APPENDIX 29-14. SEDIMENT AND EROSION MANAGEMENT PLAN

AGNICO EAGLE

Meliadine Gold Mine

Sediment and Erosion Management Plan

MARCH 2025
VERSION 5

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ᑎᑎᖅᑲᖅ ᐱᔾᔪᑎᖃᖅᑐᑦ ᐃᒪᐅᑉ ᐊᓗᐊᓄᐊᖅᑐᓂᒃ ᐊᒻᒪᓗ ᓱᕋᒃᐸᓪᓕᐊᓂᕐᒧᑦ ᐸᕐᓇᐅᑎᒥᑦ (ᐸᕐᓇᐅᑎ) ᑕᓯᕐᔪᐊᖅ ᒨᓗᒧᑦ ᐱᓕᕆᕐᒥᑦ. ᐱᔾᔪᑎᖓ ᐸᕐᓇᐅᑎᐅᑉ ᑲᑎᑎᓯᒪᔪᓂᒃ ᑐᑭᓯᐅᒪᔾᔪᑎᓂᒃ ᑐᓂᓯᓂᐊᕐᓗᓂ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐊᒻᒪᓗ ᖃᐅᔨᒋᐊᖃᑦᑕᕐᓂᕐᒧᑦ ᓱᕋᒃᐸᓪᓕᐊᓂᖃᕈᓐᓇᖅᑐᓂᒃ ᐃᓂᐅᔪᓂᒃ. ᑕᒪᓐᓇ ᐱᐊᓂᒃᑕᐅᖃᑦᑕᖅᑐᖅ ᕿᒥᕐᕈᐸᓗᒋᑦ ᖃᓄᐃᙱᓕᖅᑎᑦᑎᓂᐅᔪᙳᖅᑐᑦ ᑲᑎᓗᒃᑖᖅᓱᒋᑦ ᑕᒫᓂᖅᓴᖅᑐᑦ ᓯᑎᔪᐃᑦ (TSS) ᐊᒻᒪᓗ ᑕᕆᐅᖃᓗᐊᕐᓂᖅ, ᑲᓇᑕᒥᑦ ᒪᓕᒃᑕᐅᔪᒃᓴᐃᑦ ᐊᒻᒪᓗ ᓚᐃᓴᐣᓯᒧᑦ ᐱᔭᕇᐊᖃᖅᑐᑦ. ᑭᖑᓂᐊᒍᑦ ᐅᐸᓗᐃᑦ ᐊᒻᒪᓗ ᖃᓄᐃᑦᑑᓂᕐᒋᑦ ᖃᓄᐃᓕᐅᕐᓂᐅᔪᑦ ᓱᕋᒃᐸᓪᓕᐊᓂᕐᒧᑦ ᐱᔪᑦ, ᐊᒻᒪᓗ ᓱᓇᒥᒃ ᖃᐅᔨᓴᐃᓂᕐᒧᑦ ᐊᒻᒪᓗ ᐊᕐᒌᓗᐊᕐᕆᕆᐊᖅᑎᑦᑎᓂᕐᓄᑦ.

ᖃᐅᔨᔭᐅᔪᑦ ᖃᓄᐃᙱᓕᖅᑎᑦᑎᓂᕐᒋᓐᓄᑦ TSS ᐃᖃᓗᙵᓄᑦ ᐃᓂᕐᒋᓐᓄᓪᓗ ᑎᑎᕋᖅᑕᐅᓚᐅᖅᑐᑦ, ᐅᓗᕆᐊᓇᓗᐊᕐᕆᑦᑐᑦ ᐊᒻᒪᓗ ᐅᓗᕆᐊᓇᖅᑐᑦ ᖃᓄᐃᙱᓕᖅᑎᑦᑎᓃᑦ ᐃᖃᓗᙵᓄᑦ ᐊᒻᒪᓗ ᒪᓂᕐᕆᓐᓄᑦ. ᑲᓇᑕᒥᑦ TSS-ᒧᑦ ᒪᓕᒃᑕᐅᔪᒃᓴᐃᑦ ᐅᖃᓕᒫᖅᑕᐅᓯᒪᔪᑦ, ᓇᓗᓇᐃᖅᓱᕆᑦ ᓇᐃᑦᑐᒥᑦ ᐊᒻᒪᓗ ᐊᑯᓂᐅᔪᒥᑦ ᑕᑯᒃᓴᐅᓂᕐᒧᑦ ᑎᑭᐅᑎᓃᑦ. ᑕᕆᐅᖃᕐᓂᕐᒧᑦ ᒪᓕᒃᑕᐅᔪᒃᓴᐃᑦ ᐅᖃᐅᓯᐅᙱᔪᑦ ᑕᒡᕙᓂ ᑎᑎᖅᑲᒥᑦ. ᐸᕐᓇᐅᑎ ᑐᓂᓯᔪᖅ ᖃᐅᔨᒋᐊᖃᑦᑕᕐᓂᕐᒃ ᐊᒻᒪᓗ ᐊᕐᒌᓗᐊᕐᕆᕆᐊᖅᑎᑦᑎᓂᕐᒨᕐᒐᔪᓂᒃ ᐱᙱᓱᓄᑦ ᖃᓄᐃᓕᐅᕐᓂᐅᔪᓄᑦ: ᓴᓇᕙᓪᓕᐊᓂᕐᒥᑦ ᐃᒪᐅᑉ ᖃᓂᑕᙱᓂᑦ - ᓴᓇᕙᓪᓕᐊᑎᓪᓗᒋᑦ ᐊᒻᒪᓗ ᐊᐅᓴᖅᑎᑦᑎᓂᕐᒥᑦ; ᐊᐅᒃᐸᓪᓕᐊᓂᐅᑎᓪᓗᒍ ᐅᕙᓘᓐᓃᑦ ᑰᙵᓂᖃᓗᐊᕐᓂᐅᔪᓂᑦ - ᓴᓇᕙᓪᓕᐊᑎᓪᓗᒋᑦ, ᐊᐅᓴᖅᑎᑦᑎᓂᕐᒥᑦ ᐊᒻᒪᓗ ᐅᒃᑯᐊᖅᐸᓪᓕᐅᓂᕐᒥᑦ; ᐊᒃᑐᖅᑕᐅᓂᖃᑐᐃᓐᓇᓇᐊᖃᕐᓂᕐᒋᓐᓂᒃ ᐃᒪᖃᕐᓂᐅᔪᑦ - ᐊᐅᓵᖅᑎᑦᑎᓂᖃᖅᑎᓪᓗᒋᑦ. ᖃᐅᔨᒋᐊᖃᑦᑕᕐᓂᐅᔪᖅ ᐊᒻᒪᓗ ᐊᕐᒌᓗᐊᕐᕆᕆᐊᖅᑎᑦᑎᓂᕐᒨᕐᒐᔪᑦ ᐅᖃᐅᓯᐅᔪᑦ ᖃᓄᐃᓕᐅᕐᓂᐅᔪᓂᑦ.

EXECUTIVE SUMMARY

This document presents the Sediment and Erosion management plan (the Plan) at the Meliadine Gold Mine. The purpose of this Plan is to provide consolidated information on the management and monitoring of potential areas subjected to erosion. This is accomplished by reviewing the potential effects of total suspended solids (TSS) and turbidity, the Federal guidelines and the licence requirements, followed by the periods and types of activities subjected to erosion, and the specific monitoring and mitigating measures.

General findings on the effects of TSS on fish and fish habitat have been listed, such as sublethal and lethal effects on fish and their eggs. Federal TSS Guidelines have been cited, distinguishing the short-term and long-term exposure thresholds. Turbidity guidelines are also discussed in the present document. The Plan presents the monitoring and mitigating actions related to three (3) specific periods of activity: Periods of construction near water – during construction and operation; periods of freshet or significant runoff events – during construction, operation and closure; periods of potential impact to waterbodies – during operation. The monitoring and mitigating measures are discussed for those periods of activity.

DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	March 2019	All		Comprehensive Plan	Agnico Eagle
2	March 2020	2.3 3.3	5 7	Updated to include TSS guidelines for MEL-14 Monitoring Program Station Updated mitigation measures to include check dams	Agnico Eagle
3	March 2021	2.2.1	4	Updated Table 2.1	Agnico Eagle
4_NWB	January 2024	n/a	n/a	Submitted to Nunavut Water Board as part of the Meliadine Water Licence Amendment.	Agnico Eagle
5	March 2025	2 All	2	Added effects of TSS on fish habitat. Edits made for grammar and wording to improve clarity and readability.	Agnico Eagle

TABLE OF CONTENTS

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited – Meliadine Division
CCME	Canadian Council of Ministers of the Environment
DFO	Fisheries and Oceans Canada
Mine	Meliadine Gold Mine
NIRB	Nunavut Impact Review Board
NTU	Nephelometric Turbidity Units
NWB	Nunavut Water Board
Plan	Sediment and Erosion Management Plan
TSS	Total Suspended Solids

UNITS

h	hour
km	kilometre
km^2	square kilometre
mg/L	milligram per litre

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) operates the Meliadine Gold Mine, located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut.

This document presents the Sediment and Erosion Management Plan (the Plan). The purpose of this Plan is to provide consolidated information on the management and monitoring of potential areas subjected to erosion. This is accomplished by presenting first a review of the potential effects of total suspended solids (TSS) and turbidity, the Federal guidelines and the licence requirements, followed by the periods and type of activities subjected to erosion, and the specific monitoring and mitigating measures.

As per Nunavut Impact Review Board (NIRB) Meliadine Project Certificate No.006 Term and Condition 28, the Sediment and Erosion Management Plan should be developed to prevent or minimize the effects of destabilization and erosion that may occur due to Mine activities. The plan should also detail sediment control plans to prevent and/or mitigate sediment loading into surface water within the Mine area.

The objectives of the plan are:

- To prevent the release of sediment into streams and waterbodies during construction activities;
- To reduce and mitigate erosion and the release of sediment during operations activities;
- To specify erosion and sediment control measures that, if implemented and maintained, will help Agnico Eagle maintain compliance with the Federal *Fisheries Act*, specifically with Section 36(3) of the Act, which prohibits the deposition of deleterious substances into waterbodies frequented by fish; and
- To provide references to approvals, relevant standards, control plans and procedures for training, communications, investigation and corrective action, and audits.

SECTION 2 • TOTAL SUSPENDED SOLIDS/TURBIDITY EFFECTS, FEDERAL GUIDELINES AND LICENCE REQUIREMENTS

2.1 Effects of Total Suspended Solids on Fish Habitat

Suspended solids, and associated effects on water clarity, have the potential to affect fish and fish habitat in a variety of ways, including but not limited to:

- Smothering of deposited eggs or siltation of spawning habitats;
- Smothering of benthic invertebrate communities;
- Decreased primary productivity caused by reduced light penetration;
- Reduced visibility, which may decrease feeding efficiency and/or increase predator avoidance;
- Increase in water temperature caused by heat absorption;
- Decrease in water quality caused by increase in contaminant concentrations; and
- Clogging and abrasion of gills.

Moreover, the general findings for effects of TSS on fish and fish habitat indicate the following:

- Effects of TSS depend on both the concentration of TSS and duration of exposure;
- Effects of TSS can also be influenced by the size and shape of suspended particles;
- Lethal concentration of TSS on fish over acute exposure ranges from hundreds to hundreds of thousands of mg/L;
- Sublethal effects on fish (reduced growth, changes in blood chemistry, histological changes) associated with chronic exposures tend to be exhibited at TSS concentrations ranging from the tens to hundreds of mg/L;
- There is considerable uncertainty about potential effects of low TSS concentrations over long time periods;
- Overall, the most sensitive group of aquatic organisms to TSS appears to be salmonids, and guidelines are developed to protect this group;
- Adult salmonids are generally more sensitive to short durations of high concentrations of suspended sediments than juvenile salmonids; and
- Low suspended sediment levels are known to cause egg mortality (40 %) to rainbow trout at long durations (7 mg/L at 48 days). Guidelines for long-term exposure reflect these findings.

More details can be found in the report from Fisheries and Oceans Canada (DFO) on the effects of sediments on fish and their habitat (Fisheries and Oceans Canada, 1999).

2.2 Federal Guidelines

2.2.1 TSS Guidelines

The Canadian Council of Ministers of the Environment (CCME) specifies separate guidelines for TSS for clear and high flow periods. The guidelines are derived primarily from Caux *et al*. (1997), with application intended mainly for British Columbia streams. In the case of the application to the Meliadine Project lakes, the clear flow guidelines would be most relevant even during freshet. The lakes would not expect to see large natural fluctuations in TSS except in localized areas for short periods.

The guidelines put forth by the CCME recognize that the severity of effects of suspended sediments is a function of both the concentration of suspended sediments and the duration of exposure. Guidelines are intended to protect the most sensitive taxonomic group and the most sensitive life history stages.

Table 2.1 CCME National Guidelines and MDMER Legislated Standards for TSS

Source	Short-Term Exposure	Long-Term Exposure
CCME (1999, updated 2002)	Anthropogenic activities should not increase suspended sediment concentrations by more than 25 mg/L over background levels during any short-term exposure period (e.g., 24-h).	For longer term exposure (e.g., inputs lasting between 24h and 30 days), average suspended sediment concentrations should not be increased by more than 5 mg/L over background levels.
MDMER 2002 (last amended July 2024)	Maximum authorized concentration in a composite effluent sample = 22.5 mg/L. Maximum authorized concentration in a grab sample of effluent = 30 mg/L.	Maximum authorized monthly mean effluent concentration = 15 mg/L.

2.2.2 Turbidity Guidelines

The type and concentration of suspended matter controls the turbidity of water (CCME 1999). As turbidity is affected by factors such as the concentration, size, shape, refractive index of suspended sediments, and water colour, the relationship between turbidity and suspended sediments is site-specific (CCME 1999). Turbidity guidelines used at the Mine take into consideration the types of material generating the suspended sediments. Reference to historic datasets for a particular material type or area may help to estimate a suspended solids concentrations based on turbidity readings. In the case of turbidity for clear water, CCME (1999) recommends a maximum increase of 8 Nephelometric Turbidity Units (NTU) from background levels for a short-term exposure (e.g., 24-hour period), and a maximum average increase of 2 NTU from background levels for a longer term exposure (e.g., 30-day period).

CCME (1999) notes that in some cases short-term resuspension of sediments and nutrients in the water column can augment primary productivity, and in other cases, changes in light penetration may be inconsequential if a system is limited by other factors such as nutrients. The Caux *et al*. (1997) study considered effects of suspended sediment not only on fish but also on algae and zooplankton. In summary, the recommendations put forth by Caux *et al*. (1997) are based mainly on the most sensitive taxonomic group, which is salmonids.

However, research has shown that widespread chronic turbidity can result in reduced light penetration and subsequent reductions of primary productivity (Fisheries and Oceans Canada, 1999; Canadian Council of Ministers of the Environment, 1999; Lloyd, Koenings, & Laperriere, 1987). Consequently, water clarity is of concern at broader spatial scales and longer time frames. It should be noted that DFO's report on effects of sediment on fish and their habitat (DFO, 1999) endorses the guidelines for TSS put forth by the CCME (1999), but does not recommend following guidelines for turbidity. Rather, turbidity may be used as a surrogate for suspended sediment only when the relationship between the two parameters is established for a particular waterbody.

2.3 Licence Requirements for the Protection of Fish and Fish Habitat at Meliadine

The Nunavut Water Board (NWB) Type A Water Licence for the Meliadine Mine includes:

All surface runoff and/or discharge from drainage management systems shall not exceed the Surface Runoff and/or Discharge from Drainage Management Systems quality limits in Table 2.2. This encompasses the Monitoring Program Stations MEL-SR-1 to MEL-SR-TBD referred to in Part I, Item 9, during the Construction/Operation of any facilities and infrastructure associated with the Mine, including laydown areas and All Weather Access Road, where flow may directly or indirectly enter a water body.

Table 2.2 Surface Runoff and/or Discharge from Drainage Management Systems Quality Limits

Parameter	Maximum Average Concentration	Maximum Concentration of Any Grab Sample
Total Suspended Solids (TSS) (mg/L)	50.0	100.0
Oil and Grease	No Visible Sheen	No Visible Sheen
pH	Between 6.0 and 9.5	Between 6.0 and 9.5

Additionally, the discharge of effluent from the Final Discharge Point at Monitoring Program Station MEL-14 directed to Meliadine Lake through the Meliadine Lake Diffuser shall not exceed the following TSS concentrations, in accordance with the requirements of the Type A Water Licence (Part F, Item 3) and MDMER (see Table 2.1 above):

- Maximum authorized monthly mean effluent concentration: 15 mg/L;
- Maximum concentration of any grab sample of effluent: 30 mg/L.

SECTION 3 • SEDIMENT AND EROSION MONITORING AND MITIGATION

3.1 Sediment and Erosion during Specific Periods

The purpose of the Plan is to ensure that Agnico Eagle will successfully monitor for signs of sedimentation and erosion and minimize its resulting effects. This plan presents the monitoring and mitigating actions related to three (3) specific periods of activity for Meliadine:

- Periods of construction near water – during construction and operation;
- Periods of freshet or significant runoff events – during construction, operation and closure; and
- Periods of potential impact to waterbodies – during operation.

The construction of infrastructure near water (including water management infrastructures) could potentially lead to excess TSS. Therefore, erosion control methods must be considered during construction activities. In addition, erosion control must be considered during any dewatering activity.

The freshet season at Meliadine occurs approximately from mid-May until the end of June. In addition, there can be periods of high water flow due to rainfall events from late May to mid October. As the Meliadine Mine continues to expand, there are new areas and infrastructure that have become potentially vulnerable to excess water during the freshet season and in response to rainfall, such as, but not limited to:

- Culverts and other water management infrastructures;
- Newly constructed embankments, such as roads and berms;
- Water channels; and
- Surface runoff.

Water transfer and water discharge during operation can also lead to erosion and sedimentation.

3.2 Erosion and Sediment Monitoring

To monitor potential erosion and sedimentation, smaller water management infrastructure such as culverts, cross drains, surface runoff and ditches are inspected up to daily during freshet (minimum of once a week), on a monthly basis thereafter and after significant rain events. Larger culverts and bridges are inspected more often if they represent a risk for daily operations, for the receiving environment or for the health and safety of workers. More specifically, the following aspects are monitored during visual inspections:

- Accumulation of debris near the inlet of the crossings, impeding the free flow of water at those locations;
- Bed erosion upstream and downstream of watercourse crossing structures;
- Scour under bridge abutments and abutment foundations; and

- Erosion along cutslopes and fillslopes of embankments (rill and gully erosion), etc.

Newly excavated channels are inspected on a regular basis and after significant rain events. Erosion signs along the channel flow are monitored and documented. Inspections are carried out during the spring when surficial ice moves towards the inlet of the diversion channels to ensure that no ice blockage causes water buildup upstream of the channel, which could lead to subsequent erosion problems. It is important to develop a database to determine if adverse trends are occurring. If adverse trends are observed, then mitigation will be undertaken to prevent a major incident.

The frequency of water and turbidity sampling are in accordance with the requirements of the Type A Water Licence and MDMER. The frequency will be increased if required during the freshet season or during heavy rainfall events. Procedures for turbidity monitoring include:

- Collection of water at the site of sediment entrance (exposure), and at a reference site (i.e., in the same watercourse/waterbody in an area unaffected by the sedimentation [upstream, at least 50 m away where water does not appear to be impacted]).
- Analyze samples for turbidity using a field turbidity meter and compare the exposure sample to the reference sample.
- If the exposure sample results are higher than the reference then mitigation will be undertaken (i.e., installation of silt fencing, silt barrier booms, etc.) to prevent any impact to watercourses.

If Agnico Eagle is actively working in an area with elevated turbidity – the work will stop until the level of clarity returns to an acceptable level.

Monitoring will be documented with site photographs and inspection forms.

3.3 Mitigation Measures

The following mitigation measures could be used, if required, to reduce risks associated with erosion and sedimentation.

- Riprap or clean non-acid generating/non-metal leaching rockfill could be used to armor shorelines, bridge abutments, culverts inlets and outlets and toe berms;
- Ditches managing high volumes of water could be armored for erosion control and reduce the speed of water flow;
- Sedimentation basins could be constructed at sensitive locations to allow settlement of finer sediments;
- Check dams could be constructed in areas of sustained high levels of TSS to mitigate transport of TSS downstream;
- Ditches, culverts and other water crossing structures should be maintained free of debris to allow free flow of runoff water;

- Installation of erosion control material such as turbidity barriers, silt curtains or straw booms;
- Site-specific erosion issues may arise during the mine operation that require specific local corrective actions;
- In-stream construction during periods when streams are expected to be dry or frozen to the bottom (i.e., during winter or fall). Isolation methods will be used for work below the high water mark for streams with flowing water at the time of construction;
- Materials installed below the high water mark (i.e., riprap) will be cleaned prior to installation to avoid adding deleterious substances to watercourses. Where concrete is installed, it will be allowed to cure fully prior to installation;
- Riparian areas will be maintained whenever possible to minimize erosion and impacts to fish habitat, with vegetation removal limited to the width of the workspace footprint. Disturbed areas along the streambanks will be stabilized and allowed to re-vegetate upon completion of work to minimize future erosion;
- Debris and excess materials resulting from construction will be removed from the work site to prevent them reaching water bodies; and
- When using equipment that creates tracks on the surface, run the equipment slowly to create grooves running perpendicular the slope and not parallel to the slope. This type of texture on slopes can slow the speed of runoff and reduce the amount of erosion and sediment transported downhill. This method must also be combined with an additional method of catching sediment at the base of the slope, such as a silt fence, straw log, etc.

SECTION 4 • REFERENCES

Canadian Council of Ministers of the Environment. (1999). *Canadian Water Quality Guidelines for the Protection of Aquatic Life - Total Particulate Matter.* (Updated 2002).

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