MELIADINE GOLD MINE

Conceptual Aquatic Effects Monitoring Program Design Plan

Considerations for the Meliadine Extension

DECEMBER 2021

VERSION 2_NIRB

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EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is proposing to develop ore deposits that were previously assessed and approved by the Nunavut Impact Review Board as part of Final Environment Impact Statement for the Meliadine Mine (Project Certificate No. 006). Development of these deposits (Pump, F Zone, Wesmeg, and Discovery) and associated infrastructure (called the Meliadine Extension) will require an amendment to the Water Licence (2AM-MEL1631) and an update to the Aquatic Effects Monitoring Program (AEMP) to incorporate changes in the scope of the development into the overall study design for monitoring mine-related changes in the aquatic environment. This document outlines the overarching principles and objectives that will guide how the Meliadine Extension will be incorporated into the study design for the AEMP. An AEMP design plan was approved through the Type A Water Licence (2AM-MEL1631) for the Meliadine Mine. The current AEMP includes two study areas: Meliadine Lake and three lakes located close to the mine (referred to collectively as the Peninsula Lakes), and the AEMP is conducted annually. An update to the detailed AEMP design plan will be completed through the Nunavut Water Board process.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
V0	April 2014	All	All	Conceptual AEMP for Meliadine Mine	Golder
V1	June 2016	All	All	AEMP Design Plan for Meliadine Mine to meet requirements of Type A Water Licence issued by the Nunavut Water Board	Golder
v2_NIRB	December 2021	All	All	An overview of the AEMP for Meliadine Mine and conceptual discussion of likely changes needed to accommodate the Meliadine Extension.	Azimuth

ACRONYMS

AEMP	Aquatic Effects Monitoring Program
COPC	Contaminant of potential concern
CSM	Conceptual Site Model
EEM	Environmental Effects Monitoring
FEIS	Final Environmental Impact Statement
ICRP	Interim Closure and Reclamation Plan
IQ	Inuit Qaujimajatuqangit
MDMER	Metal and Diamond Mining Effluent Regulations
NIRB	Nunavut Impact Review Board
NuPPAA	Nunavut Planning and Project Assessment Act
NWB	Nunavut Water Board
TSS	Total suspended solids
WLWB	Wek’e`ezhı`i Land and Water Board

1 INTRODUCTION

The Meliadine Mine is located approximately 25 km north of Rankin Inlet and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut (see Figure 1-1 for the location and land use boundaries of the Meliadine Mine and Figure 1-2 for the location of the claim blocks in the region). This report provides an overview of Agnico Eagle Mines Limited's (Agnico Eagle) Aquatic Effects Monitoring Program (AEMP) design plan for the Meliadine Mine and conceptually discusses what changes would be necessary to accommodate the proposed Meliadine Extension.

1.1 AEMP Overview

An AEMP design plan was approved through the Type A Water Licence (2AM-MEL1631) for the Meliadine Mine (Golder 2016); this plan is conducted annually. The current AEMP (Golder 2016) includes two study areas: Meliadine Lake and three lakes located close to the mine (referred to collectively as the Peninsula Lakes). The methods of the monitoring program should not change with the Meliadine Extension. These methods will be reviewed during the Water Licence Amendment.

The AEMP is the integrated monitoring program that considers the activities that take place at the mine, and the potential for effects these activities may have on the aquatic environment. The program was developed in two stages. Initially, a Conceptual AEMP (Agnico Eagle, 2014; Appendix SD 7-3) was prepared as part of the Final Environmental Impact Statement (FEIS) to satisfy guidance[1] issued from the Nunavut Impact Review Board (NIRB) during their review of the application in 2014:

> *The Proponent shall develop an Aquatic Effects Monitoring Plan to provide information on monitoring, to address mitigation measures to be implemented to protect and minimize the impacts on aquatic system from any and all project activities occurring in or near and watercourses during construction, operation, temporary closure, final closure (decommission & reclamation), post-closure phases.*

The Conceptual AEMP defined the principles and objectives of the AEMP and provided an outline of aquatic monitoring designed to assess Mine-related effects predicted in the FEIS.

This report provides a conceptual-level description of how the AEMP will need to be modified to include the Meliadine Extension. It is anticipated that the AEMP Design Plan will be updated as part of the amendment to the Type A Water Licence (2AM-MEL1631) to include any further detail needed to expand the AEMP for the Meliadine Extension.

[1] From FEIS Volume 1, Appendix 1.0-A, Guideline Section # 9.4.16).

*The **Conceptual AEMP** provided the philosophy and structure of the AEMP that will be followed throughout the life of the Mine, from pre-construction through closure.*

*The **AEMP Design Plan** describes the detailed study design for monitoring mine-related changes in the aquatic environment.*

1.2 Regulatory History

The Meliadine Mine was subject to the environmental and socio-economic impact assessment and permitting processes established under the Nunavut Agreement. Article 12, Part 5 of the Nunavut Agreement sets out the environmental and socio-economic review and assessment requirements managed by the NIRB, one of five Institutions of Public Government established under the Nunavut Agreement.

Following a Part 5 public review, the Nunavut Impact Review Board (NIRB) provided the Minister with the Final Hearing Report and recommended Terms and Conditions for the Meliadine Mine. On October 10, 2014, the NIRB provided the Minister with the Final Hearing Report and recommended Terms and Conditions for the Meliadine Mine. The Minister accepted the NIRB's recommendation on January 27, 2015 and Project Certificate No.006 was issued on February 26, 2015. This included the approval of the Tiriganiaq deposit and the F Zone, Wesmeg, Pump, and Discovery deposits and the associated infrastructure (e.g., water management structures, waste rock storage facilities).

On May 19, 2016, the Minister approved the Type A Water Licence 2AM-MEL1631 to begin construction and operation of the Meliadine Mine. At that time, Agnico Eagle only applied for the Type A Water Licence required to proceed with the Tiriganiaq deposit. As indicated at that time, amendments are required to proceed with the other deposits, as part of this application (Meliadine Extension) included in Project Certificate No.006. On June 23, 2021, the Minister approved the Type A Water Licence 2AM-MEL1631 Amendment which included an updated total dissolved solids (TDS) threshold for Meliadine Lake, increase of annual freshwater consumption, additional laydown area, additional landfarm, updated waste management strategy, construction of access roads, and an updated Interim Closure and Reclamation Plan (ICRP).

Agnico Eagle is seeking to expand production at the Meliadine Mine to include development of F Zone, Wesmeg, Pump and Discovery that were previously assessed and approved by the NIRB as part of the Approved Project Certificate No. 006 but were not included in the Water Licence application to the Nunavut Water Board (2AM-MEL1631). Based on the additional geological information collected since the 2014 FEIS, Agnico Eagle refined the open pit and underground mine designs and reviewed the infrastructure required to support mining activities. In addition to development of these deposits, the Meliadine Extension also includes construction of a new portal and associated infrastructures in the Tiriganiaq-Wolf area to improve access to and expand the existing Tiriganiaq underground mine, construction of a windfarm to reduce greenhouse gas emissions, and use of additional borrow pits and quarries to develop roads and other infrastructure associated with the Extension. Figure 1-3 shows the footprint of the Tiriganiaq, F Zone, Wesmeg, and Pump deposits and associated infrastructure at the main mine site. The Discovery deposit is located approximately 22 km south of the main mine site (Figure 1-4).

Meliadine Extension, if approved, will extend the life of mine by 11 years from 2032 to 2043.

Figure 1-1. Site Location and Land Use Boundaries

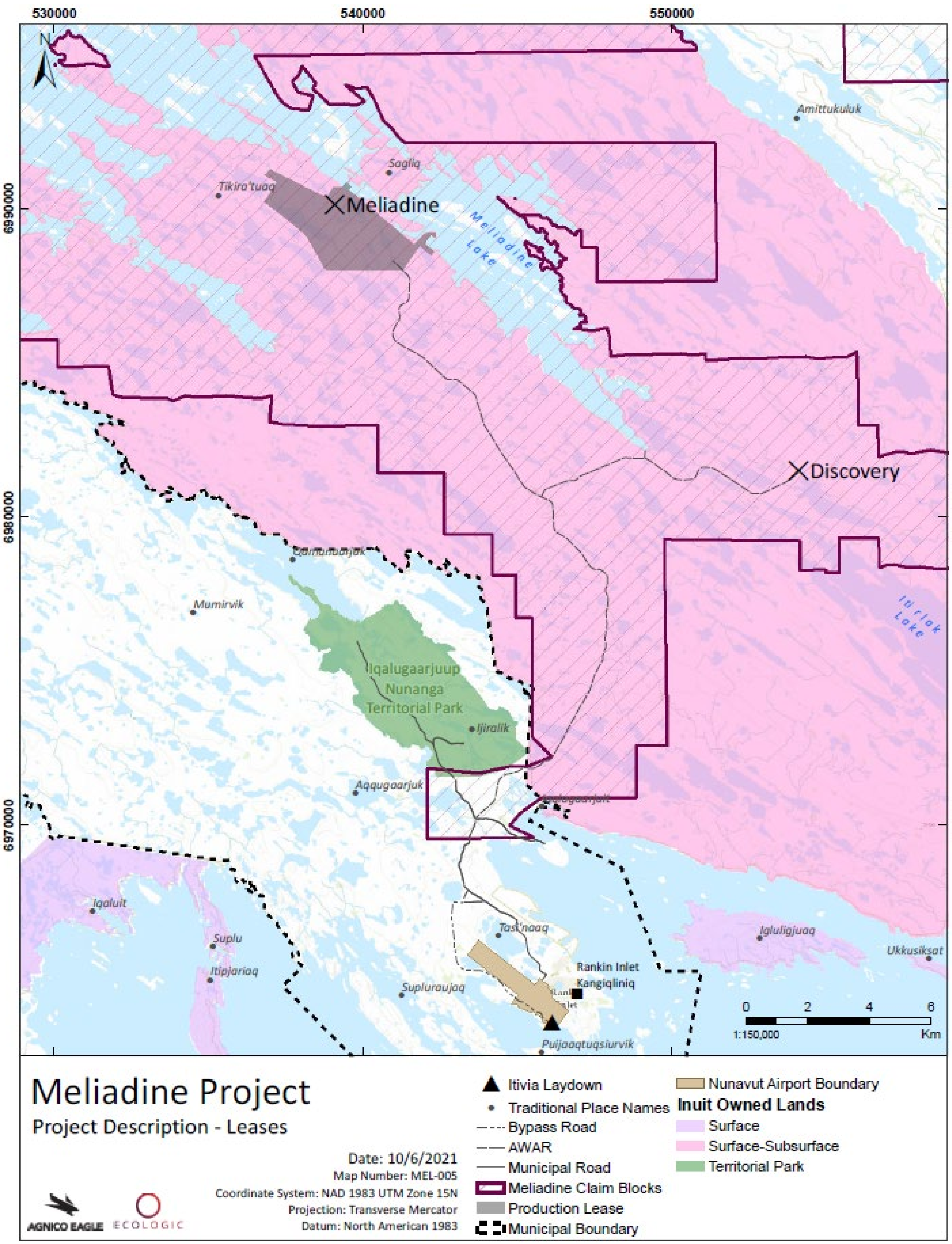


Figure 1-2. Site Location and Claim Blocks

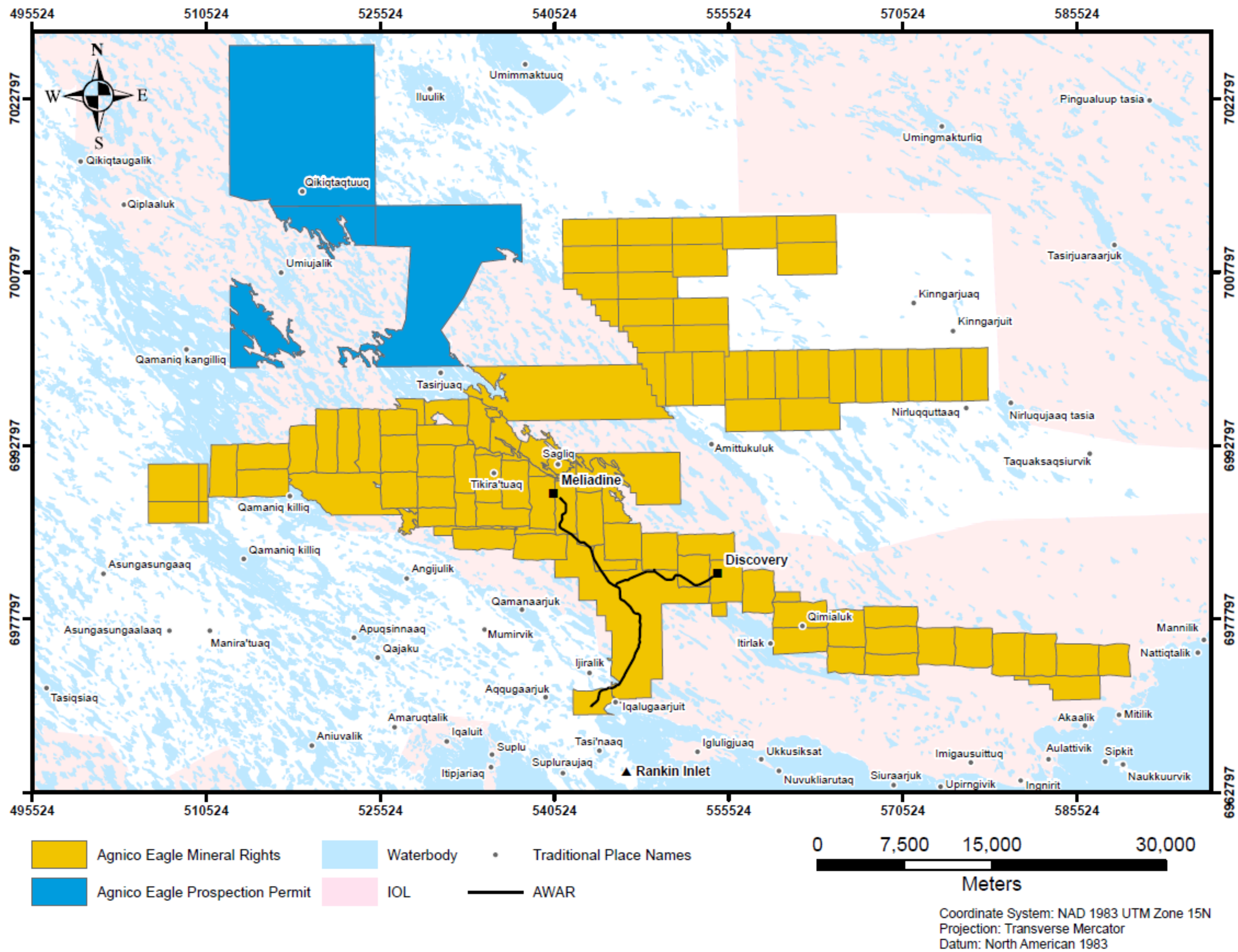


Figure 1-3. Meliadine Mine Approved and Meliadine Extension Footprint

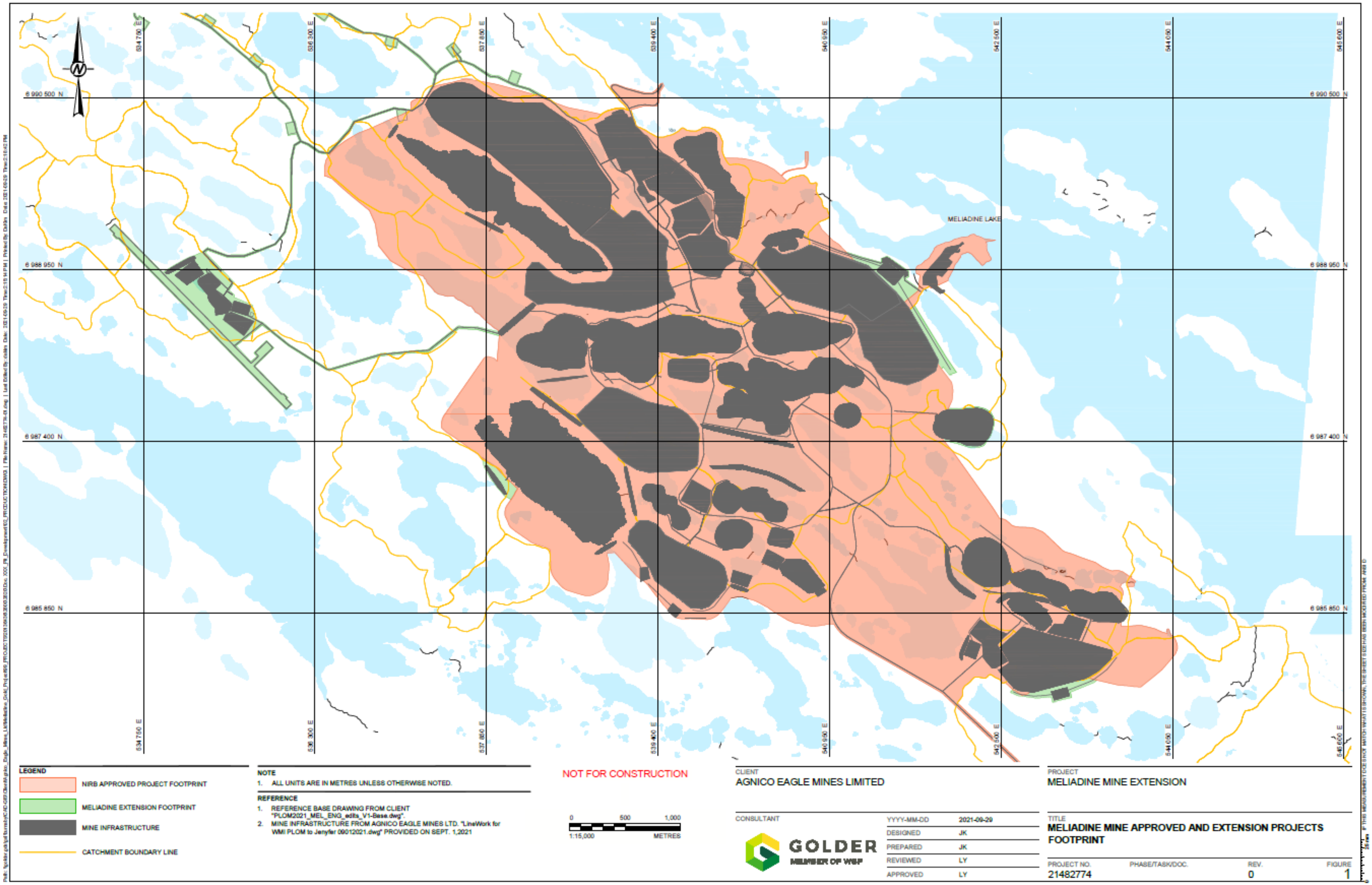
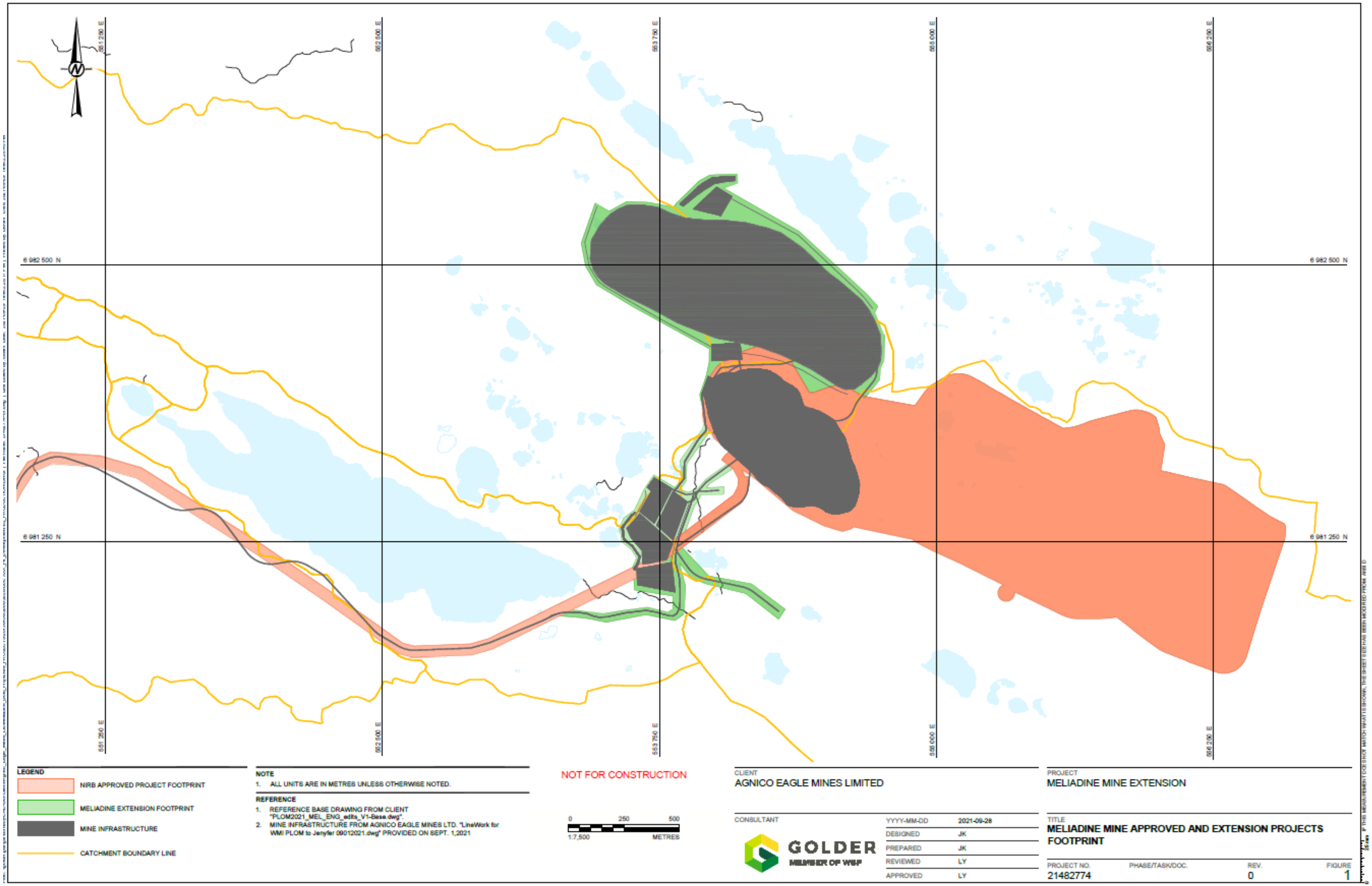


Figure 1-4. Meliadine Mine Approved and Meliadine Extension Footprint – Discovery Deposit



2 AEMP STUDY DESIGN PROCESS

The original Conceptual AEMP for the Meliadine Mine (Agnico Eagle, 2014) outlined, at a high-level, the process for developing a detailed AEMP study design. The steps in the process are:

- Define the objectives (Section 2.1),
- Review the problem formulation and refine/develop the conceptual site model (Section 2.3),
- Establish the study area(s),
- Summarize the available receiving environment data,
- Develop the sampling design (e.g., frequency of monitoring for each component) (Sections 2.4, 3, and 4),
- Develop field and laboratory methods and quality assurance and quality control procedures (included in detailed study design and not the conceptual study design), and
- Outline how the monitoring results will be interpreted in the Response Framework to inform adaptive management (Section 5), and
- Provide an overview of the reporting structure.

The detailed study designs for Meliadine Lake and selected small lakes close to the Mine (the Peninsula Lakes) were developed using this approach. An overview of each study was presented in the AEMP Design Plan (Golder 2016). It is anticipated that the detailed AEMP study design will be revised, as necessary, following the key principles outlined in Section 2.1, to accommodate the Meliadine Extension during the Water Licence Amendment process with the Nunavut Water Board.

2.1 Guiding Principles and Objectives of the AEMP

The Nunavut Agreement identifies monitoring as an important tool for verifying the accuracy of predictions made during environmental assessments and determining the effectiveness of measures taken to mitigate potential adverse environmental effects (Section 12, Part 7; NLCA 1993). The objective, or purpose, of project monitoring, as outlined in the Nunavut Agreement (Section 12.7.1) and in the *Nunavut Planning and Project Assessment Act* (*NuPPAA*; Section 135(3)), is four-fold:

a) Measure the relevant effects of projects on the ecosystemic and socio-economic environments of the Nunavut Settlement Area;
b) Determine whether the project is carried out in accordance with the terms and conditions set out in the original or amended project certificate;
c) Provide the information necessary for regulatory authorities to enforce terms and conditions of licenses; and
d) Assess the accuracy of predictions contained in the project impact statements.

2.1.1 Guiding Principles

The importance of project monitoring under the Nunavut Agreement is reflected in the following guiding principles that were used to design an effective and efficient AEMP (Agnico Eagle 2014; FEIS Appendix SD 7-3; Golder 2016):

1. Monitoring data must support decision making relative to mine activities. Monitoring data provide information to interested parties on the potential effects of the Mine to the aquatic environment, and the effectiveness of mitigation incorporated into the Mine design and the potential need for additional mitigation. Monitoring is not performed with the intent of answering fundamental questions regarding ecosystem structure and function.
2. Monitoring provides answers to specific compliance or follow-up questions regarding current status, spatial extent of effects, and temporal trends in the aquatic receiving environment.
3. Measurement endpoints must have a clear link to assessment endpoints from the environmental assessment (i.e., the FEIS). Assessment endpoints are the environmental features to be protected (e.g., fish growth and reproduction), while measurement endpoints are the physical, chemical, or biological attributes of the study design that are linked to the assessment endpoints (e.g., water chemistry, phytoplankton biomass, fish length, weight, or gonad size).

2.1.2 Objectives

Building off the guiding principles and purpose of monitoring from the Nunavut Agreement, the specific objectives of the AEMP are to:

- Determine the short- and long-term effects of the Mine on the aquatic receiving environment;
- Evaluate the accuracy of predictions made in the FEIS, including the final significance statements regarding impact to the aquatic ecosystem;
- Assess the efficacy of planned mitigation incorporated into the Mine design; and
- Collect data required to identify the need for potential additional mitigation of Mine effects within a management response framework.

Additional objectives of the AEMP include incorporation of IQ into the study design as the Mine evolves as well as a mechanism to engage in and solicit feedback on the design of the Mine.

2.2 Community Input to the AEMP

Inuit Qaujimajatuqangit (IQ) is the most successful and oldest monitoring practice in Nunavut, where the resource users do the observing or monitoring. Information collected can contribute to mine design and monitoring. IQ encompasses more than knowledge that Inuit have gained over generations; rather, IQ is a way of knowing that incorporates Inuit values, customs, and principles for living life (Pedersen et al. 2020). Input gathered through the public consultation process for the FEIS and the Traditional Use Study (Agnico Eagle 2014; FEIS, Volume 9) factored into the study design. For example, Meliadine Lake was identified as important to local residents with concerns regarding potential effects of the Mine on 1) the safety of drinking water and making tea, 2) the safety of domestic fishing, and 3) the health of fish and birds. These valued attributes of the aquatic environment were used to determine Significance Thresholds, defined as "a magnitude of change that would result in significant adverse effects." These thresholds are simple statements that define the attributes of the aquatic environment that are important to the community and that must be protected throughout the Mine phases. In short, Development of the mine must ensure that:

- Water is safe to drink for people and wildlife
- Fish are safe to eat for people and wildlife, and
- Ecological function is maintained

Agnico Eagle is committed to including IQ and accounting for public concerns stemming from IQ, where practical, in the design of management and monitoring plans for the Mine. Agnico Eagle will continue active engagement with communities and Inuit organizations as the Mine proceeds through operations and closure. In addition, feedback will be sought on the reporting of results to the local communities so that it is of relevance and meaning to them. This consultation and engagement should lead to further inclusion of IQ, as it becomes available, in updates to the design and implementation of environmental programs.

2.3 Problem Formulation and Conceptual Site Model

The problem formulation defines the questions that need to be addressed by the AEMP and identifies the components of the aquatic environment that may be affected by the Mine. The problem formation ensures that resources are directed to monitoring in areas and components of the environment where the Mine has the potential to cause effects. A process akin to the problem formulation stage of a risk assessment was completed for each component of the aquatic environment assessed as part of the FEIS in 2014. Specifically, an effects analysis was conducted on all pathways that were predicted to cause changes in the aquatic environment after implementing environmental design features and mitigation. The stressors and pathways for effects to the aquatic environment are discussed below in the conceptual site model (CSM).

A conceptual site model is a written or pictorial representation of an environmental system and the biological, physical, and chemical processes that determine the transport of contaminants of potential concern (COPCs) from sources through environmental media to environmental receptors within the system (ASTM 2014). A CSM helps visualize the linkages between stressor and receptor and is an important step in the development of an effective and efficient monitoring program. The CSM for the AEMP is a living document that will be updated as new environmental data become and in response to changes in the scope of the Mine.

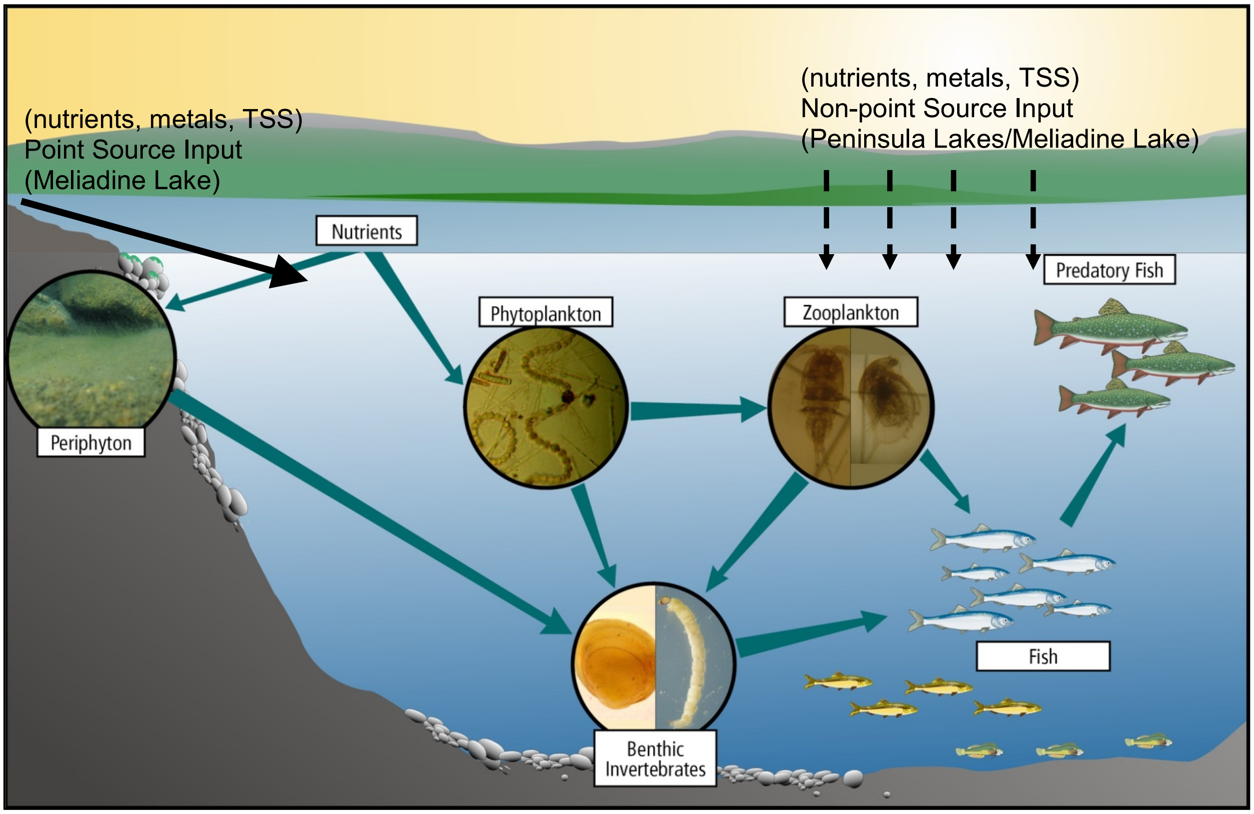
Infrastructure and development that are directly relevant to the AEMP include the following:

- The Mine footprint, including open pits, waste rock and tailings storage facilities, and infrastructure pads will remove waterbodies, alter watershed areas and drainage patterns, and change flows and water levels, all of which have the potential to affect water and sediment quality, aquatic life, and the quantity of fish habitat.

- The active diversion of water from waterbodies to other locations either within or to adjacent sub-basins during operations will decrease flows to downstream waterbodies and watercourses bypassed by the diversion, potentially leading to indirect effects to water and sediment quality, aquatic life and fish habitat quantity.
- Discharge of surface contact water may cause changes to surface water and sediment quality in Meliadine Lake (i.e., increased nutrient and metal concentrations) and may affect aquatic life. Surface contact water refers to precipitation and runoff that occurs within the footprint of the mine. The general strategy for managing surface contact water is to intercept water that comes into contact with mine infrastructure and direct it towards collection ponds through a network of dikes, channels, and culverts, thereby mitigating the uncontrolled release of contact water to the aquatic environment. In 2020, some water quality parameters like total dissolved solids and chloride were above their normal range, indicating concentrations have increased slightly over time, but changes are small, consistent with FEIS predictions, and well below guidelines for the protection of aquatic life and human drinking water quality (Azimuth 2021).
- Fugitive dust sources and air emissions may change water and sediment quality and affect aquatic life.

Figure 2-1 illustrates the interactions between stressors and receptors in the aquatic environment. The main sources of the stressors are surface contact water, spills and leaks, and aerial emissions and dust. Receptors relevant to the aquatic monitoring program include primary producers (phytoplankton and periphyton communities), primary consumers (zooplankton and benthic invertebrates), and fish. Two distinct transport pathways were identified for the Mine: point-source inputs (via direct discharge of treated contact water) to Meliadine Lake and non-point-source inputs (e.g., aerial emissions, localized surface water and groundwater) to Meliadine Lake and the Peninsula Lakes.

Figure 2-1. Conceptual Site Model Depicting Interactions Between Stressors and Aquatic Receptors.



2.4 AEMP Monitoring Components

The AEMP for the Mine has been designed around the key aspects of EEM requirements under the Metal and Diamond Mining Effluent Regulations (MDMER), with supplemental components included to fulfill the anticipated additional conditions and requirements of the Water Licence, and to monitor for potential mine-related effects to the aquatic environment.

The components of the AEMP are:

- Water quality
- Sediment quality
- Phytoplankton community
- Benthic invertebrate community
- Fish health
- Fish tissue chemistry

Following the CSM for the Mine (Section 2.3), the AEMP Design Plan included distinct studies for Meliadine Lake and the Peninsula Lakes. The Meliadine Lake study is the more substantive program owing to the fact that treated contact water is discharged to this lake, meaning biological monitoring is required to comply with MDMER. The Peninsula Lakes are primarily affected by non-point source inputs from alteration of streams and watersheds close to the mine and deposition of dust and aerial emissions. The Peninsula Lakes are not subject to MDMER, but targeted biological monitoring studies may be undertaken if changes in water quality indicate the potential for effects to aquatic life.

An overview of the Meliadine Lake and Peninsula Lakes studies is provided in the following chapters.

3 MELIADINE LAKE STUDY

3.1 Overview of Current Study Design

3.1.1 Monitoring Areas

The AEMP study area for the Meliadine Lake study was selected based on the spatial extent of effects predicted in the FEIS, concerns raised through the FEIS process about potential far downstream effects, and requirements under the federal MDMER EEM requirements. The predictions for the Mine as reported in the FEIS were that water quality concentrations at the edge of the mixing zone would not exceed guidelines for the protection of aquatic life or health-based guidelines for the protection of drinking water quality. Reviewers of the FEIS were concerned about potential far-field changes in Meliadine Lake and potential changes as far downstream as Peter Lake.

To address these concerns and assess the spatial extent of potential Mine-related changes in water quality, etc., five monitoring areas were established in Meliadine Lake:

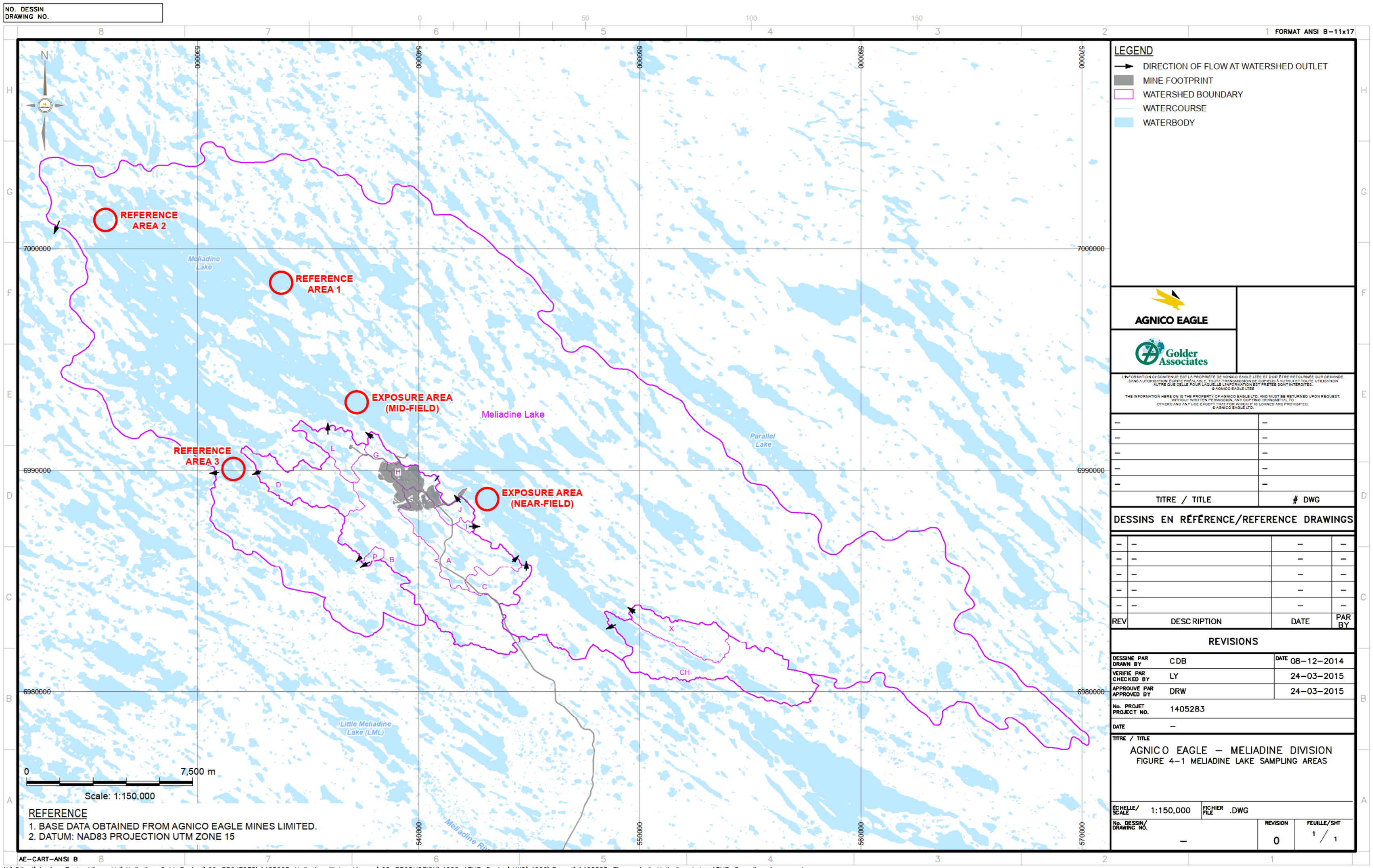
- a near-field area located in proximity to the where water is discharged,
- a mid-field exposure area located downstream (to the northwest), and
- three far-field reference areas (Figure 3-1).

Conceptually, near-field areas provide an early-warning for introductions of stressors into the receiving environment and are situated in close proximity to the primary sources of exposure at a site (i.e., the edge of the mixing zone for effluent). Mid-field areas are located farther downstream from the near-field monitoring areas and help define the spatial extent of potential changes observed at near-field area(s). Finally, reference areas provide insights into regional trends (e.g., climatic events) that would be expected to influence all sampling areas (i.e., natural temporal changes).

3.1.2 Monitoring Components

The current scope of the Meliadine Lake study includes monitoring water, sediment, phytoplankton, benthic invertebrates, fish health, and fish tissue chemistry. To improve efficiency and reduce redundancy, the scope of biological monitoring under the AEMP was harmonized with the EEM program required under MDMER. Biological monitoring studies (benthic invertebrates and fish) are conducted every 3-years to assess whether discharge of effluent is causing an effect to fish and benthic invertebrate communities. Certain aspects of the AEMP that go beyond what is required under EEM (e.g., fish tissue chemistry monitoring and additional study areas). The expanded monitoring under the AEMP compared to the EEM program reflects commitments made during the regulatory approval process.

Figure 3-1. Meliadine Lake Study Areas



3.1.3 Key Questions

To help focus the decision-making process, key questions were developed as a way of evaluating mine-related changes to water quality, the health of lower trophic level communities, fish health, and impacts to traditional and non-traditional use of the fishery in Meliadine Lake. The key questions in Figure 3-2 were originally proposed in the AEMP Design Plan (Golder 2016). These questions are addressed in the annual AEMP reports (Azimuth 2020, 2021; Golder 2017, 2018, 2019).

Figure 3-2. Key Questions for the Meliadine Lake Study

Component	Key Questions
Water Quality	Are concentrations of key parameters in effluent less than limits specified in the Water Licence?
	Has water quality in the exposure areas changed over time, relative to reference/baseline areas?
	Is water quality consistent with predictions outlined in the FEIS and less than AEMP Action Levels[1]?
Phytoplankton Community	Is the phytoplankton community affected by potential mine-related changes in water quality in Meliadine Lake?
Benthic Invertebrate Community	Is the benthic invertebrate community affected by potential mine-related changes in water and sediment quality in Meliadine Lake?
Fish Health	Is fish health affected by changes in water and sediment quality in Meliadine Lake?
Fish Tissue Chemistry	Are tissue metal concentrations in fish from Meliadine Lake increasing due to mining activities?
	Are tissue metal concentrations in fish from Meliadine Lake increasing relative to reference areas or baseline?

Notes

1. A Low Action Level is meant to be pre-emptive in nature and is well below the level at which a benchmark concentration is reached or a biological effect is measured (WLWB 2010).

3.1.4 Sampling Design

The Conceptual AEMP specified that currently accepted statistical design principles would be used to evaluate spatial and temporal Mine-related impacts on fish and fish habitat. Details regarding the number of samples, frequency of sampling, and how are analyzed to answer the key question are presented in the AEMP Design Plan (Golder 2016).

3.2 Considerations for the Meliadine Extension

Discharge of surface contact water will continue to be the primary source of potential changes to water and sediment quality and impacts to aquatic life while the Mine is in the operations phase. The general water management strategy as outlined in the Water Management Plan (Agnico Eagle 2021a) will continue to limit surface flow entering the mine footprint and restrict uncontrolled surface contact water releases from the mine footprint to the environment to limit impacts on the receiving environment.

Significant updates to the study design are not anticipated to be required as part of development of Pump, F Zone, Wesmeg, and Discovery deposits for the proposed Meliadine Extension.

4 PENINSULA LAKES AND SMALL WATERBODIES

4.1 Overview of Current Study Design

4.1.1 Monitoring Areas

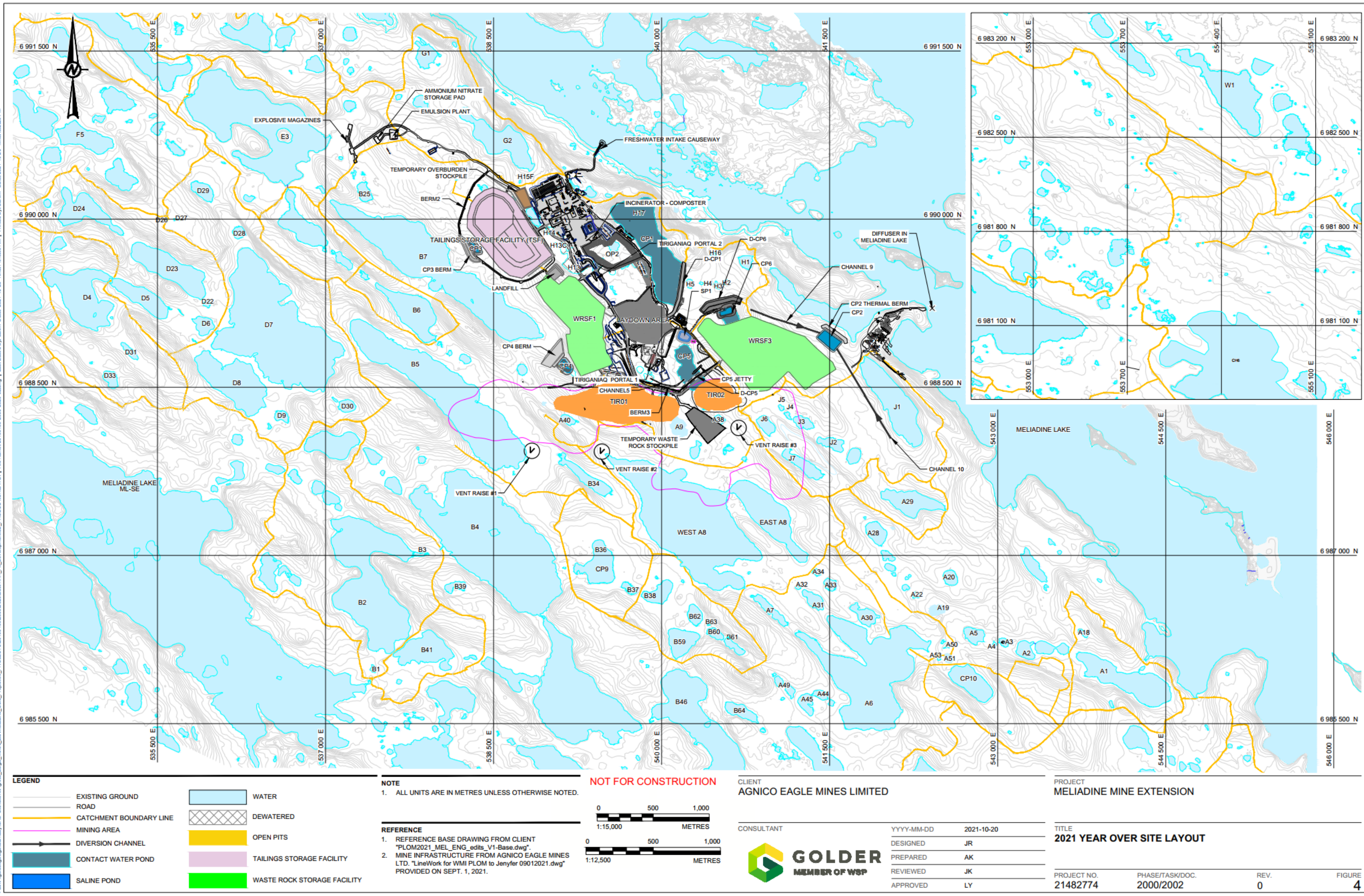
Several small watersheds drain to Meliadine Lake from the peninsula between the south and east basins of Meliadine Lake. The watersheds are comprised of an extensive network of small lakes, ponds, and interconnecting streams. The lakes are typically small (<90 ha) and shallow. The FEIS concluded that changes to water and sediment quality in the small waterbodies surrounding the Mine could result from diversion of water, changes in watershed size and contributing areas, natural hydrological processes, evaporation, and aerial deposition of particulate matter (modelled as total suspended solids [TSS]), nutrients from blasting activities (modelled as nitrate), and metals (Agnico Eagle, 2014). Aerial deposition from mine activities is expected to increase from baseline levels during preproduction, peak during pit development, and decrease to baseline levels by closure. TSS and nitrate concentrations are not predicted to increase to levels that would affect aquatic life, and changes to sediment quality as a result of TSS or nutrient input from blasting activities are not expected since changes to TSS and nitrate in water are not expected. Metal concentrations are predicted to vary between waterbodies, with some waterbodies experiencing increases for select metals above guidelines and/or greater than 10% from baseline conditions.

Lake A8, Lake B7, and Lake D7 were selected as representative lakes to monitor Mine-related changes during construction and operations (Figure 4-1). The letters A, B, and D correspond to subdrainages (watersheds) on the peninsula, and the lake numbers within each drainage basin indicate where the lake is located along the flow path. For example, Lake D7 flows into Lake D6 and so on, eventually draining into the last lake in the D watershed (Lake D1), which flows into Meliadine Lake near the outlet to the Meliadine River. Lake A8 and Lake B7 were selected based on their proximity to the mine and their comparatively large size relative to other waterbodies on the peninsula. Lake B7 is located east of the tailings storage facility while Lake A8 is located south to open Pit Tiriganiaq open pits. Lake D7 is located west of the mine and was included in the detailed study design as a reference area for Lake A8 and Lake B7.

4.1.2 Monitoring Components

Water quality monitoring is the core component of the Peninsula Lakes study. Biological studies may be undertaken if results of the water quality program indicate that the small lakes on the peninsula may be affected by mining activities.

Figure 4-1. Watershed Boundaries and Extent of the Meliadine Mine (as of 2021).



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4.1.3 Key Questions

The key questions for the Peninsula Lakes study are presented below. Key questions for other components will be added if the Peninsula Lakes study is expanded to include sediment quality or biological monitoring.

Figure 4-2. Key Questions for the Peninsula Lakes Study

Component	Key Questions
Water Quality	Are concentrations of key parameters in the Peninsula Lakes consistent with FEIS predictions and less than AEMP Action Levels[1]?
	Has water quality in the exposure areas changed over time, relative to reference/baseline areas?

Notes

1. A Low Action Level is meant to be pre-emptive in nature and is well below the level at which a benchmark concentration is reached or a biological effect is measured (WLWB, 2010).

4.1.4 Sampling Design

Details regarding the number of samples, frequency of sampling, and how are analyzed to answer the key question are presented in the AEMP Design Document (Golder 2016).

4.2 Considerations for the Meliadine Extension

Development of previously-approved deposits will expand the footprint of the mine, potentially impacting lakes and small waterbodies in close proximity to roads, open pits, waste rock facilities, and other infrastructure. The extent of the Meliadine Extension, as shown in Figure 1-3, will require dewatering of Lake B7 and Lake A8 to support continued mine development, meaning new monitoring locations will need to be established. Monitoring areas in the vicinity of the Discovery deposit (Figure 1-4) will also be required. The strategy for incorporating new monitoring areas into the study for monitoring changes in small lakes receiving non-point source discharges will follow the guiding principles outlined in Section 2.1.1. Priority will be given to selecting lakes in close proximity to major site infrastructure (e.g., open pits, waste rock storage facilities, etc.) while also factoring in the ecological importance of the waterbody (e.g., does the lake supporting an overwintering fish population or critical spawning habitat for valued ecosystem components?). Selection of new monitoring locations for the peninsula lake study, and timing for when these monitoring locations will become active, will be done through the Water Licence Amendment process.

Water quality monitoring will remain the core component of the study to monitoring changes related to non-point source discharges. Targeted biological studies would be undertaken according to the AEMP response framework.

5 ANNUAL EVALUATION

5.1 Response Framework

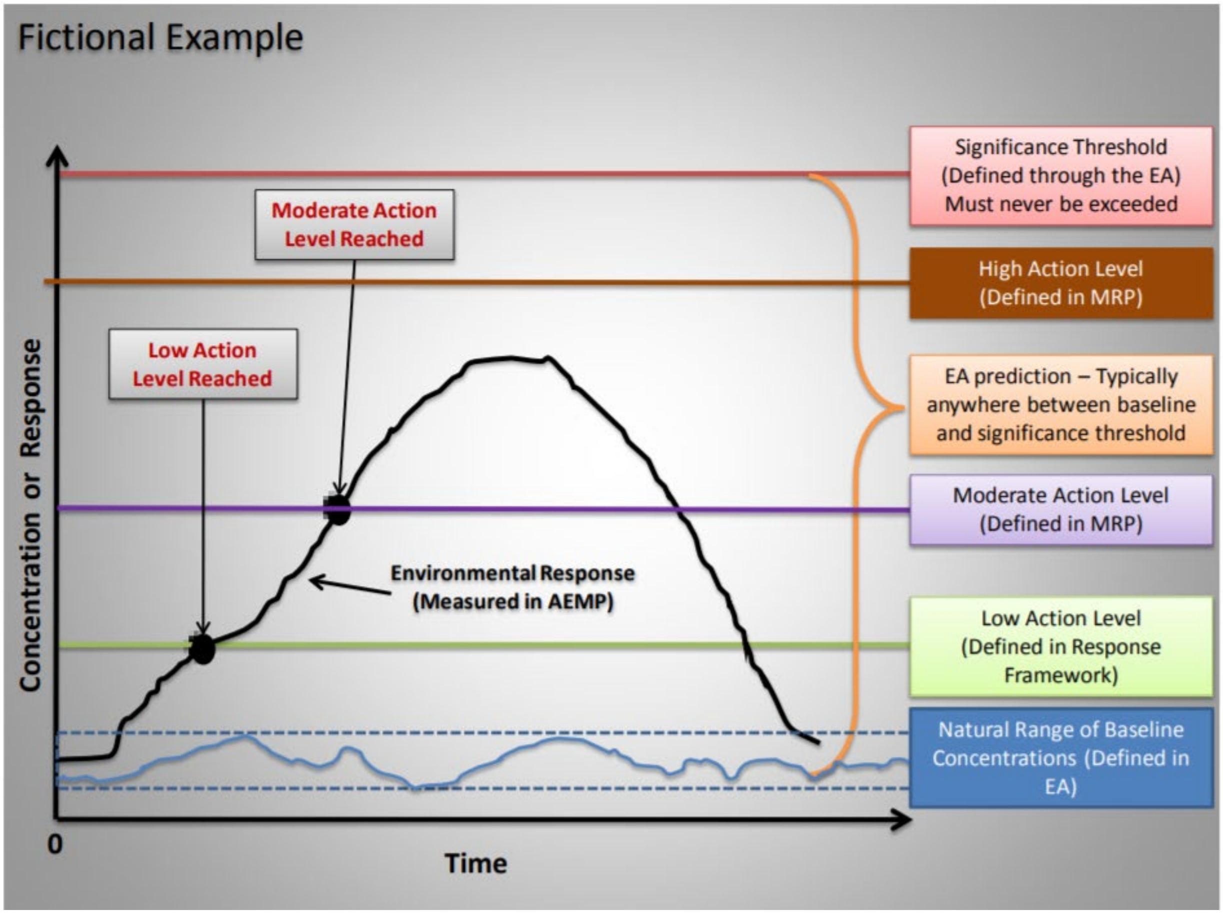
The AEMP Response Framework is the approach to adaptive management that links monitoring results with management actions. The purpose of the Response Framework is to provide early warning about potential changes in the aquatic environment so that mitigation actions can be implemented before significant changes to water quality, the health of aquatic life, or traditional use of fisheries occur.

The Response Framework uses action levels to define the level of response associated with each action level (negligible, low, medium, or high). Action levels are developed for each monitoring component (e.g., water, benthic invertebrate community endpoints, etc.) based on comparison to the baseline data (e.g., normal range assessment), by adopting water quality guidelines as AEMP Benchmarks, or statistical tests. Figure 5-1 illustrates how action levels are defined relative to changes in an environmental response, for example an increase in the concentration of a COPC or a change in biological community metric relative to baseline or reference conditions. The managed response depends on what changed in the environment (e.g., higher concentration of X parameter) and the action level that is exceeded (low, moderate, or high). Furthermore, the specific management action that would be appropriate in a given case depends on the underlying cause. For example, if a metal becomes elevated in the aquatic receiving environment, the identification of options for further assessment and/or mitigation would be different if the source of the metal is groundwater versus effluent versus dust (Azimuth 2012).

The Response Framework for Meliadine was developed based on Draft Guidelines for Adaptive Management – a Response Framework for Aquatic Effects Monitoring (WLWB 2010) and experience gained at Agnico Eagle's Meadowbank Complex (Azimuth 2012). Action levels were presented in the AEMP Design Document (Golder, 2016). Monitoring data are evaluated against these action levels in the annual AEMP reports (Azimuth 2020, 2021; Golder 2017, 2018, 2019).

Significant modifications to the Response Framework are not anticipated to be required to accommodate the Meliadine Extension.

Figure 5-1. Fictional Example of Action Levels and Response Framework Relative to an Environmental Response (from WLWB, 2010).



5.2 Reporting

Results of the AEMP will continue to be reported annually as per Schedule B, Part 17 of Water Licence 2AM-MEL1631. In years when the EEM program is conducted, a separate report that meets the requirements of the MDMER will also be prepared.

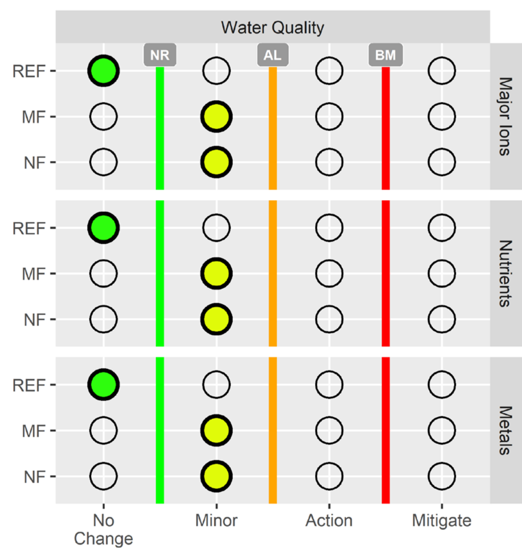
As part of the annual report, results for each component will be synthesized in an integrated manner to evaluate the overall direction of change to the aquatic ecosystem. The objective of the synthesis will be to:

- integrate AEMP findings from all components;
- determine the strength of support for each impact hypothesis and effects at the ecosystem; and
- support decision making for management responses.

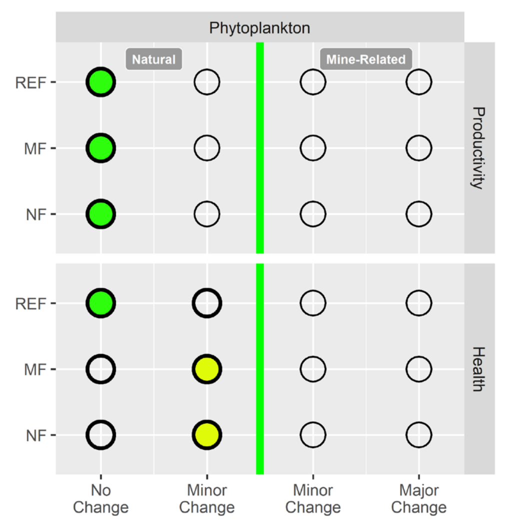
Reporting will follow the existing report template and will include a plain language interpretation of the results into a “report card” format (Figure 5-2). The purpose of the report card is to provide a condensed summary of the various lines of evidence/analyses for each component of the AEMP. The example depicted in Figure 5-2 is the report card for Meliadine Lake presented in the 2020 AEMP report (Azimuth 2021). The ratings on the x-axis indicate whether the exposure areas (i.e., near-field [MEL-01] or mid-field [MEL-02]) are similar to or deviating from baseline/reference conditions. Using the water quality report card (panel A) as example, the concentrations of major ions, nutrients, and metals measured in surface water from the NF and MF areas in 2020 have increased relative to baseline/reference conditions. The magnitude of the change in water quality was below the Low Action Level, which constitutes a "minor change in the Response Framework. In this scenario, no management actions are required beyond continued monitoring as per the AEMP Design Plan.

Figure 5-2. Example of the Report Card Summarizing the AEMP Results for Meliadine Lake

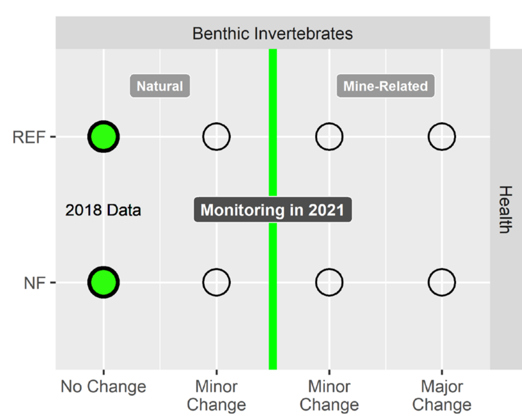
Notes: The green line represents the normal range of baseline/reference conditions (NR).
The orange line indicates an exceedance of the low Action Level (AL).
The red line indicates AL = Action Level; BM = benchmark (water quality guideline or site-specific water quality objective).



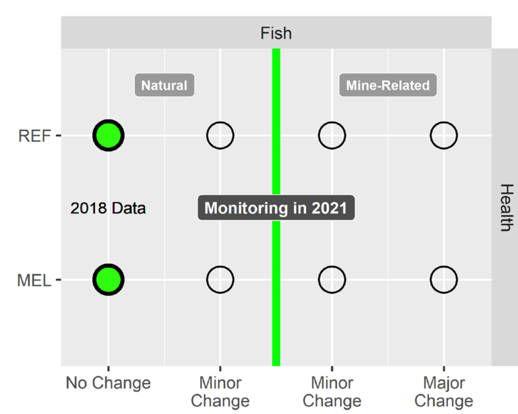
A) Water Quality



B) Phytoplankton



C) Benthic Invertebrates



D) Fish

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