenuation pond)	Longer pipelines are more complex and have higher risk of failure.	8,221 m	8,221 m	13,164 m	12,416 m	5,388 m
Length of pipeline (attenuation pond to water treatment plant)	Longer pipelines are more complex and have higher risk of failure.	411 m	411 m	1,943 m	2,497 m	398 m
Length of pipeline (combined)	Longer pipelines are more complex and have higher risk of failure.	10,642 m	10,642 m	17,117 m	18,669 m	7,796 m
Cumulative head differential	Higher head differential between source and the attenuation pond requires more energy for pumping.	461 m	457 m	511 m	382 m	377 m
Number of additional pumps required	Greater number of pumps requires more energy for pumping.	1 additional pump for 1 additional pond	2 additional pumps for 1 additional pond plus increased seepage into pit	1 additional pump for 1 additional pond	1 additional pump for 1 additional pond	2 additional pumps for significantly increased seepage into pit
Surface water management infrastructure required	More complex surface water management systems pose greater risk of failure.	None - relies on natural drainage	None - relies on natural drainage	IVR WRSF contact water collection (~ 1km) requires drilling and blasting of channel(s), with large excavation, and pumping needs	Surface water can be redirected with bermed road (~1.5 km)	None - relies on natural drainage

Criteria	Rationale	I. A53	II. A53/WT-Ex	III. A54	IV. MAM	V. WT-Ex
Seepage collection infrastructure required	More complex systems to collect and convey seepage have higher pumping requirements.	Seepage directed to Whale Tail Attenuation Pond (i.e., existing infrastructure). No new infrastructure required. Reduction of water inflow to pit.	Increased water inflow to pit (limited head) - additional in-pit pumping required.	Seepage collection infrastructure required around dam. Reduction of water inflow to pit.	Seepage collection infrastructure required around dam (downstream side of in-lake dam). Reduction of water inflow to pit.	Significant seepage to pit (high head) - additional in-pit pumping required.
Length of new roads required	More extensive road networks have a larger physical footprint.	No new roads				
Design complexity	More complex design requires additional baseline data/geotechnical studies and/or modelling.	Limited geotechnical studies required. Utilizes standard design basis. Proven structures.	Very high complexity. Geotechnical studies required re: increased water head at pit crest. Anticipate incompetent foundation conditions, therefore complex engineering. Sensitive receptors (i.e., workers) in pit, down-gradient of dam.	Additional geotechnical studies required for large dam structure adjacent to WRSF. Utilizes standard design basis. Proven structures.	Highly complex (in-water) geotechnical study required. Baseline data does not currently exist. Anticipate incompetent foundation conditions, therefore complex engineering.	Very high complexity. Sensitive receptors (i.e., workers) in pit, down-gradient of dam. Underground mine workings under pond.
Construction complexity	More complex construction (based on foundation, excavation, etc.) pose higher risk.	Low complexity (on land, competent foundation)	Very high complexity (incompetent foundation at Whale Tail Attenuation Pond)	Moderate complexity (on land, competent foundation, large structure)	Moderate-to-high complexity (incompetent foundation, in lake)	Very high complexity (incompetent foundation at Whale Tail Attenuation Pond)
Operational complexity	More complex operations and maintenance (based on number of ponds and dams, size of dam, seepage collection, etc.) pose higher risk.	• Attenuation pond within the gravity catchment area of the IVR WRSF and therefore also serves to manage this contact water without additional pumping. • Primary storage location for contact water is located in close proximity to the existing water treatment plant.	• Attenuation pond within the gravity catchment area of IVR WRSF and therefore also serves to manage this contact water without additional pumping. • Primary storage location for contact water is located in close proximity to the existing water treatment plant. • Smaller A53 pond (compared to Alternative I) requires management of a spillway and gravity channel to direct water in excess of 473,000 m3 to WTEx for temporary storage.	• Attenuation pond has large perimeter dam structure (> 2 km), increasing the level of monitoring for seepage and the requirement for collection and pump back systems. • Attenuation pond location requires up-gradient diversion of non-contact water to reduce its catchment area and to be consistent with the water management philosophy (i.e. keep clean water clean). • A54 is located the furthest distance away from the IVR pit which is the largest source of water requiring winter storage. Location of A54 will require pumping of contact water from IVR waste rock runoff. • Maintaining A53 as a clean water pond requires additional infrastructure to capture and relocate contact water.	• Operationally equivalent to current use of Whale Tail attenuation pond in drained basin of existing lake. • Requires capture and pump back of clean water infiltrating attenuation pond to reduce the volume of water to be treated. • Located the furthest distance away from the water treatment plant, requiring management of additional pipeline length and pumping equipment. • Maintaining A53 as a clean water pond requires additional infrastructure to capture and relocate contact water.	• No change in location of attenuation pond from current operations. • An increase in the volume of the attenuation pond increases its operational complexity as a result of the requirement for a dam structure adjacent to the pit and the need to actively manage seepage entering the pit. • During the winter, ice wall formations in the pit more prominent and need to be managed to maintain safe access. • Storing a large volume of water up-gradient of the mining pit increases safety to workers requiring more robust operating procedures. • Maintaining A53 as a clean water pond requires additional infrastructure to capture and relocate contact water.

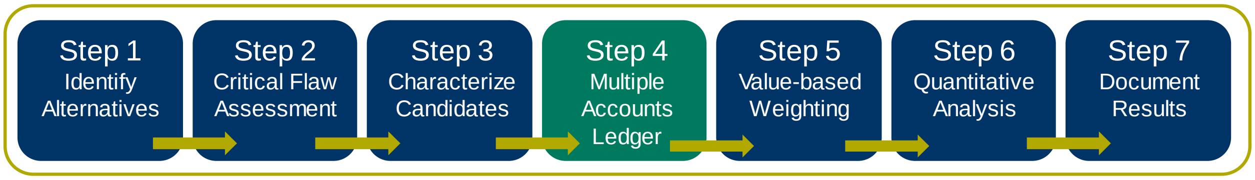
Criteria	Rationale	I. A53	II. A53/WT-Ex	III. A54	IV. MAM	V. WT-Ex
Closure complexity	More complex closure requirements (e.g. dredging, pumping) have higher risks.	• Location of attenuation pond enables reclamation activities to be completed largely independent from other domains. • Contact water can be monitored and controlled until closure completion criteria have been met. • Management of solids accumulated in the pond may be required either by covering or removing. • Dam requires breaching to reintroduce water to the reclaimed Whale Tail - Mammoth Lake watershed.	• A53 portion is the same as Alternative I. • WT-Ex portion of attenuation pond requires no additional work as returned to the natural watershed with the breach of the dam. • Closure of WT-Ex becomes more complex if management of solids is required by either covering or removing. • Closure plan currently assumes that solids in Whale Tail Attenuation Pond will not require additional mitigation at closure.	• Lengthy dam structure requires reclamation. • Extensive drainage system required at closure to divert water flows from IVR Waste Rock Storage Facility around A53 with discharge to the reclaimed Whale Tail Lake. • Reclamation of former attenuation pond area required so it is free draining and land is reclaimed to meet closure land use. • Management of solids accumulated in the pond may be required either by covering or removing. Closure plan currently assumes that solids in Whale Tail Attenuation Pond will not require additional mitigation at closure.	• Attenuation pond reclaimed by breaching a portion of the dam between the pond and Mammoth Lake. • No pumping required as the former attenuation pond reintroduced as part of the Whale Tail - Mammoth watershed with the creation of the pit lake. • Closure plan currently assumes that solids in the Whale Tail Attenuation Pond will not require additional mitigation at closure.	• Attenuation pond reclaimed by breaching the dam structure between the attenuation pond and the Whale Tail Pit. • No pumping is required as former attenuation pond reintroduced as part of the Whale Tail - Mammoth watershed with the creation of the pit lake. • Closure plan currently assumes that solids in the Whale Tail Attenuation Pond will not require additional mitigation at closure.
Post-closure complexity	More complex post-closure water management (e.g., active water treatment) have higher risks.	Passive water treatment with minimal annual maintenance. Water from former attenuation pond would flow by gravity to receiving environment. Controlled release easily established if post-closure water management is needed for run-off from IVR waste rock storage area.	Passive water treatment with minimal annual maintenance. Water from A53 portion of former attenuation pond would flow by gravity to receiving environment. Whale Tail Attenuation Pond would form part of reclaimed lake, requiring no additional post-closure management.	Active water treatment and management would be required for at least 10 years post-closure. Water from former attenuation pond will flow by gravity to receiving environment. Drainage system for contact water from IVR WRSF to the Whale Tail lake would require long-term post closure management (i.e., snow clearing).	Attenuation pond would form part of reclaimed lake, requiring no additional post-closure management.	Attenuation pond would form part of reclaimed lake, requiring no additional post-closure management.
Consequence of overtopping or dam failure	Dam overtopping or dam failure may result in consequences for the downstream environment and/or human safety.	Overflow or dam failure from A53 would be directed to Whale Tail Attenuation Pond by gravity. If volume of water released from breach exceeded capacity of Whale Tail Attenuation Pond (A53 is approximately 3x the volume of Whale Tail Attenuation Pond) then water would enter Whale Tail pit, posing a potential risk to workers and to production.	Overflow or dam failure from A53 would be directed to Whale Tail Attenuation Pond by gravity. Any overtopping or breach of dam at WT-Ex would report to Whale Tail Pit where workers are present, posing risk to workers and to production.	Overtopping or dam failure would result in contact water reporting to the natural receiving environment (outside the mine site) and could result in environmental impact.	Overtopping or dam failure downstream of alternative IV would report to the Whale Tail Pit where workers are present, posing safety risk to workers and production. A breach of the dam within Mammoth Lake could impact Mammoth Lake.	Overtopping or dam failure would report to Whale Tail Pit, where workers are present, posing safety risk to workers and production.
Biophysical Environment Account						
Meteorological conditions	Meteorological conditions may influence design and impact of attenuation pond.	Arid, Arctic environment				
Influence on climate change	Storage of water may influence local temperatures or precipitation.	Pond size not expected to influence temperatures nor precipitation patterns				
Susceptibility to climate change	Attenuation pond may be influenced by temperature or precipitation changes related to climate change.	Not expected over the life of mine				

Criteria	Rationale	I. A53	II. A53/WT-Ex	III. A54	IV. MAM	V. WT-Ex
Air emissions	Construction of the attenuation pond may result in emissions to air including fugitive dust and greenhouse gases.	Considering the scale of emissions for other mine components (e.g., mill) potential emissions associated with construction and operation of the attenuation pond are negligible.				
Topography	Topographic features may influence design of attenuation pond.	Baseline shoreline has gradual slopes.	Baseline shoreline has gradual slopes.	Baseline shoreline is generally shallow with steeper slopes on the east shore	Located in a low-lying area west of the Whale Tail Pit with shallow shoreline slopes	Relatively flat topography
Dominant surficial material	Surface material may influence the design and construction of attenuation pond.	Morainal/till				
Dominant soil subgroup	Soil type may influence the design and construction of attenuation pond.	Orthic dystric turbic cryosol				
Permafrost (presence, depth)	Permafrost depth and extent may influence the design and construction of attenuation pond.	Depth of active layer ranges from 1.3 m in areas with shallow overburden, to 4 m adjacent to lakes				
Depth of overburden	Overburden depth may influence the design and construction of attenuation pond.	Overburden can be up to 10 m thick				
Seismic conditions	Seismic conditions may influence the design and construction of attenuation pond.	Low seismic risk area				
Affected surface waterbodies	Changes to surface waterbodies may influence fisheries, birds, terrestrial wildlife, ecosystem function, and Inuit land use.	Lake A53	Lake A53	Lake A54	Mammoth Lake	No natural waterbodies
Catchment areas	Changes to catchment areas may influence downstream hydrology including water quality and quantity.	No new catchments affected				
Wetlands	Changes to wetlands may influence fisheries, birds, terrestrial wildlife, ecosystem function, and Inuit land use.	No wetlands affected				
Downstream water quality	Changes to downstream water quality may influence fisheries, birds, terrestrial wildlife, ecosystem function, and Inuit land use (including drinking water).	No expected change to downstream water quality (water quality will be treated to same standard before discharge)				
Groundwater	Changes to quality or quantity of groundwater may influence regional hydrology	No expected change to regional groundwater regime (although there may be local changes in regard to groundwater infiltration to pit)				
Ability to manage surface water quality impacts external to the attenuation pond	Improved ability to manage surface water quality impacts, and/or reduce potential impacts on surface water quality, for fish-bearing waterbodies, aside from use as an attenuation pond, will minimize external environmental impacts.	Use of Lake A53 as an attenuation pond would leverage natural drainage pathways, without affecting other waterbodies outside the mine site. Mammoth Lake would continue to receive treated discharge from the water treatment plant; no additional impact on Mammoth Lake is expected.	Use of Lake A53 as an attenuation pond would leverage natural drainage pathways, without affecting other waterbodies outside the mine site. Mammoth Lake would continue to receive treated discharge from the water treatment plant; no additional impact on Mammoth Lake is expected.	Surface runoff from the IVR WRSF naturally drains towards Lake A53. Lake A53 would be surrounded on 3 sides by the mine site. If Lake A53 is not used for an attenuation pond, extensive diversion infrastructure and other water management strategies would be required to avoid impacts on Lake A53, and the risk of water quality impacts to Lake A53 is increased. Mammoth Lake would continue to receive treated discharge from the water treatment plant; no additional impact on Mammoth Lake is expected.	Surface runoff from the IVR WRSF naturally drains towards Lake A53. Lake A53 would be surrounded on 3 sides by the mine site. If Lake A53 is not used for an attenuation pond, extensive diversion infrastructure and other water management strategies would be required to avoid impacts on Lake A53, and the risk of water quality impacts to Lake A53 is increased. Mammoth Lake (west basin) will continue to receive treated discharge from the water treatment plant; no additional impact on Mammoth Lake is expected.	Surface runoff from the IVR WRSF naturally drains towards Lake A53. Lake A53 would be surrounded on 3 sides by the mine site. If Lake A53 is not used for an attenuation pond, extensive diversion infrastructure and other water management strategies would be required to avoid impacts on Lake A53, and the risk of water quality impacts to Lake A53 is increased. Mammoth Lake would continue to receive treated discharge from the water treatment plant; no additional impact on Mammoth Lake is expected.
Fish-bearing waterbodies	The number of affected fish-bearing waterbodies influences the overall impact on fish and fish habitat.	1	1	0	1	0

Criteria	Rationale	I. A53	II. A53/WT-Ex	III. A54	IV. MAM	V. WT-Ex
Fish habitat area	The area of affected fish habitat influences the overall impact on fish and fish habitat.	Lake A53 is fish-bearing and has a baseline surface area of 15 ha	Lake A53 is fish-bearing and has a baseline surface area of 15 ha	This alternative does not affect fish habitat	Mammoth Lake is fish-bearing, with affected surface area of 26 ha	This alternative does not affect fish habitat
Diversity of fish community	The diversity of fish in affected waterbodies influences the overall impact on fish and fish habitat.	Five (5) fish species are found in Lake A53: Arctic char, lake trout, burbot, slimy sculpin, and ninespine stickleback	Five (5) fish species are found in Lake A53: Arctic char, lake trout, burbot, slimy sculpin, and ninespine stickleback	This alternative does not affect fish habitat	Six (6) fish species are found in Mammoth Lake: lake trout, Arctic char, round whitefish, burbot, slimy sculpin, and ninespine stickleback	This alternative does not affect fish habitat
Abundance of fish community	The abundance of fish in affected waterbodies influences the overall impact on fish and fish habitat.	Low abundance	Low abundance	This alternative does not affect fish habitat	Moderate abundance	This alternative does not affect fish habitat
Diversity of benthic community	The diversity of aquatic organisms in affected waterbodies influences the overall impact on fish and fish habitat.	Low presence and diversity of benthic invertebrates.				No natural waterbodies
Terrestrial habitat	Changes to terrestrial habitat may influence impacts on terrestrial wildlife and vegetation	14.4 ha of habitat typical of the region	10.2 ha of habitat typical of the region	27.1 ha of habitat typical of the region	No loss of terrestrial habitat (4.38 ha will be gained by decreased water level)	No loss of terrestrial habitat (area is within mine infrastructure)
Rare or listed plant species	Avoiding loss of rare or listed plant species is a conservation objective.	No rare or listed plant species, or suitable habitat for these species, have been identified in the vicinity of the mine site.				
Bird habitat	The area of affected bird habitat influences the overall impact on birds including waterfowl.	Birds, including waterfowl, are found throughout the area. However, no important bird habitat has been identified in relation to any of the alternatives.				
Caribou and muskox habitat	The area of affected caribou/muskox habitat influences the overall impact on caribou/muskox.	There are no caribou calving grounds near the mine site, and no areas of particular importance to caribou or muskox have been identified in relation to any of the alternatives.				
Carnivore habitat	The area of affected carnivore habitat influences the overall impact on carnivores.	No dens have been identified in relation to any of the alternatives.				
Human Environment Account						
Proximity to communities	Impacts on communities and land use may be influenced by proximity to the attenuation pond.	All alternatives are located over 150 km north of the hamlet of Baker Lake.				
Economic benefits	Construction and operation of the attenuation pond may create additional jobs and business opportunities.	No significant difference in the number or type of jobs (to construct and operate the attenuation pond), procurement, or business opportunities is expected.				
Risk to downstream communities	Real to community safety and security of downstream communities may influence well-being and community acceptance of the project. .	Considering community's physical distance from the alternatives, the alternatives represent negligible health risks and threat to inhabitants' physical safety.				
Community perception of risks/impacts	Perception of risks and impacts may influence well-being and community acceptance of the project	Concern expressed regarding relocation of fish, loss of fish habitat, and fish potentially not captured (prior to construction).	Concern expressed regarding fish relocation and loss of fish habitat.	Concern expressed regarding size of above-ground containment feature, which could obstruct landscape and interfere with caribou movements. Favourable perception regarding avoidance of impacts on fish habitat.	Concern expressed regarding impact to large fish-bearing lake, relocation of fish, loss of fish habitat, and fish potentially not captured (prior to construction). Favourable perception regarding low elevation of Mammoth Lake and thus potentially easier containment of water.	Favourable perception regarding avoidance of impacts on fish habitat by using an area already affected by the Whale Tail Pit Project.
Risks to workers in pit	Real or perceived risks to workers related to the attenuation pond may influence worker safety and/or well-being.	No significant risks identified.	Real and/or perceived risk to workers in pit due to presence of water-retaining dam above pit and ramp.	No significant risks identified.	No significant risks identified.	Real and/or perceived risk to workers in pit due to presence of water-retaining dam above pit and ramp.
Areas used for hunting	Changes to hunting areas may influence the practice of traditional hunting activities, harvests, household subsistence, and well-being.	No hunting destinations have been identified in relation to any of the alternatives.				

Criteria	Rationale	I. A53	II. A53/WT-Ex	III. A54	IV. MAM	V. WT-Ex
Areas used for fishing	Changes to fishing areas may influence the practice of traditional fishing activities, harvests, household subsistence, and well-being.	Lake A53 contains Arctic char, but has not been identified as an area for fishing. Consultation indicated that the small lake is unremarkable and there are other areas preferred for fishing.	Lake A53 contains Arctic char, but has not been identified as an area for fishing. Consultation indicated that the small lake is unremarkable and there are other areas preferred for fishing.	None	Mammoth Lake contains lake trout and Arctic char, but has not been identified as an area for fishing. Consultation indicated that the moderately sized lake is unremarkable and there are other areas preferred for fishing.	None
Areas used for trapping	Changes to trapping areas may influence traditional trapping activities, harvests, household subsistence, and well-being.	No trapping areas have been identified in relation to any of the alternatives.				
Areas used for vegetation/berry harvesting	Changes to vegetation harvesting areas may influence traditional gathering activities, harvests, household subsistence, and well-being.	No harvested species (e.g., crowberry, blueberry, blackberry, red berry, cloudberry) are identified in the vicinity of any alternative.				
Culturally or spiritually significant areas	Changes to culturally or spiritually important areas may influence traditional land use and well-being.	No trails, camps, cabins, caching sites, gravesites, traditional travel routes or other culturally important sites identified in the vicinity of the alternatives.				
Travel corridor between Baker Lake and the Back River	Residents of Baker Lake travel overland (in winter) to the Back River. Environmental or aesthetic changes could affect travellers.	The western route described in Section 6.5.5 is approximately 6-7 km east of the Amaruq mine site. None of the alternatives are significantly closer to, or would have an effect on, this travel corridor.				
Archaeological or historic sites/resources	Management and conservation of archaeological and historic resources is included in the Nunavut Agreement, which acknowledges the importance of the archaeological record to Inuit.	There is a grave site (including burial cairn and other artefacts) about 1.5 km south of the Whale Tail Dike on a hill on the east shore of Whale Tail Lake and a historic campsite exists north of Nemo Lake. None of the alternatives overlap with these or other archeological or historic resources.				
Project Economics Account						
Capital costs	Capital costs for construction of the attenuation pond may influence the economic feasibility of the Whale Tail Pit Expansion Project.	Estimated $4.7 million	Estimated $7.2 million	Estimated $17.0 million	Estimated $15.0 million	Estimated $14.9 million
Operating (sustaining) costs	Operating costs for the attenuation pond may influence the economic feasibility of the Whale Tail Pit Expansion Project.	High monitoring requirements	High monitoring requirements and moderate increase in seepage to Whale Tail Pit	High monitoring requirements	High monitoring requirements	High monitoring requirements and large increase in seepage to Whale Tail Pit
Closure costs	Costs for closure and reclamation of the attenuation pond may influence the economic feasibility of the Whale Tail Pit Expansion Project.	<10% total closure cost	<10% total closure cost	>20% total closure cost	10-20% total closure cost	10-20% total closure cost
Post-closure costs	Costs for post-closure water management monitoring of the attenuation pond may influence the economic feasibility of the Whale Tail Pit Expansion Project.	Active water treatment may be required for up to 10 years	Active water treatment may be required for up to 10 years	Active water treatment may be required for up to 20 years	No active water treatment; monitoring required for up to 10 years	No active water treatment; monitoring required for up to 10 years
Fish habitat offsetting costs	Costs to compensation for fish habitat losses, if applicable, may influence the economic feasibility of the Whale Tail Pit Expansion Project.	Compensation for loss of 14 ha fish habitat	Compensation for loss of 14 ha fish habitat	No fish habitat compensation required	Compensation for loss of 26 ha fish habitat	No fish habitat compensation required

7. MULTIPLE ACCOUNTS LEDGER (STEP 4)



7.1 OBJECTIVE

In Step 4, the characterization criteria identified in Section 6.6 are considered in the development of relevant, meaningful, and differentiating sub-accounts and indicators, which are used to create the multiple accounts ledger for the assessment. While Step 3 focused on characterizing (i.e., describing) each alternative, Step 4 provides the basis for evaluation by identifying the elements that differentiate the alternatives.

7.1.1 Sub-Accounts

Sub-accounts are also known as *evaluation criteria* and are developed to consider material benefits (advantage) or losses (disadvantages) associated with the remaining alternatives. Sub-accounts are considered and defined on a project-specific basis, and sub-accounts used in one assessment may not be relevant to another assessment.

To ensure that the sub-accounts are useful in the evaluation, the ECCC guidelines identify the following characteristics for sub-accounts:

- **Impact-driven**: must be linked to an impact (advantage or disadvantage) rather than simply a statement of fact;
- **Differentiating**: must define an aspect that distinctly differentiates one or more of the alternatives, in a way that is meaningful to the decision (i.e., if a factor is the same for all alternatives, then that factor is not important in the comparison;
- **Relevant**: must be a factor that is relevant to the decision-making process;
- **Understandable**: must be defined unambiguously, so that external parties (e.g., reviewers) cannot interpret the preferred state differently;
- **Non-redundant**: must be unique within the multiple accounts analysis (i.e., to avoid consideration of the same criteria in different sub-accounts); and
- **Independent**: must be judgementally independent such that the outcome for one criteria cannot depend on the outcome of another criteria.

Table 7-1 summarizes the ten sub-accounts identified for the assessment of the remaining attenuation pond alternatives, including the rationale and preferred state of each sub-account. The definition of sub-accounts considered the characterization criteria described in Section 6.6. It was also informed through consultation with the communities of Baker Lake and Chesterfield Inlet in July 2018, in which Elders and community members highlighted the importance of fish and the broader biophysical environment as a key element in the comparison of alternatives.

Table 7-1. List of Sub-Accounts and Rationale

Sub-Account	Rationale
Technical Account	
Containment Infrastructure	Larger and more complex containment construction and operation of infrastructure is associated with increased engineering and safety risks. Smaller and less complex infrastructure is preferred.
Ancillary Infrastructure	More extensive and complex ancillary infrastructure (e.g. pipelines and water management infrastructure) is associated with increased engineering and safety risks. Smaller and less complex ancillary systems are preferred.
Technical Complexity	Alternatives with more complex design, construction, operating and closure requirements are generally most costly and have a higher likelihood of failure. Simple and proven systems are preferred.
Consequences of Failure	In the event of a failure, alternatives with less significant consequences for the environment and/or human safety are preferred.
Biophysical Environment Account	
Surface Water	Alternatives with greater potential effects to surface water hydrology are less desirable due to potential downstream effects on the availability and/or quality of water, which could affect ecosystem function, fish and wildlife, and human use/health. Alternatives that minimize potential impacts to surface water are preferred.
Fish and Aquatic Habitat	Alternatives with greater potential effects to fish and aquatic habitat are less desirable as these resources are important for ecosystem function, traditional land use and food security (fish). Alternatives that result in extensive loss of high value fish habitat may be difficult to permit. Alternatives that minimize potential impacts to fish and aquatic habitat are preferred.
Terrestrial Habitat	Alternatives with greater potential effects to terrestrial habitat are less desirable as these resources are important for ecosystem function, wildlife, and vegetation. Impacts to terrestrial habitat may also lead to impacts on traditional land use and food security (game). Alternatives that minimize potential impacts to terrestrial habitat are preferred.
Human Environment Account	
Inuit Land Use	Inuit land use includes hunting, fishing, trapping, and vegetation harvesting, as well as cultural and spiritual use and value of the land. Alternatives that minimize potential impacts to Inuit land use are preferred.
Workforce	The well-being of workers is a priority for Agnico Eagle, and is influenced by both real and perceived risks. Alternatives that promote worker safety and well-being are preferred.
Project Economics Account	
Attenuation Pond Costs	Alternatives with lower costs over the life of the attenuation pond are preferred.

Other topics were also considered, but were not included as sub-accounts for this alternatives assessment as they did not meet the characteristics stipulated above (e.g., they were not differentiating, or were not meaningful to the selection of an alternative). For example, impacts to archaeological resources are not included as this is not a differentiating factor; and air quality was not included as an indicator as emissions related to the attenuation pond will be negligible in the context of the broader project.

7.1.2 Indicators

Indicators are also known as *measurement criteria* as they provide for the qualitative or quantitative measurement within each sub-account, thus allowing for direct comparison between alternatives. As for the sub-accounts, indicators are defined on a project-specific basis and must also be impact-driven, differentiating, relevant, understandable, non-redundant, and independent. Table 7-2 lists the indicators identified for each sub-account, with a total of 31 indicators.

Table 7-2. List of Indicators and Rationale

Sub-Account	Indicators	Rationale
Technical Account		
Containment Infrastructure	Maximum dam height	Alternatives with lower dam height have lower head, lower complexity of management, and lower consequence of dam failure, and are preferred.
	Length of dam(s) (combined)	Alternatives with shorter length of dam require less construction material, have lower complexity of management, and are preferred.
	Pond surface area (combined)	Alternatives with a smaller surface area have a lower overall physical footprint and a smaller area to be reclaimed at closure, and are preferred.
	Type of dam and foundation	Alternatives that involve frozen core dams, of smaller size, and constructed on competent and frozen foundation with low hydraulic head, are preferred.
Ancillary Infrastructure	Length of pipeline (combined)	Alternatives with shorter length of pipeline transporting contact water (source, to attenuation, to water treatment plant) are preferred.
	Additional pumps	Alternatives that require fewer additional pumps (compared to Whale Tail Pit Project) are preferred.
	Surface water management infrastructure	Alternatives that require less surface water management infrastructure are preferred (i.e., surface runoff including WRSFs).
	Seepage collection infrastructure	Alternatives that require less seepage collection infrastructure have less pumping requirements and are preferred (i.e., seepage from containment infrastructure).
Technical complexity	Design complexity	Alternatives that require less collection of baseline data (i.e., geotechnical studies) and/or engineering modelling (e.g., permafrost degradation, seepage, slope stability, etc.) are preferred.
	Construction complexity	Alternatives with less complex construction (i.e., more stable foundation, less material to be excavated, smaller foundation area) are preferred.
	Operational complexity	Alternatives with less complex operation and maintenance (i.e., fewer dams, fewer ponds, smaller area of dam face, few points for seepage collection and pumping requirements).
	Closure complexity	Alternatives with less complex closure requirements (i.e. fewer complex activities such as dredging, pumping) during the closure phase are preferred.
	Post-closure complexity	Alternatives with less complex (i.e. more passive) water management requirements following closure are preferred.

Sub-Account	Indicators	Rationale
Consequences of Failure	Consequence of overtopping	Alternatives with lower downstream consequences (environment and/or human safety) of an overtopping event are preferred.
	Consequence of dam failure	Alternatives with lower downstream consequences (environment and/or human safety and/or economic) of a dam failure event are preferred.
Biophysical Environment Account		
Surface water	Loss of natural waterbodies	Alternatives that avoid direct loss of natural waterbodies, or affect fewer natural waterbodies, are preferred.
	Ability to manage surface water quality impacts external to the attenuation pond	Alternatives that provide greater ability to manage surface water quality impacts, and/or reduce potential impacts on surface water quality (for Lake A53, Mammoth Lake, or other fish-bearing waterbodies), aside from use as an attenuation pond, are preferred.
Fish and aquatic habitat	Number of fish-bearing waterbodies	Alternatives that avoid, or minimize impacts to fish-bearing waterbodies are preferred.
	Diversity of affected fish community	Alternatives that affect fewer fish species are preferred.
	Extent of fish habitat loss	Alternatives that minimize the area of fish habitat loss are preferred.
	Abundance of affected fish community	Alternatives that affect waterbodies with lower abundance of fish are preferred.
Terrestrial habitat	Terrestrial habitat loss	Alternatives that minimize the area of terrestrial habitat loss are preferred.
Human Environment Account		
Inuit land use	Loss of waterbody used for fishing	Alternatives that avoid or minimize impacts to fishing activities, or waterbodies used for fishing, are preferred.
	Relocation of fish	Alternatives that avoid relocation of fish from one waterbody to another are preferred (due to local Elders' concerns related to intangible/ spiritual effects on fish).
	Disruption of landscape (operations)	Alternatives that minimize visual disruption of the natural landscape during operations are preferred
Workforce	Worker well-being	Alternatives that minimize real and/or perceived risks to worker well-being are preferred.
Project Economics Account		
Attenuation pond costs	Capital costs	Alternatives with lower capital costs (considering construction material and type of construction) are preferred.
	Fish habitat offsetting costs	Alternatives with lower costs for fish habitat offsetting (compensation) are preferred. Offsetting costs compared to those for the approved Whale Tail Pit Project.
	Operating / sustaining costs	Alternatives with lower operating (or sustaining) costs—compared to the base case (i.e., Whale Tail Pit Project) are preferred.
	Closure and reclamation costs	Alternatives with low costs for closure and reclamation are preferred
	Long-term post-closure costs	Alternatives with lower costs for active water treatment or other activities post-closure are preferred.

7.1.3 Multiple Accounts Ledger

The indicators listed in Table 7-2 are tabulated in the multiple accounts ledger (**Appendix B**), along with the applicable measurement parameter (e.g., length) and unit of measurement (e.g., metres). Each alternative is described, factually and objectively, in regard to each indicator.

Indicator Scales and Scoring

To provide a consistent approach to scoring both quantitative and qualitative indicators, six-point value scales are developed for each indicator. Scales range from one (1) to six (6), with higher scores indicating a higher degree of preference (e.g., less adverse impact, less risk, greater certainty). Scales are defined to cover the range of values embodied by the remaining candidates as well as other realistically conceivable alternatives. In most cases, the end points define the realistic best- and worst-case scenarios, even if these end points are beyond the bounds of the remaining alternatives. For example, the best case for habitat loss would be 'no habitat loss', regardless of whether any of the remaining alternatives would result in 'no habitat loss'.

In accordance with the ECCC Guidelines, the six-point scales should be developed to be:

- **Operational**, such that the scale should be relevant and able to accommodate any other realistically conceivable alternative that may be added at a later time;
- **Reliable**, in that different parties should arise at the same score given the same scale and background information;
- **Relevant** to the indicator being scored; and
- **Justifiable**, so that any external party should agree that the scale is reasonable.

For each indicator, the information provided for each alternative is considered against the applicable indicator's scale, and each alternative is assigned the appropriate score from one (1) to six (6). For a given indicator, candidates with higher scores are preferred over those with lower scores. In accordance with the ECCC Guidelines, the robust and transparent characterization of each candidate within the ledger supports scoring that is clear and easily reproducible so that any external party would arrive at the same conclusions.

The multiple accounts ledger—including indicators, measurement parameters/units, definition for each alternative, six-point scale, and score for each alternative—is provided in its entirety in **Appendix B**.

8. VALUE-BASED WEIGHTING (STEP 5)

The weighting component of the MAA is used to account for the fact that some indicators, sub-accounts, and/or accounts are considered to be more important to the decision-making process than others. Weightings are provided on a scale of one (1) to six (6), where a weight of six indicates that a criteria is six-times as important as a comparable criteria with a weight of one.

Tables 8-1 to 8-3 provide the weightings used for the accounts, sub-accounts, and indicators in this assessment. Weightings are only relevant in comparison to a given criteria's peers; in other words, all indicators within a given sub-account are weighted against each other, and the indicators in a separate sub-account are considered separately. The boxes outlined in the tables clearly denote how accounts, sub-accounts, and indicators are grouped and weighted.

Weightings are value-based and inherently subjective; as such, different parties may apply different weightings reflective of their value systems. Agnico Eagle developed weightings in consultation with its technical consultants. Justification for the weightings is provided below, with the objective that external parties will understand the rationale behind weightings, even if they would weight things differently. To this end, members of the working group are provided with the opportunity to develop their own weightings to see how the results may be different, or aligned, under different scenarios.

Weightings are consistent across all candidates; in other words, a given criteria cannot be considered more or less important for one candidate compared to the others.

8.1 ACCOUNTS

The weighting of accounts (Table 8-1) is based on the recommendation provided in the ECCC Guidelines. The biophysical environment is afforded the highest weight (6), and project economics (i.e., costs associated with each alternative) is weighted 1.5.

Table 8-1. Weighting of Accounts

Account	Weight
Technical	3
Biophysical environment	6
Human environment	3
Project economics	1.5

8.2 SUB-ACCOUNTS

Sub-accounts are weighted within each account (Table 8-2). Of the technical sub-accounts, the consequence of failure and technical complexity is given the highest weight (6) as these aspects are critical to the successful operation of the project. In the biophysical environment account, fish and aquatic habitat is given the greatest weight (6) due to its importance to both Inuit and regulators, and to reflect Agnico Eagle's commitment to avoiding unnecessary impacts on fish. Surface water and terrestrial habitat are closely connected with fish habitat and weighted 5 and 4, respectively.

The human environment account includes Inuit land use, which is afforded a slightly higher weight (6) than workforce (4) as both are related to the well-being of people and high values for land use (i.e., resources that are not easily accessed in other areas) have not been identified in the vicinity of the project. The project economics account has only one sub-account; in this case, the sub-account weighting have no bearing on the results, and is nominally afforded a weight of 1.

Table 8-2. Weighting of Sub-Accounts

Account	Sub-Account	Weight
Technical	Containment Infrastructure	4
	Ancillary Infrastructure	3
	Technical Complexity	6
	Consequences of Failure	6
Biophysical Environment	Surface water	5
	Fish and aquatic habitat	6
	Terrestrial habitat	4
Human Environment	Inuit land use	6
	Workforce	4
Project Economics	Attenuation pond costs	1

8.3 INDICATORS

Indicators are weighted against other indicators within the same sub-account. Overall, the influence of an indicator in the MAA will be driven by not only its weight, but also the weight of the applicable sub-account and account; as such, the weights of indicators cannot be directly compared between sub-accounts (i.e., an indicator with a weight of 3 in a sub-account with a weight of 3 will have greater influence than an indicator with a weight of 3 in a sub-account with a weight of 2).

For sub-accounts that only have one indicator, the indicator weight has no bearing on the results and is nominally appointed a weight of 1.

Table 8-3. Weighting of Indicators

Account	Sub-Account	Indicator	Weight
Technical	Containment Infrastructure	Maximum dam height	6
		Length of dam(s) (combined)	4
		Pond surface area (combined)	2
		Type of dam and foundation	6
	Ancillary Infrastructure	Length of pipeline (combined)	4
		Additional pumps	4
		Surface water management infrastructure	6
		Seepage collection infrastructure	5
	Technical Complexity	Design complexity	6
		Construction complexity	4
		Operational complexity	3
		Closure complexity	3
		Post-closure complexity	6
	Consequences of Failure	Consequence of overtopping	5
		Consequence of dam failure	6
Biophysical Environment	Surface water quality	Loss of natural waterbodies	1
		Ability to manage surface water quality impacts	4
	Fish and aquatic habitat	Number of fish-bearing waterbodies	5
		Diversity of affected fish community	3
		Extent of fish habitat loss	6
		Abundance of affected fish community	2
	Terrestrial habitat	Terrestrial habitat loss	1
Human Environment	Inuit land use	Loss of waterbody used for fishing	4
		Relocation of fish	6
		Disruption of landscape (operations)	4
	Workforce	Worker well-being	1
Project Economics	Attenuation pond costs	Capital costs	1
		Fish habitat offsetting costs	1
		Operating / sustaining costs	1
		Closure and reclamation costs	1
		Long-term post closure costs	1

Technical Account

In the containment infrastructure sub-account, the height of dam and type of foundation are afforded the highest weight (6) as these indicators speak to the attenuation ponds overall complexity and consequence of failure. The length of dam is also important (4) as it influences seepage management and monitoring requirements. In the ancillary infrastructure sub-account, surface water management infrastructure (including infrastructure required to keep clean water clean, in accordance with the overarching water management strategy) carries the highest weight (6), followed by seepage management infrastructure (5) including management of contact water from the WRSFs.

In the technical complexity sub-account, design complexity is appointed a weight of 6 due to the importance of the design for later stages of construction and operation, and the challenges of local foundation conditions and seepage management in the design. Post-closure complexity is also given a weight of 6 as long-term environmental sustainability, and support for passive water treatment post-closure, is a priority of Agnico Eagle's existing closure concept.

In the consequence of failure sub-account, the potential consequence of dam failure (i.e., dam breach) is afforded a slightly higher weight than that of dam overtopping due to the volume of stored water that could be released and the magnitude of mitigation that could be required.

Biophysical Environment Account

In the surface water sub-account, the ability to effectively manage potential water quality impacts to fish-bearing waterbodies (external to the potential use as an attenuation pond) is a priority for Agnico Eagle. The mine site has been designed within a compact footprint, taking advantage of natural drainage patterns to minimize environmental impact; therefore, this indicator is weighted 4. The number of natural waterbodies is weighted 1 due to the prevalence of small ponds and lakes throughout the landscape.

In the fish sub-account, Agnico Eagle's priority is to minimize the loss of fish habitat. The extent of the fish habitat loss is the most important indicator as habitat availability is important for healthy fisheries. For this reason, the extent of fish habitat loss is weighted as 6. The number of fish-bearing waterbodies is weighted as 5 to reflect the importance of minimizing loss of fish habitat, but recognizing that the indicator 'extent of fish habitat loss' will capture total habitat; for example, the loss of 5 small waterbodies, may not be more important if the loss of one waterbody provides a greater extent of fish habitat. The Project's location in the Arctic means that, in general, fish species diversity and abundance is relatively low across all waterbodies. The indicator of diversity of affected fish communities is relatively more important than fish abundance, and is weighted 3 to reflect that more diverse fish community reflects varied and productive habitat. The abundance of affected fish community is weighted 2 as this is not considered a key differentiator between waterbodies in the Arctic environment.

Human Environment Account

Inuit land use indicators consider potential impacts on fishing and the Inuit in relation to the land. In consultation with Inuit Elders and community members in Baker Lake, the potential need to relocate fish (i.e., to proceed with construction at a fish-bearing lake) was highlighted as point of concern related to spiritual changes to the fish. As such, the relocation of fish is given the highest weight (6). The loss of a waterbody used for fishing is weighted somewhat lower (4) as waterbodies for fishing are plentiful throughout the landscape. The potential disruption of the attenuation pond on the landscape during mine operations, which could affect the appreciation of land use activities and/or the environment, was not a significant concern raised during consultation and is also weighted 4.

Project Economics Account

The economics indicators describe costs associated with various phases and/or activities of the Whale Tail Pit Expansion Project. All costs are weighted equally, and are nominally appointed a weight of 1.

9. QUANTITATIVE ANALYSIS (STEP 6)

9.1 Calculations

The ECCC Guidelines describe the calculation of merit ratings for each candidate based on the relevant scores and weightings. Merit ratings for are calculated per the calculations in Table 9-1. The resulting "alternative merit rating" is a number between 1.0 and 6.0, where higher numbers indicate a greater degree of preference. The alternative, account, and sub-account merit ratings can be compared across alternatives.

Table 9-1. Merit Rating Calculations

Parameters			
Indicator score (S)	Indicator weight (W_I)	Sub-account weight (W_S)	Account weight (W_A)
Calculations			
Indicator merit score	($S \times W_I$)		
Sub-account merit rating	$R_S = \sum(S \times W_I)/\sum W_I$	*(for all indicators within the sub-account)*	
Account merit rating	$R_A = \sum(R_S \times W_S)/\sum W_S$	*(for all sub-accounts within the account)*	
Alternative merit rating	$R_C = \sum(R_A \times W_A)/\sum W_A$	*(for all accounts)*	

9.2 Preliminary Results

Table 9-2 provides the overall merit ratings for each of the five alternatives. Ratings are shaded from yellow to green; lower ratings are shaded yellow, higher ratings are shaded green, and darker green indicates a higher rating.

Table 9-2. Merit Ratings of Alternatives

Candidate	Description	Merit Rating
I. A53	Storage provided by the existing Whale Tail Attenuation Pond and a new pond at Lake A53.	4.21
II. A53/WT-Ex	Storage provided by an expanded Whale Tail Attenuation Pond and a new pond at Lake A53.	3.39
III. A54	Storage provided by the existing Whale Tail Attenuation Pond and a new pond at Lake A54.	3.59
IV. MAM	Storage provided by the existing Whale Tail Attenuation Pond and a new pond created by isolating the northern section of Mammoth Lake.	3.30
V. WT-Ex	Storage provided by expanding the existing Whale Tail Attenuation Pond.	3.85

The results indicate that Alternative I: A53 has the highest merit rating (4.21) followed by Alternative V: WT-Ex (3.85). Mammoth Lake is the lowest rated alternative (3.30). Figure 9-1 further illustrates the merit ratings for the five alternatives.

Investigating the results further, Table 9-3 and Figure 9-2 show how each alternative performs in regard to each of the five accounts. Alternative I: A53 has the highest rating for the technical account, where its rating of 4.53 far exceeds the other alternatives (all below 2.70). Alternative I is also rated highest in the project economics account (3.80) although the difference between alternatives is less, ranging from 3.00 to 3.80. Alternatives III has the highest rating for the human environment account (5.31), followed by Alternative I (4.54), and Alternative V has the highest rating in the biophysical environment account (4.67).

Table 9-3. Account Merit Ratings for Each Alternative

Alternative	Technical	Biophysical Environment	Human Environment	Project Economics
I. A53	4.53	3.99	4.54	3.80
II. A53/WT-Ex	2.62	3.99	2.94	3.40
III. A54	2.69	3.27	5.31	3.20
IV. MAM	2.50	3.40	4.03	3.00
V. WT-Ex	2.18	4.67	4.00	3.60

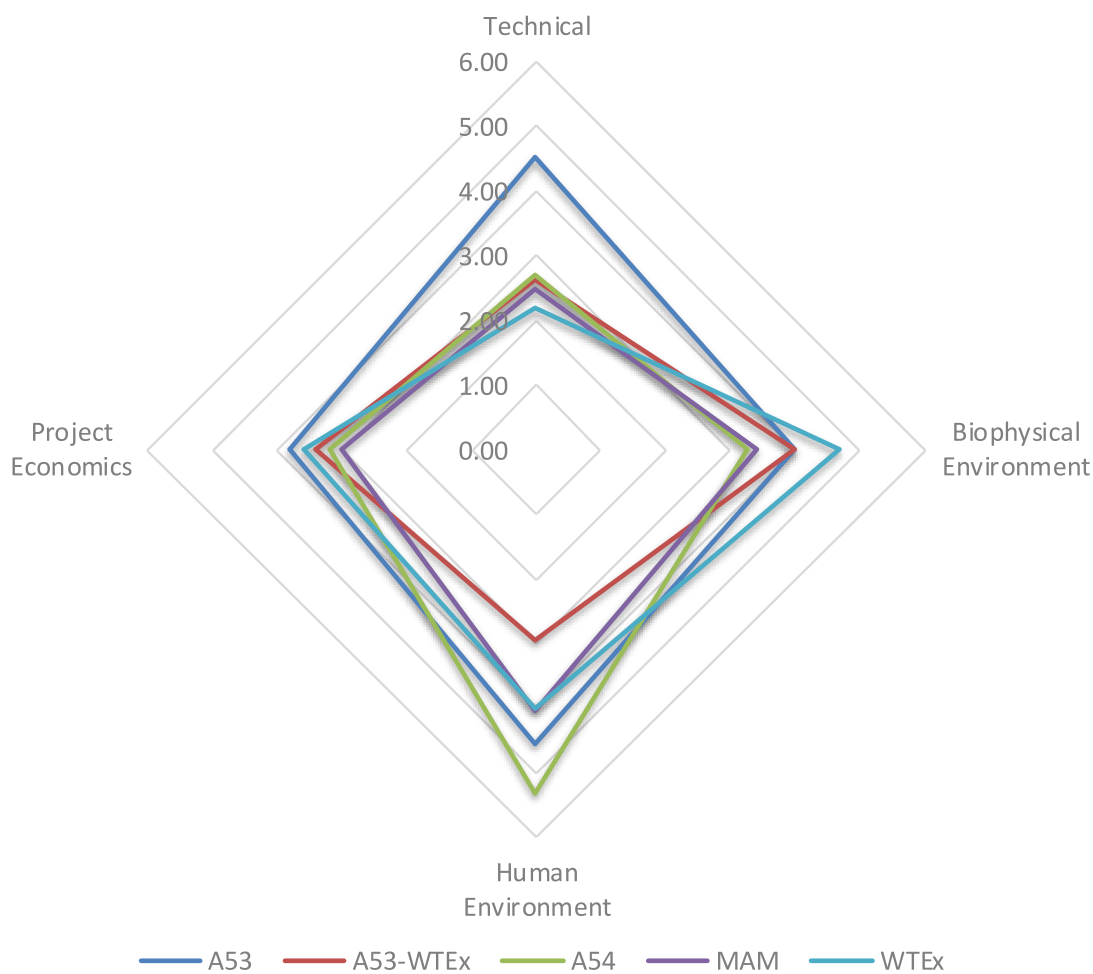
The weighted results can be further disaggregated by sub-account, as shown in Table 9-4.

Table 9-4. Sub-account Merit Ratings for Each Alternative

	I. A53	II. A53/WT-Ex	III. A54	IV. MAM	V. WT-Ex
Technical Account					
Containment infrastructure	4.11	2.67	3.00	2.67	2.33
Ancillary infrastructure	4.95	3.47	2.21	3.74	3.63
Technical Complexity	5.32	2.77	3.32	2.82	2.09
Consequences of Failure	3.82	2.00	2.09	1.45	1.45
Biophysical Environment					
Surface water	4.20	4.20	1.80	1.80	2.00
Fish and aquatic habitat	3.81	3.81	6.00	3.00	6.00
Terrestrial habitat	4.00	4.00	1.00	6.00	6.00
Human Environment					
Inuit land use	3.57	3.57	4.86	2.71	6.00
Workforce	6.00	2.00	6.00	6.00	1.00
Project Economics					
Attenuation pond costs	3.80	3.40	3.20	3.00	3.60

Figure 9-1. Alternative Merit Ratings

Figure 9-2. Account Merit Ratings



Considering the results, the following factors are highlighted:

- Impacts to fish-bearing waterbodies are unavoidable features of Alternatives I, II, and IV and drive the ratings in the fish and aquatic habitat sub-account.
- Alternative V's high rating in the biophysical account is driven by the fact that this alternative is entirely located within the existing mine footprint
- The ability to manage potential impacts to surface water outside the attenuation pond is an advantage of Alternatives I and II in the surface water sub-account.
- The ratings of the Inuit land use sub-account are driven by feedback from consultation with Elders and residents of Baker Lake, who indicated a preference to avoid impacts to fish-bearing lakes.
- The workforce sub-account addresses real and perceived risks to the well-being of workers in the Whale Tail Pit. Alternatives I, III and IV do not include a water-retaining dam adjacent to the pit and are favoured in this sub-account.

9.3 SENSITIVITY ANALYSIS

The sensitivity analysis is designed to test the strength of the results and identify areas where a change in weightings may significantly influence the results. Considering the results of the preliminary quantitative analysis in Section 9.2, the objective of the sensitivity analysis is to understand possible sources of bias and subjectivity in the preceding calculations. This is achieved by changing the value-based weightings and examining the results. Although the "scores" are be fact-based and therefore not subject to variation, the weightings of accounts, sub-accounts, and indicators may vary between stakeholders and could have a significant impact on the results.

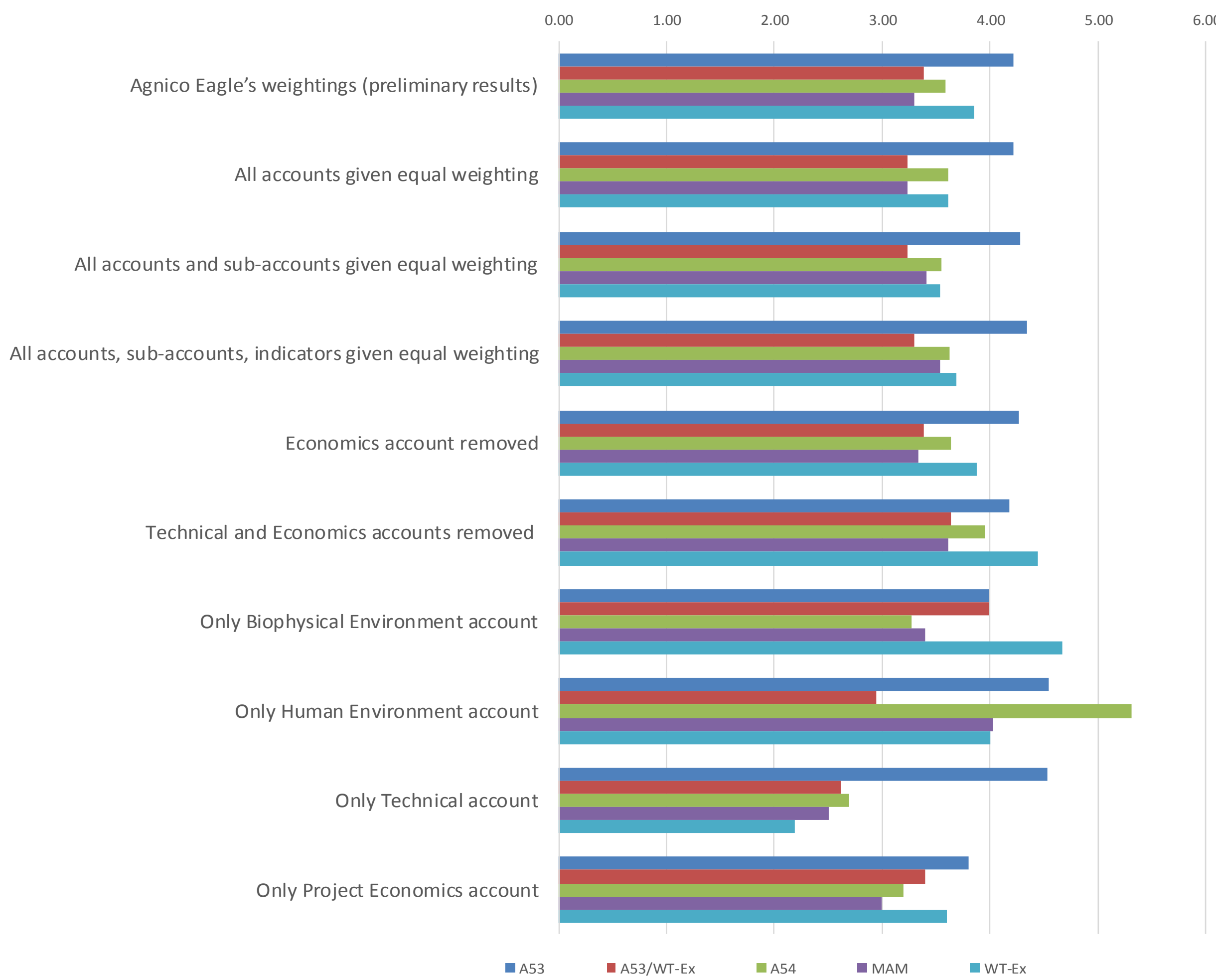
A total of 10 sensitivity scenarios were considered, as summarized in Table 9-4 and Figure 9-2. Overall, Alternative I (i.e., use of Lake A53 as the attenuation pond) is maintained as either the highest or second-highest rated alternative across all scenarios.

- Alternative V (i.e., expanding the Whale Tail Attenuation Pond) receives the highest rating when only the biophysical environment account is considered, as this alternative does not affect any natural water bodies. However, the technical and human safety risks of this alternative are highlighted in other scenarios.
- Alternative III (i.e., use of Lake A54 as the attenuation pond) receives the highest rating when only the human environment account is considered, reflecting both Inuit Elders' preference to avoid impacts on fish (and relocation of fish) as well as avoidance of a water-retaining dam adjacent to the Whale Tail Pit. However, this alternative also performed poorly in regard to the technical, biophysical environment, and project economics accounts.
- Alternative II (i.e., use of Lake A53 combined with an expanded Whale Tail Attenuation Pond) and Alternative IV (i.e., isolation of a portion of Mammoth Lake) offer no clear advantage over the other alternatives.

Table 9-5. Sensitivity Analysis (Alternative Merit Ratings)

Scenario	I. A53	II. A53/WT-Ex	III. A54	IV. MAM	V. WT-Ex
Agnico Eagle's weightings (preliminary results)	4.21	3.39	3.59	3.30	3.85
Equal weighting for all accounts	4.22	3.24	3.62	3.23	3.61
Equal weighting for all accounts and sub-accounts	4.28	3.23	3.55	3.41	3.54
All accounts, sub-accounts, indicators given equal weighting	4.34	3.30	3.62	3.54	3.69
Economics account removed	4.26	3.39	3.63	3.33	3.88
Technical and Economics accounts removed	4.18	3.64	3.95	3.61	4.44
Only Biophysical Environment account	3.99	3.99	3.27	3.40	4.67
Only Human Environment account	4.54	2.94	5.31	4.03	4.00
Only Technical account	4.53	2.62	2.69	2.50	2.18
Only Project Economics account	3.80	3.40	3.20	3.00	3.60

Figure 9-2. Sensitivity Analysis (Alternative Merit Ratings)



10. CONCLUSIONS

Based on the outcomes of the quantitative analysis described in Section 9, including consideration of the sensitivity analysis, it is clear that the preferred attenuation pond alternative is Alternative I (Lake A53). This alternative proposes to store contact water for the Whale Tail Pit Expansion Project in a new attenuation pond to be constructed at Lake A53, with a storage capacity of 646,638 m^3, supplemented by the existing Whale Tail Attenuation Pond with a storage capacity of 133,232 m^3.

Lake A53 is a fish-bearing waterbody and use of this lake as an attenuation pond will require an amendment to Schedule 2 of the MDMER. The advantages of this alternative include a relatively small footprint, reduced need for surface water management infrastructure, reduced complexity over the life of the pond, reduced consequences in the event of dam failure or overtopping. This alternative also facilitates effective management of surface water quality impacts at the mine site as natural drainage conditions support the collection of contact water from the IVR WRSF at Lake A53, and the downstream environment is restricted to other sectors of the mine site.

The alternatives assessment has considered other options for the attenuation pond, including two alternatives that do not involve use of fish-bearing waterbodies as an attenuation pond. However, the disadvantages of these alternatives based on technical, environmental, and safety considerations were highlighted in the results.

Agnico Eagle will consider the results of this alternatives assessment in the development of further design and engineering for the Whale Tail Pit Expansion Project. During the FEIS review, Agnico Eagle will continue with Indigenous and public consultations, and address any Information Requests on the alternatives assessment, as well as provide a final fish habitat compensation plan for Lake A53, in support of a streamlined Schedule 2 amendment process.

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Appendix A

Table of Concordance with ECCC Guidelines

APPENDIX A. TABLE OF CONCORDANCE WITH ECCC GUIDELINES

The left-hand column of the following table is populated with text taken from the *Guidelines for the Assessment of Alternatives for Mine Waste Disposal* (ECCC 2016; Chapter 2: Requirements of Alternatives Assessment, Sections 2.2 to 2.8). The original Guidelines included examples in bulleted lists and tables to illustrate the described requirements, details associated with specific types of mining components that are not relevant to the alternatives considered in this report, and narrative discussion of general concepts in and approaches to multiple accounts analysis. For the sake of brevity and simplicity, these portions of the Guidelines have been omitted from this Table of Concordance. Instances of omitted text are indicated by ellipses.

ECCC Guideline Requirements	Report Section
2.2 Step 1: Identify Candidate Alternatives The first step in the alternatives assessment process entails developing a list of all possible (i.e., reasonable, conceivable and realistic) candidate mine waste disposal alternatives for the site. This should include different mine waste disposal technologies, different disposal storage options, and different disposal locations. At this time it is imperative that no a priori judgements be made about any of the alternatives.	Section 4.3.2
It may be appropriate to establish a basic set of threshold criteria to establish the regional boundaries for selecting candidate alternatives. These threshold criteria should be as broad as possible and must be fully described and rationalized to ensure transparency…	Section 4.2
2.3 Step 2: Pre-Screening Assessment The process of screening, called the pre-screening assessment in these guidelines, entails excluding those alternatives that are "non-compliant" in that they do not meet certain unique minimum specifications which have been developed for the project. This process is often referred to as a "fatal-flaw analysis" in the context of mine waste disposal alternatives assessments. A fatal flaw is defined as any site characteristic that is so unfavourable or severe that, if taken singly, it would eliminate that site as a candidate mine waste disposal alternative. In simple terms, these would be considered the "show-stoppers".	Section 5
There is not a "master list" that qualifies as pre-screening criteria. These criteria need to be uniquely developed for each project, and a thorough qualification and justification of the rationale must be provided. The selection of pre-screening criteria and its rationale needs to be carefully considered since the objective at this time is to provide a transparent process for potentially eliminating the majority of alternatives from detailed analysis and assessment. Therefore, it should be clear to external reviewers that the pre-screening criteria, when evaluated singly, are sufficiently important to eliminate an alternative from further consideration. The level of detail required to support that conclusion has to be evaluated on a case-by-case basis, and it may have to be extensive to be sufficiently supportive.	Section 5.2
Pre-screening criteria should be formulated such that there is a simple "YES" or "NO" response to whether the alternative complies with the set criteria. Most importantly, it must be clear to the external reviewer that there would be no reasonable mitigation strategy that would convert a "YES" into a "NO". […] Results of the pre-screening assessment are best presented in the form of a summary table that lists each alternative against the pre-screening criteria (and associated rationale) set for the project…	Section 5.3, Table 5-1

ECCC Guideline Requirements	Report Section
2.4 Step 3: Alternative Characterization […] Site specific characterization criteria should be developed for each project. To facilitate smooth transition towards the next more rigorous steps of the evaluation process these criteria should be categorized into four broad categories, or "accounts" in the context of these guidelines, that consider the entire project life cycle. This means that both short and long term environmental, technical and socio-economic aspects associated with construction through operation, mine closure and ultimately post-closure maintenance and monitoring need to be considered. The "accounts" can be summarized as follows:	Section 6
• Environmental characterization: This account focuses on characterizing the local and regional environment surrounding the proposed TIA. These include elements such as climate, geology, hydrology, hydrogeology, water quality and potential impacts on aquatic, terrestrial and bird life.	Section 6.5.2
• Technical characterization: This focuses on characterization of the engineered elements of each alternative such as storage capacity, dam size and volume, diversion channel size and capacity, dumping techniques, haul distances, sedimentation and pollution control dam requirements, tailings discharge methods, pipeline grades and routes, closure design, discharge and/or water treatment infrastructure and supporting infrastructure such as access roads.	Section 6.5.1
• Project economic characterization: The focus of this account is to characterize life of project economics. All aspects of the mine waste management plan need to be considered including investigation, design, construction (inclusive of borrow development and royalties where applicable), operation, closure, post closure care and maintenance, water management, associated infrastructure (including transport and deposition systems), compensation payments and land use or lease fees.	Section 6.5.4
• Socio-economic characterization: This account focuses on how a proposed TIA may influence local and regional land users. Elements that are considered here include characterization and valuation of land use, cultural significance, presence of archaeological sites and employment and/or training opportunities…	Section 6.5.3
• The deliverable for this step should ideally be a series of summary tables that list the selected characterization criteria for each account for each of the alternatives under consideration. The table should include a concise summary of the rationale behind each criterion. This format allows an external reviewer to easily compare the factual characteristics across alternatives…	Section 6.6
2.5 Step 4: Multiple Accounts Ledger […] In order to evaluate alternatives using the MAA decision making tool, it is necessary to develop a multiple accounts ledger. This ledger seeks to identify those elements that differentiate alternatives, and provides the basis for scoring and weighting as described in Step 5, which is necessary to complete the evaluation. The multiple accounts ledger consists of the following two elements: (1) sub-accounts, known as evaluation criteria, and (2) indicators, known as measurement criteria.	Section 7

ECCC Guideline Requirements	Report Section
2.5.1 Sub-Accounts Sub-accounts (evaluation criteria) are developed using the characterization criteria selected during Step 3. The fundamental difference between these sets of criteria is that characterization criteria are factual and have been developed with no a priori judgements being made regarding any of the alternatives being considered, while evaluation criteria consider only the material impact (i.e., benefit or loss) associated with any of the alternatives being evaluated… The choice of sub-accounts must be carefully considered so that only those sub-accounts that truly differentiate mine waste disposal alternatives are presented for evaluation. To facilitate this, sub-accounts should comply with the following guidelines: • Impact driven: The evaluation criteria must, as far as practicable, be linked to an impact as opposed to merely being a factual element. For example, the size of an impacted lake in itself is not a relevant sub-account, but if the size of the lake is linked to its value or potential habitat loss, then the sub-account is appropriate. • Differentiating: The sub-account must define an aspect which distinctly differentiates one alternative from another, and that difference is expected to have a material effect on the final selection of an alternative. For example, land ownership may be an important evaluation criterion, if different alternatives fall on ground with different ownership. Conversely, if all the mine waste disposal alternatives under consideration were on land belonging to a single owner, then there really is no need to consider this sub-account in the analysis. • Value relevance: A sub-account must be relevant in the context of the alternatives being evaluated. For example, the size of dams in itself is not a relevant sub-account unless it is linked to a relevant context such as increased long-term risk of failure or increased maintenance and inspection requirements. • Understandability: Sub-accounts must be unambiguously defined, such that two external reviewers cannot interpret the outcome differently. For example, distance between the TIA and the mill complex may be a sub-account with the understanding that greater distances pose greater technical and environmental risk. However, someone may assume that because there is a significant dust hazard associated with a proposed alternative, a greater distance could be advantageous due to reduced worker health and safety risks. • Non-redundancy: There should not be more than one sub-account that measures the same evaluation criteria. If individual sub-accounts measure similar criteria, consideration should be given to combining those criteria. • Judgemental independence: Sub-accounts should be judgementally independent, which means that preferences with respect to a single criteria, or trade-offs between criteria, cannot depend on the value of another. For example, assume "traditional land use" is one sub-account and another is "landowner perception". It may be concluded that for one alternative "hunting" will be impacted which would result in a negative impact on "traditional land use". However, if "landowner perception" is influenced by a decrease in hunting then judgemental independence does not exist… The deliverable at this stage in the process will be a summary table which lists the sub-accounts complete with the rationale behind each. Appropriate supporting documentation will likely have to be clearly referenced…	Section 7.1.1

ECCC Guideline Requirements	Report Section
2.5.2 Indicators To allow qualitative or quantitative measurement of the impact (i.e., benefit or loss) associated with each alternative for any given sub-account, the sub-account needs to be measurable. Sub-accounts by nature are often not directly measurable, and need to be sufficiently decomposed to allow measurability. This decomposition takes the form of sub-sub-accounts, which in the language of MAA are called indicators, or measurement criteria. […] These indicators may be different for the different life-cycle stages of the project (i.e., construction, operation and closure) and, where appropriate, may be divided into separate time periods. When selecting indicators thought should be given to the parameter that will be used to define measurability. This measurability is required in order to continue to Step 5, which is the value-based decision process. Assigning measurability is relatively simple for sub-accounts that readily lend themselves to parametric terms such as "water quality" or "capital costs". The challenge comes when measurability needs to be assigned to sub-accounts that do not readily lend themselves to parametric terms such as "traditional land use" which must be supplemented by indicators such as "effects on hunting". This problem can be overcome by constructing qualitative value scales. […] In order to develop a qualitative value scale it is necessary to define at least two points on the scale (usually the end points). The points on the scale are defined descriptively and draw on multiple concepts in the definition of the indicator. […] Qualitative value scales should be developed to have the following characteristics: • Operational: The decision maker should be able to rate alternatives that were not specifically used to define the scale, i.e., should another TIA be added for evaluation at a later time, the scale developed previously should still be relevant. • Reliable: Different external reviewers should be able to rate an alternative according to the value scale and assign the same score. • Value relevant: The value scale must be directly relevant to the indicator being scored. • Justifiable: Any external reviewer should reach the conclusion that the value scale is reasonable and representative. The deliverable for this part of the process will be the expansion of the sub-accounts summary table to include indicators. As previously stated, this collective information is also known as the multiple accounts ledger…	Section 7.1.2
2.6 Step 5: Value-Based Decision Process At the conclusion of Step 4, the multiple accounts evaluation is complete and the value-based decision process begins. This process entails taking the list of accounts, sub-accounts and indicators and assessing the combined impacts for each of the alternatives under review. This entails scoring and weighting of all indicators, sub-accounts and accounts and quantitatively determining merit ratings for each alternative. These three processes are described in the following sections. **2.6.1 Scoring** […] Scoring is done by developing qualitative value scales for every indicator, including those which appear to be readily measurable. […] By following this procedure, it is abundantly obvious to the external reviewer why a particular indicator score has been assigned to an alternative, and since the qualitative value scale has been developed collaboratively, with input from stakeholders, there is built in confidence that the scoring is appropriate…	Section 7.1.3 and Section 8 Section 7.1.3

ECCC Guideline Requirements	Report Section
2.6.2 Weighting At this time the analyst, with input from stakeholders, needs to have the ability to introduce their value bias between individual indicators. This is done by applying a weighting factor to each indicator. […] It is important to bracket the weighting factor, and in the context of these guidelines, it is recommended that the weighting factors range from 1 through 6. This means that any one indicator can be considered to be up to 6 times more significant than another. […] Considering the inherent subjectivity of weighting, there is a natural tendency to want to standardize or prescribe weighting factors. This would result in a fixed value bias, which reflects the value bias of the imposing guidelines with no consideration of site specific conditions, rather than allowing the analyst with input from stakeholders, to set value bias relevant to their project. Notwithstanding this, within the framework of these guidelines, it is proposed that the Base Case of the alternatives assessment use the following weightings for accounts: • Environment - 6 • Technical - 3 • Project Economics - 1.5 • Socio-Economic - 3 The analyst is still encouraged to assign other weightings to accounts and demonstrate their effect on the assessment outcome, as described in Step 6…	Section 8
2.6.3 Quantitative Analysis The quantitative analysis is relatively simple, and given the potentially large amount of accounts, sub-accounts, and indicators this analysis is well suited to using a spreadsheet type approach. 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 × W) is calculated as the product of these values. […] At this time it is possible to compare alternative merit ratings for all mine waste disposal alternatives evaluated and the preferred option will be the one which has the highest merit rating. The deliverable at this point in the process will be summary tables […]. It is, however, very important that justification is provided for all the weightings used along every step of the process. An external reviewer should be able to review the weightings, and conclude that they are reasonable, even though he may not agree with them.	Section 9.2
2.7 Step 6: Sensitivity Analysis […] The way to test the sensitivity of the value based decision making process is to assign different weightings to those indicators, sub-accounts and accounts according to a range of value systems representative of the perceived disparity. The level and type of sensitivity analysis that should be carried out is not set, and should not be prescriptive. It is entirely project specific and to a large extent will be based on feedback received from stakeholders throughout the alternatives assessment process. […] The merit rating of each alternative is compared to the base case analysis to determine if the results of the sensitivity analysis are likely to lead to a different decision about which alternative may be the preferred option. […] The deliverable for this step would be a well-documented summary of the sensitivity analysis that was carried out. This may be presented in summary tables similar to those presented in Step 5 […].	Section 9.3
2.8 Step 7: Document Results The final step in the alternatives assessment process entails thorough documentation of the results. This is best done through a comprehensive technical report, which systematically describes the outcome of each of the steps as recommended in these guidelines. The primary technical alternatives assessment report should be a concise summary of the findings of each step, using comparative summary tables and descriptive definitions which make the results immediately apparent to the external reviewer. Detailed supporting information related to elements such as cost estimate breakdowns, or geochemical assessment should be presented in appendices, or if stand-alone reports have been produced, these should be properly referenced and made available for review.	Sections 4 to 9

Appendix B

Multiple Accounts Ledger

MAA Ledger: Technical Account

Indicator	Rationale	Parameter (Unit)	I: A53	II: A53/WT-Ex	III: A54	IV: MAM	V: WT-Ex	Scale	I: A53	II: A53/WT-Ex	III: A54	IV: MAM	V: WT-Ex
Containment Infrastructure													
Maximum dam height	Alternatives with lower dam height have lower head, lower complexity of management, and lower consequence of dam failure, and are preferred.	Height (m)	6 m	7 m	12 m	11 m	13 m	1 15.0 m or more 2 11 m to 14 m 3 7 m to 10 m 4 3 m to 6 m 5 2 m or less 6 No dams	4	3	2	2	2
Length of dam(s) (combined)	Alternatives with shorter length of dam require less construction material, have lower complexity of management, and are preferred.	Length (m)	671 m	505 m	2,422 m	418 m	415 m	1 1,501 m or more 2 1,001 m to 1,500 m 3 501 to 1000 m 4 101 to 500 m 5 100 m or less 6 No dams	3	3	1	4	4
Pond surface area (combined)	Alternatives with a smaller surface area have a lower overall physical footprint and a smaller area to be reclaimed at closure, and are preferred.	Area (ha)	25.7 ha	32.2 ha	20.5 ha	26.1 ha	22.5 ha	1 50.0 ha or more 2 40.0 ha to 49.9 ha 3 30.0 ha to 39.9 ha 4 20.0 ha to 29.9 ha 5 10.0 ha to 19.9 ha 6 9.9 ha or less	4	3	4	4	4
Type of dam and foundation	Alternatives that involve frozen core dams, of smaller size, and constructed on competent and frozen foundation with low hydraulic head, are preferred.	Qualitative scale	On land, frozen core dam. Competent and frozen foundation.	A53: On land, frozen core dam. WT-Ex: Drained lake bed, unfrozen, highly fractured foundation conditions. Complex structure (moderate size) with concrete secant pile + grouting.	On land, frozen core dam, very large volumes. Competent and frozen foundation.	Lake bed, unfrozen. Uncertain foundation conditions. Complex structure with concrete secant pile (no grouting).	Drained lake bed, unfrozen, highly fractured foundation conditions. Very complex structure (large size) with concrete secant pile + grouting.	1 Incompetent and unfrozen foundation with high hydraulic head. Very complex and/or large infrastructure. 2 Incompetent and unfrozen foundation with high hydraulic head. Complex and/or moderate size infrastructure. 3 - 4 - 5 Competent and frozen foundation with low hydraulic head. 6 No dam required; competent and frozen foundation.	5	2	5	2	1
Ancillary Infrastructure													
Length of pipeline (combined)	Alternatives with shorter length of pipeline transporting contact water (source, to attenuation, to water treatment plant) are preferred.	Length (m)	10,642 m	10,642 m	17,117 m	18,669 m	7,796 m	1 16,000 m or more 2 14,000 to 15,999 m 3 12,000 to 13,999 m 4 10,000 to 11,999 m 5 8,000 to 9,999 m 6 7,999 m or less	4	4	1	1	6
Additional pumps	Alternatives that require fewer additional pumps (compared to Whale Tail Project) are preferred.	Number of pumps (#)	1 additional pump (attenuation pond)	2 additional pumps (attenuation pond + increased seepage into Whale Tail Pit)	1 additional pump (attenuation pond)	1 additional pump (attenuation pond)	2 additional pumps (attenuation pond + increased seepage into Whale Tail Pit)	1 2 pumps 2 - 3 1 pump 4 - 5 - 6 0 pumps	3	1	3	3	1
Surface water management infrastructure	Alternatives that require less surface water management infrastructure (surface runoff including WRSFs) are preferred.	Qualitative scale	None - relies on natural drainage	None - relies on natural drainage	IVR WRSF contact water collection (~ 1km) - drill and blast channel(s), large excavation, need to pump	Redirect surface water with bermed road (~1.5 km)	None - relies on natural drainage	1 Drill and blast, with pumping requirement and large channel excavation 2 Drill and blast, with pumping requirement or large channel excavation 3 Drill and blast channel, no pumping requirement, small excavation 4 Above-grade berm required: new build, no existing infrastructure 5 Above-grade berm required: alongside existing linear infrastructure 6 None	6	6	1	5	6
Seepage collection infrastructure	Alternatives that require less seepage collection infrastructure (i.e., seepage from containment infrastructure) have less pumping requirements and are preferred.	Qualitative scale	Seepage directed to WTAP (i.e., existing infrastructure). No new infrastructure required. Reduction of water inflow to pit.	Increased water inflow to pit (limited head) - additional in-pit pumping required.	Seepage collection infrastructure required around dam. Reduction of water inflow to pit.	Seepage collection infrastructure required around dam (downstream side of in-lake dam). Reduction of water inflow to pit.	Significant seepage to pit (high head) - additional in-pit pumping required.	1 Significant increase in water inflow to pit; in-pit pumping required 2 Increase in water inflow to pit; in-pit pumping required 3 No material change in water inflow to pit; no additional infrastructure required 4 Reduction of water inflow to pit; contact water collection infrastructure required 5 Reduction of water inflow to pit; non-contact water collection require 6 Reduction of water inflow to pit; no additional infrastructure required.	6	2	4	5	1

Indicator	Rationale	Parameter (Unit)	I: A53	II: A53/WT-Ex	III: A54	IV: MAM	V: WT-Ex	Scale	I: A53	II: A53/WT-Ex	III: A54	IV: MAM	V: WT-Ex
Technical Complexity													
Design complexity	Alternatives that require less collection of baseline data (i.e., geotechnical studies) and/or engineering modelling (e.g., permafrost degradation, seepage, slope stability, etc.) are preferred.	Qualitative scale	Limited geotechnical studies required. Utilizes standard design basis. Proven structures.	Very high complexity. Geotechnical studies required re: increased water head at pit crest. Anticipate incompetent foundation conditions, therefore complex engineering. Sensitive receptors (i.e. workers) in pit, down-gradient of dam.	Additional geotechnical studies required for large dam structure adjacent to WRSF. Utilizes standard design basis. Proven structures.	Highly complex (in-water) geotechnical study required. Baseline data does not currently exist. Anticipate incompetent foundation conditions, therefore complex engineering.	Very high complexity. Sensitive receptors (i.e., workers) in pit, down-gradient of dam. Underground mine workings under pond.	1 Very high complexity 2 High complexity 3 Moderate-to-high complexity 4 Moderate complexity 5 Low-to-moderate complexity 6 Low complexity	6	1	4	2	1
Construction complexity	Alternatives with less complex construction (i.e., more stable foundation, less material to be excavated, smaller foundation area) are preferred.	Qualitative scale	On-land construction of dam structure with competent foundation conditions results in low complexity of construction	Very high complexity of design requires specialized contractors, engineering oversight, and robust QA/QC program during construction.	On-land construction of dam structure with competent foundation conditions reduces complexity of construction; but large length of dam structure increases time to construct and risk for construction errors. Overall moderate complexity.	Highly complex design with in-water work requires specialized contractors, environmental controls, engineering oversight and robust QA/QC program during construction	Very high complexity of design requires specialized contractors, engineering oversight, and robust QA/QC program during construction.	1 Very high complexity 2 High complexity 3 Moderate-to-high complexity 4 Moderate complexity 5 Low-to-moderate complexity 6 Low complexity	6	1	4	2	1
Operational complexity	Alternatives with less complex operation and maintenance (i.e., fewer dams, fewer ponds, smaller area of dam face, few points for seepage collection and pumping requirements)	Qualitative scale	Attenuation pond is within the gravity catchment area of the IVR waste rock storage area and therefore also serves to manage this contact water without additional pumping. Primary storage location for contact water is located in close proximity to the existing water treatment plant. Low complexity overall.	Attenuation pond is within the gravity catchment area of the IVR waste rock storage area and therefore also serves to manage this contact water without additional pumping. Primary storage location for contact water is located in close proximity to the existing water treatment plant. Smaller A53 pond (compared to Alternative I) will require management of a spillway and gravity channel to direct water in excess of 473,000 m3 to WT-Ex for temporary storage. Moderate complexity overall.	Attenuation pond has the longest perimeter dam structure of all options, increasing the level of monitoring for seepage and the requirement for collection and pump back systems. Attenuation pond location requires up-gradient diversion of non-contact water to reduce its catchment area and to be consistent with the water management philosophy (i.e. keep clean water clean). A54 is located the furthest distance away from the IVR pit which is the largest source of water requiring winter storage. Location of A54 will require pumping of contact water from IVR waste rock runoff. Maintaining A53 as a clean water pond will require additional infrastructure to capture and relocate contact water. Moderate-to-high complexity overall.	Operationally equivalent to current use of Whale Tail attenuation pond with contact water stored within a portion of an existing lake. Will require capture and pump back of clean water infiltrating attenuation pond to reduce the volume of water to be treated. MAM is located the furthest distance away from the water treatment plant, requiring management of additional pipeline length and pumping equipment. Maintaining A53 as a clean water pond will require additional infrastructure to capture and relocate contact water. Moderate-to-high complexity overall.	No change in location of attenuation pond from current operations. An increase in the volume of the attenuation pond increases its operational complexity as a result of the requirement for a dam structure adjacent to the pit and the need to actively manage seepage that will enter the pit. During the winter, ice wall formations in the pit will be more prominent and need to be managed to maintain safe access. Storing a large volume of water up-gradient of the mining pit increases risk to worker safety requiring more robust operating procedures. Maintaining A53 as a clean water pond will require additional infrastructure to capture and relocate contact water. Very high complexity overall.	1 Very high complexity 2 High complexity 3 Moderate-to-high complexity 4 Moderate complexity 5 Low-to-moderate complexity 6 Low complexity	6	4	3	3	1
Closure complexity	Alternatives with less complex closure requirements (i.e. fewer complex activities such as dredging, pumping) during the closure phase are preferred.	Qualitative scale	Location of attenuation pond enables reclamation activities to be completed largely independent from other domains. Contact water can be monitored and controlled until closure completion criteria have been met. Management of solids accumulated in the pond may be required either by covering or removing. Dam will require breaching to reintroduce water to the reclaimed Whale Tail - Mammoth Lake watershed. Overall moderate-to-high complexity.	A53 portion is the same as Alternative I. WT-Ex portion of attenuation pond requires no additional work as it will be returned to the natural watershed with the breach of the dam. Closure of WT-Ex becomes more complex if management of solids is required by either covering or removing. Closure plan currently assumes that solids in Whale Tail Attenuation Pond will not require additional mitigation at closure. Overall moderate-to-high complexity.	Long dam structure will need to be reclaimed. Extensive drainage system will be required at closure to divert water flows from IVR Waste Rock Storage Facility around A53 with discharge to the reclaimed Whale Tail lake. Reclamation of former attenuation pond area will be required so it is free draining and land is reclaimed to meet closure land use. Management of solids accumulated in the pond may be required either by covering or removing. Closure plan currently assumes that solids in Whale Tail Attenuation Pond will not require additional mitigation at closure. Overall high complexity.	Attenuation pond is easily reclaimed by breaching a portion of the dam between the pond and Mammoth Lake. No pumping is required as the former attenuation pond will be reintroduced as part of the Whale Tail - Mammoth watershed with the creation of the pit lake. Closure plan currently assumes that solids in the Whale Tail Attenuation Pond will not require additional mitigation at closure. Overall low-to-moderate complexity.	Attenuation pond is easily reclaimed by breaching the dam structure between the attenuation pond and the Whale Tail Pit. No pumping is required as the former attenuation pond will be reintroduced as part of the Whale Tail - Mammoth watershed with the creation of the pit lake. Closure plan currently assumes that solids in the Whale Tail Attenuation Pond will not require additional mitigation at closure. Overall low-to-moderate complexity.	1 Very high complexity 2 High complexity 3 Moderate-to-high complexity 4 Moderate complexity 5 Low-to-moderate complexity 6 Low complexity	3	3	2	5	5
Post-closure complexity	Alternatives with less complex (i.e. more passive) water management requirements following closure are preferred.	Qualitative scale	Passive water treatment with minimal annual maintenance. Water from former attenuation pond will flow by gravity to receiving environment. Controlled release is easily established if post-closure water management is needed for run-off from IVR waste rock storage area.	Passive water treatment with minimal annual maintenance. Water from A53 portion of former attenuation pond will flow by gravity to receiving environment. Whale Tail Attenuation Pond will form part of reclaimed lake, requiring no additional post-closure management.	Active water treatment and management will be required for at least 10 years post-closure. Water from former attenuation pond will flow by gravity to receiving environment. Drainage system for contact water from IVR WRSF to the Whale Tail lake will require long-term post closure management (i.e., snow clearing).	Attenuation pond will form part of reclaimed lake, requiring no additional post-closure management.	Attenuation pond will form part of reclaimed lake, requiring no additional post-closure management.	1 Active water management and/or treatment in perpetuity 2 Active water management and/or treatment for an undetermined period 3 Active water treatment and management for >10 years 4 Active water treatment and management for <10 years 5 Passive water management with minimal annual maintenance 6 No post closure management required	5	5	3	3	3

Indicator	Rationale	Parameter (Unit)	I: A53	II: A53/WT-Ex	III: A54	IV: MAM	V: WT-Ex	Scale	I: A53	II: A53/WT-Ex	III: A54	IV: MAM	V: WT-Ex
Consequences of Failure													
Consequence of overtopping	Alternatives with lower downstream consequences (environment and/or human safety) of an overtopping event are preferred.	Qualitative scale	Overflow will be directed to Whale Tail Attenuation Pond by gravity. Releases to the environment or to areas to the mining area would not result.	Any overtopping of WT-Ex would report to the Whale Tail pit where workers are present. The contingency storage in WT-Ex is not provided by this option. Overflow would introduce operational complexity but would be manageable. Potential moderate-to-high consequence.	Overtopping would report to the natural receiving environment and could result in environmental impact. Potential high consequence.	Overtopping would report to the Whale Tail pit where workers are present. Overflow would introduce operational complexity but would be manageable. Potential moderate-to-high consequence.	Overtopping would report to the Whale Tail pit where workers are present. Overflow would introduce operational complexity but would be manageable. Potential moderate-to-high consequence.	1 High consequence - release of contact water could affect fish-bearing water bodies or areas of public use. 2 Moderate-to-high 3 Moderate consequence - release of contact water would affect natural water bodies but poses no risk to human safety. 4 Low-to-moderate 5 Low consequence - water would be contained by existing mine infrastructure 6 No consequence - water would be fully contained by existing mine infrastructure designed to collect and store water.	6	2	1	2	2
Consequence of dam failure	Alternatives with lower downstream consequences (environment and/or human safety and/or economic) of a dam failure event are preferred.	Qualitative scale	Dam failure at A53 would result in water reporting to Whale Tail Attenuation Pond. If volume of water released from breach exceeded capacity of Whale Tail Attenuation Pond (A53 is approximately 3x the volume of Whale Tail Attenuation Pond) then water would enter Whale Tail pit, posing a potential risk to workers and to production. Overall potential moderate-to-high consequence.	Dam failure at A53 would result in water reporting to the expanded Whale Tail Attenuation Pond (WT-Ex). If volume of water released from breach exceeds capacity of WT-Ex then water would enter Whale Tail pit, posing a potential risk to workers and to production. Dam failure at WT-Ex would also result in water entering Whale Tail pit and posing a risk to workers and to production. Overall potential moderate-to-high consequence.	Dam failure would result in water reporting to the natural receiving environment and could result in environmental impact. Potential moderate consequence.	Dam failure would result in water reporting to Whale Tail pit, posing a potential risk to workers and to production. A breach of the structure dividing Mammoth Lake would result in the same consequence and would also result in an environmental impact to Mammoth Lake itself. Potential high consequence.	Downstream Dam failure would result in water reporting to Whale Tail pit, posing a potential risk to workers and to production. Potential high consequence.	1 High consequence - release of contact water likely to result in impacts to worker safety and would have material economic impact to the business 2 Moderate-to-high consequence - release of contact water may result in impacts to worker safety and may have material economic impact to the business 3 Moderate consequence - release of contact water would have a long term impact on the receiving environment but poses no risk to human safety. 4 Low-to-moderate - water may be released to natural environment but at quantities unlikely to have a long term impact 5 Low consequence - water would be contained by existing mine infrastructure 6 No consequence - water would be fully contained by existing mine infrastructure designed to collect and store water.	2	2	3	1	1

MAA Ledger: Biophysical Environment Account

Indicator	Rationale	Parameter (Unit)	I: A53	II: A53/WT-Ex	III: A54	IV: MAM	V: WT-Ex	Scale	I: A53	II: A53/WT-Ex	III: A54	IV: MAM	V: WT-Ex
Surface Water													
Loss of natural water bodies	Alternatives that avoid impacts to natural water bodies, or affect fewer natural water bodies, are preferred.	Number of water bodies (#)	1	1	1	1	0	1 More than 20 water bodies 2 16 to 20 water bodies 3 11 to 15 water bodies 4 5 to 10 water bodies 5 1 to 5 water bodies 6 None	5	5	5	5	6
Ability to manage surface water quality impacts external to the attenuation pond	Alternatives that provide greater ability to manage surface water quality impacts, and/or reduce potential impacts on surface water quality (for Lake A53, Mammoth Lake, or other fish-bearing waterbodies), aside from use as an attenuation pond, are preferred.	Qualitative scale	The use of Lake A53 as an attenuation pond will leverage natural drainage pathways, without affecting other water bodies outside the mine site. No additional impact on fish-bearing waterbodies (including Mammoth Lake) are expected.	The use of Lake A53 as an attenuation pond will leverage natural drainage pathways, without affecting other water bodies outside the mine site. No additional impact on fish-bearing waterbodies (including Mammoth Lake) are expected.	Surface runoff from the IVR WRSF naturally drains towards Lake A53. Lake A53 will be surrounded on 3 sides by the mine site. Extensive diversion infrastructure and other water management strategies will be required to avoid impacts on Lake A53, and the risk of water quality impacts to Lake A53 is increased. However, impacts to other fish-bearing waterbodies (including Mammoth Lake) are not expected.	Surface runoff from the IVR WRSF naturally drains towards Lake A53. Lake A53 will be surrounded on 3 sides by the mine site. Extensive diversion infrastructure and other water management strategies will be required to avoid impacts on Lake A53, and the risk of water quality impacts to Lake A53 is increased. However, impacts to other fish-bearing waterbodies (including the west basin of Mammoth Lake) are not expected.	Surface runoff from the IVR WRSF naturally drains towards Lake A53. Lake A53 will be surrounded on 3 sides by the mine site. Extensive diversion infrastructure and other water management strategies will be required to avoid impacts on Lake A53, and the risk of water quality impacts to Lake A53 is increased. However, impacts to other fish-bearing waterbodies (including Mammoth Lake) are not expected.	1 Other than the attenuation pond, water quality impacts to Lake A53, Mammoth Lake, or other fish-bearing water bodies are anticipated. 2 - 3 - 4 Other than for use as the attenuation pond, water quality impacts to Lake A53, Mammoth Lake, or other fish-bearing water bodies are not anticipated. 5 - 6 Water quality impacts to Lake A53, Mammoth Lake, or other external fish-bearing water bodies are not anticipated.	4	4	1	1	1
Fish and Fish Habitat													
Number of fish-bearing water bodies	Alternatives that avoid, or minimize impacts to fish-bearing water bodies are preferred	Number of water bodies (#)	1	1	0	1	0	1 3 or more 2 2 3 1 4 - 5 - 6 0	3	3	6	3	6
Diversity of affected fish community	Alternatives that affect fewer fish species are preferred.	Number of species (#)	5 species	5 species	0 species	6 species	0 species	1 6 or more species 2 4 or 5 species 3 3 species 4 2 species 5 1 species 6 0 species	2	2	6	1	6
Extent of fish habitat loss	Alternatives that minimize the area of fish habitat loss are preferred.	Area (ha)	Loss of Lake A53, with area of 14 ha	Loss of Lake A53, with area of 14 ha	No fish habitat affected.	Loss of Mammoth Lake (North Basin) with area of 26 ha	No fish habitat affected.	1 >250 ha 2 150-200ha 3 100-150 4 25 -100 5 <25 ha 6 Zero	5	5	6	4	6
Abundance of affected fish community	Alternatives that affect waterbodies with lower abundance of fish are preferred.	Qualitative Scale	Low abundance	Low abundance	None	Moderate abundance	None	1 High abundance 2 Moderate-to-high abundance 3 Moderate abundance 4 Low -to-moderate abundance 5 Low abundance 6 None - no fish habitat is affected	5	5	6	3	6
Terrestrial Habitat													
Terrestrial habitat loss	Alternatives that minimize the area of terrestrial habitat loss are preferred.	Area (ha)	14.4 ha	10.2 ha	27.1 ha	No loss of terrestrial habitat (4.38 ha will be gained by decreased water level)	No loss of terrestrial habitat (area is within mine infrastructure)	1 More than 25 2 20 to 25 3 15 to 20 4 10 to 15 5 5.0 to 9.9 ha 6 4.9 ha or less	4	4	1	6	6

MAA Ledger: Human Environment Account

Indicator	Rationale	Parameter (Unit)	I: A53	II: A53/WT-Ex	III: A54	IV: MAM	V: WT-Ex	Scale	I: A53	II: A53/WT-Ex	III: A54	IV: MAM	V: WT-Ex
Inuit Land Use													
Loss of waterbody used for fishing	Alternatives that avoid or minimize impacts to fishing activities, or waterbodies used for fishing, are preferred.	Qualitative Scale	No fishing activity has been reported at Lake A53 through consultation, traditional land use studies, or other feedback. The lake is small and unremarkable, and there are many other lakes more suitable for fishing throughout the area.	No fishing activity has been reported at Lake A53 through consultation, traditional land use studies, or other feedback. The lake is small and unremarkable, and there are many other lakes more suitable for fishing throughout the area.	No fish-bearing waterbodies are affected.	No fishing activity has been reported at Mammoth Lake through consultation, traditional land use studies, or other feedback. The lake is moderately sized and could be used for fishing although there are many other lakes more suitable for fishing throughout the area.	No fish-bearing waterbodies are affected.	1 Affected waterbody is reported to be a destination for fishing 2 Affected waterbody is reported to be fished opportunistically 3 - 4 Affected waterbodies could be used for fishing, but no fishing activity has been reported or otherwise indicated 5 - 6 Affected waterbodies (if any) are not used for fishing	6	6	6	4	6
Relocation of fish	Alternatives that avoid relocation of fish from one waterbody to another are preferred (due to local Elders' concerns related to intangible/spiritual effects on fish).	Qualitative Scale	Lake A53 is fish-bearing. Use of this lake will require fish to be relocated.	Lake A53 is fish-bearing. Use of this lake will require fish to be relocated.	Lake A54 is not fish-bearing. Therefore, relocation of fish is not required.	Mammoth Lake is fish-bearing. Use of this lake will require fish to be relocated.	No fish-bearing waterbodies are affected. Therefore, relocation of fish is not required.	1 Relocation of fish is required 2 - 3 - 4 - 5 - 6 Relocation of fish is not required	1	1	6	1	6
Disruption of landscape	Alternatives that minimize visual disruption of the natural landscape during mine operations are preferred.	Qualitative Scale	Includes construction of a moderately sized dam (approx. 6 m high, 500 m long) plus two smaller dams (approx. 50 m and 120 m) at Lake A53. This would result in a 110% increase to the natural water surface area. However, considering that the pond surrounded on 3 sides by the mine site, the overall change in the landscape as a result of the attenuation pond is expected to be minor.	Includes construction of a moderately sized dam (approx..5 m high, 280 m long) plus one small dam at Lake A53 (approx. 100 m long); and an additional dam at the WTAP (7 m high, 125 m long). This would result increase the natural water surface area of Lake A53 by 78%. Considering that Lake A53 is surrounded on 3 sides by the mine site, the overall change in the landscape is expected to be minor.	Includes construction of a large, horseshoe shaped dam (approx.. 12 m tall and 2,040 m long), plus a small dam (380 m long). This would increase the water surface area of Lake A54 by over 20 times its size. The pond is on the east edge of the mine site. The overall change in the landscape is expected to be moderate-to-major.	Includes construction of a 418 m long dam across Mammoth Lake. The water surface area would be largely unchanged from the baseline though it will be transected by the dam. The pond is on the west edge of the mine site. The overall change in the landscape is expected to be minor-to-moderate.	Includes construction of a 13 m high and 415m long dam on the south side of the open pit. The pond will be surrounded on all sides by the mine site, located within the footprint of the first phase of the Whale Tail Pit Project. No additional effect on the natural landscape is effect.	1 The attenuation pond will result in major changes to the natural landscape 2 The attenuation pond will result in moderate-to-major changes to the natural landscape 3 The attenuation pond will result in moderate changes to the natural landscape 4 The attenuation pond will result in minor-to-moderate changes to the natural landscape 5 The attenuation pond will result in minor changes to the natural landscape 6 The attenuation pond will not affect the natural landscape	5	5	2	4	6
Workforce													
Worker well-being	Alternatives that minimize real or perceived risks to worker well-being are preferred.	Qualitative Scale	Includes existing Whale Tail Attenuation Pond with capacity of 133,232 m^3. No water-retaining dam at the Whale Tail Attenuation Pond.	Includes expanded Whale Tail Attenuation Pond with capacity of 288,666 m^3. There is a 7 m high water retaining dam at the expanded Whale Tail Attenuation Pond, adjacent to Whale Tail Pit. The dam would create a perception of risk for workers in the pit.	Includes existing Whale Tail Attenuation Pond with capacity of 133,232 m^3. No water-retaining dam at the Whale Tail Attenuation Pond.	Includes existing Whale Tail Attenuation Pond with capacity of 133,232 m^3. No water-retaining dam at the Whale Tail Attenuation Pond.	Includes expanded Whale Tail Attenuation Pond with capacity of 758,870 m^3. There is a 13 m high water retaining dam at the expanded Whale Tail Attenuation Pond, adjacent to Whale Tail Pit. The dam would create a perception of risk for workers in the pit.	1 Water-retaining dam (>10 m high) above workers in pit. 2 Water-retaining dam (6-10 m high) above workers in pit. 3 Water-retaining dam (2-5 m high) above workers in pit. 4 Water-retaining dam (< 2 m) above workers in pit. 5 - 6 No water-retaining dam above workers in pit.	6	2	6	6	1

MAA Ledger: Project Economics Account

Indicator	Rationale	Parameter (Unit)	I: A53	II: A53/WT-Ex	III: A54	IV: MAM	V: WT-Ex	Scale	I: A53	II: A53/WT-Ex	III: A54	IV: MAM	V: WT-Ex
Attenuation Pond Costs													
Capital costs	Alternatives with lower capital costs (considering type and size of construction) are preferred.	Estimated Cost ($)	671 m long; 29,423 m3; Frozen core dam Estimated cost: $4.7 M	505 m long; 25,284 m3; frozen core and secant pile dams Estimated cost: $4.5 M (secant) + $2.7 M (frozen core) = $7.2 M	2,422 m long; 322,029 m3; frozen core dam Estimated cost: $17.0 M	418 m long; 80,144 m3; secant pile. Estimated cost: $15.0 M	415 m long; 97,646 m3; secant pile. Estimated cost $14.9 M	1 More than $20 million 2 $16 to $20 million 3 $11 to $15 million 4 $6 to $10 million 5 $1 to $5 million 6 <$1 M	5	4	2	3	3
Fish habitat offsetting costs	Alternatives with lower costs for fish habitat offsetting (compensation) are preferred. Offsetting costs compared to those for the approved Whale Tail Pit Project.	Estimated Cost ($)	Offsetting costs higher than base case as need to compensate for 14 hectares of fish habitat for all of Lake A53.	Offsetting costs higher than base case as need to compensate for 14 hectares of fish habitat for all of Lake A53.	No fish habitat offsetting required	Offsetting costs higher than base case and Lake A53 as need to compensate for 26 hectares of north basin of Mammoth Lake.	No fish habitat offsetting required	1 $2 million or more 2 $1.5 million to $1.9 million 3 $1.0 million to $1.4 million 4 $0.5 million to $0.9 million 5 Less than$0.5 million 6 No fish habitat offsetting costs	3	3	6	1	6
Operating / sustaining costs	Alternatives with lower operating (or sustaining) costs, compared to the approved Whale Tail Pit Project, are preferred.	Estimated Cost ($)	Operational costs higher than base case (additional pump required); no seepage pumping; low monitoring costs; no additional manpower required.	Operational costs higher than base case (additional pump required); pumping costs in WT Pit will increase with increased seepage; high monitoring costs; no additional manpower required.	Operational costs higher than base case (additional pump required); no seepage pumping; higher monitoring costs with longer infrastructure; no additional manpower required.	Operational costs higher than base case (additional pump required); no seepage pumping; high monitoring costs; no additional manpower required.	Operational costs similar to base case; highest monitoring costs; pumping costs in WT Pit will increase with increased seepage; infrastructure costs similar; no additional manpower required.	1 One additional pump, high increase in seepage in pit, high monitoring requirements. 2 One additional pump, moderate increase in seepage in pit, high monitoring requirements. 3 One additional pump, high monitoring requirements. 4 High monitoring requirements. 5 Low monitoring requirements. 6 No change from base case (Whale Tail Project)	3	2	3	3	1
Closure and reclamation costs	Alternatives with lower costs for closure and reclamation are preferred.	Estimated Cost ($)	Location of attenuation pond enables reclamation activities to be completed largely independent from other domains which can reduce cost and provide flexibility in timing. Management of solids accumulated in the pond may be required either by covering or removing. Dam will require breaching to reintroduce water to the reclaimed Whale Tail - Mammoth Lake watershed. Pumps and piping will be removed and the channel between A53 will require upgrading to support final closure. Overall incremental cost increase is expected to be small.	A53 portion is the same as Alternative I. WTEX portion of attenuation pond requires the dam to be breached. The cost of removal is higher for dams constructed on incompetent ground (as for WT-Ex) compared to structures on land. The higher costs will be more than offset because only a portion of WT-Ex will be removed. Closure of WT-Ex becomes more costly if management of solids is required by either covering or removing. Closure plan currently assumes that solids in Whale Tail Attenuation Pond will not require additional mitigation at closure. Overall incremental cost increase is expected to be small.	Long dam structure will need to be reclaimed. Reclamation will require dams to be re-contoured or removed to ensure positive drainage. Added cost to this option to construct the a drainage system to divert water flows from IVR Waste Rock Storage Facility around A53 with discharge to the reclaimed Whale Tail Lake. Management of solids accumulated in the pond may be required either by covering or removing. Closure plan currently assumes that solids in Whale Tail Attenuation Pond will not require additional mitigation at closure. Overall incremental cost increase is expected to be high.	A portion of the dam between the pond and Mammoth Lake will be breached. The cost of removal is higher for dams constructed on incompetent ground (as for MAM) compared to structures on land. The higher costs will be more than offset because only a portion of MAM will be removed. The dam structure between the attenuation pond and the Whale Tail pit will also be breached. Closure plan currently assumes that solids in Whale Tail Attenuation Pond will not require additional mitigation at closure. Overall incremental cost increase is expected to be moderate to high.	A portion of the dam structure between the attenuation pond and the Whale Tail Pit will be breached. The cost of removal is higher for dams constructed on incompetent ground (as for WT-Ex) compared to structured on land. The higher costs will be more than offset because only a portion of WT-Ex will be removed. Closure plan currently assumes that solids in WT-Ex will not require additional mitigation at closure. Overall incremental cost increase is expected to be moderate to high.	1 Incremental cost increase is high (>20%) of the total cost of closure for the water management system. Low cost certainty for closure of this option. 2 Incremental cost increase is high (>20%) of the total cost of closure for the water management system. High cost certainty for closure of this option. 3 Incremental cost increase is moderate to high (10-20%) of the total cost of closure for the water management system. Low to Moderate cost certainty for closure of this option. 4 Incremental cost increase is small (<10%) of the total cost of closure for the water management system. High cost certainty for closure of this option. 5 Small incremental cost increase - Pumping equipment to be removed and portions of dam structures to be breached. 6 No incremental cost - No incremental closure beyond the approved Whale Tail Pit Project closure plan.	4	4	2	3	3
Long-term post closure costs	Alternatives with lower costs for active water treatment or other activities post-closure are preferred.	Estimated Cost ($)	Water from former attenuation pond will flow by gravity to receiving environment. Controlled release is easily established if post-closure water treatment is needed for run-off from IVR waste rock storage area. Active water treatment may be required for less than 10 years.	Water from A53 portion of former attenuation pond will flow by gravity to receiving environment. WT-Ex will form part of reclaimed lake, requiring no additional post-closure management. Active water treatment may be required for less than 10 years.	Water from former attenuation pond will flow by gravity to receiving environment. Drainage system for contact water from IVR WRSF to the Whale Tail lake will require long-term post closure management (i.e., snow clearing). Active water treatment may be required for up to 20 years.	Attenuation pond will form part of reclaimed lake, requiring no additional post-closure management. Monitoring may be required for up to 10 years.	Attenuation pond will form part of reclaimed lake, requiring no additional post-closure management. Monitoring may be required for up to 10 years.	1 Active water treatment and management required in perpetuity. 2 Active water treatment and/or management will be required and time period is undetermined 3 Active water treatment and/or management for <20 years 4 Active water treatment and/or management may be required <10 years 5 Post closure monitoring required for <10 years 6 No post-closure monitoring required	4	4	3	5	5