Appendix 38

Whale Tail 2022 Report on the Implementation of Measures to Avoid and Mitigate Serious Harm to Fish

AGNICO EAGLE

MEADOWBANK COMPLEX

WHALE TAIL MINE

2022 REPORT ON THE IMPLEMENTATION OF MEASURES TO AVOID AND MITIGATE SERIOUS HARM TO FISH

In Accordance with

DFO Fisheries Act Authorization 16-HCAA-00370

and

DFO Fisheries Act Authorization 20-HCAA-00275

Prepared by:
Agnico Eagle Mines Limited – Meadowbank Complex

March, 2023

EXECUTIVE SUMMARY

In July, 2018, and July, 2020, Agnico Eagle Mines Ltd. (Agnico) was issued Fisheries Act Authorizations (FAAs) 16-HCAA-00370 and 20-HCAA-00275 for the Whale Tail Mine.

Conditions 2.1 - 2.3 of FAA 16-HCAA-00370 and Conditions 2.1 and 2.2 of 20-HCAA-00275 describe a suite of measures and standards to avoid and mitigate impacts to fish and fish habitat that are required to be implemented while mine activities are ongoing, to ensure impacts to fish and fish habitat are limited to those authorized.

This report has been developed in fulfillment of Condition 3 of these FAAs, which indicates that Agnico will monitor the implementation of these avoidance and mitigation measures and provide a stand-alone report to DFO annually.

In fulfillment of Condition 3.1, this document summarizes the implementation of the specified measures and standards to avoid and mitigate serious harm to fish. Photos and/or figures of the mitigation measures are included, as applicable (according to Condition 3.1.3 of 16-HCAA-00370 and Condition 3.1.1 of 20-HCAA-00275), along with a commentary on effectiveness based on relevant monitoring results, and any required contingency measures in the event that the mitigation did not function successfully (according to Condition 3.1.4/3.1.2).

As required by FAA 16-HCAA-00370 Condition 3.1.1, an evaluation of the effectiveness of the FAA-listed monitoring programs (and other relevant monitoring programs) in validating changes to fish and fish habitat predicted in the Project FEIS is provided in Section 12.5.1.3 of the 2022 Meadowbank Complex Annual Report to the NIRB as a component of the Post-Environmental Assessment Monitoring Program. This approach was adopted beginning in 2021, in an effort to reduce redundancy in reporting and better focus this report on the implementation and effectiveness of the avoidance and mitigation measures.

In summary, all measures and standards to avoid and mitigate serious harm to fish identified in Condition 2 of FAA 16-HCAA-00370 and 20-HCAA-00275 were implemented as required in 2022. In most cases, monitoring results demonstrated these primary mitigation and avoidance measures to be effective. The implementation of contingency mitigation for the protection of fish and fish habitat was limited to corrective measures for two exceedances of peak-particle velocity limits under the Blast Monitoring Program. The FAA-listed and FEIS-planned mitigation measures and standards (see Appendix A) were therefore considered effective in limiting impacts of construction activities to fish and fish habitat to those authorized.

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SECTION 1 • INTRODUCTION

In July, 2018, and July, 2020, Agnico Eagle Mines Ltd. (Agnico) was issued Fisheries Act Authorizations (FAAs) 16-HCAA-00370 and 20-HCAA-00275 for the Whale Tail Mine. Approved fish habitat offsetting related to these FAAs is described in the *Fish Habitat Offsetting Plan for Whale Tail Pit* (March, 2018) and the *Whale Tail Pit Expansion Project - Fish Habitat Offsetting Plan* (March, 2020).

This report was developed in response to Condition 3 of these FAAs, which relates to monitoring and reporting of specified measures and standards to avoid and mitigate serious harm to fish. In particular, this report addresses Condition 3.1 of both FAAs:

Condition 3.1: ***The Proponent shall monitor the implementation of avoidance and mitigation measures referred to in section 2 of this authorization, and provide a stand-alone report to DFO, by March 31, annually and indicate whether the measures and standards to avoid and mitigate serious harm to fish were conducted according to the conditions of this authorization.***

In fulfillment of Condition 3.1, Section 2 of this document summarizes the implementation of the specified measures and standards to avoid and mitigate serious harm to fish, as identified in Section 2 of FAA 16-HCAA-00370 and 20-HCAA-00275. Where appropriate and available, dated photographs with GPS coordinates (or other identifiers) and inspection reports are provided or referenced, as required in FAA 16-HCAA-00370 Condition 3.1.3 and FAA 20-HCAA-00275 Condition 3.1.1.

While presented somewhat differently between the two FAAs, these measures and standards may be summarized as:

1. Sediment and erosion control - Sediment and erosion control measures must be in place and shall be upgraded and maintained, such that release of sediment is avoided at the location of the authorized work, undertaking, or activity. And: *Before commencing any works, undertakings and/or activities that have the potential to release sediment into waters frequented by fish, the Proponent shall prepare and implement site specific sediment and erosion control plans for any near or in-water works under the guidance of a certified Professional in erosion and sediment control (CPESC or equivalent).*

2. Adherence to the *General Fish-out Protocol for Lakes and Impoundments in the Northwest Territories and Nunavut* (Tyson et al., 2011) and approved fish-out work plans;

3. Adherence to the *Freshwater Intake End-of-Pipe Fish Screen Guideline* (Fisheries and Oceans Canada, 1995) (FAA 16-HCAA-00370) or the *Interim code of practice: End-*

of-pipe fish protection screens for small water intakes in freshwater (https://www.dfo-mpo.gc.ca/pnw-ppe/codes/screen-ecran-eng.html) (FAA 20-HCAA-00275) for any and all intake in waterbodies that support fish;

4. Development of a Blasting Mitigation Plan, which shall adhere to the guidance in *Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies, NWT 2000 – 2002* (Cott and Hanna, 2005);

5. Adherence to the *Protocol for Winter Water Withdrawal from Ice-Covered Waterbodies in the Northwest Territories and Nunavut* (Fisheries and Oceans Canada, 2010);

6. Ensure that all project infrastructure in watercourses is designed and constructed in such a manner that it does not unduly prevent or limit the movement of water or fish species in fish bearing streams and rivers, unless otherwise authorized by Fisheries and Oceans Canada. And: *The Proponent shall provide detailed engineering plans to DFO for review and approval for construction works that have the potential to impact fish and fish habitat, at least 90 days prior to the commencement of the works.*

Section 2 of this report also provides a commentary on the effectiveness of the measures and standards, based on results of relevant monitoring programs, including those specified under Condition 2.4 of FAA 16-HCAA-00370 and Condition 2.3 of FAA 20-HCAA-00275 where applicable:

1. Most recent Core Receiving Environment Monitoring Program;

2. Most recent Water Quality and Flow Monitoring Plan;

3. Most recent Water Quality Monitoring and Management Plan for Dike Construction and Dewatering; and

4. Most recent Blast Monitoring Program.

In the event that avoidance and mitigation measures did not function properly according to monitoring results, Section 2 of this report further provides details of any contingency measures that were required to be followed to prevent further impacts (in fulfillment of FAA 16-HCAA-00370 Condition 3.1.4 and FAA 20-HCAA-00275 Condition 3.1.2).

Finally, while not included in this report, Section 12.5.1.3 of the 2022 Meadowbank Complex Annual Report to the NIRB further provides an evaluation of the effectiveness of the above-described monitoring programs (and other relevant monitoring programs) in validating changes to fish and fish habitat predicted in the Project FEIS, as required by FAA 16-HCAA-00370 Condition 3.1.1 (discussed in Section 3).

SECTION 2 • AVOIDANCE AND MITIGATION MEASURES

A commentary on the implementation of each FAA-listed measure to avoid or mitigate serious harm to fish and fish habitat in 2022 is provided below.

2.1 SEDIMENT AND EROSION CONTROL

According to FAA 16-HCAA-00370 and 20-HCAA-00275, *"before commencing any works, undertakings and/or activities that have the potential to release sediment into waters frequented by fish, the Proponent shall prepare and implement site specific sediment and erosion control plans for any near or in-water works under the guidance of a certified Professional in erosion and sediment control (CPESC or equivalent)."*

Further: *"Sediment and erosion control measures must be in place and shall be upgraded and maintained, such that release of sediment is avoided at the location of the authorized work, undertaking, or activity."*

The authorized works, undertakings, and activities, according to these FAAs, include:

1. *Construction of Whale Tail and Mammoth Dikes (complete, with remedial work in 2022 as discussed in this report);*
2. *Dewatering of the north basin of Whale Tail Lake (complete);*
3. *Construction of the freshwater jetty in Nemo Lake (complete);*
4. *Fish-out and dewatering of specified IVR area waterbodies and watercourses (complete);*
5. *Water withdrawal for the purposes of operations from A16;*
6. *Construction and operation of the IVR pit, waste rock storage facility, and attenuation pond (ongoing);*
7. *Construction of 2 groundwater storage ponds (not constructed).*

The preparation and implementation of sediment and erosion control plans for these and any other construction works underway in 2022 is described below in Sections 2.1.1 and 2.1.2. The ongoing monitoring and maintenance of sediment and erosion control measures for water management infrastructure site-wide is described in Section 2.1.3.

2.1.1 Preparation of Sediment and Erosion Control Plans

Sediment and erosion control measures for any construction work, undertaking, or activity having the potential to impact waters frequented by fish (including but not limited to the DFO-

Authorized works listed above) are described in design reports that are prepared by professionals and stamped by a Professional Engineer. These reports are sent to the NWB for review at least 60 days prior to the intended construction initiation. These reports are available for DFO comment during the NWB review period, and construction is not initiated until a positive response is received from NWB. These reports, with the potential to impact waters frequented by fish, are also provided directly to DFO, with 90 days notice. Reports are available on the NWB public registry.

In 2022, design reports were submitted to the NWB (and DFO where applicable) for the following construction activities. No comments from DFO regarding these design plans have been received to date. Item 1 was identified as having potential to impact waters frequented by fish, and therefore includes sediment and erosion control measures for the protection of fish and fish habitat, as discussed further below. Items 2, 3, and 4 were not identified as having potential to impact waters frequented by fish, so are not discussed further in this report.

1. Whale Tail Dike West Abutment Thermal Berm – report submitted December 19, 2022

2. Whale Tail SANA Crusher Pad – report submitted May 16, 2022 (>30 m from any waterbody)

3. Whale Tail A-47 Sump – report submitted May 24, 2022 (>30 m from any waterbody)

4. Whale Tail Camp Pad Extension – report submitted August 5, 2022 (>30 m from any waterbody)

2.1.1.1 Whale Tail Dike West Abutment Thermal Berm

- *Design Report Date*: December 16, 2022
- *Planned Construction Initiation Date*: March-April, 2023
- *Summary*: This report presents the design specifications for a thermal berm to be constructed on the downstream side of the west abutment of the Whale Tail Dike (Figure 1). The design is similar to the east abutment which was partially constructed in 2022 and is discussed in the next section below. A portion of the west abutment thermal berm overprints a portion of the dike foundation that has become recently flooded for water management purposes. This area will be drawn down post-closure and returned to terrestrial habitat.
- *Sediment and erosion control strategy*: Due to the shallow depth of water and the winter construction period, it is not expected to encounter free water during the construction of the structure. As such, it is not expected that sediment control measures will be required during construction. If water is encountered

during the construction, construction activities will either be put to a stop until the water freezes and work will then resume or will be completely stopped depending on the advancement of the works. Water quality monitoring for TSS will be performed during the work and compared to limit established in Part D, Item 7 of the Water License. Agnico Eagle will also perform weekly water quality monitoring in Whale Tail South during construction to ensure no sediment release.

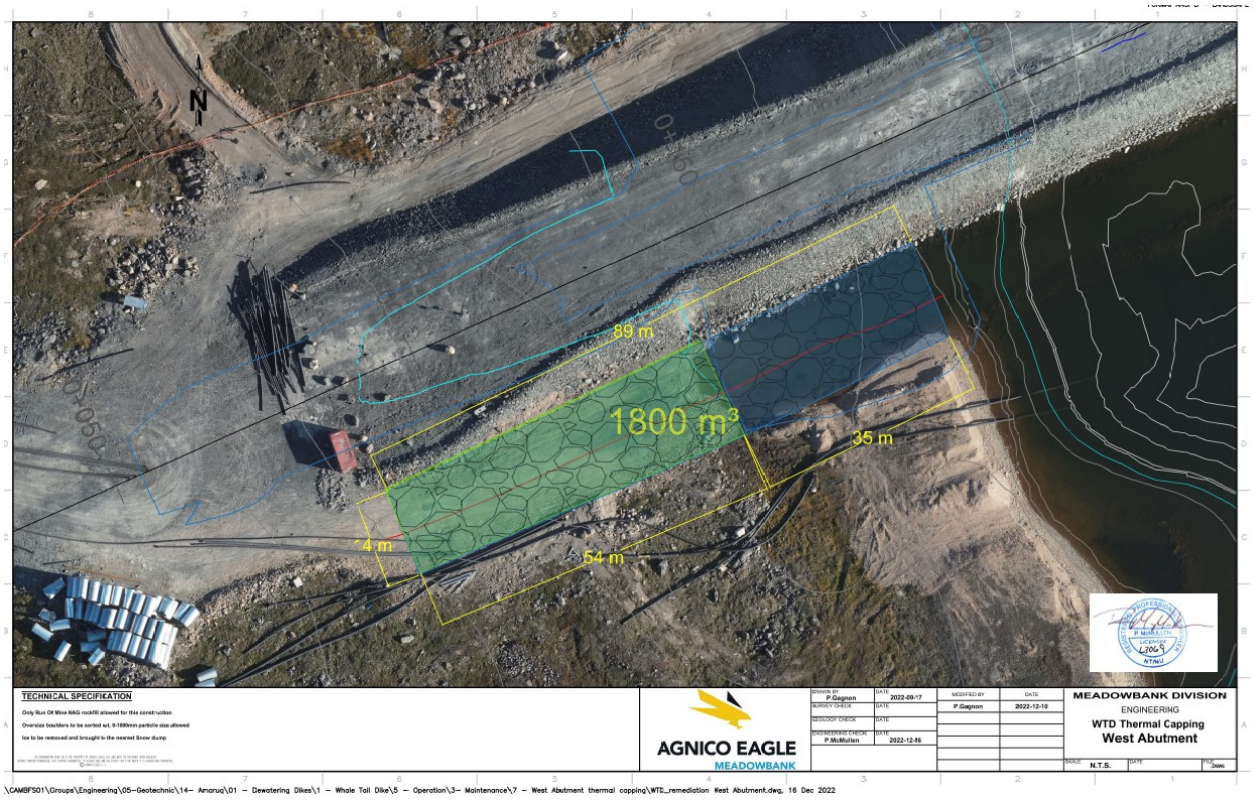

Figure 1. Planned location of the Whale Tail Dike West Abutment Thermal Berm.

2.1.2 Implementation of Sediment and Erosion Control Measures

During construction activities, sediment and erosion control measures are implemented for projects, as described in Design Reports. Following the completion of construction activities, Construction Summary Reports are submitted to the NWB, and are available for DFO review. Construction Summary Reports fully describe the mitigation measures that were implemented (either according to design reports, or contingency measures as necessary) to reduce sedimentation and erosional concerns, along with as-built designs and photographic records (before, during, after construction). These reports are available from the NWB public registry.

For all construction projects with potential to impact fish or fish habitat, this report will provide a summary of any sediment/erosion control mitigation measures required for the protection of

fish/fish habitat, select construction photographs, and a commentary on effectiveness of the mitigation according to relevant water quality monitoring (e.g. Freshet Action Plan, CREMP, Water Quality and Flow Monitoring Plan, Water Quality Monitoring and Management Plan for Dike Construction and Dewatering). Any contingency mitigation measures that were required will also be described.

Of the four project activities for which Construction Summary Reports were submitted in 2022 (listed below), none had the potential to impact waters frequented by fish, so no further discussion is provided here for these activities. However in addition to these activities, construction works were initiated for the Whale Tail Dike East Abutment Thermal Berm (September, 2022). This activity was not completed in 2022 so the Construction Summary Report is not yet available, but since it occurred in a fish-bearing waterbody, an update in the context of this report is provided below. No other construction activities occurred in 2022 that had the potential to impact waters frequented by fish.

1. IVR WRSF Water Management System – report submitted March 22, 2022 (>30 m from any waterbody)
2. WT Emulsion Plant – report submitted August 18, 2022 (>30 m from any waterbody)
3. WT SANA Crusher Pad – report submitted November 21, 2022 (>30 m from any waterbody)
4. WT Camp Pad Extension – report submitted December 20, 2022 (>30 m from any waterbody)
5. (Whale Tail Dike East Abutment Thermal Berm – construction in progress)

2.1.2.1 Whale Tail Dike East Abutment Thermal Berm

- *Report Date*: N/A
- *In-water Construction Dates*: September 25 – 27, 2022
- *Summary*: On September 22, 2022, Agnico advised DFO and the NWB of their intent to begin construction of a thermal berm located on the downstream side of the east abutment of the Whale Tail Dike (Figure 2). The thermal berm was a component of the previously approved Whale Tail Dike design, but construction of this portion was delayed until the present time since there was uncertainty as to its necessity. As a result, part of the berm is being constructed on top of a portion of the existing dike base that has become flooded as a result of dike construction. This area was terrestrial under baseline conditions, and water levels will ultimately be drawn down such that this area is returned to terrestrial habitat at closure (2026). The berm foundation (in-water portion) was

constructed from September 25 – 27, 2022, with plans to finish construction in Q2 2023.

- *Sediment and erosion control strategy*: In keeping with erosion and sediment control plans included in the original Whale Tail Dike design report and following the Water Quality Monitoring and Management Plan for Dike Construction and Dewatering (2020), double turbidity barriers were deployed in Whale Tail South (Figure 3 and 4) before commencing any works and water quality monitoring was conducted as described below.

- *Monitoring Methods:* Water quality monitoring was conducted by surface grab samples outside of the turbidity curtains in Whale Tail Lake (Station ST-WT-DC-12), before, during and after the in-water remediation work. The Environment Department measured daily the temperature, pH, conductivity, turbidity, and dissolved oxygen. TSS analyses were performed daily by Agnico's onsite assay laboratory using standard methods. Accredited laboratory analysis for TSS, nutrients, major ions, and metals (full suite) was also conducted weekly during and after the in-water work (September 25 and October 2).

- *Results:* All results were less than available CCME guidelines and NWB Water License Part D, Item 7 criteria for TSS (50 mg/L for an individual sample, or 15 mg/L for the monthly mean), with a maximum recorded individual TSS value from the accredited laboratory of 2.0 mg/L.

- A Construction Summary Report including results of erosion and sediment control monitoring and any contingency mitigation will be issued 90 days following completion, and reported accordingly.

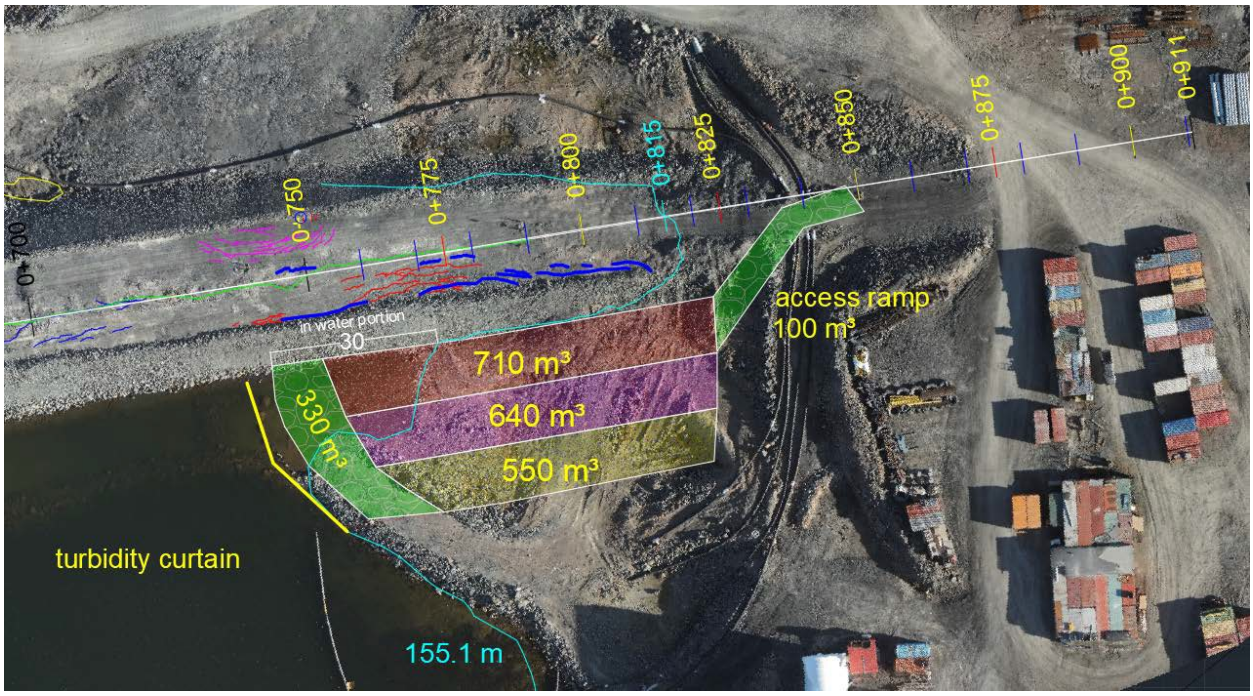

Figure 2. Location and material quantities for the east abutment thermal berm. The in-water area overprints a portion of the dike foundation that has become temporarily inundated by construction of the dike itself.

Figure 3. Turbidity curtains deployed during in-water construction for the Whale Tail Dike East Abutment Thermal Berm (September, 2022).

Figure 4. In-water construction for the Whale Tail Dike East Abutment Thermal Berm (September, 2022) showing turbidity curtains.

2.1.3 Maintenance of Sediment and Erosion Control Measures

Under the Freshet Action Plan and Erosion Management Plan, inspections of Whale Tail Mine water management infrastructure (including but not limited to bridges, culverts, ditches, Whale Tail South Channel, IVR Diversion Channel) are conducted daily to weekly by dedicated personnel starting in May to document and address any turbidity or erosional concerns such as: bed erosion upstream and downstream of watercourse crossing structures, scour under bridge abutments and abutment foundations, erosion along cutslopes and fillslopes of embankments (rill and gully erosion), etc.

Water quality monitoring for turbidity/TSS is also conducted as required based on visual observations. For non-contact water management infrastructure (IVR Diversion Channel, WTS Channel), sampling is conducted on a regular schedule according to NWB Water License requirements, and TSS limits apply.

For all erosion monitoring surveys, an inspection log is maintained, documenting general conditions at each location, observations on flow rates and clarity, turbidity sample collection

(as required), and any mitigation measures that are implemented to prevent erosional concerns.

In 2022, no major erosion concerns that required mitigation actions were identified during visual inspections for Whale Tail Haul Road water management infrastructure (e.g., scour, bed erosion, etc.). Similarly, no major turbidity concerns were identified, no water quality samples were required to be collected, and no contingency mitigation measures (e.g., straw booms or woodchip booms) were required to be installed.

For onsite infrastructure, no major erosional concerns were observed (e.g., scour, bed erosion, gullying, etc.) requiring management action. All water quality monitoring results for TSS in the Whale Tail South Channel and IVR Diversion Channel met NWB Water License limits for TSS.

Under the Freshet Action Plan, the following situation with potential to lead to erosional concerns was identified, with actions taken as described.

- In August 2020, culverts were installed across the road leading to the emulsion plant, near the Mammoth Dike south abutment, after ponding water was observed on the upstream (south) side of this road during freshet. In 2021, overland flow was again observed across this road in May, while culverts were blocked with ice and snow. Attempts were made to thaw the culverts, but some flow across the road continued until mid-June (in 2020 prior to culvert installation, the overland flow continued until mid-July). Sediments control measures (straw and wood-chip booms) were installed downstream of the road to avoid potential sediments transportation. In 2022, plywood was installed to stop snow accumulating in the culverts over winter, and in the spring, snow was cleared from the culvert areas and the plywood was removed. No flow over the road was recorded during freshet, but booms were still installed on the south side of the road in late May and these successfully addressed turbidity concerns, as determined through visual assessment. The installation of silt fences or booms in mine site footprint areas such as this is a planned mitigation measure as described in the FEIS (see Appendix A) and implemented under the Freshet Action Plan.

Results of receiving environment TSS monitoring in the nearest downstream waterbody (Mammoth Lake) were reviewed in the context of this report to confirm the success of these measures. As shown in Figure 5, TSS remained below the CREMP trigger value in Mammoth Lake throughout 2022.

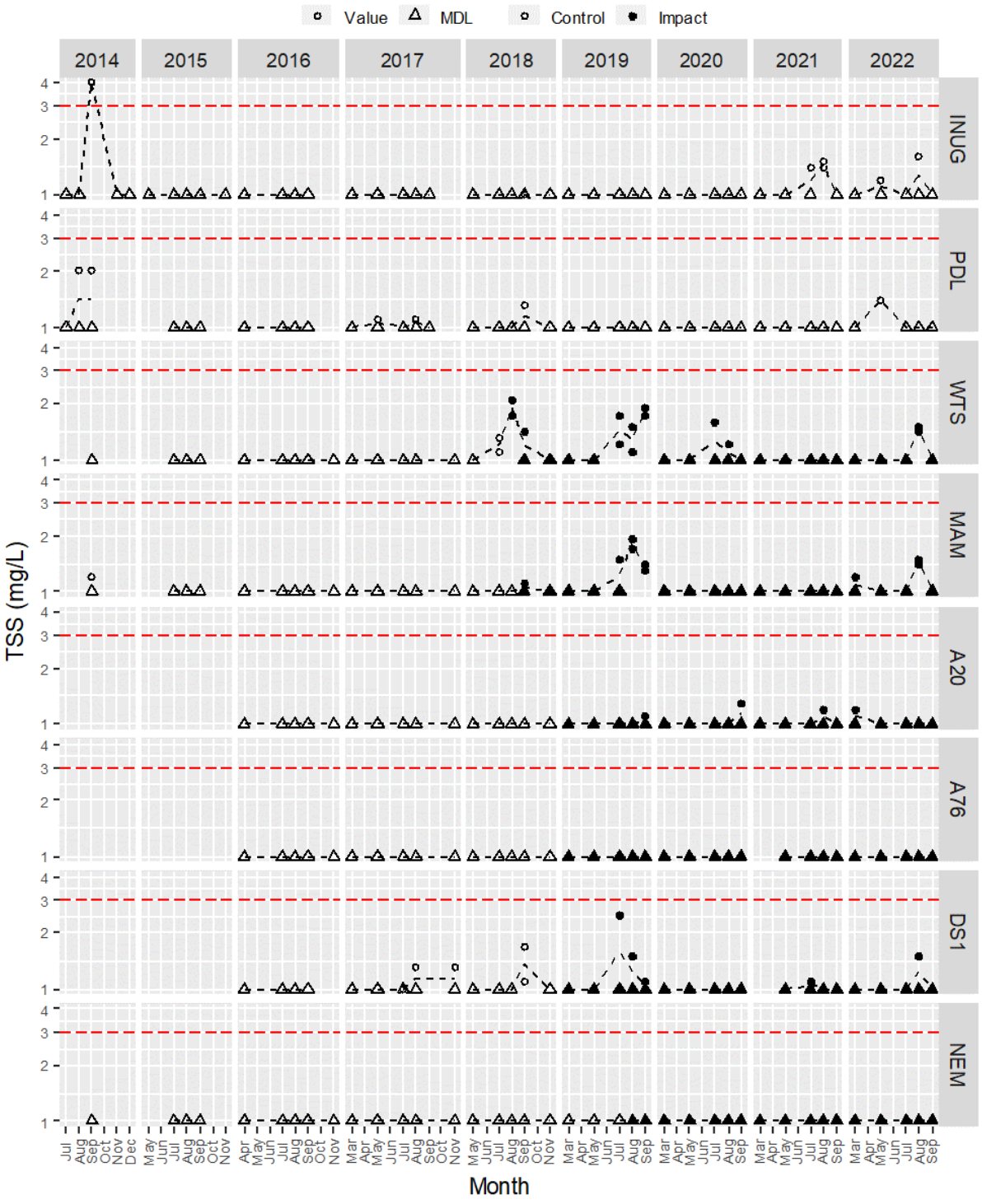

Figure 5. Measured concentrations of TSS in Whale Tail area lakes (from the 2022 Core Receiving Environment Monitoring Report). MAM = Mammoth Lake.

2.2 ADHERENCE TO THE FISH-OUT PROTOCOL AND APPROVED FISH-OUT WORK PLANS

In accordance with the FAAs, Agnico adhered to the Fish-out Protocol for Lakes and Impoundments in the Northwest Territories and Nunavut (Tyson et al., 2011) and approved fish-out work plans for the Whale Tail Mine when fish-outs of Whale Tail Lake (North Basin) and the IVR area waterbodies were conducted in 2018 and 2020 (see previous versions of this report).

No fish-outs occurred at the Whale Tail Mine in 2022.

2.3 ADHERENCE TO FRESHWATER INTAKE END-OF-PIPE FISH SCREEN GUIDELINES

In accordance with the FAAS, Agnico adheres to the Freshwater Intake End-of-Pipe Fish Screen Guideline (Fisheries and Oceans Canada, 1995) or the Interim Code of Practice: End-of-Pipe Fish Protection Screens for Small Water Intakes in Freshwater (https://www.dfo-mpo.gc.ca/pnw-ppe/codes/screen-ecran-eng.html) for any and all intakes in waterbodies that support fish.

No new freshwater intakes in fish-bearing waterbodies were installed in 2022.

The only operating freshwater intake in a fish-bearing waterway was the Nemo Lake intake. Construction of this intake occurred in 2018 and has been previously reported.

2.4 DEVELOPMENT OF A BLASTING MITIGATION PLAN

In accordance with Condition 2.3.3 of FAA 16-HCAA-00370 and Condition 2.2.3 of FAA 20-HCAA-00275, Agnico has developed a Blast Monitoring Program (Version 7, January 2022) that adheres to the guidance in the document “Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies, NWT 2000 – 2002” (Cott and Hanna, 2005) and “Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters” (Wright and Hopky, 1998) as modified by the DFO for use in the north.

A report on blast monitoring according to the Blast Monitoring Program is provided every year in the Meadowbank Complex Annual Report to the NIRB. Every blast is monitored with an Instantel Minimate Blaster to ensure that vibrations generated by blasting (peak particle velocity; PPV) are less than 13 mm/sec and the overpressure (instantaneous pressure change; IPC) is under 50 KPa at the nearest fish-bearing waterbody (on recommendation of DFO). The results of blast monitoring are systematically analyzed by the Engineering Department within 24 hours following the blasting operation. The blast monitoring results are interpreted and a blast mitigation plan is implemented immediately if the vibrations or the overpressure exceed guidelines. Further, Agnico will submit technical memorandums to DFO regarding blast monitoring and mitigation for blasting activity that occurs outside the limits of the current Blast Monitoring Program (none were required in 2022).

Based on comments from DFO received during the November 2022 meeting in review of the 2021 Report on the Implementation of Measures to Avoid and Mitigate Serious Harm to Fish (March, 2022), a historical summary of blast monitoring and mitigation for the Whale Tail Mine is provided here (Table 1). In all cases, contingency mitigation measures implemented in response to exceedances of blast monitoring limits were eventually successful in eliminating ongoing issues. The success of any individual contingency mitigation measure is considered highly dependent on the identified cause of an exceedance, and Agnico continues to implement individual investigations in each case, with results reported directly to DFO. Agnico is has also pro-actively reviewed overall blast mitigation options in response to exceedances that occurred in 2022, and is implementing a suite of controls as further described in the 2022 Blast Monitoring Report, provided here as Appendix B.

Table 1. Historical summary of blast monitoring results and contingency mitigation implemented in the case of exceedances for the Whale Tail Mine.

Year (# Blasts)	Location	# PPV >13 mm/s	# IPC >50 kPa	Identified Cause	Description of Mitigation
2018 (45)	Construction – Amaruq Quarry	1	0	1 (Mar 22) – Nine preshear holes were detonated on the same delay.	1 - Reduce the explosives quantity per delay.
	Construction - Attenuation Pond	1	0	1 (Apr 30) – Shortened delay.	1 – Extend the delay.
2019 (174)	Whale Tail Pit	5	0	1 (May 17) - Five preshear holes were detonated on the same delay.	1 - Reduce the explosives quantity per delay.
				2 (May 22) - This blast was close to the blast monitoring station but a bit far from the lake shore.	2 – Move the station nearer to the lake (implemented June 26).
				3 (June 8) - Six preshear holes were detonated on the same delay.	3 - Reduce the explosives quantity per delay. Station not yet moved.
				4 (June 15) - Five preshear holes were detonated on the same delay.	4 - Reduce the explosives quantity per delay. Station not yet moved.
				5 (June 22) - There was a working pump very near the blast monitoring station during the blast, likely affecting the monitoring results.	5 – Station moved nearer to the lake after this exceedance (June 26).
	Construction - Mammoth Dike	3	0	1 (Feb 20) - The sinking cut (slightly deeper holes required for creating the free face on the first blast of the sequence) were responsible for passing the limit.	1 - The remaining blast was cut in 2 sequences; wouldn't have any sinking cuts; optimized blast timing to allow more time for the material to move.
				2 (Feb 23) – Blast was closer to the monitoring station	2 – In addition to the above, increase the collar to reduce the powder factor.
				3 (Feb 26) - The lithology in the sector of this third blast was found to be predominantly in sound bedrock compared to sequence 1 that was mainly in till, therefore shock waves propagating more efficiently across the ground which may have contributed to higher vibration values.	3 - No more blasting to occur under these conditions.
2020 (383)	Whale Tail Pit	1	0	1 (Jul 10) - Eight preshear holes were detonated on the same delay.	1 - Reduce the explosives quantity per delay.
	IVR Pit	0	0	-	--

Year (# Blasts)	Location	# PPV >13 mm/s	# IPC >50 kPa	Identified Cause	Description of Mitigation
	Construction – Whale Tail South Channel	3	0	1 (Jan 27) - Blast had no open face; material in that area seems to be harder than the others.	1 - Collar for holes longer than 5 m will be increased from 1 to 1.5 m in order to reduce the powder factor; slow down the timing between the rows which creates a better freeface for the material to move during the blast and thus having less waves traveling towards the lake; ensure no holes are on the same delay; have an open face; and blasts will be shot in shorter sequences of around 100 holes rather than over 200 holes.
				1 (Feb 5) - The blast monitor was not installed properly (i.e. uneven contact with natural soil, loose material in contact with the station)	2 – In addition to the above, a second blast monitor will be installed with additional Quality Control; the timing delay for the blast will be increased further; and quality control will be increased to ensure that no overloading occurs.
				3 (Feb 10) - The second blast monitor malfunctioned and failed to record the vibration during the event, and the first blast monitor was still not installed properly. Although no hole was on the same delay, the time delay was not increased as initially planned after the previous exceedance, due to internal miscommunication.	3 – In addition to the above, the second blast monitor will be reinstalled and its installation and operation will be validated by additional Quality Control. All potentially defective devices were sent back for maintenance and recalibration. A third blast monitor will be installed on a rock anchor at some distance to gather information on blast vibration propagation. The timing delay for the blast will be increased further.
2021 (315)	-	0	0	-	-
2022 (373)	IVR Pit	2	0	1 (Apr 18) – Shortest distance to date between blast and monitoring station.	1 – During the initial blast, the size of the blast pattern was reduced (60k tonnes) compared to normal (200k tonnes) to help minimize vibrations, but supplemental mitigation is evidently required. For subsequent blasts, to minimize vibrations: the northern part of IVR 2

Year (# Blasts)	Location	# PPV >13 mm/s	# IPC >50 kPa	Identified Cause	Description of Mitigation
					will be drilled using 4.5” bit rather than 6.5” to decrease the explosives per delay; patterns at IVR-2 will be smaller in size than mass blasts at IVR-1 and Whale Tail Pit; a QAQC item is added to the Drill & Blast checklist to validate vibrations prior to approval to determine if 4.5” or 6.5” bits are to be used. No subsequent exceedance among all blasts at IVR Pit until September (see below).
				2 (Sept 9) – As above. The theoretical model, with a built-in safety factor to ensure no recorded vibrations exceeds the estimated PPV, was estimating 12.05 mm/s for pattern 5130MSV26 and 12.78 mm/s for pattern 5130MSV08 in this delay. The large difference between the model that purposefully overestimates the PPV and the recorded one (17.37 mm/s) indicates the exceedance likely comes from the instrument itself or the way the geophone was installed. It is suspected that leaving the bolted geophone with the exposed connections in the environment could also be a cause of the seismograph misreading blast vibrations.	2 – In addition to the above: Purchase of 5 new seismographs (scheduled for 2023, but will be expedited to this year); the second Nemo Lake Blast Monitoring Station will be reinstalled and all monitoring stations will be identified with adequate signage; the geophones will either be installed in an enclosed and water proof space or brought inside after each use to eliminate the risk of poor connectors contact; until the new seismographs come in and are tested, the safety factor will be increased in the blast vibration model so that the scaled distance relationship formula overestimates to an extent that the estimated PPV of blasts 5130MSV26 and 5130MSV08 is above the recorded value.

2.5 ADHERENCE TO THE PROTOCOL FOR WINTER WATER WITHDRAWAL

In 2022, under-ice water withdrawal occurred for the freshwater intake from Nemo Lake only. Withdrawal volumes conformed with the *Protocol for Winter Water Withdrawal from Ice-Covered Waterbodies in the Northwest Territories and Nunavut* (Fisheries and Oceans Canada, 2010) – i.e. total under-ice withdrawal did not exceed 10% of the available water volume.

As described in Agnico's response to DFO's Technical Comment 2.2.2 on the Whale Tail Pit Expansion Project Water License Amendment application (October 7, 2019), the available under-ice volume of Nemo Lake was calculated as 6,169,226 m^3. For calculating under-ice volumes, hydrological statistics were extracted from the elevation-volume table (Table A-19) provided in Appendix 6-M of the Final Environmental Impact Statement (FEIS) for the Whale Tail Pit Project. The calculations assumed a 2-m ice thickness during winter.

Estimated total under-ice water withdrawal from Nemo Lake for the winter of 2021-2022 (conservatively, September – June, inclusive) was 63,549 m^3, which is less than 10% of the available under-ice volume (10% of 6,169,226 m^3 = 616,923 m^3).

2.6 PROJECT INFRASTRUCTURE IN WATERCOURSES

In accordance with the FAAs, Agnico will ensure that all project infrastructure in watercourses is designed and constructed in such a manner that it does not unduly prevent or limit the movement of water or fish species in fish bearing streams and rivers, unless otherwise authorized by Fisheries and Oceans Canada.

Further, Agnico will provide detailed engineering plans to DFO for review and approval for construction works that have the potential to impact fish and fish habitat, at least 90 days prior to the commencement of the works.

As discussed in Section 2.1.1, Design Reports are provided to the NWB for review at least 60 days prior to any construction activity, and these reports are available for DFO comment. Reports are also provided to DFO at least 90 days prior to any construction works that have the potential to impact fish and fish habitat. Following construction, Construction Summary Reports are provided to the NWB, providing details of the final construction methods. All Design Reports and Construction Summary Reports provided to the NWB/DFO in 2022 are summarized in Section 2.1.

In 2022, no project infrastructure was designed or constructed in any fish-bearing stream or river.

As described in Section 2.1 a letter indicating Agnico's intent to immediately begin construction of the East Abutment Thermal Berm was sent to DFO in September, 2022. This project was approved by DFO previously as part of the design report for the Whale Tail Dike

(2018), but construction was delayed relative to dike construction (2018-2019) due to uncertainty around its necessity. In addition, a design report was submitted to DFO in December, 2022, for construction of a newly designed West Abutment Thermal Berm to be built in March-April, 2023. While both projects overprint the footprint of the Whale Tail Dike, they will be partially constructed in an area of temporary flooding that was created when the water level of Whale Tail Lake was raised against the dike for water management purposes in 2019. However, this area is planned to be drawn down at closure (2026) and for the purposes of fish habitat offsetting calculations, it was not assumed to provide fish habitat during the period of temporary flooding. Communications by email were received from DFO in October, 2022 to confirm whether the East Abutment Thermal Berm footprint was included in habitat loss calculations. Agnico provided a response indicating that this area was terrestrial under baseline conditions and would be returned to terrestrial habitat post-closure, so it is not included in fish habitat loss calculations. No comment from DFO was received as of today regarding the design report submitted for the West Abutment Thermal Berm.

No other works were designed or constructed in 2022 with the potential to impact fish or fish habitat.

SECTION 3 • VALIDATION OF FEIS-PREDICTED IMPACTS

In accordance with Condition 3.1.1 of DFO Authorization 16H-CAA-00370 and following Agnico's discussions with DFO and KivIA in October 2021 on the content of this report, a review of FEIS-predicted impacts to fish and fish habitat is provided in Section 12.5.1.3 of the 2022 Meadowbank Complex Annual Report to the NIRB as a component of the Post-Environmental Assessment Monitoring Program. This approach was proposed in an effort to reduce redundancy in reporting and better focus this report on the implementation and effectiveness of the DFO specified avoidance and mitigation measures, as listed in Section 2 of the FAAs. It is noted that validation of FEIS predictions is not a condition of the DFO FAA for the Whale Tail Pit Expansion Project (20-HCAA-00275) but nevertheless the PEAMP evaluation includes the relevant assessment of predictions for that Project phase.

In line with Condition 3.1.1 of 16-HCAA-00370, the purpose of the PEAMP evaluation is to:

1. Summarize predicted residual impacts to fish and fish habitat valued components (VCs).

2. For each prediction, present historical and current-year results from relevant monitoring programs.

3. When current monitoring results do not support an impact prediction (i.e. current-year measured impacts are outside of the range of predicted impacts), a trend analysis is

conducted to review baseline and all monitoring data to date. A discussion of those results is provided.

4. Previously reported trend analyses are updated, regardless of current year monitoring results. In this way, discussions and trend analyses will be presented in the PEAMP moving forward for all instances where impact predictions have historically been exceeded on one or more occasions.

5. Effectiveness of the monitoring programs at assessing impact predictions is discussed. A summary of the FEIS-planned mitigation measures for each VC is provided, along with a description of implementation in the current monitoring year. Where monitoring results indicate that impact predictions can no longer be supported, a description will be provided of the proposed adaptive management approaches.

SECTION 4 • SUMMARY

As described in Section 2 of this report, all of the measures and standards to avoid and mitigate serious harm to fish identified in Section 2 of FAA 16-HCAA-00370 and 20-HCAA-00275 were implemented as required in 2022.

With regards to **sediment and erosion control**, only one construction project implemented in 2022 had the potential to release sediment into waters frequented by fish (Whale Tail Dike East Abutment Thermal Berm). Sediment and erosion control plans (turbidity curtains) were in place and monitored in keeping with the previously-approved design report for the Whale Tail Dike, and the Water Quality Monitoring and Management Plan for Dike Construction and Dewatering (2020). All monitoring results were less than CCME Water Quality Guidelines for the Protection of Aquatic Life, and NWB Water License Part D, Item 7 criteria for TSS (50 mg/L for an individual sample or 15 mg/L for the monthly mean), with a maximum recorded individual TSS value of 2.0 mg/L (from the external accredited laboratory). As a result, no contingency mitigation was required. Sediment and erosion control for previous construction projects was monitored and maintained through the Freshet Action Plan and Erosion Management Plan. In 2022, booms were installed in an area of managed overland flow (under-road culverts) to reduce turbidity and limit potential for TSS release to Mammoth Lake. Visual inspections were conducted to ensure this mitigation measure was effective, and those results were confirmed through review of receiving environment water quality monitoring. As a result, no contingency mitigation was required.

With regards to **adherence to fish-out protocols**, no fish-outs were conducted at the Whale Tail Mine in 2022.

With regards to **end-of-pipe fish screens**, no new fresh-water intakes were installed in fish-bearing waterbodies in 2022.

With regards to **blast mitigation**, a Blast Monitoring (& Mitigation) Program is maintained as required by the DFO Authorizations, and in 2022 two blasts were recorded to exceed PPV limits of 13 mm/s at the nearest fish-bearing waterbody (Nemo Lake). In each case an investigation was conducted, and corrective measures (contingency mitigation) was implemented to minimize the potential for another exceedance. The mitigation that was immediately successful after the first exceedance (April) included decreasing the explosives per delay through a reduction in drill bit size and further reducing the size of mass blasts. A second exceedance occurred (September) that was thought to be related to issues with monitoring equipment. However, pending arrival of new equipment, the safety factor was increased in the blast vibration model. No further exceedances occurred.

With regards to **under-ice water withdrawal**, total under-ice water withdrawal from Nemo Lake for the winter of 2020-2021 was 63,549 m^3, which is less than 10% of the available under-ice volume (10% of 6,169,226 m^3 = 616,923 m^3).

With regards to notification of **construction works with the potential to impact fish and fish habitat**, Agnico sent to DFO one notice of intent to begin construction of a previously-approved design report (East Abutment Thermal Berm), and one design report for a new activity (West Abutment Thermal Berm) to be constructed in March-April, 2023. Both projects are being constructed partially in an area of temporary flooding for water management purposes on the shoreline of Whale Tail Lake South. Agnico received and replied to DFO comments on the East Abutment Thermal Berm notification (October, 2022) and did not receive comments from DFO as of today on the West Abutment Thermal Berm design report (submitted December, 2022).

Since limited contingency mitigation was required in 2022 (only in response to two blast monitoring events), these and other mitigation measures implemented as part of the Project (Appendix A) were therefore considered effective in limiting impacts on fish and fish habitat to those authorized.

Further validation of all FEIS-predicted impacts is discussed in Section 12.5.1.3 of the 2022 Meadowbank Complex Annual Report to the NIRB as a component of the Post-Environmental Assessment Monitoring Program, using current-year and historical monitoring results from all relevant programs.

APPENDIX A

Summary of FEIS-Designed Mitigation Measures

A complete list of the Project's mitigation measures related to fish and fish habitat, as designed in the FEIS is provided in Table A-1, along with a commentary on implementation in 2022.

Table A- 1. Mitigation measures described in the FEIS Addendum (Agnico Eagle, 2018; Table 3-C-7) to reduce impacts of the project to fish and fish habitat, and commentary on current implementation.

Project Activity	Planned Mitigation Measure (FEIS Addendum, Table 3-C-7)	Implementation (2022)
Mine infrastructure footprint	Best management practices for erosion and sedimentation control (e.g., ground cover, silt fences and curtains, runoff management), where needed.	**Yes** – Freshet Action Plan
Site water management (road infrastructure) and Whale Tail Haul Road operation	Where possible, in-stream works will be constructed in winter when watercourses are frozen. In-stream works will be conducted according to DFO timing windows to avoid critical periods for fish.	**N/A** (no construction in fish-bearing watercourses in 2022)
	Mining staff will not be allowed to hunt or fish while on their work rotation; Agnico Eagle will develop and enforce "no hunting, trapping, harvesting or fishing policy" for employees and contractors, which will be consistent with the Meadowbank Mine.	**Yes**
	Watercourses will be inspected upstream and downstream of the crossings for, erosion, scour, and flow blockages	**Yes** – Road Inspection
	Regular inspection of the road to identify any areas where ponding of water along the road represents a risk, and installing additional culverts or drains to alleviate risk, where required.	**Yes** – Road Inspection
	Rock aprons at culvert inlets and outlets will provide erosion protection and prevent localized erosion from concentrated high velocity flows above the peak 1:10 year rainfall event.	**Yes** – Road Inspection
	Use of staggered culvert configuration, and removal of snow at the culvert inlet and outlet prior to the freshet to promote drainage and increased conveyance of flow during spring thaw and freshet.	**Yes** – Road Inspection
Earthworks: Drilling, blasting and excavation (includes Quarry/Borrow Pit) and Crushing activities	Only the required amount of explosive will be used as necessary for the amount of rock or borrow material to be blasted	**Yes** – Blast monitoring Program
	Applicable guidelines for set-back distances and quantities of explosives will be followed.	**Yes** – Blast monitoring Program
	Where possible, stockpiling of rock and fill from quarries and borrow sites will be placed such that surface water is not diverted through the piles with runoff to surface waterbodies; drainage from quarries will not flow directly into any waterbodies or watercourses.	**Yes** - Mine Waste Rock Management Plan
	Borrow and rock quarry activity will be at least 31 m from the high water mark of any waterbody	**Yes** - Mine Waste Rock Management Plan
	Borrow pits and quarry will be excavated and sloped for positive drainage	**Yes** - Mine Waste Rock Management Plan
	Quarries will be inspected on a regular basis to monitor water ponding, particularly at spring melt.	**Yes** - Mine Waste Rock Management Plan
	Drainage from borrow pits and quarry will not flow directly into any waterbodies or watercourses.	**Yes** - Mine Waste Rock Management Plan
	When there is ponded water in the rock quarry or borrow pits that could enter a waterbody or watercourse, a water quality sample will be collected and analyzed, and the	**Yes** - Mine Waste Rock Management Plan

Project Activity	**Planned Mitigation Measure** (FEIS Addendum, Table 3-C-7)	**Implementation (2022)**
	results used to determine appropriate mitigation measures (e.g., prevent runoff from entering waterbody or watercourse).	
	To avoid and mitigate Serious Harm to Fish, Agnico Eagle will continue to adhere to blasting requirements and will continue to use practices consistent with those used at the Meadowbank Mine. Agnico Eagle will engage with DFO, when required.	**Yes** – Blast monitoring Program
	Use of non-acid generating material at watercourse crossings; testing will verify lack of acid rock drainage and metal leaching potential.	**Yes** - Mine Waste Rock Management Plan
	Any PAG or high metal leaching waste rock will be segregated at source and placed into designated areas within the waste rock storage facilities.	**Yes** - Mine Waste Rock Management Plan
General Construction /Decommissioning Activities	Best management practices for erosion and sedimentation control (e.g., silt curtains, runoff management, armouring of banks), where needed to limit disturbance to lakes and streams.	**Yes** - Mine Waste Rock Management Plan
	In-stream works will be in winter, when possible, to avoid increased TSS and turbidity, and changes to water quality	**Yes**
	Where applicable, runoff from construction / decommissioning activities will be captured and managed to minimize suspended solids (e.g., discharged into an attenuation pond to settle out suspended sediments)	**Yes** – Design report
	Where possible, in-stream works will be constructed in winter when watercourses are frozen. In-stream works will be conducted according to DFO timing windows to avoid critical periods for fish.	**Yes**
	Bridge abutment installation will span majority of the active channel (i.e., outside of the high-water mark), and if feasible, construction will occur in winter	**N/A** – no bridge installation in 2022
	Disturbed areas along the streambanks will be stabilized and allowed to revegetate upon completion of work	**Yes** – streambanks allowed to revegetate
Site Water Management	A Surface Water Management Plan will be implemented	**Yes** – Water Management Plan
Dike Construction / Decommissioning causing release of sediment	Use of the Dewatering Dikes, Operations, Maintenance and Surveillance Manual developed by Agnico Eagle.	**Yes** - Water management infrastructure OMS
	Best management practices for erosion and sedimentation control (e.g., ground cover, silt fences and curtains, runoff management), where needed.	**Yes** – Water Quality Monitoring Plan for Dike Construction and Dewatering + Freshet Action Plan
	During summer construction, turbidity curtains will be installed near the portion of the alignment where dike construction will occur, which is an approach demonstrated at other northern mining projects	**Yes** – Water Quality Monitoring Plan for Dike Construction and Dewatering
	Non- potentially acid generating, chemically inert material (i.e., granite) will be used to construct the dike to prevent leaching of metals into water.	**Yes** – Design construction report
	Turbidity monitoring will be conducted at designated locations throughout open water and under-ice conditions, within and outside of the zone of the turbidity curtains. In the event that TSS concentrations approach monitoring thresholds, a review of local conditions and activities will be conducted.	**Yes** – Water Quality Monitoring Plan for Dike Construction and Dewatering

Project Activity	**Planned Mitigation Measure** (FEIS Addendum, Table 3-C-7)	**Implementation (2022)**
General mining activities and use of vehicles causing fugitive dust & other air emissions	Implement dust control measures, if needed on mine roads.	**Yes –** Air Quality and Dustfall Monitoring Plan
	Equipment and vehicles will comply with relevant non-road emission criteria at the time of purchase	**Yes –** Air Quality and Dustfall Monitoring Plan
	Enforcing speed limits (maximum speed 50 km/h) to suppress dust production.	**Yes –** Whale Tail Transportation Management Plan
	If deemed necessary through monitoring, dust from roads will be managed through use of dust suppressant	**Yes –** Air Quality and Dustfall Monitoring Plan
	The running surface of the road will be maintained thereby reducing the generation of dust.	**Yes –** Air Quality and Dustfall Monitoring Plan
	Adherence to the Air Quality and Dustfall Monitoring Plan	**Yes –** Air Quality and Dustfall Monitoring Plan
	Most personnel arriving at or leaving the site will be transported by bus, thereby reducing the amount of traffic (and dust).	**Yes**
	Adherence to water quality monitoring and adaptive management in the CREMP to detect changes in water quality	**Yes** - CREMP
	Construction equipment and trucks will be equipped with industry-standard emission control systems.	**Yes**
	Compliance with regulatory emission requirements will be met.	**Yes –** FEIS air quality impact assessment
	Exhaust emissions from non-road vehicles will be managed through regular and routine maintenance of vehicles	**Yes** – Maintenance logs
	SO_2 emissions from non-road vehicles and stationary equipment will be reduced through the use of low emission diesel fuel.	**Yes**
Waste Rock Storage Areas and Stockpiles	A Water Management Plan has been developed and describes the containment and management of contact water on-site.	**Yes** – Water Management Plan
	Contact water will be monitored and managed through the Storage and Attenuation Ponds. The IVR Diversion will divert clean runoff from the upper watershed of the IVR Pit to the Nemo Lake watershed.	**Yes** – Water Management Plan
	Seepage will be captured at sumps and diverted to the Attenuation Pond.	**Yes** – Water Management Plan
	Facility discharge water will be monitored for water quality, and treated as required, prior to discharge	**Yes** – Water Management Plan
	Performance of the dikes will be monitored throughout their construction and operating life.	**Yes** – Water Management Plan
Site Water Management	Manage pumping rates so total annual discharge from Whale Tail and Nemo Lake does not drop below the 10-year dry condition	**Yes** – Water Management Plan
	Water withdrawal rate(s) will be controlled to avoid effects on the source water lake(s).	**Yes** – Water Management Plan
	Capture and reuse site water to reduce freshwater requirements	**Yes** – Water Management Plan
	Pumped water from the dewatered lakes will be directed through properly designed structures to prevent erosion in the receiving waterbodies	**Yes** – Water Management Plan
	Pumped discharge will be directed to the lake environment, and not directly to outlets, to attenuate flow changes	**Yes** – Water Management Plan

Project Activity	**Planned Mitigation Measure** (FEIS Addendum, Table 3-C-7)	**Implementation (2022)**
	Best management practices for erosion and sedimentation control (e.g., silt curtains, runoff management, armouring of banks, sloping of banks), where needed	**Yes** – Water Management Plan
	Water Management Plan will be implemented	**Yes** – Water Management Plan
	A fish-out of the diked area of Whale Tail and Mammoth lakes, and smaller waterbodies in the northeast area for the Expansion Project, will be conducted before and during dewatering phase; the fish-out plan will be designed and implemented in consultation with DFO and local Inuit communities, and will consider recommendations in Tyson et al. (2011).	**NA -** fish-out complete
	Appropriately sized fish screens, which meet DFO guidelines, will be fitted to pumps to limit fish access and to limit fish entrained to the smaller species and life stages	**Yes** – Water Management Plan
	Runoff and seepage from the Project site will be diverted to sumps and the attenuation pond (and treated if required) prior to release.	**Yes** – Water Management Plan
	Water quality in attenuation ponds will be monitored and managed such that the discharge meets discharge limits.	**Yes** – Water Management Plan
	Potential acid generating rock and metal leaching waste rock will be segregated at source and placed into designated areas within waste rock locations	**Yes** - Mine Waste Rock Management Plan
Fuel Storage and use (includes Chemical and Hazardous material Storage and Explosives Storage Area)	The Spill Contingency Plan will be implemented, including ready access to an emergency spill clean-up kit for cleaning up any spills	**Yes** - Spill Contingency Plan
	Hazardous materials and fuel will be stored according to regulatory requirements to protect the environment and workers and will be stored at the Meadowbank Mine.	**Yes** – Hazardous Management Plan
	Storage tanks (e.g., fuel, engine oil, hydraulic oil, and waste oil and coolant) will be double walled, or located in lined and bermed containment areas	**Yes** – Hazardous Management Plan
	Hazardous wastes will be temporarily stored at Whale Tail Pit site and then transported to the Meadowbank Mine in appropriate containers to prevent exposure until they are shipped off site to an approved facility	**Yes** – Hazardous Management Plan
	Individuals working on site and handling hazardous materials will have appropriate training (e.g. WHMIS)	**Yes** – Hazardous Management Plan
	Soils from petroleum spill areas will be deposited at the Meadowbank Mine Landfarm	**Yes** – Landfarm Management Plan
	Equipment will be re-fueled, serviced, or washed away from the watercourse crossings.	**Yes** – best practices
	Fuel, lubricants, hydraulic fluids, and other chemicals will be stored at least 31 m away from the high water mark of any waterbody.	**Yes** – Weekly Inspection
	Construction equipment will be regularly maintained	**Yes** – Maintenance Logs
	Emergency spill kits will be available wherever toxic materials or fuel are stored and transferred	**Yes** – Spill Contingency Plan
	Enforced speed limits	**Yes**
Mining Activities and Water Management – effluent release	Adherence to Water Management Plan	**Yes** – Water Management Plan
	Runoff and seepage from the Project site will be diverted to sumps and the attenuation pond	**Yes** – Water Management Plan
	Treated sewage will be piped to the attenuation pond	**Yes** - Completed

Project Activity	**Planned Mitigation Measure** (FEIS Addendum, Table 3-C-7)	**Implementation (2022)**
	Water quality in Attenuation Ponds will be monitored and managed such that the discharge entering Mammoth Lake, Whale Tail Lake, or the alternative discharge locations (Lake 1 or Lake 5) meets discharge limits. If water quality does not meet discharge limits, it will be circulated and re-treated.	**Yes** – Water Management Plan

APPENDIX B

2022 Blast Monitoring Report

ANNUAL REPORT MEMORANDUM

Agnico Eagle Mines Ltd Meadowbank Complex
Environment Department

SUBJECT: 2022 Meadowbank and Whale Tail Blast Monitoring Report for the Protection of Nearby Fish Habitat

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1. Introduction and Objectives

In accordance with NIRB Project Certificate No.004 Condition 85 and Project Certificate No. 008 Condition 22, Agnico Eagle Meadowbank Complex developed a blasting program which complies with *The Guidelines for the Use of Explosives In or Near Canadian Fisheries Water*[1] (Wright and Hopky,1998) as modified by the DFO for use in the North and adhere to guidance provided in *Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies*[2] (Cott and Hanna, 2005). As a result, Agnico Eagle conducts monitoring to evaluate blast related peak particle velocity (PPV) and overpressure (IPC) to protect nearby fish bearing waters.

The detonation of explosives in or near water produces compressive shock waves that can cause significant impacts to the swim bladders of fish, rupture other internal organs and/or damage or kill fish eggs and larvae. In addition, the effects of the shock waves can be intensified in the presence of ice. Consequently, the Guidelines for the Use of Explosives in or Near Canadian Fisheries Water guidelines have been developed by DFO to protect fish and fish habitat from works or undertakings that involve explosives in or near fisheries waters. Guidance provided in Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies (Cott and Hanna, 2005) was also followed. It includes the following requirements:

1. No explosive is to be detonated in or near fish habitat that produces an instantaneous pressure change (IPC) greater than 100 kPa in the swim bladder of a fish; representatives from DFO requested that Agnico Eagle use a value of 50 kPa instead of 100 kPa; and

2. No explosive is to be detonated that produces a peak particle velocity greater than 13 mm/s in a spawning bed during the period of egg incubation (for lakes near the Meadowbank mine, it takes place between August 15 and June 30).

Peak particle velocity (PPV) and overpressure monitoring data was recorded throughout 2022 during blasting activities at Whale Tail, IVR, and IVR West Pits for the protection of fish. The locations of the blast monitoring stations on surface in 2022 at Whale Tail Mine are highlighted in Table 1 and Figure 1.

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[1] *Wright, D.G., and G.E.Hopky.Guidelines for the use of explosives in or near Canadian fisheries Water. 1998.Can. Tech.Rep. Fish.Aquat. Scie.2107: IV+34P.*
[2] *Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies, NWT 2000-2002 guidelines.*

Table 1: 2022 Surface Blast Monitoring Stations – Whale Tail Mine

Station	Easting	Northing
IVR Pit (Nemo Lake)	606,588	7,256,993
IVR Pit (Nemo Lake 2)	606,673	7,256,972
Whale Tail Pit (Mammoth Station 2)	605,945	7,255,169
Whale Tail Pit (Mammoth Station 3)	605,872	7,255,000

No blast monitoring was conducted at the Meadowbank mine site in 2022 as mining operations ceased in 2019.

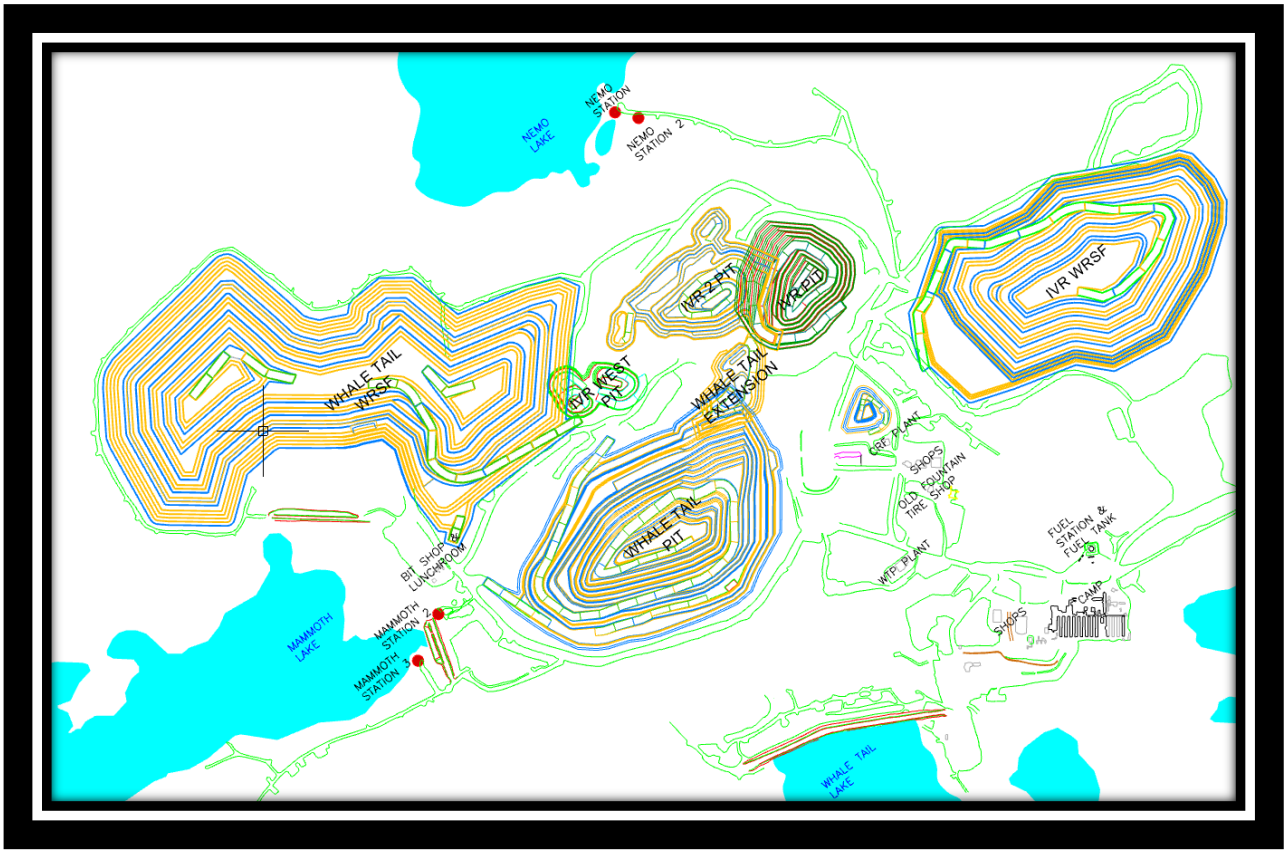

Figure 1 – Whale Tail Blast Monitoring Stations

2. Methods

2.1- Blast Monitoring

Blasts were monitored using Instantel's Minimate & Micromate Blaster which is fully compliant and is annually calibrated with the international Society of Explosives and Engineers performance specifications for blasting seismographs (Instantel, 2005). The Minimate & Micromate Blaster has three main parts: a monitor, a standard transducer (geophone) and a microphone. The monitor contains the battery and electronic components of the instrument. It also checks the two sensors to ensure they are functioning. The transducer measures ground vibration with a mechanism called a geophone [3].

This instrument measures transverse, vertical and longitudinal ground vibrations. Transverse ground vibrations agitate particles in a side-to-side motion. Vertical ground vibrations agitate particles in an up and down motion. Longitudinal ground vibrations agitate particles in a back-and-forth motion progressing outward from the event site (Instantel, 2005). The Minimate & Micromate Blasters calculate the PPV for each geophone and calculate the vector sum of the three axes. The result is the Peak Vector Sum (PVS) and is the resultant particle velocity magnitude of the event:

$$PVS = \sqrt{(T^2 + V^2 + L^2)}$$

Where:

T = particle velocity along the transverse plane
V = particle velocity along the vertical plane
L = particle velocity along the longitudinal plane

The transducer is installed as per the model specifications. All monitoring follows Agnico Eagle Blast Monitoring Program.

2.2- Data Analysis

In 2022, the engineering department continued the work established in 2021 of documenting blast patterns, sequences, and detonation results leading to both accurate material documentation and blast design optimization. In addition, procedures were reviewed, and a flow process was developed internally to optimize blast patterns from the planning to the design stages considering a radius of influence near surface blast monitoring stations.

The blast monitoring data was screened to ensure blast PPV and IPC monitoring results corresponded to a single blast event. Data is collected per each blast date and may include a composite of blast patterns. As a result, data may include multiple blast patterns that could have occurred during the same monitoring event (i.e., a single PPV and IPC value for 3 blast patterns). The data was screened to remove all redundant data points (such as replicate readings).

[3] *Instantel INC.2005.Minimate Blaster Operation Manual.*

2.3- Results, Discussion and Conclusions

PPV and IPC blast monitoring exceedances are presented in Table 2 and results in Table 4. Blast monitoring results are reviewed after each blast and a blast vibration mitigation (Investigation & Corrective Measures) plan begins immediately, if the vibrations or the overpressure exceeds the guidelines.

In 2022, 187 blasts were monitored at IVR. There were two (2) blasts exceeding the PPV concentration DFO limit of 13 mm/s and no blast (0) exceeding the IPC measurement DFO limit of 50kPa.

For Whale Tail, 186 blasts were monitored. There were no (0) PPV readings exceeding 13 mm/s and no blast (0) exceeding the IPC measurements DFO limit of 50 kPa.

Table 2: Whale Tail PPV and IPC exceedance 2018-2021

Year	PPV exceedance	IPC exceedance
2018	2	0
2019	8	0
2020	4	0
2021	0	0
2022	2	0
Total	**16**	**0**

A total of 2 PPV exceedances were recorded in 2022. The exceedances occurred on April 18th, 2022, and September 9th, 2022 (egg incubation period is from August 15 to June 30). The events were located at Nemo Lake Station following blast activities related to the IVR 2 pit:

- The exceedance on April 18th was recorded at the IVR Pit Nemo Lake Station corresponding to 5151MSV11 and 5144SUI28 with PPV reading of 17.27 mm/s and IPC of 20.21 kPa. Pattern 5151MSV11 contained six (6) holes detonated on the same delay. The exceedance was not reported to the DFO within the 72h due to a Health and Safety related event. To mitigate the probability of another exceedance, the corrective measures taken and the explanation of the delay in DFO notification are provided in the Appendix A. (20-HCAA-00275-2022-04-18)

- The exceedance on September 9th was recorded at IVR Pit Nemo Lake Station corresponding to 5130MSV08 and 5130MSV26 with PPV reading of 17.37 mm/s and IPC of 20.33 kPa. Pattern 5130MSV08 had three (3) holes detonated on the same delay. To mitigate the probability of another exceedance, the corrective measures taken are provided in the Appendix B. (20-HCAA-00275 2022-09-09)

As a result of DFO guideline exceedance in 2022, the mining team has deployed a number of controls to maintain compliance. In summary, these controls are as follows:

Control: Reinstalled Nemo monitoring station and added redundant data collection
Purpose: Reduce the risk of collecting faulty vibration data and improve theoretical modeling inputs by having multiple sources of comparison.

Control: Blast vibration theoretical model factor of safety increased
Purpose: Additional conservatism built into the vibration model, and internal trigger for pattern redesign (shape, size, hole diameter), in order to limit vibration. This will be regularly reviewed and updated as additional data is collected from the monitoring stations in an effort to improve modeling accuracy.

Control: Decreased blast pattern sizes in vibration sensitive areas
Purpose: Fewer pattern rows reduces the number of holes and charges on the same delay limiting the amount of energy released at the same time which limits vibration.

Control: Patterns with smaller hole diameters in vibration sensitive areas if needed
Purpose: Reduces the overall charge on the same delay limiting the amount of energy released at the same time which limits vibration.

In compliment to the items listed above, each blast design is subject to an approval checklist, that includes a vibration review and tie-in consideration, completed by at minimum 2 qualified people (Designer, Approver). Blast direction to limit shockwave propagation towards sensitive areas is also considered in the design process.

Vibration prediction, or modeling, is also completed for each blast. The modeling is based in using historical seismograph data to help predict expected vibrations from blasts of similar size, location, and geometry. It is calibrated to overestimate vibration in order to maintain a factor of safety within the calculated values. Additionally, Agnico Eagle is also currently evaluating the implementation (partial or complete) of electronic blasting within open pit operations. This would increase the precision of the blast timing allowing for better control of vibration.

In 2022, for Whale Tail Pit, the average PPV was 3.36 mm/s with a maximum of 11.05 mm/s. For IVR Pit, the average PPV was 3.98 mm/s with a maximum of 17.37 mm/s.

As previously mentioned, corrective actions were implemented to minimize recorded PPVs, especially those within a radius of influence near fish stations to remain compliant during blasting operations into the future.

Table 4: Maximum and average PPV and IPC per year

Location	Parameters	2018	2019	2020	2021	2022
Whale Tail Pit	Max PPV (mm/s)	26.1	20.9	14.6	12.7	11.05
	Average PPV (mm/s)	4.5	2.16	0.98	1.6	3.36
	Max IPC (kPa)	30.54	24.46	17.09	14.90	12.93
	Average IPC (kPa)	5.01	2.23	1.19	1.40	3.93
IVR Pit	Max PPV (mm/s)	N/A	N/A	6.5	8.6	17.37
	Average PPV (mm/s)	N/A	N/A	0.67	1.22	3.98
	Max IPC (kPa)	N/A	N/A	7.59	10.10	20.33
	Average IPC (kPa)	N/A	N/A	0.81	1.20	4.66

APPENDIX A – April 18th, 2022 IVR Pit Blast Exceedance

AGNICO EAGLE
MEADOWBANK

April 27th, 2022

José Audet-Lecouffe
Senior Biologist
Fish and Fish Habitat Protection Program
Fisheries and Oceans Canada
301-5204 50th Ave (Franklin)
5204, 50th Avenue
Yellowknife, NT
X1A 1E2

Re: 20-HCAA-00275 – 2022-04-18 Agnico Eagle IVR Pit Blast Exceedance

Dear José Audet-Lecouffe,

Agnico Eagle Mines would like to notify Fisheries and Oceans Canada that on April 18th, 2022 an exceedance in the peak particle velocity (PPV) occurred during the blasting activities related to the Pit IVR-2 at the Meadowbank Complex. As such, please find below information in relation to this event.

As detailed in the Blast Monitoring Program, Agnico Eagle aims to comply with the DFO's Guidelines for Use of Explosives in or Near Canadian Fisheries Waters and shall adhere to the guidance provided in the Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies, NWT 2000-2002. Those guidelines stipulated that:

- no explosive is to be detonated in or near fish habitat that produces an instantaneous pressure change (IPC) greater than 50 KPa; and
- no explosive is to be detonated that produces a peak particle velocity (PPV) greater than 13 mm/s in a spawning bed during the period of egg incubation (for lakes near the Meadowbank Complex, it takes place between August 15 and June 30).

Description of Event

On April 18th, 2022, patterns 5151MSV11 and 5144SUI28 were blasted in IVR-2. Analyze of the blast monitoring station data at Nemo Station (Figure 1) showed that the PPV was 17.27mm/s and IPC was 20.21 KPa.

As per the normal practices to minimize blast vibrations, the blast tie-in was designed to minimize the amount holes on the same delay.

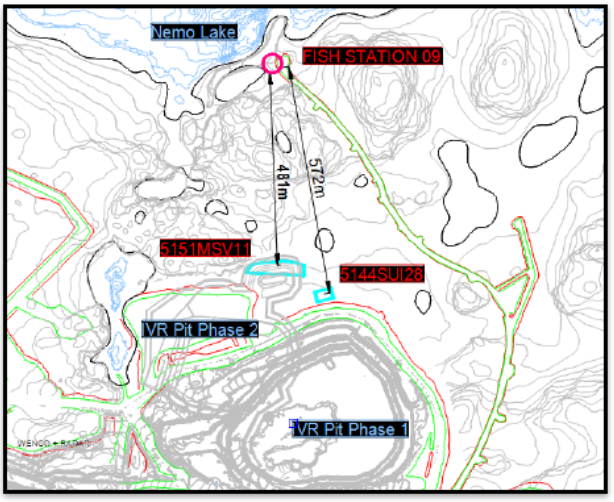

Figure 1: Nemo Lake Blast monitoring station vs blast patterns

Investigation of Exceedance

The blast patterns 5151MSV11 and 5144SUI28 were small in terms of dimension (60,000 tonnes combined) compared to the usual sizes of mass blast patterns (200,000 tonnes plus). The smaller size of the blasts was to help minimize the blast vibrations.

The Blast patterns were designed with the normal drill bit diameter of 6.5inches similar to all other mass blast patterns in the pit.

The distance between the blast pattern 5151MSV11 and Nemo Lake is the shortest one we had to date.

The delay between the event (April 18th) and the reporting (April 27th) is caused by a review in our operating procedure following an event that resulted in an explosion of one of our blast monitors in the hand of an employee. We had to make sure manipulation of the monitor was safe.

Corrective Measures

To minimize the risk of another exceedance, here are the corrective measure that will be implemented:

- The northern part of IVR 2 should be drilled using 4.5" to decrease the explosives load per delay.
- Patterns in IVR-2 will be smaller in size than other mass blasts in IVR-1 and Whale Tail Pit.
- Add a new verification item to our Drill & Blast checklist consisting of validating the vibrations prior to approval to determine if 4.5" or 6.5" is to be used.

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Should you have any questions or require further information, Agnico Eagle remains available at your convenience.

Regards,

Agnico Eagle Mines Limited – Meadowbank Complex

Alexandre Lavallee
Alexandre.lavallee@agnicoeagle.com
Environment and Critical Infrastructures Superintendent

AGNICO EAGLE
MEADOWBANK

APPENDIX B – September 9th, 2022 IVR Pit Blast Exceedance

AGNICO EAGLE
MEADOWBANK

September 12th, 2022

José Audet-Lecouffe
Senior Biologist
Fish and Fish Habitat Protection Program
Fisheries and Oceans Canada
301-5204 50th Ave (Franklin)
5204, 50th Avenue
Yellowknife, NT
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20-HCAA-00275 2022-09-09 Agnico Eagle IVR Pit Blast Exceedance

Dear José Audet-Lecouffe,

Agnico Eagle Mines would like to notify Fisheries and Oceans Canada that on September 9th, 2022 at 6:15AM an exceedance in the peak particle velocity (PPV) occurred during the blasting activities related to the Pit IVR- 2 at the Meadowbank Complex. As such, please find below information in relation to this event.

As detailed in the Blast Monitoring Program, Agnico Eagle aims to comply with the DFO's Guidelines for Use of Explosives in or Near Canadian Fisheries Waters and shall adhere to the guidance provided in the Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies, NWT 2000-2002. Those guidelines stipulated that:

- no explosive is to be detonated in or near fish habitat that produces an instantaneous pressure change (IPC) greater than 50 KPa; and
- no explosive is to be detonated that produces a peak particle velocity (PPV) greater than 13 mm/s in a spawning bed during the period of egg incubation (for lakes near the Meadowbank Complex, it takes place between August 15 and June 30).

Description of Event

On September 9th, 2022, patterns 5130MSV26 and 5130MSV08 were blasted in IVR-2, subsequently. Analysis of the blast monitoring station data at Nemo Station (Figure 1) showed that the PPV was 17.37mm/s and IPC was 20.3 KPa.

As per the normal practices to minimize blast vibrations, the blast tie-in was designed to minimize the amount holes on the same delay.

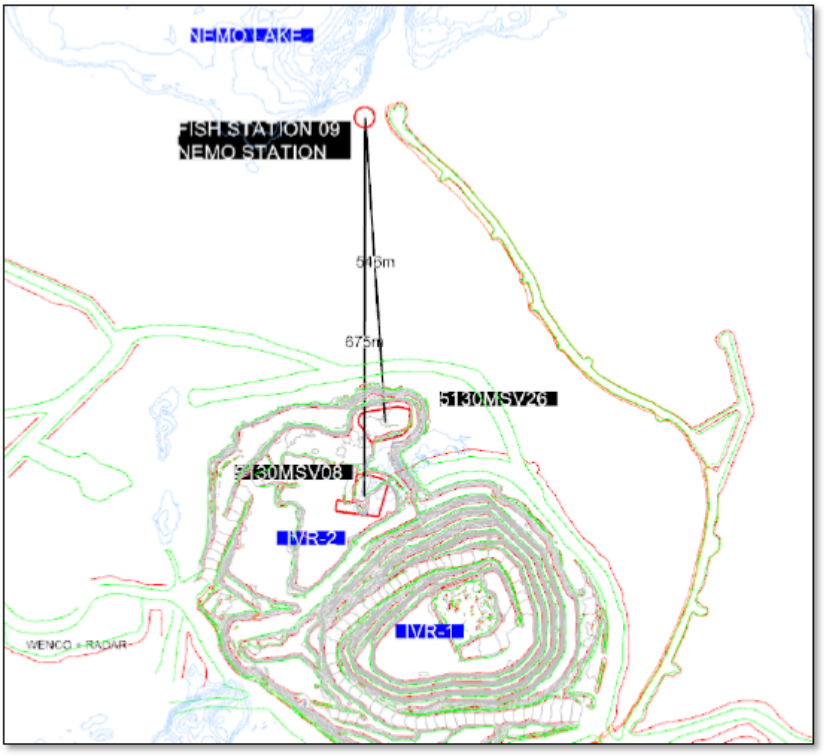

Figure 1: Nemo Lake Blast monitoring station vs blast patterns

Investigation of Exceedance

The blast patterns 5130MSV26 and 5130MSV08 were small in terms of dimension (89,000 tonnes each) compared to the usual sizes of mass blast patterns in IVR- and Whale tail Pit (200,000 tonnes plus). The smaller size of the blasts was to help minimize the blast vibrations by minimizing the blast row length, thus decreasing the amount of holes on the same delay.

The event was analyzed within the first 24 hours, and observed to be at a Peak Particle Velocity of 17.37mm/s and an Instantaneous Pressure Change of 20.3kPA.

Since the last exceedance in April 2022, Agnico Eagle has successfully estimated and monitored 88 blasts at Nemo Station. The theoretical model, with a built-in safety factor to ensure no recorded vibrations exceeds the estimated PPV, was estimating 12.05mm/s for the 5130MSV26 and 12.78mm/s for the 5130MSV08. The large difference between the model that purposefully overestimates the PPV and the recorded one indicates the exceedance likely comes from the instrument itself or the way the geophone was installed.

In addition to the previous corrective measures following the last exceedance in April 2022, a second monitoring station was installed at Nemo Station to have redundancy in the measures to help mitigate the risk of a faulty reading due to poor installation or no event recordings (malfunctioning seismograph). Unfortunately, the second monitoring station for Nemo Lake was recently dismantled for a modification needed at the Freshwater intake Pump Station. The second station was intended to be reinstalled following the completion of the works, estimated to be completed on September 15th.

Lastly, since the last exceedance, awareness and education of the adequate techniques to install a seismograph has been done, with a large emphasis on properly tightening the geophone to the ground via a bolt. However, it is suspected that leaving the bolted geophone with the exposed connections in the environment could also be a cause of the seismograph misreading blast vibrations.

Corrective Measures

To minimize the risk of another exceedance, here are the corrective measure that will be implemented:

- Purchase of 5 new seismographs. This was scheduled for 2023, but will be expedited to this year. This will reduce likelihood of equipment malfunction.
- The second Nemo Station will be reinstalled and all monitoring stations are to be identified with adequate signage.
- The geophones will either be installed in an enclosed and water proof space or brought inside after each use to eliminate the risk of poor connectors contact.
- Until the new seismographs come in and are tested, the safety factor will be increased in the blast vibration model so that the scaled distance relationship formula overestimate to an extent that the estimated PPV of blasts 5130MSV26 and 5130MSV08 is above the recorded value.

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Should you have any questions or require further information, Agnico Eagle remains available at your convenience.

Regards,

Agnico Eagle Mines Limited – Meadowbank Complex

Alexandre Lavallee
Alexandre.lavallee@agnicoeagle.com
Environment and Critical Infrastructures Superintendent