

**Nova Scotia
Comment Index
Touquoy Gold Project Site Modifications Addendum:
Decision Date May 12, 2022**

Government Reviewers

Number	Source	Date
1	NS Department of Municipal Affairs and Housing	April 13, 2022
2	NS Environment and Climate Change (NSECC) Wetland & Water Resources Specialist	April 20
3	Nova Scotia Office of L'nu Affairs	April 20
4	NSECC Inspection Compliance and Enforcement Division	April 21
5	NSECC Air Quality Unit	April 20
6	Nova Scotia Department of Public Works	April 21
7	Environment and Climate Change Canada	April 21
8	NSECC Climate Change Unit	April 22
9	NSECC Resource Management Unit	April 22
10	NS Culture and Heritage Development	April 22
11	Nova Scotia Department of Fisheries and Aquaculture	April 22
12	Fisheries and Oceans Canada	April 22
13	Health Canada	April 22
14	NSECC Senior Hydrogeologist Water Resources Management Unit	April 22
15	NSECC Environmental Health	April 22
16	NSECC Surface Water Quality Specialist - Water Resources Management Unit	April 22
17	NS Natural Resources and Renewables Geoscience and Mines Branch	April 22
18	NS Natural Resources and Renewables Wildlife and Crown Lands	April 22
19	NSECC Water Resources Engineer - Water Resources Management Unit	April 22

Mi'kmaq of Nova Scotia

	Kwilmu'kw Maw-Klusuaqn Negotiation Office (KMKNO)	May 06
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Public comments

239	Public comments anonymous	March-April
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1	Ecology Action Centre	April 22
2	MacGregors Industrial Group	April 20
3	Save the Caribou	April 21
4	East Coast Environmental Law	April 22
5	Eastern Shore Forest Watch	April 22
6	NS Salmon Association	April 22
7	St Mary's River Association	April 22
8	Sierra Club Canada	April 22
9	CPAWS	April 22
10	Atlantic Salmon Federation	April 22



Department of Municipal Affairs and Housing

Maritime Centre, Floor 8 North
1505 Barrington Street
PO Box 216
Halifax, NS B3J 2M4

Date: April 13, 2022
To: NS Department of Environment and Climate Change
From: Department of Municipal Affairs and Housing
Subject: **TOUQUOY GOLD PROJECT SITE MODIFICATIONS ADDENDUM**

As requested, the Department of Municipal Affairs and Housing has reviewed the Environmental Assessment Registration Documents for the Touquoy Gold Project Site Modifications Addendum for the Touquoy Gold Mine located in Moose River, Nova Scotia.

Although we have found nothing of concern respecting the Department's areas of mandate, we would like to remind the proponent to ensure that they have undertaken adequate consultation with the Municipality in order to confirm conditions for compliance with municipal land use planning policies and by-law provisions.

Thank you for the opportunity to review the Registration Documents for the above-noted project.

Date: April 20th, 2022

To: Bridget Tutty, Nova Scotia Environment & Climate Change - EA Branch

From: Wetland & Water Resources Specialist, Water Resources Management Unit

Subject: Addendum to the Touquoy Gold Project Modifications EA - Wetlands

Scope of Review:

The following review of the AMNS Addendum to the Touquoy Gold Project Modifications Environmental Assessment Registration Document (EARD) (AMNS, March 2022) is specific to the mandate of the NS ECC Wetlands Program within the Sustainability and Applied Sciences (SAS) Division. The review considers whether the environmental concerns associated with wetlands and the proposed mitigation measures to be applied have been adequately addressed within the EARD Addendum.

Reviewed Documents:

- Stantec. 2022. Addendum to the *Touquoy Gold Project Modifications - Environmental Assessment Registration: Response to Ministerial Request for Additional Information*. Atlantic Mining Nova Scotia Inc.

Comments:

Section 5.1, IR 10: *Provide additional analysis for avoidance of Wetland #15, a Wetland of Special Significance under the ECC Wetland Policy.*

The response from the Addendum states that Wetland 15 is proposed to be partially altered by the WRSA expansion and there exists the potential for indirect alteration by groundwater seepage from the Project. High level comments have been provided on minimization of the wetland 15 alteration; however, no comments were provided related to avoidance. *NS Wetlands Conservation Policy* (2011) objective is to “manage human activity in or near wetlands, with the goal of no loss in Wetlands of Special Significance (WSS) and the goal of preventing net loss in area and function for other wetlands”. NSECC’s Wetland Policy does not support any alteration (direct or indirect) of a WSS. Avoiding unnecessary impacts to any WSS should be considered a top priority in Project design.

Section 5.2, IR 11: *Provide an analysis of potential impacts to the Ship Harbour Long Lake Wilderness Area and proposed mitigations.*

In the Addendum response AMNS states the following:

- *“In consideration of the proximity of the wilderness area to the Touquoy Mine Site and potential Project interactions with Fish River, Moose River and Scraggy Lake, there could potentially be Project-related effects on the Ship Harbour Long Lake Wilderness Area. Project activities could result in direct and/or indirect loss or alteration of wildlife habitat (e.g., through light, noise, air emissions) and/or through physical or chemical changes in fish and fish habitat, including wetland habitat”.*
- *“As no significant residual indirect effects to wetlands along the Moose River and within the Ship Harbour Long Lake Wilderness Area are expected, additional wetland monitoring within these wetlands is not Proposed”.*

The two statements above are inconsistent. It is recommended that AMNS provide evidence that there are no indirect effects to wetlands. It should be noted by the AMNS that all wetlands within the Ship Harbour Long Lake Wilderness Area (located downstream of Touquoy Project Area) are considered WSS. Any Project activities that influence either quality or quantity of the hydrologic inputs to these wetlands could be considered a wetland alteration and is not supported by the Wetland Policy. Potential for decreased quality of outflow waters from the Touquoy pit lake into Moose River has been identified in the EARD and could influence the conditions in some of these WSS. Maintenance of water quality and quantity shall be considered by the proponent in their Project design and addressed in their wetland monitoring plans.

Additionally, wetland monitoring approaches shall be proposed for representative WSS within the Ship Harbour Long Lake Wilderness Area, to determine the magnitude of downstream indirect impacts resulting from the proposed undertaking.

Date: April 20, 2022.

To: Bridget Tutty, Nova Scotia Environment

From: Beth Lewis, Consultation Advisor
Nova Scotia Office of L'nu Affairs

Janel Hayward, Consultation Advisor
Natural Resources & Renewables

Subject: **Touquoy Gold Project Site Modifications Project – Information Addendum**

The Nova Scotia Office of L'nu Affairs (OLA) and the Nova Scotia Department of Natural Resources & Renewables (NRR) has reviewed the **Touquoy Gold Project Site Modifications Addendum** for Environmental Assessment for the **Touquoy Gold Project Site Modifications Project** dated March 2022. The following review considers whether the information within the submission will assist the Province in assessing the potential of the proposed project to adversely impact established and/or asserted Mi'kmaq Aboriginal and Treaty Rights. OLA and NRR staff reviewed all sections of the Addendum.

In section 2.3 **IN-SITU WATER TREATMENT (IR 3, page 16)**, the proponent indicates:

- Open pit effluent will be discharged into Moose River.
- A new WRSA sediment pond and treatment system will be constructed at the water return location for Watercourse #4 for WRSA runoff returned to the watercourse.

Comments: In their review of the EARD, KMKNO indicated that the EARD did not provide specific information regarding impacts to fish/fish habitat of importance to Indigenous communities. The addendum appears to also lack this information. As well, there are no possible mitigations/accommodations identified in response to the possible fish and fish habitat impacts. Proponent should identify potential impacts to species/habitat of importance to the Mi'kmaq and related mitigations/accommodations. As well, the proponent should indicate if/when possible mitigations were shared with the Mi'kmaq.

In Section **3.3 MOOSE RIVER IMPACTS (IR 7, page 34)**, the proponent states that alterations may result in potential effects to fish and fish habitat, including decreases in wetted perimeter and physical area of fish habitat available, and the creation of barriers to fish passage and changes to water temperature during periods of low flow. The proponent then further states that substantive residual effects to fish habitat as a result of the Open Pit are not anticipated, and no mitigation measures are proposed.

Comments: These two statements seem to contradict each other. Various species of fish and their habitat are important and culturally significant to the Mi'kmaq that occur in the project area or immediate surrounding area. It is not clear on what basis the determination was made that potential effects to fish and fish habitat are not substantive. Proponent should be clearer on why identified potential effects have been determined to be not substantive.

In section **4.1.2 2021 FLORA SURVEYS METHODOLOGY (IR 9, page 41)** proponent lists several observed species but does not identify if they are of significance to the Mi'kmaq.

Comments: Proponent should provide a list of species that are significant to the Mi'kmaq of Nova Scotia.

In section **5.2 SHIP HARBOUR LONG LAKE WILDERNESS AREA (IR 11, page 54)**, the proponent indicates that project planning and design and the application of proven mitigation measures will be used to reduce adverse environmental effects. The proponent references the WRSA expansion, new Clay Borrow Area, and Plant Access Road as key mitigations to reduce impacts on terrestrial and wetland habitat and avoid fish habitat. The proponent also indicates that where potential interactions cannot be avoided, measures to mitigate and reduce adverse effects are proposed.

Comments: No specific mitigations are outlined in this section. Proponent should provide details on the proposed mitigations to reduce adverse effects. As well, the proponent should indicate if/when possible mitigations were shared with the Mi'kmaq.

In section **5.2 SHIP HARBOUR LONG LAKE WILDERNESS AREA (IR 11, page 55)**, the proponent refers to the Mainland Moose Management Plan (MMMP) (McCallum Environmental Ltd. 2017a) and the Wildlife Management Plan (WMP) (McCallum Environmental Ltd. 2017b) and that both will be updated to account for proposed modifications to the Touquoy Gold Project and potential interactions with the Ship Harbour Long Lake Wilderness Area. The MMMP outlines protocols to monitor usage of the Touquoy Mine Site and surrounding landscape including the minimization of moose-human interaction and supporting research, education and stewardship related to mainland moose recovery.

Comments: It is not clear what specific mitigations regarding moose are proposed beyond minimizing human-moose interactions and supporting research. Proponent should provide specifics regarding mitigations to adverse impacts to moose as it is a species of importance to the Mi'kmaq. As well, the proponent should indicate if/when possible mitigations were shared with the Mi'kmaq.

In section **7.4 FISH AND FISH HABITAT IMPACTS (IR 16, page 60)** the proponent states the following: "Following additional clarification from DFO regarding the determination of harmful alteration, disruption, and destruction (HADD) associated with flow reductions following the submission of the EARD, the project as proposed will result in the HADD to fish habitat (approximately 2,941 m²) as a result of reductions in flow to Watercourse #3, #4 (upstream of the proposed water management pond), #12 and #13. AMNS is continuing to consider options to avoid or mitigate effects to fish and fish habitat."

Comments: It is not clear what options for mitigating HADD impacts are being considered. Proponent should provide details on possible mitigations that are being considered and if/when these mitigations have been shared with the Mi'kmaq.

In **Appendix I (Page 10)**, the proponent notes that American Eel was captured and observed at MR-02 at Moose River.

Comments: American Eel is listed as endangered and is of cultural significance to the Mi'kmaq. Proponent should identify potential impacts to species/habitat of importance to the Mi'kmaq and related mitigations/accommodations. As well, the proponent should indicate if/when possible mitigations were shared with the Mi'kmaq.

Date: April 21, 2022
To: Bridget Tutty, Environmental Assessment Officer
From: ICE Division
Subject: Touquoy Gold Project Modifications EARD – Addendum

The scope of this review from ECC-ICE Department is to review the additional information requested by the Minister of Environment and Climate Change (Minister) on September 8, 2021. The report titled “*Addendum to the Touquoy Gold Project Modifications – Environmental Assessment Registration, Response to Ministerial Request for Additional Information*” dated March 2022 prepared by Stantec Consulting Ltd. was used to complete this review.

In-Pit Tailings Disposal Comments

Ministerial Request: Describe mine pit permeability and detail mitigation measures to decrease pit permeability.

Mine Pit Permeability

The Hydrogeological Site Investigation presented in Appendix B.1, proposed drilling of 12 boreholes around the Open Pit perimeter targeting fault areas. It was recommended to complete the following:

- i. In-situ packer testing to characterize bedrock hydraulic conductivity in all boreholes.
- ii. Downhole geophysical logging in selected boreholes to collect structural geological data.
- iii. Install Casagrade-type piezometers to measure water levels and collect water quality samples to characterize groundwater levels, flow directions, recharge and discharge zones, and groundwater quality in all boreholes.
- iv. Conduct falling/rising head tests in seven existing monitoring wells.
- v. Install three drive-point piezometers in the sediments of the nearby surface water receivers that may be affected by dewatering and/or seepage. Conduct falling/rising head tests in the drive point piezometers to estimate the hydraulic conductivity of the sediments.
- vi. Excavate up to nine test pits along the alignment of the proposed spillway to confirm depth to bedrock and characterize the overburden.

Only half the investigation recommendations were done as Items iii), v) and vi) were not completed due to scheduling and winter conditions. The consultant states “*It is understood*

that these items will be completed when the weather and related site conditions improve in spring 2022”.

The Addendum states, *“faults in the bedrock were not specifically tested to assess hydraulic conductivity in advance of modelling”* and the applicant later recommends *“additional characterization of the hydrogeological parameters in the vicinity of the Touquoy Open Pit, to confirm the properties of the faults and identify potential high permeability fractures.”* as a means of reduce adverse effects on groundwater resources.

The proposed mitigation measure of lining the pit wall from the crest of the pit to the rock bench at 60 m elevation was based on targeting most of the underground workings and does not include any of the fault/fracture zones.

Detail mitigation measures to decrease pit permeability

In the *Environmental Assessment Regulations*, *“mitigate means, with respect to an undertaking, to eliminate, reduce, or control the adverse effects or the significant environmental effects of an undertaking, and may include restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means.”* The applicant has proposed a mitigation measure, a low permeability liner on the western wall of the exhausted Open Pit Mine, to manage groundwater contamination in the area of known historic underground workings.

No evidence has been provided to demonstrate that installation of a liner along/against a near-vertical wall can be completed from an engineering or practical standpoint. Without an issued for construction drawing, stamped by a licensed professional engineer registered in the province of Nova Scotia with Engineers Nova Scotia, this mitigation measure is a **conceptual plan only** and cannot be accepted as the proposed mitigation measure to protect Moose River.

Grouting of high permeability fractures was presented as an additional mitigation measure to decrease pit permeability, **if required**. The problem with this statement is that if tailings are deposited into the Open Pit and monitoring is showing evidence of contamination in Moose River and/or groundwater, there will be no possible way to undue this contamination. The seepage cannot be collected and treated. Monitoring and reacting on the results of the data is not a mitigation measure.

Minimal information was provided for grouting methodology, long-term viability, or likelihood of success. The applicant proposes, during detailed design, to establish mitigation zones based on the location, characteristics, and permeability ratings of the faults. Additional work is required to determine where the high permeable fractures are located. In 2016, borehole drilling around the Touquoy TMF concluded that installation of a grout curtain in the bedrock beneath the TMF would be the mitigation measure to reduce groundwater seepage. However, challenges with the bedrock prevented the installation of a grout curtain and the TMF was re-designed to include an upstream clay blanket.

In the EARD Focus Report prepared in November 2007 for the Touquoy Site, the applicant concluded that releasing effluent into Moose River as an alternative plan to discharging into Scraggy Lake, would affect fish habit because in dry years, the river is reduced to a series of

“sluggish pools”. NSECC interprets this to indicate that dilution of effluent may be insufficient during seasonally dry periods.

Ministerial Request: Clarify the mine pit capacity for project tailings and future proposed tailings deposition.

The total volume of tailings proposed to be deposited in the exhausted Touquoy Open Pit is presented in Table 2.1. The table does not include the waste rockfill placement to the elevation 60 m bench proposed as part of the seepage mitigation measure (clay till liner) along/against the west and southwest section of the pit.

A statement is made that should economics warrant the processing of low-grade ore, development and permitting of an alternate storage facility would be required at that time.

Ministerial Request: Describe how the pit and Waste Rock Storage Area discharge points will meet Metal and Diamond Mining Effluent Regulations and Fisheries Act requirements.

An assimilative capacity study of Moose River and site-specific criteria was proposed for the effluent discharge point from the pit to Moose River but was not presented for Watercourse #4. While discharge to a waterbody meets the Metal and Diamond Mining Effluent Regulations (MDMER) concentration limits, these limits do not protect fish and fish habitat. The applicant is proposing MDMER limits for Watercourse #4, which is not protective to fish and fish habitat.

The application states that engineered wetland(s) may be used as additional treatment method for the effluent discharge at the WRSA.

The assimilative capacity study of Moose River to develop site-specific criteria used SW-2 as a background station. The applicant’s Industrial Approval under Term and Condition 7.c) identifies SW-11 as “Moose River – Upstream at Facility Boundary”. The applicant provided treatment options, stating the details of the treatment plant are undergoing design. The concentrations of total aluminum, arsenic, cobalt, copper, and nitrite were identified to potentially exceed the site-specific criteria however, the proposed plan is to treat is arsenic and ammonia only based on predicted exceedances of the MDMER.

An environmental water balance was used to predict the Open Pit effluent overflow to Moose River following mine closure. Predictions were based on normal climate conditions, assumed as conditions between 1981 and 2010. There have been no mention of climate change variables and potential influences on models and predictions.

Ground and Surface Water Comments

Ministerial Request: Provide a third-party expert review of the ground and surface water modelling presented and referenced in the Environmental Assessment Registration Document (EARD).

The applicant retained Wood Environmental & Infrastructure Solution (Wood) to complete a third-party peer review of the water modelling presented and referenced in the Touquoy Gold Project Site Modifications Environmental Assessment Registration Document (EARD) registered on July 16, 2021.

In the *Primary Recommendations Related to Proposal to Expand the WRSF* section of the Wood's report (Chapter 3.0), Wood states that it is not expected that the expansion of the Waste Rock Storage Area (WRSA) will result in significant changes to environmental impact and used "common sense" to make this determination. Further in the section, Wood states that the documentation provided by the proponent to support the groundwater modelling lacks sufficient detail to conduct a detailed review. A similar statement was made in the *Primary Recommendations on the Proposed Disposal of Tailings in the Open Pit* section of the report (Chapter 4.0). Wood questioned why the model is diluting the concentrations of contaminants that originate within the Open Pit by a factor of **one million** along the less than 100 m flow path from the Open Pit to Moose River as there would almost be no attenuation along such a short path. Wood stated that in reviewing the WRSA and the TMF, almost no or only limited attenuation is being seen and therefore recommends that the proponent re-examine the groundwater modelling work and provide additional detail to support their conclusions.

In general, the documentation provided by the proponent to support the groundwater modelling lacks sufficient detail to allow Wood to complete a detailed review and recommends that further explanation and details be provided. The proponent did not address the dilution factor of the concentrations of contaminants entering Moose River and concluded that the updated model results show similar results in comparison to the model submitted as part of the EARD in July 2021.

The third-party review raised questions pertaining to Annual Reports, indicating that the source predictions were not supported by the geochemical data. The third-party review identified issues with the assessment of in-pit tailings storage.

Ministerial Request: In consultation with the Inspection and Compliance Division and Water Resources Branch at ECC, clarify or provide information related to water quality and quantity analysis inconsistencies.

The applicant recommends implementation of the "Project-specific GWCP" as a measure to reduce the adverse effects on groundwater resources. Versions of the GWCP (Groundwater Contingency Plan) were reviewed by ECC in 2018 and 2019. The department relayed the need for use of potable criteria and the need to establish action limits and to identify a specific course of action that will be taken when those limits were reached. The GWCP was never updated to

include this, so the ECC deemed the GWCP inadequate and was never accepted by the department. On June 25, 2021, ECC informed AMNS that the GWCP would no longer be required, and that the Department will be setting criteria in the Industrial Approval in current/future Amendments and/or through a formal notice under Section 58 of the Environment Act. The criteria are based on protection of groundwater in areas where there is no serviced water, and on the protection of freshwater aquatic life in watercourses. This message was delivered to AMNS again in October 2021, in the Certificate of Variance to temporarily raise the WRSA and in the Minister's decision letter of the 2012-084244-12 Appeal dated March 17, 2022.

Furthermore, the conclusions of the assessment of potential environmental effects on groundwater quantity and quality *"will not result in groundwater quality that exceeds the GCDWQ for a consecutive period of 30 days or more for existing or future groundwater users located outside of the PDA."*

Wetlands and the Ship Harbour Long Lake Wilderness Area Comments

Ministerial Request: *Provide additional analysis for avoidance of Wetland #15, a Wetland of Special Significance under the ECC Wetland Policy.*

Under the NSECC's Wetland Alteration Application Guided Template, it highlights the need for discussion related to *"..justification for the need to alter wetland habitat, including the constraints for avoiding and minimizing the direct impact, will be presented. This may include consideration of alternative project location, sizes, and approaches to avoid/minimize altering the wetland where it was feasible."*

The Addendum and EARD states that the WRSA was reduced due to engineering and environmental (wetland) constraints and that the expansion *"has been micro-sited to the extent practicable..."*. There were high-level comments about minimization, but no details were provided as to why portions of the WRSA expansion couldn't be relocated to avoid impacts to Wetland 15, a recognized Wetland of Special Significance.

Blue Felt Lichen, the Species at Risk that triggers the designation of Wetland of Special Significance for Wetland 15, is sensitive to air pollution and changes in macro and micro-climatic conditions.

Ministerial Request: *Provide an analysis of potential impacts to the Ship Harbour Long Lake Wilderness Area and proposed mitigations.*

The applicant states that Project activities could result in direct and/or indicated loss of alteration of wildlife habitat, and/or through physical and chemical changes in fish and fish habitat (including wetland habitat). A priority mitigation measure was the design of the WRSA, Clay Borrow, and Play Access Road to reduce impacts and avoid fish habitat. Note that the information provided likely is focusing on the new modifications and may not take into

consideration and potential for current impacts to the Wilderness Area. Other mitigation measures provided are generic, standard construction measures (i.e. refueling to occur >30 m from waterbody).

There is a statement that the Surface Water Management Plan and Erosion and Sediment Control Plan will be updated to reflect the proposed modifications to the site. Effluent proposed to be discharged into Moose River and Watercourse #4 will be treated to meet MDMER limits or site-specific water quality objectives. Note – the MDMER limits are not protective of fish.

The applicant states that no significant residual indirect effects to wetlands along the Moose River and within Ship Harbour Long Lake Wilderness Area are expected, and no additional monitoring is proposed. No additional surface water monitoring sites are proposed to monitor effects on the Wilderness Area. The applicant states *“However, should changes to predicted water quality and quantity be observed, the monitoring programs will be revisited in consultation with applicable regulatory agencies”*.

There are current water quality concerns in surface water and groundwater around the site, as well as water quantity impacts in Watercourse #4 and potentially Moose River. There was no discussion as to whether these observed impacts could influence the Wilderness Area, a cumulative effects assessment was not completed. The proposed modifications are not presumed to cause significant effects, but the applicant has not provided the supporting document for this conclusion.

Historic Tailings Comments

Ministerial Request: *Provide a description and map of historic mine tailings within or near the proposed project footprint. Provide a plan to manage the historic tailings.*

The applicant provided the 2018 Historic Tailings Management Plan which selected Cell Encapsulation within the Tailings Management Facility (TMF) as the chosen remedial option. The applicant acknowledges that this remedial option cannot be used in the future as the TMF is nearing capacity and presents the following three options:

- i. Off-site disposal
- ii. Disposal within the current pit limits, and
- iii. Relocate or adjust the spillway location to avoid disturbing the historic tailings.

Conclusions

Non-Compliances with applicant's Industrial Approval

1. The Industrial Approval defines the background surface water station to be SW-11, as stated in Term and Condition 7.c). The assimilative capacity study completed to develop site-specific criteria for the discharge to Moose River uses SW-2 as background. SW-2 is not representative of "background" as it is potentially site-influenced and is located near historic tailings. The use of SW-2 as background is non-compliant with the applicant's Industrial Approval.
2. The use of the "Project-specific GWCP" is recommended as a measure to reduce adverse effects on groundwater resources. ECC deemed the GWCP (Groundwater Contingency Plan) inadequate and set criteria in the Industrial Approval based on protection of groundwater in areas where there is no serviced water, and on the protection of freshwater aquatic life in watercourses. This message was delivered to the applicant on three different occasions: i) in a meeting on June 25, 2021, ii) in the Certificate of Variance to temporarily raise the WRSA issued November 8, 2021, and iii) in the Minister's decision letter of the 2012-084244-12 Appeal dated March 17, 2022. The continued use of the GWCP is non-compliant with the applicant's Industrial Approval.
3. The applicant concluded that groundwater quantity and quality "*will not result in groundwater quality that exceeds the GCDWQ for a consecutive period of 30 days or more for existing or future groundwater users located **outside of the PDA.***" As reference above, ECC set criteria in the Industrial Approval based on protection of groundwater in areas where there is no serviced water (ie Touquoy Site is classified as potable), and on the protection of freshwater aquatic life in watercourses. Not classifying the site as potable is non-complaint with the applicant's Industrial Approval.

Open Pit permeability and mitigation measures to decrease pit permeability

4. The pit permeability is still not well defined. The applicant has only completed about half of the scope of work presented in the Hydrogeological Site Investigation and plans to complete the outstanding items in Spring 2022 and use this information to update the model. The applicant did not assess hydraulic conductivity in advance of modeling of the faults and fracture zones within the Open Pit to identify potentially high permeable zones. Additional mitigation measures may be required for the fault and/or fracture zones.
5. The mitigation measures to decrease pit permeability are still not defined. Despite not completing the full Hydrogeological Site Investigation to identify the presence of preferential pathways, the applicant has concluded that additional seepage mitigation measures **are not required** to avoid interactions between the Touquoy Open Pit and the surrounding environment, but state grouting will be completed "if required".

- a. No evidence has been provided to demonstrate that installation of a liner along/against a near-vertical wall can be completed from an engineering or practical standpoint. Without an issued for construction drawing, stamped by a licensed professional engineer, registered in the province of Nova Scotia with Engineers Nova Scotia, this mitigation measure is a conceptual plan only and cannot be accepted as the proposed mitigation to protect Moose River.
- b. The proposed mitigation measure of lining the pit wall from the crest of the pit to the rock bench at 60 m elevation was based on targeting most of the underground workings and does not include any of the fault/fracture zones within the open pit. Mitigation measures may be required beyond the west and southwest sections of the pit.
- c. Grouting of high permeability fractures will be done "if required" implies that contamination has already occurred. This is not an acceptable form of mitigation and does not fall under the definition of "mitigate" in the *Environmental Assessment Regulations*.
- d. No information was presented on how the bedrock geology around the Touquoy Open Pit is favorable to grouting when it did not work around the TMF. This question was posed to the applicant as part of the Beaver Dam Mine EA Information Requirements. The applicant stated this question was not relevant as the Touquoy TMF is not part of the Beaver Dam Proposed activity.

The clarification/additional information regarding a mitigation measure that previously failed at Touquoy is relevant to proposed mitigation under this EA review and is required information.

Mine pit capacity

6. The capacity of the exhausted Touquoy Open Pit Mine remains unclear. The proposed mitigation measure of lining includes the placement of rockfill to the 60 m elevation bench. The applicant did not present the capacity this rockfill take within the pit.

Requirements for Waste Rock Storage Area discharge point water quality to meet Metal and Diamond Mining Effluent Regulations and the Fisheries Act

7. The applicant proposes that the WRSA water discharge into Watercourse #4 will meet Metal and Diamond Mining Effluent (MDMER) Regulations. Harm to fish can occur even if discharge to Moose River is meeting MDMER limits. The applicant has not proposed discharge limits that is protective to fish under the Fisheries Act.

Wetlands and the Ship Harbour Long Lake Wilderness Area

8. Rational was not provided as to why the WRSA expansion could not be sited to avoid all impacts to Wetland #15.
9. The applicant did not provide the supporting documentation of how it was concluded that impacts to the Ship Harbour Long Lake Wilderness Area water resources would not cause adverse effects. No monitoring was proposed.

Historic Tailings management plan

10. The applicant was asked to provide a plan to manage the historic tailings but instead presented three options: off-site disposal, disposal within the current pit limits or to relocate/adjust the spillway location to avoid disturbing the historic tailings. The applicant has not provided a plan to manage the historic tailings as requested by the Minister.

Please refer to Appendix A for the information ICE is requesting.

Appendix A – ICE Information Request

In-pit tailings disposal

1. Complete and update the groundwater model with the following information:
 - a. The outstanding scope of work listed in Items iii), v) and vi) listed above and
 - b. The additional characterization of the hydrogeological parameters to confirm the properties of the faults and identify the potential high permeability fractures.
2. Update the proposed mitigation measures to include the fault/fracture zones. If mitigation for the fault/fracture zones is not required, please present the findings to back up this conclusion.
3. Provide the Issued-for-Construction (IFC) stamped engineered construction drawings for any proposed mitigation measure(s).
4. Update the mine pit capacity to include all planned waste storage.
5. Provide details regarding the use of grouting as a mitigation measure. The following shall be included, but not limited to:
 - a. Permeability of the rock vs depth with the installation of the grout curtain,
 - b. Long-term viability of grouting, and
 - c. How the bedrock geology around the Touquoy Open Pit is favorable to grouting when it did not work around the TMF.
6. Summarize, or provide rationale, for excluding mitigations measures from the other portions of the Open Pit.

Ground and Surface Water

7. Provide Wood with the information listed in Attachment 2 and 3 of the Wood memorandum titled “*Water Modelling Third-party Review of the Touquoy Gold project Site Modifications – Environmental Assessment Registration*” in order to complete a detailed review of the groundwater modelling.
8. Complete the assimilative capacity study of Moose River to be compliant with the Industrial Approval which uses SW-11 as the background station and propose discharge criteria that will be protective of fish and fish habitat.
9. Submit an assimilative capacity study of Watercourse #4 to propose site specific effluent discharge criteria that that will be protective of fish and fish habitat.
Provide a map that illustrates the size and location of the proposed engineered wetlands for additional treatment of the WRSA effluent.

Wetlands and the Ship Harbour Long Lake Wilderness Area

10. Provide rational as to why the WRSA expansion could not be sited to avoid all impacts to Wetland 15. What are the constraints?
11. Provide specifics as to how water quality and quantity have impacted fish and fish habitat within the Ship Harbour Long Lake Wilderness Area taking into consideration the current site activities and the proposed changes (cumulative effects assessment).

Historic Tailings Comments

12. Provide a plan to manage the historic tailings as requested by the Minister.

Environment and Climate Change

Date: April 20th, 2022

To: Bridget Tutty, Nova Scotia Environment and Climate Change

From: Air Quality Protection Advisor, Air Quality Unit

Subject: Touquoy Gold Project Site Modifications Environmental Assessment
Registration Project - Addendum

Further to your request, the Air Quality Unit has no further comments on potential air quality and noise impacts resulting from the Touquoy Gold Project Site Modifications, other than those previously provided on August 10th, 2021.

Date: 21 April, 2022
To: Bridget Tutty, Environmental Assessment Officer
From: Environmental Services, Nova Scotia Public Works
Subject: Touquoy Gold Project Site Modifications Addendum

The Nova Scotia Department of Public Works (NSDPW) staff have reviewed the addendum documents that have been provided. The proponent prepared this document as a response to a request for additional information from an EA report that was filed last summer.

The addendum did not have any additional information from a Traffic Engineering perspective, therefore; there are no comments on the addendum documents themselves.

There is a continuing reference to a planned realignment of a Plant Access Road, however; it appears that a Working Within Highway Right of Way Permit to complete this activity was obtained.

Sincerely,

Environmental Services
Department of Public Works

From: [Tutty, Bridget R](#)
To: [Tutty, Bridget R](#)
Subject: FW: Touquoy Gold Project Site Modifications Addendum for Environmental Assessment
Date: May 1, 2022 6:46:00 PM

From: Fazeli, Maryam (ECCC) <Maryam.Fazeli@ec.gc.ca>

Sent: April 21, 2022 10:36 AM

To: Tutty, Bridget R <Bridget.Tutty@novascotia.ca>

Subject: RE: Touquoy Gold Project Site Modifications Addendum for Environmental Assessment

**** EXTERNAL EMAIL / COURRIEL EXTERNE ****

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Hello Bridget,

Environment and Climate Change Canada (ECCC) has reviewed the Addendum to the Touquoy Gold Project Site Modifications – Environmental Assessment Registration document, and offers the following comments:

Water Quality

- The Addendum (Section 2.4, page 20) states, “Effluent from the final discharge point for in-pit disposal of tailings will only be discharged provided the water quality is suitable for discharge in that it meets applicable MDMER and provincially applicable limits.” The proponent should be reminded that, in general, effluent from Recognized Closed Mines is subject to the General Prohibition of the deposit of deleterious substances of the *Fisheries Act* (Section 36(3)) rather than the MDMER effluent limits, and that this should be considered in the development of any post closure scenarios.
- Appendix A (Section 2.1, page 1) states, “Surface water quality monitoring has been conducted during construction, and will be conducted for one year post-operation for water quality parameters specified in the MDMER.” Is the proposed one year of monitoring post-operation separate from a post-closure monitoring program? Presumably, it may take considerable time for the system to reach equilibrium.
- Appendix A (Section 2.2, page 2) refers to the SSWQO for arsenic in Moose River completed by Intrinsik. Has this SSWQO been peer-reviewed?

Wildlife and Wildlife Habitat

Comments provided on August 16, 2021 do not appear to have been addressed, and therefore remain applicable.

Please feel free to contact me if you have any questions.

Regards,

Maryam Fazeli

Physical Science Officer, Environmental Protection Operations Directorate

Environment and Climate Change Canada

maryam.fazeli@ec.gc.ca

Officier des sciences physiques, Direction des opérations de protection de l'environnement

Environnement et Changement climatique Canada

maryam.fazeli@ec.gc.ca

From: Miller, Michelle <Michelle.Miller@novascotia.ca>

Sent: April 22, 2022 10:40 AM

To: Tutty, Bridget R <Bridget.Tutty@novascotia.ca>

Cc

Subject: RE: Touquoy Gold Mine Site Modifications EA Reviewer Comments

Hi Bridget

The Climate Change Unit has no comments on the Addendum.

Michelle

Michelle Miller (she/her)

Manager, Climate Change Mitigation

Nova Scotia Environment and Climate Change

902-456-0286

Michelle.Miller@novascotia.ca

Environment & Climate Change

Date: April 22, 2022

To: Environmental Assessment Branch

Cc: Chuck McKenna, Manager, Sustainability & Applied Science (Resource Management Unit)

From: Staff within the Resource Management Unit of Nova Scotia Environment and Climate Change

Subject: Reviewer Comments on Touquoy Gold Project Site Modifications Addendum for Environmental Assessment – March 2022

Introduction

The following reviewer comments have been developed by technical staff within the Resource Management Unit of NSECC based on review of the Touquoy Gold Project Site Modifications Addendum for Environmental Assessment documentation; March 2022.

Comments

As presented, significant uncertainty remains concerning the potential risk of the In-Pit Tailings Disposal Plan proposed in the Addendum to the Touquoy Gold Project Modifications – Environmental Assessment Registration documentation.

Insufficient information has been provided to support the assertion that residual environmental effects to groundwater quality will not be significant.

The site is subject to potable groundwater criteria. The proponent has supported their prediction that effects to groundwater will not be significant by re-stating, “*the in-pit disposal of tailings will not result in groundwater quality that exceeds the GCDWQ for a consecutive period of 30 days or more for existing or future groundwater users located outside of the PDA.*” It is unclear, why this outcome would be considered acceptable, as it does not comply with applicable criteria.

To our knowledge, in-pit disposal of tailings is not well supported within jurisdictions that protect and preserve potable groundwater. In this case, inadequate management controls/engineered structures (e.g., liners, secondary containment, leachate collection, underdrainage systems) have been proposed to ensure migration of contaminants to the surrounding environment will be prevented.

End

Date: April 22nd, 2022

To: Bridget Tutty, Nova Scotia Environment

From: Coordinator Special Places, Culture and Heritage Development

Subject: Touquoy Gold Project Site Modifications Addendum

Staff of the Department of Communities, Culture, Tourism, and Heritage has reviewed the Touquoy Gold Mine Project Site Modifications Addendum EA documents and have provided the following comments:

Archaeology

Staff reviewed the sections of the EA document pertaining to archaeology. Staff compared maps supplied in the EA documents to the maps in the ARIA report for HRP A2021NS053. It appears that an additional space of approximately 18 ha has been added that was not assessed under HRP A2021NS053. CRM Group's 4th recommendation is that if the scope of development expands outside of previously assessed areas, further archaeological assessment should be conducted. If this change in scope goes outside of assessed areas, there will need to be an ARIA for any previously unassessed terrain.

In the report for HRP A2021NS053, which was reviewed and approved by CCTH, CRM Group made the following five (5) recommendations:

1. It is recommended that the proposed Clay Borrow Pit expansion study area, as defined in this report, be cleared of any requirement for further archaeological investigation.
2. It is recommended that the proposed Waste Rock Storage Area expansion study area, as defined in this report, be cleared of any requirement for further archaeological investigation.
3. It is recommended that no ground impacts occur within 50 metres of Moose River or Square Lake, outside of the study area tested in this report. Any unavoidable ground impacts within that area should be preceded by archaeological assessment, including shovel testing.
4. If any further changes are made to the layout of the mine and associated facilities beyond the area of previous archaeological assessment, it is recommended that those proposed area be subjected to an Archaeological Resource Impact Assessment.
5. In the event that archaeological deposits or human remains are encountered during construction activities associated with the Touquoy Gold Mine, all work in the associated area(s) should be halted and immediate contact made with the Special Places Program (John Cormier: 902-424-6475).

Botany

Staff reviewed the sections of the EA document pertaining to botany. Minor error with a species rank on page 43 of the registration document: *Usnea strigosa* is an S5, not an S3. This means it is not a tracked species, as is implied in the report.

Palaeontology

Staff have reviewed the sections of the EA document pertaining to palaeontology. Due to the bedrock and surficial geology of the site it is not expected to have fossils associated with the area.

Zoology

No CCH staff were available to review the sections relating to zoology.

Fisheries and Aquaculture

Date: April 22, 2022

To: Bridget Tutty, Nova Scotia Environment and Climate Change

From: Executive Director, Policy and Corporate Services
Nova Scotia Department of Fisheries and Aquaculture

Subject: Touquoy Gold Project Site Addendum – Environmental Assessment

Thank you for the opportunity to review the Touquoy Gold Project Site Addendum documents.

The Department of Fisheries and Aquaculture has the following comments:

- The backpack electrofishing sampling effort completed on Moose River seemed minimal considering the length and shocking time at each site. As well, limiting sampling to riffle habitats, rather than sampling a site that supports riffle, run and pool habitats, may limit the ability of samplers to capture a full picture of the local fish community composition.
- Any changes to existing roads or new roads constructed on site must consider the potential for alterations to directly/indirectly impact watercourses with respect to fish habitat and fish passage.
- This project is not near any known recreational (Saltwater) and commercial harvesting, Processing/Buying facilities or marine plants harvesting operations. As such, this project will have minimal or no effect on these activities.
- Aquaculture impacts identified during the review - There are eight shellfish aquaculture sites and one rockweed lease within 25km radius of the proposed project.

Agriculture

Date: April 22, 2022

To: Bridget Tutty, Nova Scotia Environment and Climate Change

From: Executive Director, Policy and Corporate Services,
Nova Scotia Department of Agriculture

Subject: Touquoy Gold Project Site Modifications – Environmental Assessment

Thank you for the opportunity to review the Touquoy Gold Project Site Modifications Addendum documents.

The Department of Agriculture has no concerns about this proposal, given that:

- One small (1.8 acre) blueberry farm was identified within a 5 km buffer zone of the proposed project.
- The soils around the site are Class 7 or poorer.



PO Box 1006, P500
Dartmouth, NS
B2Y 4A2

April 22, 2022

Our file *Notre référence*
21-HMAR-00410

Bridget Tutty
Environmental Assessment Officer
Nova Scotia Environment and Climate Change
1903 Barrington Street, Suite 2085
Halifax, NS
B3J 2P8

**Subject: DFO comments on Addendum to the Environmental Assessment
Registration Document (EARD) – Touquoy Gold Project Site
Modifications**

Dear Bridget Tutty:

The Fish and Fish Habitat Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received your request to review the Addendum to the Environmental Assessment Registration Document (EARD) for the proposed Touquoy Gold Project Site Modifications on March 18, 2022. We understand that the proponent is proposing the following:

- expand the existing waste rock stockpile area (WRSA) by 7.1 hectares (ha);
- expand the existing clay borrow area by 6.4 ha and construct a 1.4 ha clay overburden pile;
- construct a sediment collection pond to the southwest of the WRSA and another collection pond to the northeast of the Mill Plant;
- construct a spillway to connect the WRSA collection pond and Watercourse #4 (unnamed tributary to Moose River);
- permanently dispose of mine tailings in the exhausted open pit; and
- relocate the road used to access the Mill Plant to the west of its existing location.

DFO has reviewed the Addendum to the EARD, select appendices and acknowledges the extensive supporting documentation that was submitted by the proponent as well. Due to the limited time period allocated to DFO for review and the extent of the material submitted, the Department could not conduct an extensive review of the entire submission package. Our review focused on sections of the Addendum to the EARD, appendices and supporting documents most relevant to the conservation and protection of fish and fish habitat. DFO offers the following comments for consideration:

Section 2.1 Mine Pit Permeability

- The original March 2007 EARD and 2008 Focus Report for the Touquoy Gold Project concluded that Moose River is “*well protected from the open pit by geology*” and that there is a “*lack of interaction between groundwater and surface water*”. The identification of 22 faults and historic underground mine workings that intersect the open pit wall in the Addendum, including many with seepage in the immediate vicinity of Moose River, do not support the previous conclusions.
- The Addendum concludes the data used in the original groundwater flow and solute transport model is conservative, and that the 2021 hydrogeological data demonstrate generally lower permeability in the bedrock around the open pit.
 - The loss of baseflow in Moose River predicted by the groundwater flow and solute transport model is substantially different from the observed change in flow from the hydrometric stations in Moose River. Therefore, this aspect of the model’s predictions have not been validated and may not be conservative.
 - The 2021 hydrogeological site investigation found a decreasing trend of hydraulic conductivity with depth, meaning that hydraulic conductivity is generally highest near the elevation of Moose River. In addition, there does not appear to be an estimate of hydraulic conductivity in the overburden where Moose River is located, and it is not clear if permeability of the overburden was factored into the groundwater flow and solute transport model and EA predictions.
- The Addendum states: “*Regular observations of the fault traces on the pit walls have identified some discrete areas of seepage, with total flow from the exposed faults being generally very low.*” This conclusion is subjective as written. Has the total flow from the areas of seepage been quantitatively measured? If not, it would be more accurate to characterize the total flow from the exposed faults as unknown.

Section 2.4 Discharge Points and Regulatory Requirements

- The proposed spillway connecting the pit lake to Moose River will require a regulatory review under sections 34.4 and 35 of the *Fisheries Act* by DFO prior to construction. Additional information about the proposed spillway (e.g., detailed engineering design) is required to complete this review.
- The *Metal and Diamond Mining Effluent Regulations* (MDMER) pursuant to the *Fisheries Act* allow for the release of certain deleterious substances, and establishes maximum concentration limits to provide some level of protection to fish and fish habitat from mining activities. The Pollution Prevention Provisions under section 36 of the Act and the MDMER are administered by Environment and Climate Change Canada (ECCC).

- An important point to consider in the context of the assessment is that the maximum authorized monthly mean concentration of many deleterious substances under the MDMER are greater than the CCME water quality guidelines for the protection of aquatic life. While the EARD and Addendum predict that effluent will meet the concentration limits set out under the MDMER, monitoring data from ECCC's effects monitoring program shows that effluent from mines meeting the MDMER concentration limits has potential to result in a variety of adverse effects to fish and fish habitat downstream (<https://www.canada.ca/en/environment-climate-change/services/managing-pollution/publications/third-national-assessment-monitoring-data.html>).
- Any effects to fish and fish habitat resulting from activities authorized under the MDMER by ECCC are exempt from the prohibitions under sections 34.4 and 35 of the *Fisheries Act*, but not from prohibitions under sections 32, 33, or 58 of the federal *Species at Risk Act* (SARA). Should a decision be made to add the Southern Upland population of Atlantic Salmon and/or the Eastern Canada population of American Eel to Schedule 1 of the federal *Species at Risk Act*, any impacts to individuals of these species, their residence, and/or critical habitat from the project may be subject to the prohibitions and permitting provisions of SARA.
- The 2008 Focus Report for the original project EA provided an alternatives analysis regarding potential discharge locations for mining effluent from the TMF. Discharging effluent into Moose River was one of the alternatives considered in Section 2.11.7 of the Report. The following excerpt from page 31 of the Focus Report should be considered in the context of the proposed plan for in-pit tailings disposal and connection of the pit lake to Moose River via a spillway:

“Effluent could be piped to Moose River for discharge from Site (1). The average flow in Moose River is significant, 6000 M m³/yr. Moose River may host a small salmon population. Some years, however, Moose River dries up into a series of pools. Sufficient dilution could not be guaranteed in this event, possibly resulting in impact.”
- This conclusion from the 2008 Focus Report highlights the importance of considering the concentration of deleterious substances during years when actual flows in Moose River fall below the monthly average. Section 8.0 of the assimilative capacity study in Appendix D of the Addendum uses estimates of the average monthly flow in Moose River at SW-2 to estimate assimilation ratios. However, the average monthly flows measured by AMNS at SW-2 in August 2017, August and September 2018, July through September 2019, and July and August 2020 were well below the average monthly flows used in the study to estimate the assimilation ratio. For example, the study used an estimated average flow of 381 L/s at SW-2 for the month of August, whereas the average flow measured at SW-2 in August 2019 and August 2020 was only 98.1 L/s and 117.2 L/s, respectively. Therefore, the assimilative study does not appear to consider assimilation ratios during years when flows are below average,

which monitoring data suggests is likely to occur regularly during the post-mine closure period, and the predictions may not represent the likely worst-case scenario.

- Section 8.0 of the assimilative capacity study states: “*The Open Pit effluent post-mine closure will be driven by the same metrological factors (precipitation, evaporation, snowmelt) as the whole Moose River catchment. A very low flow in the river will correspond to a very low effluent flow from the Open Pit. The same relationship will exist with high flows.*”. Based on this relationship, it is not clear why the average effluent flow presented in the study for the period June-August is substantially less than it is for September (4.6 L/s vs. 12.3 L/s, respectively) when the estimated average flows in Moose River presented for the same time periods are similar (487 L/s vs. 450 L/s, respectively).

Section 3.2 Watercourse #4

- The Addendum states that: “*The results of the estimated resulting flows at SW-19 are presented in Figure 3.2 j-1 and will be confirmed by the modeling proposed in IR C.5 (Appendix A).*”. It is important to point out that changes in flow from project works and activities cannot be confirmed by additional modelling; instead, they can only be further refined. A monitoring program involving empirical observations of flow in Watercourse #4 before and after the works and activities have been undertaken is the only way to accurately assess changes in flows from the Project and validate/confirm model predictions.
- A Before-After Control-Impact study would help verify effect predictions related to flow changes in Watercourse #4 from the WRSA expansion and spillway. Factors that could influence monitoring results or their interpretation should be proactively identified and addressed in the monitoring study design (e.g., location of hydrographic monitoring stations, effect of evapotranspiration and wetland interflow, presence of in-stream structures, etc.).
- It would be informative for AMNS to also report and consider the monthly minimum and maximum flows measured at the Watercourse #4 hydrometric stations during each month in 2021. Flows are highly variable and there are important limitations associated with using average flows to characterize the natural flow regime of a watercourse and to predict effects.

Section 3.3 Moose River Impacts

- DFO’s review of the data and information provided by AMNS related to Moose River impacts from the open pit is ongoing. The review is complex due to the quantity and nature of the information involved. The Department continues to have concerns related to the proponent’s analysis and conclusions on this matter.
- DFO has attempted to clarify the ecological flow guidelines and the assessment methods set out in the Department’s Framework for Assessing Ecological Flow Requirements to Support Fisheries in Canada for AMNS on a number of occasions

(e.g., August 16, 2021 comments on the EARD; December 15, 2021 comments on the technical review of the proposed Beaver Dam Mine Project). In the Addendum, AMNS continues to misinterpret the Framework and have not applied the guidelines as intended. Therefore, the conclusions presented in the Addendum related to DFO's ecological flow requirements in Moose River should be disregarded.

- With regards to monitoring flows in Moose River and other affected watercourses in the project area, DFO recommends the following:
 - AMNS's flow monitoring program should be supervised by an experienced hydrologist with Professional Engineer or Professional Geoscientist designation.
 - AMNS should continue monitoring daily flows at the hydrometric stations in Moose River and the Long Lake tributary, including the HM-3 and HM-4 stations installed in 2021. All efforts should be made to ensure that there are no gaps in the daily flow data from these stations during the June 1 to September 30 period.
 - AMNS should measure discharge at each station using the velocity-area method approximately every 2 weeks during the June 1 to September 30 period to develop a robust stage-discharge relationship.
 - AMNS should ensure that a "control" hydrometric station in Moose River is properly sited, installed, and maintained. This control station should be located upstream of the zone of influence of the Touquoy mine (e.g., SW-11b or another location). Prior to installation, the experienced hydrologist should ensure that there are no obvious environmental conditions or features at the location that could affect the accuracy of the flow data (e.g., presence of aquatic vegetation, heterogeneous channel section, etc.).

Section 5.2 Ship Harbour Long Lake Wilderness Area

- The Addendum states that: "*Work operation will be conducted at a time and in a manner to protect watercourses from siltation and disturbance.*". This mitigation is vague as written and does not explain how watercourses will be protected from siltation and disturbance.
- The Addendum states that: "*The duration of work below the ordinary high-water mark will be planned to respect the DFO timing windows, as required.*"
 - It is not clear what project works will be carried out below the ordinary high-water mark. DFO timing windows of least risk for in-water works in the area is June 1 to September 30. AMNS should consider regulatory timelines for the *Fisheries Act* authorization application process in planning the project, which includes a 60-day review period to determine if the application is complete

and adequate, followed by a 90-day period for DFO to process a complete application and decide whether to issue the authorization.

- The Addendum states that: “*If explosives are required, use of explosives will follow DFO blasting guidelines.*” It is not clear what project works or activities may require the use of explosives or what exactly is meant by “DFO blasting guidelines”. Any proposed works or activities involving blasting in or near fish habitat should be submitted to DFO for regulatory review.

Section 7.1 Fish Survey Data

- NS ECC requested that AMNS provide all fish surveys and relevant data that has been completed at or near the site. AMNS did not provide the pre-development, baseline fish sampling dataset collected by Conestoga-Rovers & Associates Ltd. in Moose River that was used to inform the original project EA in 2007-2008. It is not clear whether this dataset is available, but it would help to clarify baseline conditions for the fish community in Moose River prior to development of the mine.

Section 7.2 Square Lake Fish Surveys

- DFO is satisfied with the data and information provided related to fish and fish habitat in Square Lake. This information provides the Department with a better understanding of the existing conditions in the vicinity of the WRSA.

Section 7.3 Moose River Fish Surveys

- NS ECC requested that AMNS conduct fish sampling in Moose River. Only a limited amount of information about the state of the Moose River fish community can be gleaned from less than 20 minutes of electrofishing in the river on a single day. This information is not adequate to identify trends or characterize any changes in the fish community since development of the Touquoy mine. This survey represents the first attempt to characterize the state of the fish community in Moose River since development of the mine.
- The original project EARD identified this reach of Moose River as providing habitat for “*a wide variety of fish species*”, including Atlantic Salmon and Brook Trout, and observed “*numerous juvenile Atlantic Salmon*” in the project area. Therefore, it is notable that no Atlantic Salmon or Brook Trout were captured, and that the diversity of fish species captured was low.

Section 7.4 Fish and Fish Habitat Impact

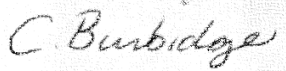
- In general, DFO is satisfied with the proponent’s assessment of impacts to fish and fish habitat outlined in Section 7.4. The proposed expansions of the WRSA and clay borrow area, and the construction of the proposed spillway from the WRSA, will result in the harmful alteration, disruption, or destruction of approximately 2,941 m² of freshwater fish habitat in Watercourses #3, #4, and #12. Therefore, the proposal

requires authorization pursuant to paragraphs 34.4(2)(b) and 35(2)(b) of the *Fisheries Act* in order to proceed.

- A monitoring plan will be required by authorization to verify the effect prediction that effluent released from the expanded WRSA into Watercourse #4 will counterbalance the loss of flow associated with further reduction of its catchment area.
- Additional information (i.e., updated ESC Plan) is needed to understand how Watercourses #3 and #4 will be protected from siltation from the expanded clay borrow area. Lessons learned from the offsite clay borrow pit should be incorporated into the ESC Plan.

If you have any questions with the content of this letter, please contact me at our Dartmouth office at 902-233-9731 or by email at Christopher.Burbidge@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,

A handwritten signature in cursive script that reads "C. Burbidge". The signature is written in black ink on a light-colored background.

Chris Burbidge
Senior Biologist
Ecosystems Management-Regulatory Reviews
Maritimes Region

From: Allain, Jérémie (HC/SC) <jeremie.allain@hc-sc.gc.ca>

Sent: April 22, 2022 3:55 PM

To: Tutty, Bridget R <Bridget.Tutty@novascotia.ca>

Cc:

Subject: RE: Touquoy Gold Project Site Modifications Addendum for Environmental Assessment

**** EXTERNAL EMAIL / COURRIEL EXTERNE ****

Exercise caution when opening attachments or clicking on links / Faites preuve de prudence si vous ouvrez une pièce jointe ou cliquez sur un lien

Good Afternoon,

As per your email below regarding the Touquoy Gold Project Site Modifications, please identify any project-related human health impacts to which you require advice and guidance from Health Canada.

HC's role in Impact/Environmental Assessment is founded in statutory obligations under the Canadian Impact Assessment Act, and its knowledge and expertise can be called upon by reviewing bodies (e.g., Impact Assessment Agency of Canada, review panels, Indigenous groups and/or other jurisdictions). In the absence of such a request from one of the above noted groups, HC is unable to carry out a comprehensive review of the project. However when staff capacity and time permits, we are happy to accommodate requests for human health advice and guidance related to provincial environmental assessments within a reasonable timeframe.

Health Canada currently possesses expertise in the following areas related to human health: air quality, recreational and drinking water quality, traditional foods (country foods), noise, and methodological expertise in conducting human health risk assessment.

To help with your review of human health impacts, I have attached a document of common human health considerations in project reviews and links to Health Canada's guidance documents.

Kindest regards,

Jérémie Allain, M.Sc
(il | he)

Spécialiste intérimaire en évaluation environnementale / DGORAL-Direction générale des opérations réglementaires et de l'application de la loi
Santé Canada / Gouvernement du Canada

jeremie.allain@hc-sc.gc.ca / Tél.: 514-213-1846

Acting Environmental Assessment Specialist / ROEB- Regulatory Operations and Enforcement Branch
Health Canada / Government of Canada
jeremie.allain@hc-sc.gc.ca / Tel.: 514-213-1846

Health Canada currently possesses expertise in the following areas related to human health: air quality, recreational and drinking water quality, traditional foods (country foods), noise, and methodological expertise in conducting human health risk assessment. Based on Health Canada’s “*Guidance for Evaluating Human Health Impacts in Environmental Assessment*”, please consider the following information on these topics to assist in your review. Please note that Health Canada does not approve or issue licenses, permits, or authorizations in relation to the EA.

	Consideration	Reference Document
Receptor Location(s)		
<p>Please ensure the registration document clearly identifies the locations of all receptors that may be impacted by the proposed project, including any receptors located along the transportation route, if applicable.</p>	<ul style="list-style-type: none"> • It is important to clearly describe the location and distance from the proposed site(s) to all potential human receptors (permanent, seasonal or temporary), taking into consideration the different types of land uses (e.g. residential, recreational, industrial, etc.), and identifying all vulnerable populations (e.g. in schools, hospitals, retirement or assisted living communities). Note that the types of residents and visitors in a particular area will depend on land use, and may include members of the general public and/or members of specific population subgroups (Indigenous peoples, campers, hunters, etc.) • If there are any receptors within the vicinity of the proposed site(s), impacts to human health should be considered. 	<p>Section 7.1.3 of <i>Health Canada. 2019. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Human Health Risk Assessment. Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario.</i> https://publications.gc.ca/site/eng/9.870475/publication.html</p>
Atmospheric Environment		
<p>Project impacts to the atmospheric environment include changes to air quality and noise, and can occur in both the construction and operation phases of the project. Project impacts to air quality are commonly caused by emissions from equipment or</p>	<ul style="list-style-type: none"> • If there are receptors within the vicinity of the proposed project, impacts to the atmospheric environment should be considered. Atmospheric environment impacts to human health may include: <ul style="list-style-type: none"> ○ impacts to air quality (dust or fumes including NOx, SOx, and PM2.5) ○ increased noise from construction or operations • If there are receptors within the vicinity of the project, it may be 	<p><i>Health Canada. 2016. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise. Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario.</i> http://publications.gc.ca/pub?id=9.832514&sl=0</p>

<p>vehicles as well as by dust. Noise impacts are commonly caused by equipment as well as by activities such as blasting.</p>	<p>necessary to inform receptors prior to loud activities, such as blasting.</p> <ul style="list-style-type: none"> • If there is the potential for impacts to human receptors from noise and/or air quality changes from the project, the proponent should consider establishing mitigation measures. If complaints are received additional mitigation measures may be required. 	<p><i>Health Canada. 2016. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Air. Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario.</i> http://publications.gc.ca/pub?id=9.802343&sl=0</p>
<p>Recreational and Drinking Water Quality</p>		
<p>The proponent should consider whether any nearby waterbodies are used for recreational (i.e. swimming, boating, or fishing) or drinking water purposes, as well as whether there are any drinking water wells in the vicinity of the project. Nearby drinking and/or recreational water quality may be impacted by accidents or malfunctions, such as a fuel spill; by dust and increased sediment runoff; and by other chemical discharges to the environment. Additionally, wells in the vicinity of the project may be impacted by activities such as blasting.</p>	<ul style="list-style-type: none"> • If there is the potential for impacts to drinking and/or recreational water quality from the project site, the proponent should consider establishing mitigation measures. If complaints are received additional mitigation measures may be required. • The proponent should consider preparing a response plan in the event of an accident or malfunction with the potential to impact drinking and/or recreational water quality. Response plans should include a spill response kit, adequate spill response training, and a communication plan to notify all recreational and drinking water users in the impacted area as well as all relevant authorities. • In some cases, for projects that are likely to have an impact on drinking and/or recreational water quality, the proponent should consider conducting water monitoring prior to the start of the project (to establish a baseline). Monitoring would continue throughout the construction, operation and decommissioning phases of the project (as applicable) to monitor for any changes in water quality or quantity. 	<p><i>Health Canada. 2017. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Water Quality. Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario.</i> http://publications.gc.ca/pub?id=9.832511&sl=0</p>
<p>Country Foods</p>		
<p>If there are plants or animals present in the vicinity of the project that are consumed by</p>	<ul style="list-style-type: none"> • If there is the potential for impacts to country foods from the proposed project, the proponent should consider establishing mitigation measures. If complaints are received additional 	<p><i>Health Canada. 2017. Guidance for Evaluating Human Health Impacts in Environmental Assessment: Country</i></p>

<p>humans, there may be potential for impacts to country foods. The proponent should consider all country foods that are hunted, harvested or fished from the vicinity of the project. Impacts to country foods may occur from the release of contaminants into soil or water (including from an accident or spill) or from deposition of air borne contaminants.</p>	<p>mitigation measures may be required.</p> <ul style="list-style-type: none"> • The proponent should consider preparing a response plan in the event of an accident or malfunction with the potential to impact country foods. Response plans should include a spill response kit, adequate spill response training, and a communication plan to notify all potential consumers of country foods in the impacted area as well as all relevant authorities. 	<p><i>Foods. Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario.</i> http://publications.gc.ca/pub?id=9.855584&sl=0</p>
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Date: April 22, 2022

To: Bridget Tutty
Environmental Assessment Officer

Cc: Manager, Water Resources Management Unit

From: Senior Hydrogeologist, Sustainability and Applied Science Division (SAS)

Subject: Review of Touquoy Gold Project Site Modifications Addendum
for Environmental Assessment March 2022

Environmental Assessment (EA) reviews from the NSE Sustainability and Applied Science Division Senior Hydrogeologist focus primarily on groundwater resources. This includes the potential for the proposed undertaking/project to adversely affect groundwater resources, including general groundwater quality, quantity, municipal water supplies, local water supply wells and groundwater contributions to stream baseflow, groundwater recharge and wetlands. The review is conducted of materials provided by the proponent during the EA registration process including references to previously submitted material.

The previous 2021 EA Registration Document (July 16, 2021) was submitted by Atlantic Mining NS Inc (AMNS) based on the proposed modifications to the project consisting of four main components:

- Use of the exhausted Open Pit for tailings disposal instead of the existing approved Tailings Management Facility (TMF)
- Expansion of the Waste Rock Storage Area (WRSA)
- Expansion of the Clay Borrow Area
- Realignment of the Plant Access Road used to access the Plant Site

It is noted that the proponent anticipates the proposed modifications to extend the operations at the Touquoy mine site by approximately 3 years (2022 to 2025). The changes would allow for increases in waste rock volumes, filling and closure of the TMF and placement of additional tailings after 2022 into the Open Pit area. The proponent is also anticipating potential use of the Open Pit for much more mine tailings deposition from other proposed mines with an anticipated end date of 2033 (Table 2.1, p. 2.12 2021 EA Registration Document).

On September 8, 2021, the Minister of Environment and Climate Change determined that the Registration information was insufficient to make a decision on the Project and that additional

information is required. AMNS was required to provide information regarding in-pit mine tailings disposal, ground and surface water, fish and fish habitat, protected areas, wildlife, wetlands and historical mine tailings. For groundwater this included, among others, the requirement to provide a third-party expert review of the ground and surface water modelling presented and referenced in the 2021 Environmental Assessment Registration Document (EARD).

This review then primarily is of the Additional Information response submitted by AMNS to the Minister in the report “*Addendum to the Touquoy Gold Project Modifications – Environmental Assessment Registration – March 2022*” (2022 EARD). The review is not exhaustive and for the groundwater modelling components relies heavily upon the 3rd party review conducted Wood Environmental and presented in Appendix C.

1. Open Pit Tailings Disposal

a) Open pit source water quality

As identified in the 3rd party review, 2022 EARD Appendix C, questions remain about the validity of the modelled source terms for water quality in the open pit following tailings deposition (Appendix C.1, p.6). An uncertainty analysis showing potential variability in source water quality was not presented. This is an important aspect of determining the potential for subsequent groundwater solute transport and thresholds for determining treatment.

b) Groundwater seepage

i. Affected layers/depths/k

The stratigraphic geologic layers in the vicinity of the open pit are not well correlated in the 2022 EARD with regards to depths, thicknesses and hydraulic conductivity measurements. The 3rd party review also raises unaddressed questions concerning details of the proposed Open Pit tailings disposal with regard to the location of the proposed final water level and the elevation of stratigraphic layers with higher hydraulic conductivities (such as the overburden and upper weathered bedrock layers (Appendix C.1, p.5).

Concerns are raised over the accuracy of reported stratigraphic depths and corresponding hydraulic conductivity tests from borehole logs (Appendix B1, Table 6-3 BH21-09 depths mBGS do not match depths from borehole logs from Appendix C BH21-09, particularly of concern with respect to high k zones).

Finally, the groundwater model conceptual layers initially presented in the 2021 EARD model are not initially clearly shown (compare 2021 EARD Appendix D, Figure 4.2 with 10 layers to Table 4.6 with 14 layers, same document). Presumably some layers are combined and this should be clearly identified

ii. UG Mine workings and GPR anomalies

The new presentation of the existence of extensive underground (UG) mine workings and GPR measured anomalies (fracture zones) in the SW area between the OPM and the Moose River raises new significant concerns about the potential for preferential flow pathways in this area. Little is said about the

possibility for these findings to affect flow.

c) Groundwater solute transport

i. Conceptual explanations

The 3rd party review raises questions about the validity of the predicted solute transport from the OPM to the Moose River (Appendix C.1, p.5-6) and suggests the need for additional work: *“Wood recommends that the proponent re-examine the groundwater modelling work and provide additional detail to support their conclusions of limited transport of potential contaminants from the pit lake to the Moose River through groundwater.”*

AMNS refers to these comments in the 2022 EARD and provides some rationale. AMNS reports *“As described in Section 5.4.1 of the modeling report (Appendix D.1 of the EARD), the diffusion coefficient of chloride, a conservative species under most natural conditions, was used to represent the diffusion characteristics of the generic solute in the transport model.”* 2022 EARD p. 26.

However, this rationale does not seem adequate in addressing the concerns. The choice of chloride as a non-reactive solute is reasonable. In the modelling conducted however, diffusion is not actually a significant feature for solute transport. My understanding is that this modelling situation is set up based only on advective-dispersive transport and not diffusion or adsorption attenuation characteristics. In that sense, the questions initially raised by Wood are still relevant. If advective-dispersive transport is the main flow mechanism, the only attenuating factor between the OPM and Moose River will be dilution. However, with such a short flow path (100 m or less) and flow primarily being horizontal from the upgradient side (i.e. OPM with higher source concentrations) groundwater dilution will be minimal. By what mechanism is the model predicting such limited non-reactive solute spread? This does not make conceptual sense and should be addressed. In fact, as long as there are any flow vectors to the Moose River, long-term equilibrium with the OPM would likely result in much higher solute concentrations down-gradient.

d) Remaining uncertainties

Additional concerns relate to the long-term presence of “point source” concentrations of contaminant parameters from the OPM pit lake. The potential for variability of these source terms from those modelled, versus actual concentrations needs to be more fully evaluated.

e) Discussion

The 2022 EARD does not satisfactorily address the concerns for potential release and transport of groundwater contaminants via flow paths between the OPM and Moose River. This would require more specific work as identified, however it is likely that significant uncertainties will remain. The quantification of these concerns would need to be fully expressed and evaluated (including potential variabilities and worst case scenarios).

2. Proposed Open Pit Seepage and Discharge Water Quality Mitigations

a) Partial liner and fracture grouting

The proposed plan by AMNS includes groundwater seepage mitigation along the SW wall of the OPM through the use of a liner type system installed on the steep, mined rock face. It is not clear if this could actually be installed as proposed. It is also not clear how effective this may potentially be in reducing seepage flow. Fracture grouting by downhole pressure grouting in boreholes is also proposed to mitigate individual fracture flow. How underground mine workings would be field located and grouted was not presented. Uncertainties related to the liner or grouting mitigations proposed are not presented.

b) Potential water quality treatment (in-pit)

AMNS presents options for treatment that include batch treatment of the OPM pit lake itself as well as treatment of surface flows (presumably discharges). However, these are presented as conceptual. In addition, treatment considerations are made assuming that MDMER and site specific water quality objectives are acceptable for discharge. It is not clear that this should be the case. Only Arsenic and Ammonia are carried through for potential treatment whereas other parameters are also shown to have exceeded water quality objectives

3. Waste Rock Storage Area (WRSA)

a) Recharge/Seepage uncertainties

The 3rd party reviewer notes questions about the choice of infiltration/groundwater recharge ratios for the WRSA and how these directly affect seepage. These seem very relevant to determining groundwater seepage/flow and water quality in WC 4.

“With respect to the boundary condition selected to represent seepage from the WRSA there is no justification provided for the initial input value for the recharge to the WRSA. As this value directly represents the amount of seepage discharging from the base of the WRSA, there should be discussion of the appropriateness of the input value and how it was derived.” (2022 EARD Appendix C, Attachment 3, p. 5, Peer Review of Appendix D.1 and D.2 of the Touquoy Gold Project Site Modifications – Detailed Comments)

b) Effects of TMF

Concerns are also raised again about the cumulative effects of groundwater quality parameters from the combined WRSA and TMF. These are similarly raised by the 3rd party reviewer:

“As model simulations show that the collection ditches intercept about half of the groundwater seepage from the WRSA this can be important consideration. The Tailings Management Facility (TMF) which is located directly south of the WRSA has not been included in the modified model. The TMF will likely influence the groundwater elevations and flow directions within the footprint of this structure. As particle tracking results show that there is the potential for WRSA seepage to travel beneath the TMF, the potential model error introduced by omission of this feature should be included. Had the TMF been included in the model, some of the seepage from the WRSA that is presently modelled as being captured by the

TMF seepage collection system may have been simulated as being deflected to a natural water feature instead.” (2022 EARD Appendix C, Attachment 3, p. 5, Peer Review of Appendix D.1 and D.2 of the Touquoy Gold Project Site Modifications – Detailed Comments)

c) WC 4 and seepage quality

Concerns remain about the seepage quality current and predicted for WC 4. As noted by the 3rd party reviewer: *“Concerning the sulfate anomaly in Watercourse 4 (WC4) however, more information is necessary”* (2022 EARD Appendix C, Attachment 2, p. 2 – Third-party Review Response Table for Groundwater, Surface Water and Geochemistry comments).

4. Summary of Review

As noted in the discussion above, significant concerns are expressed about the environmental protection and sustainability of the proposed modifications in the EARD addendum, as related to groundwater resources. Comments regarding this include:

- The 3rd party modelling review for surface water and groundwater models was very helpful in collating/summarizing key aspects of some highly technical studies. The reviewers noted numerous methodological or information concerns that could affect the predictive model outcomes. The review, although thorough, was still not able to address every concern for this highly complex scenario, with multiple interacting components. This is the nature of environmental models and highlights the recommendation that high reliance on modelling results in this case is not reasonable.
- For further clarity AMNS should fully address each technical comment and concern raised by this review and the 3rd party groundwater and surface water model reviewer, Wood Environmental. In particular, this includes individual reviewer comments made in:
 - 2022 EARD Appendix C.1 Water Modelling Third-Party Review of the Touquoy Gold Project Site Modifications Environmental Assessment Registration
 - 2022 EARD Appendix C, Attachment 2, Third-party Review Response Table for Groundwater, Surface Water and Geochemistry
 - 2022 EARD Appendix C, Attachment 3, Peer Review of Appendix D.1 and D.2 of the Touquoy Gold Project Site Modifications – Detailed Comments)

It is also recommended that responses to the review comments should be provided back to the 3rd party reviewer for validation to ensure they are fully and adequately addressed.

- Concerns remain about the adequacy of treatment/containment of the Open Pit for long-term tailings disposal and the resultant potential for significant groundwater impacts and groundwater-surface water discharge of impacts (such as to Moose River or site watercourses). Many of these concerns cannot be addressed by additional modelling, however more information to better refine the complex modelling work and allow greater

site conceptual understanding could be helpful.

- The use of the exhausted bedrock Open Pit for tailings disposal does not seem of comparable environmental safety to a more fully engineered design primarily employed for mine tailings disposal, such as the TMF or fully lined facilities. It is not clear from the submission that open pit disposal in this situation could be considered a preferred or adequate solution from the perspective of long-term maintenance of groundwater quality and the potential for discharges to Moose River.
- Additional concerns relate to the continued evidence for potential shorter term groundwater impacts of the Open Pit to water quantity (dewatering) in the Moose River.
- It is noted that while the expansion of WRSA may not be relatively large compared to the existing condition, concerns remain relating to groundwater quality impacts in this area and how they affect surface water through groundwater discharges (for example to WC 4). This includes both in the present and potential future states. These cannot be separated out from operational issues that may currently exist – related to both the WRSA and the TMF, where they may interact.

Environment and Climate Change

Date: April, 2022
To: Bridget Tutty, Environmental Assessment Officer
From: Environmental Health
Subject: Touquoy Gold Mine Site Modification

Scope of review:

The focus of this Environmental Assessment review from the NSE Sustainability and Applied Science Division's Regional Environmental Health Consultant is potential impacts on human health. In general, the scope of this review includes the assessment of the potential for the proposed undertaking/project to adversely affect human health in all phases of the project. Note that while general comments may be included, applicable technical specialists should be consulted for specific guidance.

Documents reviewed:

The documents outlined below formed the basis for this EA review:
Touquoy Gold Mine Site Modifications Environmental Assessment
Addendum

Comments:

There are no additional comments with regard to this project.

Environment and Climate Change

Date: April 22, 2022

To: Bridget Tutty, Nova Scotia Environment & Climate Change

Cc: Manager, Water Resources Management Unit

From: Surface Water Quality Specialist, Sustainability and Applied Science Division

Subject: Touquoy Gold Project Modification – Additional Information Addendum

Scope of Review:

As Surface Water Quality Specialist with the Nova Scotia Environment and Climate Change (NSECC) Sustainability and Applied Science Division, the following Touquoy Gold Project Modifications – Additional Information Addendum Environmental Assessment (EA) review focuses on surface water quality, with additional commentary on the following subjects: surface water quantity and groundwater quantity and quality.

The following review considers whether the Addendum and its appendices, in association with the original Environmental Assessment Registration Document and its appendices, have adequately addressed the environmental concerns identified in the Minister's Decision associated with in-pit tailings disposal and ground and surface water. The recommendations provided below are meant to supplement the actions outlined in the EARD.

While general comments on fish and fish habitat, wetlands, surface water quantity, and groundwater quality and quantity may be included below, the comments of applicable technical specialists should also be consulted.

Reviewed Documents

The following documents formed the basis for this review:

1. Stantec Consulting Ltd. 2022. *Addendum to the Touquoy Gold Project Modifications - Environmental Assessment Registry Document. Response to Ministerial Request for Additional Information. Dartmouth, Nova Scotia.*
2. Stantec Consulting Ltd. 2021. *Environmental Assessment Registry Document, Touquoy Gold Project Modifications. Dartmouth, Nova Scotia.*
3. (NSECC) Minister's Decision, Touquoy Gold Project Modifications. September 8, 2021.

Comments / Recommendations

General

- It is noted that the current project directs all tailings to a specifically designed Tailings Management Facility (TMF) with liner materials along its margins, and that the proposed project modifications will, if undertaken, redirect future tailings disposal to the flooded (exhausted) open pit. It is further noted that, should this redirection of future tailings disposal be carried out, surface water discharge from that open pit – which may bear tailings contaminants – would be directed to the Moose River above its confluence with the Fish River, a subwatershed not currently subject to the deliberate discharge of site water.
- The proposed modifications will result in two tailings management facilities on-site rather than one. The applicant has not provided indication or evidence that the use of exhausted open pits for tailings disposal is common and/or accepted industry practice, or that such practice has an acceptable record for meeting environmental targets.

In-Pit Tailings Disposal

Mine Pit Permeability and Mitigation Measures

- The addendum confirmed that the EARD acknowledges the potential for groundwater flow pathways between the open pit and Moose River during the post-closure phase of the project (i.e., at which time the open pit would receive tailings derived from ore mined from other project sites).
- The addendum further confirmed that, during the post-closure period, the deposition of tailings in the open pit will lower the water quality in the pit, primarily the pore water quality in the tailings located there. It also acknowledged that this lower quality water has the potential to migrate toward Moose River via groundwater - which indicates that the pit is permeable.
- The addendum identifies three major features that contribute permeability to the open pit wall:
 - the presence of high permeability fractures along the wall of the open pit; (s. 2.1.2);
 - the presence of faults, which may serve as preferential pathways (for groundwater transport from the open pit, some of which may lead to the Moose River) (s. 2.1.3);
 - underground workings intersecting the pit wall, located in the western area of the pit, between it and Moose River (s. 2.1.3).
- Two main types of permeability mitigation are proposed: a pit wall liner, and fracture grouting.
- The pit wall liner mitigation was proposed at a concept level and includes a vertically-oriented clay till layer located between the crest of the pit to (approx.) 60m.
- The information provided about the proposed mitigation measures is at a high level (i.e., not detailed). The applicant did not present any how likely the proposed mitigation measures were to limit seepage through the open pit walls or provide any estimate for the longevity of the proposed measures. That is, the proponent did not predict how long the proposed mitigation measures may be expected to last and indicate if they would be expected to hold up for the entirety of the proposed open pit lake filling period (approx. 9 years). The information provided

does not provide this reviewer with satisfactory confidence that the proposed mitigation measures can adequately address the risk of contaminating Moose River through the discharge of contaminated groundwater to Moose River.

Mine Pit Capacity

- The EARD indicated that the TMF was expected to reach its capacity by March 2022, and that the open pit would be exhausted by 2022. Although this reviewer was unable to find it explicitly acknowledged, it may be inferred that all tailings from the Touquoy open pit, created by processing mine ore after the TMF closes are proposed to be deposited into the open pit for final disposal.
- The Addendum's Table 2.1 indicates a total pit capacity of 11,458,000 m³, and projects (incompletely) that this capacity may be completely used up by tailings deposits from three other NS gold mines owned by the proponent.
- The data presented in the table is somewhat confusing, however, as it identifies 100% of Touquoy tailings will be deposited in the open pit. This contradicts the inference this author makes that significantly less than 100% of Touquoy tailings will be deposited into the open pit, as the majority of tailings from this site have already been deposited into the on-site TMF.
- Further, it indicates that the Touquoy open pit may accommodate only 2.85% of the tailings from its Fifteen Mile Stream facility – contrary to indications from the EIS for that project projecting 100% tailings disposal into the Touquoy open pit. The table also suggests a very modest capacity of 321,525 m³ for the storage of tailings from Cochrane Hill.
- The addendum identified a risk that the volume of tailings generated by processing ore from other the proponents' other mines exceeds the volume predicted, due to variation in ore yield from original projections – an event that has occurred at the Touquoy Mine. If this event should occur at one or more of the applicants' mines, then the open pit may run out of capacity to hold the tailings from all sites. Despite possible changes in tailings density or intentional tailings thickening (which would increase the pit's capacity), this situation would, if it occurred, ultimately create the demand for an additional tailings holding facility, beyond the existing Touquoy TMF and proposed Touquoy open pit.

Proposed In-Situ Water Treatment Plan and Schedule

- The EARD and Addendum clearly identify that two new final discharge points (FDPs) will be established on the site pursuant to approval of the proposed activities:
 - one at Watercourse 4, for treated wastewater originating from the Waste Rock Storage Area (WRSA), and
 - the other at Moose River, for the discharge of water from the open pit.
- The addendum implies that only nitrite / nitrate is expected to require treatment for Watercourse 4. It identifies three (general) treatment options for these substances at WC4 FDP: i) one of three forms of Bed Reactors, ii) Reverse osmosis, and iii) an ion exchange process. No further details are presented to distinguish between the options, to determine how a recommendation will be derived, or how likely any proposed treatment process is to achieve MDMER discharge objectives.
- The addendum indicates that water treatment will be required for arsenic and ammonia and

implies (s. 2.3) that it may be required for metals and sediments.

- The addendum confirms that treatment will be required and continuous at year 9 (at which time the pit is modelled to have been completely filled), through year 30. It implies that treatment will be required from the period of year 3 through year 9, but related information is unclear.
- Water treatment plans, as presented, appear to be uncertain. While cyanide destruction and in-pit sedimentation appear to be processes that the proponent is committed to, the proponent has yet to decide how it will remove metals and sediments and adjust pH. It proposes one of three options:
 - Batch treatment (by adding lime slurry to the open pit)
 - The use of a package treatment plant installed on-site
 - A combination of the first two options
- In addition, the proponent has modeled the requirement to treat both ammonia and arsenic, based on the use of a mixing zone study and the assumed approval for the use of such a zone. Several treatment options have been proposed for these two substances (four and three, respectively), although, again, no additional information was provided to indicate the suitability of the proposed options, if they are industry standard approaches or innovative, potentially previously-untried methods, their predicted success of these options, how a decision would be made, or other such information.
- Overall, given the lack of detail provided, it is uncertain whether the proposed water treatment processes will or can achieve the level of treatment required (i.e., MDMER effluent discharge criteria and/or any other applicable criteria).

Pit and Waste Rock Storage Area / federal legislative requirements

- Proponents described that discharge points from the WRSA and open pit will meet the requirements of the Fisheries Act and Metal and Diamond Mining Effluent Regulations (MDMER) by 1) submitting required documentation regarding the establishment of these new Final Discharge Points (FDPs) to the regulator (ECCC), 2) performing any required water treatment, and 3) performing any required compliance testing (i.e., performing acute lethality testing to confirm that the substances are not lethal to the test species when exposed to specified concentrations at pre-determined durations).
- For the WRSA FDP, the proponent indicates that treatment will consist of settling and, if needed, engineered wetlands. The creation of functional engineered wetlands is not a simple matter, however, and the neither the location for these proposed wetlands nor any supporting details were provided to support their proposed use or performance.
- For the open pit FDP, the proponent indicates that effluent will only be discharged provided that it meets MDMER and provincial limits (s. 2.4). This contradicts the information presented in Appendix A (s. 6.1) and original EARD (s. 7.7.2), which clearly indicate the intended use of a mixing zone of 92m to dilute the effluent to meet MDMER requirements.
- Proposed water treatment for the open pit includes i) water cover over the deposited tailings, to reduce metal leaching, and ii) the unconfirmed (potential) use of a passive treatment system. No further information was provided about the latter system. Overall, the Addendum did describe, at a high level, how the proponent intends to meet federal legislative requirements, although

not with sufficient details to enable this reviewers to conclude that these plans are likely to achieve their objective.

- MDMER concentration limits applicable to the Touquoy mine do not necessarily prevent adverse environmental effects
 - While the EA Addendum predicts that effluent from the open pit will, at the end of the mixing zone, meet the concentration limits set out under the MDMER (schedule 4 Table 2), monitoring data from ECCC's effects monitoring program (<https://www.canada.ca/en/environment-climate-change/services/managing-pollution/publications/third-national-assessment-monitoring-data.html>) shows that effluent from mines meeting the MDMER concentration limits has the potential to result in a variety of adverse effects to fish and fish habitat downstream.

Ground and Surface Water

Third Party Expert Review

- Proponents provided a third-party review of the modelling presented in the EARD.
- The third-party reviewers found that the documentation provided by the proponent through the EARD to support the groundwater modelling lacks sufficient detail to enable a detailed review.
- The reviewers indicated that the deposition of tailings to the open pit is a change to the existing project and represents a potentially significant environmental risk (at a local scale). They concluded that “the modelling documents submitted by the proponents in support of tailings disposal in the open pit lack sufficient detail to confirm the conclusions of these studies that the effects will not be significant.
- The reviewers provided several comments and recommendations regarding the proposed disposal of tailings in the open pit. The recommendations are presented below. This reviewer supports the third-party reviewer recommendations and suggest that the proponent be required to comply with all terms identified below.
 - Additional drilling and other work be undertaken in the area between the open pit and Moose River to refine the stratigraphy (particularly the bedrock contact), to provide additional measures of hydraulic conductivity of the key units, and to better define river stage levels. This information should be used to update the conceptual model of the site in this area, and if determined to be significantly different than the one used in the transport groundwater model for the open pit, develop a refined groundwater model for re-evaluation of groundwater flows from the flooded pit lake to the Moose River
 - Evaluate scenarios where a deeper bedrock-overburden allows for some groundwater seepage through the overburden from the open pit to the Moose River, and present potential mitigation measures
 - Re-examine the groundwater modelling work and provide additional detail to support their conclusions of limited transport of potential contaminants from the pit lake to the Moose River through groundwater.
 - Provide further explanation of how these (pit lake concentration) calculations were completed, and the assumptions used.
 - Present information to validate predicted tailings pore water quality and predicted open

- pit lake discharge water quality against equivalent waters from the existing TMF.
 - Supplement the assimilative capacity report with a scenario where there is no attenuation of contaminant concentrations in groundwater along the flow path, to support the attenuation rates predicted in the EARD.
 - Consider the development of an additional contingency measure for the project to provide hydraulic containment of contaminants within the pit lake by lowering the pit lake below the level at which runoff or groundwater seepage moves from the pit lake towards the Moose River. This measure may be either a long-term option or a short-term option to allow time for the proponent to evaluate treatment options.
 - Trigger thresholds should be developed, that would initiate treatment studies should future monitoring or re-assessment of the pit lake models indicate that pit lake concentrations or groundwater flows from the open pit be higher than predicted in the EARD.
- Pursuant to the recommendations of the third-party review, the proponents updated the assimilative capacity study for the Moose River (Appendix D to the Addendum). As part of this study, they also completed a mixing zone study, using the Cormix model. A summary of model inputs and assumptions used in the study was presented, but the source of the inputs and the reasonableness or reliability of the assumptions was not submitted. The absence of supporting documentation did not enable this reviewer to independently conclude that model inputs were justified. Instead, reviewers are forced to rely on the information presented.

Impacts to Watercourse #4

- This Addendum documents that the project will result in the reduction in the catchment area flowing to Watercourse #4 by 5.1 ha (WRSA) and 5.9 ha (Clay borrow pit), totalling 11.0 ha. The addendum indicates that this catchment reduction will result in a loss of 8% compared to pre-project condition. This figure (8%) under-represents the projected flow loss, as it did not account for the flow loss from the clay borrow pit.
- The proponent indicated that flow loss to watercourse #4 will be compensated for by supplementing its flow from the WRSA runoff. Such flow alteration may require an approval under the department's watercourse alteration program.
- The proponent indicates that there is no expected impact to Watercourse #4 due to open pit dewatering or filling during operation.

Impacts to Moose River

- Figure 1 shows a field-identified watercourse flowing into Moose River that appears to abut the Open Pit. The addendum does not clearly indicate that this watercourse does not now and will not be, in future, transmit water from the open pit to the Moose River.
- Proponents have clarified that current operations have resulted in a minor reduction of flow to Moose River due to a diversion of groundwater to the open pit that would otherwise have flowed to Moose River.
- The addendum indicates that the modeled reduction in groundwater flow to Moose River at station SW-2 is 49 m³/d on a mean annual basis, and 29 m³/d on a summer flow basis. It further implies that measured reductions in Moose River flow rates exceed the modeled reductions,

and presents data and statistics intended to show that pit dewatering is responsible for only a small fraction of the observed losses.

Clarify Water Quality / Quantity analysis Inconsistencies

Thirty-seven specific questions were addressed under the banner of this question in Appendix A of this Addendum. This reviewer's focus was restricted to sections A and E, excluding sections B, C, and D. For the two sections carefully reviewed, the majority of these inconsistencies were adequately addressed. Only one specific questions generated a substantive comment, presented below.

- A.2 – Water Quality Objectives. The proponent noted that used a site-specific water quality objective (SSWQO) for arsenic that it developed specifically for the Touquoy mine as a Water Quality Objective for the purpose of this EA. More particularly, the proponent compared model predictions of surface water Arsenic concentrations to the SSWQO and used this comparison as the basis for assessing the potential for environmental effects. The adoption and application of this SSWQO for this purpose is unreasonable because the proponent has not been independently submitted the SSWQO to the Department's Inspection, Compliance, and Enforcement division to seek approval for its use, and as such no such approval has been issued.

Date: April 22, 2022

To: Bridget Tutty
Environmental Assessment Officer

From: George MacPherson, Director, Mineral Management Division (MMD)
Diane Webber, Director, Geological Survey Division (GSD)

Subject: Comments on the Environmental Assessment Registration Document Addendum
Touquoy Gold Project Site Modifications
Atlantic Mining NS Inc.
Moose River, Nova Scotia

The Geoscience and Mines Branch within the Nova Scotia Department of Natural Resources and Renewables has conducted a review of selected sections of the Environmental Assessment Registration Addendum submitted by Atlantic Mining NS Inc., dated March 2022, for the proposed Touquoy Gold Project Site Modifications. This review was conducted through the lens of requirements as laid out under the Nova Scotia *Mineral Resources Act* and its associated regulations.

It is understood that this addendum was submitted to the Environmental Assessment Branch within the Nova Scotia Department of Environment and Climate Change at the Department's request to provide additional information to the Minister of Environment and Climate Change to allow for an informed decision regarding proposed modifications to the Touquoy Gold Project as they relate to aspects including in-pit mine tailings disposal, ground and surface water, fish and fish habitat, protected areas, wildlife, wetlands, and historical mine tailings. Additionally, it is understood that this addendum is intended to be a complete and wholesome response to the additional information request.

The following comments are provided regarding the project and is limited to the review of documents submitted and reviewed as part of the Environmental Assessment Registration Document Addendum:

1. Modifications as laid out in the addendum are expected to support efficient mining within the mineral lease as well as the associated properties (i.e., Beaver Dam, Fifteen Mile Stream) as supported under Section 80 of the *Mineral Resources Act*.
2. As per Section 86 (3) of the *Mineral Resources Act* the department requests that the proponent files a revised reclamation plan which covers all planned changes to future

reclamation activities of any portion of the project that may be affected by these proposed modifications.

- a. If the revised reclamation plan filed under Section 86 (3) is shown to have increased in the expected reclamation cost estimate, then pursuant to Section 88 (1) (f) the proponent is to post a revised security with the Registrar of Mineral and Petroleum Titles.
3. As part of the revised reclamation plan, details of the proposed reclamation design, beyond the concepts provided, would be required to assess the long-term suitability of the reclamation plan for the subject site and determine compliance with the *Mineral Resources Act* and associated regulations. Details required would include the following:
 - a. Detailed commitments to progressive reclamation of the Waste Rock Stockpile Area.
 - b. Detailed timeline and sequence of the progressive and final reclamation of the site, including the Waste Rock Stockpile Area and the Touquoy pit.
 - c. Timeline for the completion of various studies and the development of the detailed final designs as noted throughout the submission.
 4. The Department of Natural Resources and Renewables supports the conceptual plan to place the tailings in the mined-out Touquoy Open Pit. Such sub-aqueous disposal of tailings appears to be a reasonable approach for tailings disposal in this instance; however, additional details are requested to allow for proper review and comment regarding long-term feasibility of tailings deposition and reclamation. Details would include the following:
 - a. Consideration as to if the in-pit deposition rate of tailings may exceed the tailings ability to consolidate (i.e., pore water becoming trapped in tailings at the base of the pit), particularly in the early stages of deposition when the thickness of deposited tailings is likely to increase at its highest rate (due to the geometry of the pit).
 - b. Confirmation if the supernatant portion of the tailings deposited are expected to:
 - i. Remain in-pit until process water within the current Tailings Management Facility has been exhausted; or,
 - ii. Supplement process water from the current Tailings Management Facility until the current facility is exhausted.
 - c. If the in-pit water is to supplement the Tailings Management Facility process water, confirm that the in-pit water depth will allow for the operation of the in-pit reclaim pump while providing sufficient water cover of the tailings.
 - d. As the surface area of the in-pit tailings area will differ in size in comparison to the surface area of the current Tailings Management Facility (thus the required

volume of water to meet the required thickness of the water cover will differ), how will the transition between these facilities effect the water requirements for freshwater make-up withdrawal in the short and long term.

The proponent has previously demonstrated that their gold mining project is providing tangible benefits for both Nova Scotia and the proponent, the details requested above are not necessarily required prior to approval of the Environmental Assessment as Items 1, 2, and 3 may be addressed through the *Mineral Resources Act*, and Item 4 is operational in nature and may be appropriately addressed in an updated Industrial Approval and/or Water Approval.

The Geoscience and Mines Branch would like to reiterate that the Department of Natural Resources and Renewables supports the continued development of the mineral resources within the province when conducted in a manner that promote the sustainable development of natural resources to support jobs, help grow the economy, provide social benefits, and in an environmentally responsible manner. Therefore, the Geoscience and Mines Branch supports the approval of the Environmental Assessment.



Natural Resources and Renewables

MEMORANDUM

TO: Bridget Tutty, NS Department of Environment and Climate Change
FROM: Nova Scotia Department of Natural Resources and Renewables
DATE: April 22, 2022
RE: Touquoy Gold Project

The Department of Natural Resources and Renewables (herein the Department or NRR) provides the following comments on the above project:

Crown Lands:

The proponent has obtained a Crown land lease for the Touquoy Gold project for the following purpose:

Unless agreed otherwise by the Lessor, the Lessee shall use the Property for the sole purpose of surface mining for and processing of gold and for the placement of infrastructure necessary to develop and operate a surface gold mine, including, processing of gold and/or storing of mine tailings from other mine sties as well as reclamation of the site (the "Project"), and for no other purpose.

The Crown land lease contains the following conditions:

7 (a) The Lessee shall be required to leave a thirty metre treed buffer zone along watercourses within the Property, which shall be referred to as the "Management Zone". Removal of vegetation is prohibited within this Management Zone.

7 (b) The Lessee shall locate the min pit at least 70 metres away from the Moose River and the Lessee shall construct a vegetated berm between the mine pit and the Management Zone.

If there are any changes to the reclamation plan, which forms part of the Crown lease, the Department requires the proponent to apply for an amendment to the Crown land lease to incorporate the new plan. It is not clear from the information provided if a change to the reclamation plan has occurred. The following information would need to be confirmed with the Department's Land Administration Division:

Waste Rock Storage Area

- The collection pond to the east appears to be close to watercourse #4, and over top of wetlands #17, and #42.
- The storage expansion to the north is close to Square Lake, however, the disturbance limits mirror the lake on the east side, so an assumption would be the mirroring is to accommodate the buffer. **This would need to be confirmed**

Plant Site

- The east collection pond appears to be within the current roadway; therefore, it doesn't appear to be an issue.
- The access road to the southwest is close to unnamed waterways and/or wetlands, however, the disturbance limits mirror these, so an assumption would be the mirroring is to accommodate the buffer. **This would need to be confirmed.**

Clay Burrow Area

- The eastern boundary of this area appears to be close to watercourse #3. It is not clear if it meets the 30 m buffer. **This would need to be confirmed.**

Wildlife, Wildlife Habitat and Species-at-Risk:

With respect to wildlife, the Minister of Environment and Climate Change requested the following information from the proponent in the addendum:

- *Provide all flora and fauna survey data referenced in the EARD with corresponding analysis.*

This requirement directly results from the following comments provided by the Department of Natural Resources and Renewables with respect to the project:

3. Further Detail Required: The document is informed by surveys that underpin the 2007 application, but the details of these surveys are not provided. Without that information, it is not possible to evaluate the validity of the work or results. Surveys in question include the Habitat and Vegetation Surveys, the 2004 Herptile-Specific Survey, and the Lichen Survey work.

The Department has the following recommendations as conditions for approval: a) Provide detailed information on the surveys associated with the 2007 EA that support decisions within this EA application. Additional field surveys may be required if this information is deemed by the Department to be inadequate to support decisions concerning wildlife and associated habitats. b) Provide information to indicate surveys took place in Wetland 15 to confirm the presence or absence of Snapping Turtles. Without data to suggest otherwise, it is assumed turtles are present in this wetland and associated mitigation measures will have to be developed in consultation with the Department.

Comments:

4.1.3 Flora 2021 Survey Results. Although the proponent has stated that the single day of vegetation surveys (September 30th) was within the growing season, there is a concern that the single day of surveys nearing the end of the season could result in an incomplete assessment. In order for rare plant surveys to be defensible, surveys should be conducted twice during the growing season.

4.1.4 Lichen Survey 2020 and 2021 Methodology. *“In the event lichen specimens could not be identified in the field, lichen samples were collected (when in abundance on site) in paper bags and stored for future identification.”* The Department is concerned that the inability to identify a lichen in the field could have resulted in the inadvertent destruction or disturbance of a listed Endangered or Threatened species, in contravention of the *Endangered Species Act* (ESA.)

Figure 4.1. Lichen tracks in the southern area of the Local Area of Assessment (LAA) seems disproportionate to the amount of potential suitable habitat and is not comparable to the survey effort in other areas of the LAA

Figure 4.1. It is unclear which lichen tracks were conducted in 2020 and 2021. Appendix F Table 1 Summary of Flora Fauna Surveys and Data Source References provides some detail relating to methodology but information is lacking for older data sets (2004-2007). It is recognized that in many cases this may be the result of incomplete records by previous surveyors and changes in survey standards that are beyond the control of the current author of the report. Data has not been provided (in terms of GIS shapefiles, data points, and transects) to the Wildlife Division, NRR.

Conditions:

The following conditions are requested as part of the addendum:

1. **With respect to the proposed undertaking, the proponent must ensure they are compliant with federal and provincial Acts and regulations such as the *Migratory Bird Convention Act*, the *Species at Risk Act*, the *Wildlife Act*, and the *Endangered Species Act*, and that any regulatory requirements such as permits are adhered to.**
2. **Proponent must provide all data points for SAR/SoCC species and GPS track logs for lichen surveys.**
3. **Additional vegetation surveys are required. A minimum of two days of vegetation surveys (one early/mid season, one late season) must be conducted within the growing season**
4. **A detailed species list of all lichen specimens collected during field surveys and locations must be provided to NRR.**

The following conditions were requested as part of the review of the *July 2021 Torquoy Gold Project Modifications-Environmental Assessment Registration Document* and are still relevant to this addendum:

5. **Clearing of vegetation and grubbing must occur outside of the breeding season for most bird species (April 15 to August 15). If the activity must be conducted during the breeding season, approval may be granted following the development and implementation of an appropriate bird/nest survey, and only following approval by NRR.**
6. **Revegetation measures should be with local naturally occurring seed or plant sources.** Where possible, any soil removed for site prep should be stored in a manner where the seed source remains viable and reused for revegetation on site.
7. One occurrence of Blue Felt Lichen (*Degelia plumbea*) is within the expansion LAA in wetland 15. In addition, there is another Blue Felt Lichen in wetland 40 within 500m of the clay borrow expansion area and within 50m of an access road and other infrastructure. **Mitigation measures and a monitoring program for protection of Blue Felt Lichen must be developed in consultation with the Wildlife Division, NRR.**
8. **The lichen monitoring plan identified by the proponent in Section 9.6 Mitigation must be developed in consultation with the Wildlife Division, NS NRR and only implemented following approval of the plan.**
9. **Due to a lack of information, NRR requires the proponent to update the Wildlife Management Plan (WMP) to ensure that activities are compliant with relevant Acts and regulations pertaining to wildlife and species at risk (*Migratory Birds Convention Act, federal Species at Risk Act, Nova Scotia Species at Risk Act, Endangered Species Act, and Wildlife Act*). The WMP must be developed in consultation with the Department's Wildlife Division and be approved by NRR and Environment and Climate Change before any work commences. At a minimum, the WMP should include the following:**
 - **Measures to ensure the site is managed in a way to prevent the creation of habitat for species such as, but not limited to, Common Nighthawk (*Chordeiles minor*), Bank Swallow (*Riparia riparia*), and native turtle species (Wood Turtle (*Glyptemys insculpta*), Snapping Turtle (*Chelydra serpentina*), and Eastern Painted Turtle (*Chrysemys picta*)).**
 - **Mitigations against impacts of noise, light, and dust during the construction and operation of the project;**
 - **Measures to prevent the spread of invasives on and off site, including a revegetation plan;**
 - **Management of non SAR/SoCC wildlife within the PDA;**
 - **Communication plan in the event of observations, encounters, or adverse effects of the undertaking on wildlife and/or SAR.**

MEMORANDUM

To: Bridget Tutty, EA Branch

From: Water Resources Engineer, Water Resource Management Unit,
Sustainability and Applied Science Division

CC: Jennifer Rocard, Manager, Water Resource Management Unit

Date: April 22, 2022

Subject: Touquoy Gold Project Modifications EA Application Review
Comments

Scope of review:

The scope of this review from the NSE Sustainability and Applied Science Division Water Resources Engineer is to assess the potential environmental impacts and proposed mitigations of the proposed undertaking on surface water quantity and management and assess them for significance. While comments may also include considerations for impacts on general surface water quality, groundwater, freshwater fish habitat, and wetlands, appropriate technical specialists for these areas should be consulted for specific review and comment. Format of comments generally follows pulling direct statements from the submission and supporting documents, with sub-bullets reflecting feedback on these statements.

Limitations of Review:

Due to the limited time provided for review and complexity of this file, the comments and conclusions/recommendations below are based upon review of only the most relevant sections/appendices of the current submission related to surface water, specifically the sections within the EA submission and Appendices A, C and D. Limited review has been conducted of other related volumes of information (e.g., original EIS submission, etc.).

Review re: Touquoy Gold Project Modifications EA Application:

General:

- Operations are currently under an Industrial Approval
- Proposing to complete the following modifications:
 - use of the exhausted Open Pit for tailings disposal instead of the existing approved Tailings Management Facility (TMF)
 - expansion of the Waste Rock Storage Area (WRSA)
 - expansion of the Clay Borrow Area
 - relocation of the road used to access the Mill Plant
- Environmental Assessment was originally approved in 2008, with mining of the current open pit at Touquoy commencing in October 2017

Groundwater

- “The groundwater flow model (Appendix D.1 to the EARD) was used to predict the groundwater inflow rates to the Open Pit during the filling of the Open Pit with tailings and water. The filling of the Open Pit was simulated by adding tailings to the model, and then predicting the groundwater inflow rates to the pit over time” (pg. 5)
- “The potential impacts to groundwater quality associated with in-pit tailings disposal during filling were **predicted** to be minor in nature and localized to within a short radius of the flooded Open Pit... As described in the Touquoy groundwater modelling report (Appendix D.1 to the EARD), **the model simulated** the release of water from the pore spaces in the deposited tailings, and the pit lake quality based on a relative contribution basis. The total groundwater seepage rate was **simulated** to contribute approximately 0.6% of the flow in Moose River River; therefore, the mass loading of the primary compounds of concern were **predicted** to be low and not anticipated to adversely affect the water quality in Moose River. (pg. 6, emphasis my own)
 - It is noted that the results stated here are reliant upon the adequacy of the Groundwater Flow Model (bolded emphasis mine).
- “The bedrock hydraulic conductivities obtained from the new 2021 investigations are generally within or below the historical ranges used for the previous modelling, as shown on Figure 2.2.” (pg. 8)
- “Specific changes made to the groundwater flow model include: Incorporating new estimates of hydraulic conductivity in the bedrock units and selected fault zones; Refining the locations of underground mine workings based on additional information from AMNS and a surface geophysical investigation; Recalibrating the groundwater flow model to reflect the new field data; Re-running the groundwater flow and transport model to update the predicted mass fluxes of dissolved constituents from the Open Pit that have the potential to affect Moose River. Other than the changes above, the groundwater flow and transport model was unchanged from that submitted in support of the EARD.” (pg. 11)
- “The calibration quality of the updated model is similar to the calibration quality of the original EARD model. Additional details and model output are presented in Appendix B.2. The updated model results are similar to the results from the original EARD model.” (pg. 11)
 - Results aren’t summarized in main submission?
- “Based on the available information and analysis completed, the hydraulic conductivity for the bedrock in the pit area does not indicate additional seepage mitigation is required to avoid

environmental interactions. However, to address any uncertainty related to the presence and interconnectivity of the underground workings, a low permeability liner is proposed on the western side of the Open Pit. Pit. In addition, there are localized fault zones where concentrated grouting may be required.” (pg. 12)

- “The results from updated groundwater flow and transport modelling do not substantively change the predicted groundwater contributions to the assimilative capacity modelling performed for the EARD. In the water balance/water quality models, groundwater flows are added to the calculated surface water flows in Moose River. Since the predicted groundwater seepage quality and mass loading would not be changed based on these results, the predicted overall water quality in Moose River would not be affected by the relatively minor reductions to groundwater seepage rates.”
- Section 5.5 of the appendix asks to “Describe uncertainty present in the results presented and potential ranges of values that should be considered in the assessment of impacts from what is proposed?” (App A, pg. 24)
 - The answer that follows does not address the request for a range of potential values that should be considered in the assessment of impacts.

Water quantity: Site Drainage and Water Balance

- “The Third Party Review indicated that the small expansion to the WRSA would not likely result in a significant change in the related environmental effects.” Pg 21
- “Water quality results reported in the 2020 Annual report (Attached to EARD as SD 19) indicated that there may be a design/construction issue with the WRSA ditch on the western side of the WRSA, contributing to observed changes in water quality...The following provides an update on the requirements and progress of the investigations and proposed remediation for the WRSA ditch and related water management.” (pg. 21)
- “The Touquoy Integrated Water and Tailings Management Plan presents an environmental water balance and the site wide water balance model. The environmental water balance was provided for context as it was used as a starting point in the Touquoy site wide water balance model to estimate the proportion of precipitation as runoff after evapotranspiration and infiltration losses (i.e. the runoff coefficient). As the site has been in operation since 2018, these initial runoff coefficients estimated in the environmental water balance have been updated through bi-monthly calibration to metered data in the site wide water balance model. The environmental water balance was completed for the site based on the 1981-2010 climate normal conditions at the Middle Musquodoboit climate station. In this model, when temperatures are below zero it is assumed that precipitation was stored as snow thus no runoff. This is a common assumption in a water balance in an Atlantic climate. Rational for these assumptions are provided below:
 - As much of the project catchment area is unforested/unvegetated, transpiration is only a small portion of evapotranspiration year-round and considered negligible for the site.
 - Lake evaporation rates are reported at the Truro climate station as zero for these same winter months. The Truro climate station is used to represent pond evaporation in the water balance model.

Typically, the ground is frozen in the winter months limiting soil saturation or natural percolation into the ground.” (App A, pg. 16)

- Please confirm if the assumptions stated here are also present in the site wide water balance, which through Section 4.7 of Appendix A is understood to have superseded the environmental water balance. As mentioned in my original comments, negligible runoff in winter months is not an accurate depiction of winter conditions in Nova Scotia, where we see significant flow events related to rain on snow/frozen ground conditions every year throughout the winter months. How is the water that is ‘stored’ as snow during winter months considered in the overall annual water balance, and how does this assumption impact overall results and predictions? For example, does the water stored in the modelled hypothetical snowpack carry over from month to month and accumulate across all months with <0 deg C average temperatures, and does the model currently consider the melt of this accumulated snow all at once as soon as monthly average temperatures exceed 0 deg C?
- “Both evapotranspiration and infiltration losses are accounted for in the site wide water balance model as a whole and as discussed above in comment 1.5a), and have been calculated based on observed data.” (App A, pg. 19)
 - Where is comment 1.5a)? From a search in the document, there is no other reference to 1.5a)
- “Explanation of Table 5.1 of Appendix A.1 to the EARD” (App A, pg. 19)
 - To confirm, what Table 5.1 are they referring to? Table 5.1 in Appendix A.1 of the EARD is “Table 5.1 MDMER Schedule 4 Table 2 Limits of the Metal and Diamond Mining Effluent Regulations”, which does not seem to align with what is referred to here?
- “Pumped inflows to the pit, which includes the runoff to open pit catchment, runoff from Scraggy stockpile, and runoff from the WRSA have been presented in Table 4.1, as net precipitation and already account for these evapotranspiration and infiltration losses. This includes the pumped inflows discussed above, the evaporation loss of the pit lake, and the pit groundwater inflow.” (App A, pg. 19)
 - Does ‘Pumped inflows to the pit’ really mean ‘sum of inflows to pit during pit filling’ in Table 4.1?
- “Similarly, the monthly volumes reported in Table 4.11 of the Touquoy Integrated Water and Tailings Management Plan (Appendix A.1 of the EARD) incorporate the evapotranspiration and infiltration losses. The inflows to the pit are presented as net precipitation in Table 4.11 as “Sum of Inflows to Pit.” Losses due to evaporation and spillage were also accounted for in the process balance. These losses are calculated as metered data is available throughout the mill circuit. These losses account for approximately 3% of tailings production (t). These monthly losses were not presented in the Open Pit Process Water Balance Touquoy Integrated Water and Tailings Management Plan. The monthly volumes of “Discharged with thickened tailings” accounts for these losses and have been calibrated to observed pumped discharge data.” (App A, pg. 20)
 - It remains unclear how evaporation has been incorporated into the Water Balance. From a review of the above and Table 4.11, it seems that evaporation values are included as part of the “discharged with thickened tailings” columns within Table 4.11 of Appendix A of the EARD, and are calculated through metered data from existing operations. How does that relate to the evaporation that will increase as a result of changes to open water surface area within a filling open pit?

- “The environmental water balance was provided for context as it was used as a starting point in the Touquoy site wide water balance model to estimate the proportion of precipitation as runoff after evapotranspiration and infiltration losses (i.e. the runoff coefficient). As the site has been in operation since 2018, these initial runoff coefficients estimated in the environmental water balance have been updated through bi-monthly calibration to metered data in the site wide water balance model. The site wide water balance model at Touquoy has been matching closely with the observed values. Therefore, the environmental water balance has been superseded by the site wide water balance model.” (App A, pg. 20)

Water Resources:

- “The confidence of regional regression is high especially at timescales applied in this Project such as mean annual flow, mean monthly flow, peak flows and low flows from which environment flow or instream maintenance flows are derived.” (App A, pg. 5)
 - How do values obtained through regression compare against measured data across timescales outlined above?
- “The simulated runoff coming from the WRSA is calibrated bi-annually based on observed pump records of toe seepage/runoff to the WRSA ponds. The value of runoff and evaporation carried in the water balance model will be based on the latest available data.” (App A, pg. 21)
 - The other questions posed in comments included highlighting that the runoff coefficient used in different parts of the assessment was observed to differ, with App D.2, pg. 2 of the EARD stating “Assuming the runoff coefficient of 30% of the net precipitation, the infiltration rate into the WRSA is estimated to be 70% of net precipitation.”, while the runoff coefficient for the WRSA in App A, pg. 21 and otherwise provide a value of 0.43. Please clarify these differences
- “Section 5.1 presents Table 5.1 and information related to the question is provided. It is reported that “The modeled recharge and ET should not be evaluated in isolation; rather, the net annual recharge (modeled recharge – modeled ET) from the model output should be compared with the expected range of the percentage of annual precipitation that recharges groundwater of 10% to 30%.” (App A, pg. 23)
 - The values related to modeled ET have changed from the original submission, but remain significantly different than the values that would be expected for ET annually in Nova Scotia. As asked in the original comments, were these values reviewed after the auto-calibration that took place for appropriateness in terms of representing realistic conditions? What are the impacts on the results if realistic annual ET numbers are used?
- “Uncertainty in predictive model results presented in the EARD is mainly due to the density of available data in areas of potential impacts from mining operations; specifically, the area between the pit and Moose River and the area around the WRSA. Based on the additional work carried out in this area and subsequent updates to the model (Section 2.1 and Appendix B.3 of the Main Addendum Report), the certainty associated with modelling predictions has been increased.” (App A, pg. 25)
 - The answer provided in D.5 does not address the original question, including an overview of the range of potential values that could result

Scraggy Lake:

Moose River:

- “Upon further investigation, seepage into the Open Pit appears to have a minor influence on stream flows in Moose River during low-flow. This is attributable to the diversion of groundwater to the Open Pit that would have otherwise discharged to Moose River. It is not considered to be baseflow seepage from Moose River to the Open Pit.” (pg. 29)
 - What is ‘minor’ influence?
- “Hydrometric monitoring has been undertaken at select locations in Moose River (Table 3.3). A more detailed analysis of estimated and observed flow is provided for Moose River using data from the 2021 monitoring period, included below.”
 - Please provide a figure that provides monitoring locations. Several stations are not shown on previously provided figures, and an updated figure is not provided to support effective review of what is put forward.
- “Water quality was simulated to improve overtime and in Year 30 is expected to meet discharge quality, without considering any water quality improvements realized from batch treatment during filling” (App A, pg. 20)
- “Overlaying the calculated and estimated flows enables investigation of potential flow losses at SW-2 that may be associated with the Open Pit... Calculated and observed flows at SW-2 during summer 2021 monitoring tracked consistently with observed differences of less than 10% of calculated flows...The investigation examined potential flow losses to the pit by examining daily pit dewatering records and determined that the upper bound of proportion of total decrease in instantaneous streamflow attributed to the Open Pit is 9%, meaning that no more that 9% of the calculated to observed flow difference could be attributed to pit inflow losses from the Moose River. Apart from the interpreted small potential flow loss to the Open Pit, other potential sources of variance between calculated and observed flows include, but are not limited to:
 - Evapotranspiration losses, as indicated in correspondence from NRCan (2020) that flow observed in rivers during the warm summer months is subject to heavy evapotranspiration losses (20-50% of the flow)
 - The flow response from precipitation events at HM-1 Long Lake tributary varying from the response in Moose River; thus, showing a delay in discharge from rainfall events
 - Natural characteristics of the river and watershed” (App A, pg. 12)
 - It remains unclear how values are being calculated for SW-2 based on the language provided here. It is stated that “The method used to calculate the flows at SW-2 were to take the flows estimated (measured) at SW-11 upstream of the mine site and estimated (measured) at HM-1 (Long Lake tributary) and then **prorate these flows** to the combined Moose River watershed at SW-2.” From this language (with specific mention of those words that I have bolded), both flows are prorated? Please clearly clarify exactly what is being done
 - How valid are pit dewatering records as an indication of flow losses from Moose River as a result of mine activities? Additional information is required to support if this information is going to be used as the evidence to support the determination of the extent of the mine activities influence on losses observed in Moose River. Additional information should include how often is water in the pit pumped, how is it metered,

what is the volume and area of water ponds within the pit before it is pumped, among other potentially pertinent information.

- As previously outlined in comments, evapotranspiration losses of “20-50% of the flow” in a flowing watercourse, and particularly in the context of justifying losses between two monitoring points ~3 km apart as I understand the case to be here, is not defensible. Clarification of exactly what question the person referenced here was actually answering is recommended
- “Figure 3 presents the regression analysis completed to determine the relationship between catchment areas and average flow in April, August, September, and June-July-August for the selected WSC stations.” (App D, pg. 6)
 - The average July flow figure shown in Figure 3 only has 4 stations listed, with no stations less than 100 km² used. It is unclear why a different approach was used for July - please clarify.
- “An environmental water balance was used to predict the Open Pit effluent overflow to Moose River at mine closure (Stantec 2021b).” (App D, pg. 8)
 - It is stated that “Therefore, the environmental water balance has been superseded by the site wide water balance model.” (App A, pg. 20)
 - Why is the environmental water balance being used in this assessment?
- “Per Appendix D.5 of the EARD, Section 8.0, low river flows correspond to low effluent flows and high river flows correspond to high effluent flows. This occurs because the Touquoy pit effluent and river flow are driven by the same meteorological factors. As a result, the dilution scenario in Moose River differs from a typical wastewater dilution scenario where effluent flow is constant and is not subject to seasonal climate or meteorological event changes. Regarding effluent flow to Moose River, the lowest dilution ratio occurs when the effluent flow rate is high in comparison to the receiving water body flow rate. During typical low flow months, both the effluent flow rate and receiving water flow rate are low, resulting in a higher dilution factor. Typical low flow metrics were not applied for this reason.” (App A, pg. 31)
 - It is further noted that the assessment provided in Appendix D uses average monthly effluent flow rates. Where the connection between effluent discharge and river flow conditions is used to support the assessment, has any consideration been made for the potential differences in runoff responses between the Open Pit and Moose River? As a result of the significant differences in watershed sizes as noted on page 12 of Appendix D, the timing of peak flows associated with rainfall events are likely to differ between the open pit and the Moose River, with a potential scenario of discharges from the Open Pit occurring in advance of relative increases within Moose River (and thus less assimilative capacity).
 - In addition, using the logic provided in App A pg. 31, why is the dilution ratio so different between June/July August and September, as shown in Table 8.1 of Appendix D?
- Table 8.1 - Dilution Ratio in the Receiver at Full Mixing (App D, pg. 12)
 - From the perspective of validation of the use of the relationships shown in Figure 3 of Appendix D, how do values of receiver flow calculated and provided here compare against measured values?

Watercourse #4:

- It is stated “Flow cross sections were measured at minimum of 10 site visits.” (pg. 27).
 - Can you please clarify what this means? Is this saying that flow gauging was completed at each site a minimum of 10 different occasions?
- It is stated that “Mean monthly flows at Watercourse #4 surface water monitoring locations are presented in Table 3.2 below, as instantaneous flow rates over the 2021 monitoring period of record.”
 - Please clarify what is meant by “as instantaneous flow rates over the 2021 monitoring period of record”
- “As a part of detailed engineering, Stantec intends to model the watershed of Watercourse #4 upstream of Mooseland Road using a hydrologic model such as HEC-HMS or PC-SWMM for a series of precipitation events ranging from a 10 mm, 25 mm, 2 year to 100 year return period to characterize existing conditions in a series of hydrographs.” (App A. pg. 14)
- “Through proposed hydrologic modeling during detailed engineering, which will be included in the Industrial Approval submission, AMNS intends to demonstrate the compatibility of the new sedimentation pond outflows at the new FDP in Watercourse #4 to contribute higher flows without inducing flooding or erosion and extend baseflows in this relatively intermittent section of Watercourse #4 headwaters.” (App A. pg. 14)
- “The MAF and MMF estimates in Table 3.2 bring the statistical strength and verification undertaken in vetting and confirming the Regional Hydrology Dataset grouping and therefore are considered more accurate and consistent with other long term flow estimates based on the Regional Hydrology dataset.” (App A, pg. 15)
 - The original intent of the question I posed is not addressed here – as summarized in my original comments, the question was focused on the differences between the information presented in Table 7.10 in the original EARD and what was presented in Table 7.22 in the original EARD, which is not addressed here. Upon substantial re-review of Table 7.20, 7.21, and 7.22 of the original EARD, as well as Appendix A of the addendum, I believe I better understand the intent of Tables 7.21 and 7.22. The questions I previously highlighted in the EARD could be rephrased as why do the values in 7.22 not match the ‘Difference’ column within Table 7.20 (which uses information first introduced in Table 7.10)?
 - As additional feedback on the new information presented in the addendum: As outlined in Table 7.10 of the EARD, the three WC4 catchments are all <math><0.8 \text{ km}^2</math> in area. The smallest watershed used in the regional analysis is $\sim 10 \text{ km}^2$. It should be noted that using the regional hydrology dataset in this context involves significant extrapolation from the relationship developed, and recognition of the uncertainty that results from this. In addition, Figure 4.1 on page 22 of Appendix A shows results from 2021 monitoring. How do the values outlined in Table 3.2 compare to observed data?
 - New numbers are provided here, but what do they mean in the context of the submission and how these numbers were used? Discussion of what this change means in terms of the plans for Watercourse #4 is not provided, including any potential impacts of these changes on the originally submitted plan to divert area of the WRSA to supplement flows
- “The results of the estimated resulting flows at SW-19 are presented in Figure 1.5. j-1 and will be confirmed by the modeling proposed in 1.3.e.” (App A, pg. 21)

- No Figure 1.5 j-1 is provided, and there is no section 1.3.e to review what modeling is proposed. Without knowing what is proposed it is difficult to comment, but it is worth noting that measurements and observations are what confirm modelled estimations, not models.

Conclusions & Recommendations:

It continues to be difficult to have a clear understanding of what tools are being used for what purposes as it relates to developing and supporting conclusions related to impacts on water resources associated with the proposed works, and on the level of confidence in the assumptions and models being used to support assessment of impacts.

- The questions that have been answered in the submission (e.g., Appendix A) have been provided without much in terms of context or with reference to who's specific comment they are addressing, and as a result, are challenging to clearly tie to specific comments that were made in order to evaluate whether the original questions have been answered. In addition, some of the answers are provided in a way that is challenging to tie back to the conclusions made in the original EARD related to environmental impacts, and several questions originally posed in comments appear to have been unanswered.
- As outlined in original EARD comments and as highlighted through discussions with Atlantic Gold and their consultants following the submission of the original EARD, the challenges related to the definition of 'baseline' and the need for clarity surrounding what conditions the proposed additional works were evaluated against (e.g., against current conditions or conditions outlined in original EA) and the need for discussion of cumulative impacts related to the proposed additional works with consideration with what was in reported in the original EA submission are not clearly addressed in the addendum.
- Several questions remain related to the impact of stated assumptions on results. Where these predictions form the foundation of understanding the potential impacts of the works, this information is critical to be clearly understood prior to approving the EA