Appendix D.3

Fifteen Mile Stream Project Tailings Management Plan for Environmental Impact Statement Submission,

Knight Piésold Ltd

Prepared for
Atlantic Mining NS Corp
409 Billybell Way, Mooseland
Middle Musquodoboit, Nova Scotia
Canada, B0N 1X0

Prepared by
Knight Piésold Ltd.
Suite 1400 - 750 West Pender Street
Vancouver, British Columbia
Canada, V6C 2T8

VA101-708/4-3

FIFTEEN MILE STREAM PROJECT
TAILINGS MANAGEMENT PLAN FOR ENVIRONMENTAL IMPACT STATEMENT SUBMISSION

Rev	Description	Date
0	Issued in Final for EIS Submission	September 30, 2019
1	Issued with Revisions to Water Management Infrastructure	June 16, 2020

Knight Piésold CONSULTING

EXECUTIVE SUMMARY

The Tailings Management Plan outlines Atlantic Mining NS Corp.'s strategies to responsibly manage tailings produced by the Fifteen Mile Stream Project. The Project will generate tailings that will be stored in a Tailings Management Facility, located to the east of the Open Pit, adjacent to the Plant Site.

The primary objectives of this plan include ensuring the long-term physical and chemical stability of the tailings and preventing contamination of groundwater and surface waters proximal to the TMF.

This plan outlines the:

- Applicable legislation and guidelines
- The design basis and operating requirements of the TMF
- Environmental protection measures to be implemented
- Proposed monitoring to confirm the effectiveness of the mitigation strategies
- The responsibilities of AMNS and its contractors

The plan applies to the construction and operational phases of the Project. At closure, the TMF will be reclaimed as described in the Project Description of the EIS (Chapter 2).

The Tailings Management Plan is a discipline-specific biophysical management plan that forms part of AMNS's overall Environmental Management Plan (EMP) developed for The Project. AMNS will update this as part of the Industrial Approval (IA) application process and prior to construction to reflect relevant design changes during detailed engineering, and through the life of the Project based on the outcome of management reviews, incident investigations, regulatory changes, or other Project-related changes.

Related environmental management plans are presented in the Environmental Management System Framework document provided in the appendices to the EIS.

This plan has been prepared to comply with existing regulations and follow the available guidelines provided by the federal and provincial governments.

The proposed Process Plant throughput is approximately 5,500 tonnes per day (tpd). Tailings will be produced at a slurry solids content of approximately 38% solids by weight before being pumped to the TMF. The tailings will be conveyed in a single overland pipeline and discharged from the TMF embankment via spigotted offtakes.

A total of 13.4 million tonnes (Mt) of tailings will be discharged to the TMF over the 7-year mine life. The estimated average settled dry density of the tailings is approximately 1.3 tonnes per cubic metre (t/m^3).

During the Construction Phase, a starter dam will be constructed using material generated from pre-stripping of the Open Pit and from excavation of a local till borrow source and will provide approximately 12 months of tailings storage. An embankment raise is scheduled to take place during the first year of operations. The TMF embankments will be progressively expanded at scheduled intervals during operations, utilizing the downstream method of construction.

Materials from the Open Pit (non-acid generating (NAG) waste rock) and borrow pits (low-permeability till) will be used to construct the expansions. The embankment will include an upstream liner system with the liner extending from the upstream toe of the embankment into the TMF basin to control seepage gradients prior to the development of the tailings beaches.

Measures will be taken to:

- Minimize exposure of the tailings to the atmosphere, to reduce ML/ARD, and also reduce potential dusting
- Prevent runoff and seepage from interacting with surface or groundwater
- Stabilize the TMF embankments
- Prevent harm to wildlife

Adaptive management may be required if environmental performance monitoring indicates results that differ from those predicted. The need for any corrective actions to on-site management of the TMF or installation of additional control measures will be determined on a case-by-case basis, based on monitoring conducted as described above.

Guidelines for monitoring, inspection and reporting on the performance of the TMF are outlined in the Canadian Dam Association Dam Safety Guidelines and the CDA Technical Bulletin on the Application of the Dam Safety Guidelines to Mining Dams.

These documents provide requirements for dam safety inspections and reviews, and the development of an Operations, Maintenance, and Surveillance (OMS) Manual as well as an Emergency Preparedness and Response Plan (EPRP) specific to the TMF. The OMS Manual and EPRP will be prepared as part of an Industrial Approval Application and will be reviewed and revised annually and as each staged TMF expansion is constructed.

Geotechnical instrumentation will be installed in the TMF embankments and foundation during construction, and will be utilized during the Operation, Closure and Reclamation, and Post-Closure Phases of the Project.

AMNS will submit annual reports as required by the Nova Scotia Department of the Environment (NSE) and as outlined in the IA.

Roles and responsibilities with respect to tailings management will be developed and assigned as part of the preparation of the OMS Manual. Prior to conducting any work on the mine site, AMNS will designate a Mill Operations Manager who must be present onsite regularly, and who is ultimately responsible for application of all requirements on the site. As such the Mill Operations Manager is ultimately responsible for the safety of the TMF.

The Mill Operations Manager or designate will conduct regular evaluations of the monitoring activities as needed. This Plan may be updated if additional methods for monitoring are found to be more appropriate.

TABLE OF CONTENTS

PAGE

TABLES

FIGURES

ABBREVIATIONS

AEMP	aquatic effects management plan
AMNS	Atlantic Mining NS Corp.
AQDMP	air quality and dust management plan
ARD	acid rock drainage
CDA	Canadian Dam Association
EDF	environmental design flood
EDGM	earthquake design ground motion
EIS	environmental impact statement
EMP	environmental management plan
EoR	Engineer of Record
EPRP	emergency preparedness and response plan
ERP	emergency response plan
ESCP	erosion and sediment control plan
FMS	Fifteen Mile Stream
IDF	inflow design flood
ITRB	independent tailings review board
KP	Knight Piésold Ltd.
MAC	Mining Association of Canada
MDE	maximum design earthquake
MDMER	Metal and Diamond Mine Effluent Regulations
ML	metal leaching
mm	millimetres
Mt	million tonnes
NPAG	non-potentially acid generating
NSE	Nova Scotia Department of Environment
OBE	operating basis earthquake
OMS	operating, maintenance and surveillance
PAG	potentially acid generating
PGA	peak ground acceleration
PMF	probable maximum flood
Project, the	Fifteen Mile Stream Project, the
QA/QC	quality assurance/quality control
QPO	quantitative performance objective
SOP	standard operating procedure
SWMP	site water management plan
SWMS	surplus water management system
t/m^3	tonnes per cubic metre
TMF	tailings management facility
TMP	tailings management plan
tpd	tonnes per day
TSS	total suspended solids
WTP	water treatment plant

1.0 GENERAL

1.1 PURPOSE

The Tailings Management Plan (TMP) outlines Atlantic Mining NS Corporation's (AMNS) strategies to responsibly manage tailings generated at the Project. The Project will generate tailings that will be stored in a Tailings Management Facility (TMF) located to the east of the Open Pit (Figure 1.1).

The TMP is a discipline-specific biophysical management plan that forms part of the Project's Environmental Management System (EMS). AMNS will update this plan prior to construction to reflect relevant design changes resulting from detailed engineering. It will also be refined throughout the life of the Project based on the outcome of management reviews, incident investigations, regulatory changes, or other Project-related changes.

Related environmental management plans are presented in the Environmental Management System Framework document provided in the appendices to the EIS.

1.2 SCOPE AND OBJECTIVES

The primary objectives of tailings management activities are to ensure the long-term physical and chemical stability of the tailings and prevent contamination of groundwater and surface waters proximal to the TMF.

This plan outlines:

- Applicable legislation and guidelines
- Design basis and operating requirements of the TMF
- Environmental protection measures to be implemented
- Proposed monitoring to confirm the effectiveness of the mitigation strategies
- Responsibilities of AMNS

This plan applies to the Construction and Operation Phases of the Project. At closure, the TMF will be reclaimed as described in Project Description of the EIS (Chapter 2).

ORGANIC MATERIAL STOCKPILE (BY OTHERS)
SELOAM BROOK
SELOAM BROOK DIVERSION CHANNEL
SELOAM BROOK DIVERSION BERM
EGERTON MACLEAN OPEN PIT (BY OTHERS)
TILL STOCKPILE COLLECTION POND
ORE STOCKPILE COLLECTION POND
TILL STOCKPILE (BY OTHERS)
ORE STOCKPILE (DEPLETED)
EXISTING ROAD
NORTH SEEPAGE COLLECTION POND
STAGE 4 TMF EMBANKMENT EL. 164 m
TOPSOIL STOCKPILE
1 2.3 FIG
STAGE 4 RECLAIM CAUSEWAY
TMF PERIMETER ROAD
RECLAIM BARGE
SURPLUS WATER REMOVAL SYSTEM
TAILINGS MANAGEMENT FACILITY
EL. 156 m
EAST SEEPAGE COLLECTION POND
EAST LAKE
NON-PAG WASTE ROCK STOCKPILE COLLECTION POND
PAG WASTEROCK STOCKPILE (BY OTHERS)
NON-PAG WASTEROCK STOCKPILE (BY OTHERS)
DRUMLIN POTENTIAL BORROW, TYP.
PLANT SITE BY OTHERS)
MINE INFRASTRUCTURE (BY OTHERS)
EXISTING ACCESS TRAILS
RUNOFF COLLECTION SUMP
WATER TREATMENT PLANT (BY OTHERS)
SURPLUS WATER DISCHARGE PIPELINE
TO ANTI-DAM FLOWAGE
4 999 000 N
4 998 500 N
4 998 000 N
4 997 500 N
536 500 E
537 000 E
537 500 E
538 000 E
538 500 E
539 000 E
539 500 E
540 000 E
540 500 E

PLAN
SCALE A

LEGEND:

- MINE WATER
- FRESH WATER
- TAILINGS
- EMBANKMENT FILL
- WETLAND
- OPEN PIT (BY OTHERS)
- ORE STOCKPILE (DEPLETED)
- PAG STOCKPILE (BY OTHERS)
- NON-PAG STOCKPILE (BY OTHERS)
- TILL STOCKPILE (BY OTHERS)
- ORGANIC MATERIAL STOCKPILE (BY OTHERS)
- PLANT SITE (BY OTHERS)
- TOPSOIL PILE (BY OTHERS)
- RECLAIM PUMPS
- SURPLUS WATER REMOVAL SYSTEM
- WATER MANAGEMENT POND
- STREAM
- EXISTING ROAD
- PROPOSED ROAD
- SEEPAGE COLLECTION DITCH
- NON-CONTACT WATER DITCH
- POWERLINE
- RECLAIM WATER PIPE
- SURPLUS WATER PIPELINE
- SURPLUS WATER DISCHARGE PIPELINE
- TAILINGS DISCHARGE PIPE
- TAILINGS DEPOSIT

NOTES:

1. COORDINATE GRID IS NAD83, ZONE 20 T.
2. CONTOURS BASED ON 2014 LIDAR OBTAINED FROM GEONOVA, REPRODUCED AND DISTRIBUTED WITH THE PERMISSION OF INTERNAL SERVICES. CONTOURS HAVE BEEN PRODUCED BY KNIGHT PIESOLD LTD. AND INCLUDES DATA PROVIDED BY INTERNAL SERVICES. THE INCORPORATION OF DATA SOURCED FROM INTERNAL SERVICES WITHIN THIS PRODUCT SHALL NOT BE CONSTRUED AS CONSTITUTING AN ENDORSEMENT BY INTERNAL SERVICES OF OUR PRODUCT.
3. WETLAND AND WATER COURSE MAPPING PROVIDED BY McCALLUM ENVIRONMENTAL LTD. SEPTEMBER 06, 2018. DATA PROVIDED IN DRAFT WITH NO IMPLIED WARRANTIES AND SHALL BE CONSIDERED PRELIMINARY.
4. DIMENSIONS AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.

FOR INFORMATION ONLY

SCALE A 100 50 0 100 200 300 400 500 600 m

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
1	12JUN'20	ISSUED WITH REPORT	JEF	RMM/SC	DDF

ATLANTIC MINING NS CORP.

FIFTEEN MILE STREAM PROJECT

PROJECT OVERVIEW

Knight Piésold CONSULTING

P/A NO. VA101-708/4

REF NO. 3

FIGURE 1.1

REV 1

1.3 CORPORATE GOVERNANCE

AMNS is committed to developing an Environmental Management System (EMS) based on environmental risk; as a due diligence procedure from the perspectives of fiscal, legal, social and environmental responsibility. Development and implementation of the EMS, with associated procedures to be detailed in an Environmental Protection Plan (EPP), will include all phases of the TMF from construction to operation, maintenance, monitoring and ultimately closure, as well as integrate other aspects such as documentation. It is intended that the EMS and associated procedural level EPP will integrate systems, plans and processes across the Fifteen Mile Stream Project, including the Best Applicable Practices (BAPs) for tailings management.

1.4 APPLICABLE LEGISLATION AND GUIDELINES

This plan has been prepared to comply with existing regulations and follow the available guidelines provided by the federal and provincial governments. The following guidelines and regulations have been considered in the development of the tailings management plan:

- Canadian Dam Association, 2013. 2007 Dam Safety Guidelines – 2013 Revision.
- Canadian Dam Association, 2014. Technical Bulletin – Application of Dam Safety Guidelines to Mining Dams.
- Government of Canada, 2016. *Fisheries Act, 1995.* R.S.C., 1985, c. F-14. Amended 2016.
- Government of Canada, 2018. *Canadian Environmental Protection Act, 1999.* S.C. 1999, c.33. Amended 2018.
- Government of Canada, 2018. *Metal and Diamond Mining Effluent Regulations*. SOR/2002-222. Amended 2018.
- Environment and Climate Change Canada, 2009. *Environmental Code of Practice for Metal Mines*.
- Government of Nova Scotia, 2017. Nova Scotia *Environment Act,* Chapter 1 of the Acts of 1994-95 (Amended 2017).
- Government of Nova Scotia, 2018. Nova Scotia *Mineral Resources Act*, Chapter 3 of the Acts of 2016 (Amended 2018).
- Government of Nova Scotia, 2016. Nova Scotia *Occupational Health and Safety Act*, Chapter 7 of the Acts of 1996 (Amended 2016).
- Government of Nova Scotia, 1995. Nova Scotia *Water Act,* Chapter 500 of the Revised Statutes, 1989 (Amended 1995).
- Government of Nova Scotia, 2000. Nova Scotia *Water Resources Protection Act,* Chapter 10 of the Acts of 2000.
- Mining Association of Canada (MAC), 2017. *A Guide to the Management of Tailings Facilities.* Third Edition.
- Mining Association of Canada (MAC), 2019. *Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities*. Second Edition.

1.5 STAKEHOLDER ENGAGEMENT AND COLLABORATION

AMNS will develop or continue existing procedures for collaborative engagement with all stakeholders and the Mi'kmaq of Nova Scotia in the areas impacted by tailings or dam activities to improve overall tailings and watershed stewardship. Evidence demonstrating stakeholder and Mi'kmaq engagement on tailings

issues will be reviewed on an ongoing basis. All tailings related complaints from stakeholders or the Mi'kmaq within the geographic setting will be summarized as part of Complaints Response Procedure and reviewed at least annually.

Regulatory liaison on all phases of tailing management is of mutual benefit to AMNS and regulatory bodies. Development of BAPs for tailings management is intended to be a collaborative process. While inputs from broader stakeholder and Mi'kmaq engagement will support this, AMNS intends to directly collaborate with staff of Nova Scotia Environment (NSE) and Department of Natural Resources (DNR) on all aspects of its tailings management strategy from design through to construction, operation, maintenance, monitoring and ultimately closure of the TMF.

AMNS is committed to providing summaries of comments and documents from the IE and ITRB on an ongoing periodic basis. In the event that the IE or ITRB identify conditions that demonstrate the potential for non-compliant conditions, these findings will be conveyed to regulators immediately with together with an appropriate corrective action plan.

2.0 RELEVANT PROJECT ACTIVITIES

2.1 TAILINGS PRODUCTION

The proposed Process Plant throughput is approximately 5,500 tonnes per day (tpd). Tailings will be produced at a slurry solids content of approximately 38% solids by weight before being pumped to the TMF. The tailings will be conveyed in a single overland pipeline and discharged from the TMF embankment via spigotted offtakes.

A total of 13.4 million tonnes (Mt) of tailings will be discharged to the TMF over the 7-year mine life. The estimated average settled density of the tailings is approximately 1.3 tonnes per cubic metre (t/m^3).

2.2 TAILINGS GEOCHEMISTRY

The geochemistry of the FMS tailings are presented in a separate report provided in the appendices of the EIS (Lorax Environmental Services Ltd. (Lorax), 2019).

2.3 TAILINGS MANAGEMENT FACILITY

The TMF will contain tailings for the life of the Project. While this plan describes the TMF, supporting information is provided in the report *Preliminary Waste and Water Management Design for Submission of the Environmental Impact Statement* (Knight Piésold Ltd., 2019), included as an appendix to the EIS.

2.3.1 TMF BEST APPLICABLE PRACTICES

Key aspects for tailings management include:

- Identifying issues and concerns
- Managing liabilities
- Identifying opportunities for cost and operational efficiency
- Providing input into design, construction, operation and closure and rehabilitation
- Providing input into the monitoring, surveillance and associated record keeping
- Educating operators and the Mi'kmaq and external stakeholders alike
- Improving data management
- Providing a standardized review process to ensure implementation of BAPs

AMNS's corporate governance supports development of Best Applicable Practices (BAPs) specific to the FMS TMF. BAPs will be adhered to in all phases of construction, operation, and closure and reclamation of the TMF. BAPs will be developed based on industry definition and relevant guidelines and legislation, including CDA Dam Safety Guidelines (CDA 2013 & 2014), and the MAC guidelines on *Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities* (MAC, 2019).

BAPs will be adhered to through the development of Quantitative Performance Objectives (QPOs) to be incorporated into the standard operating procedure for the TMF. These will include measuring and reporting on tailings beach lengths, calibration of TMF filling schedule during operations, water balance audits, construction material availability, and scheduling to ultimate TMF embankment heights. QPOs will be

developed as part of the Operation, Maintenance and Surveillance (OMS) Manual that will be prepared for the TMF.

2.3.2 GENERAL DESCRIPTION AND FILLING SCHEDULE

The general arrangement of the TMF is presented in Figure 2.1, and its location is at UTM 539,045 E and 4,998,615 N (Zone 20T NAD 83). The TMF will utilize natural topographical containment provided to the south of the facility to minimize embankment construction requirements. The TMF has one rock/earthfill embankment that impounds the TMF to the west, north, and east. The embankment is approx. 3,000 m long at its centreline with a maximum height of approx. 28 m. The embankment will include an upstream liner system with the liner extending from the upstream toe of the embankment into the TMF basin to control seepage gradients prior to the development of the tailings beaches.

The TMF will be constructed in four stages, as shown with the TMF filling curve on Figure 2.2. The first stage during the Construction Phase will involve constructing a starter dam using non-potentially acid generating (NPAG) material generated from pre-stripping of the Open Pit and from excavation of a local till borrow source and will provide approximately 12 months of tailings storage. Embankment raises will be undertaken during the first year of operations and subsequently in year 3 and year 6 of operations, all utilizing the downstream method of construction. Non-potentially acid generating (NPAG) waste rock from the Open Pit and low-permeability till from borrow pits will be used to construct the expansions.

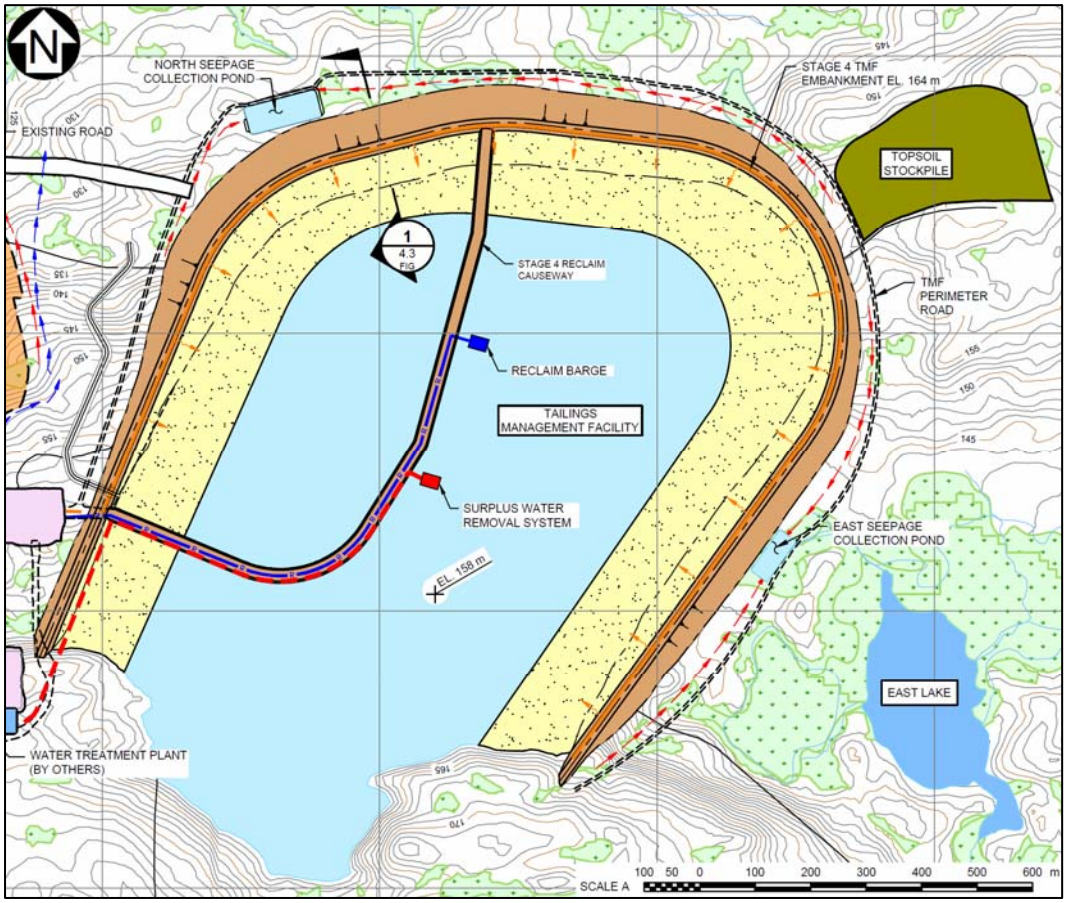
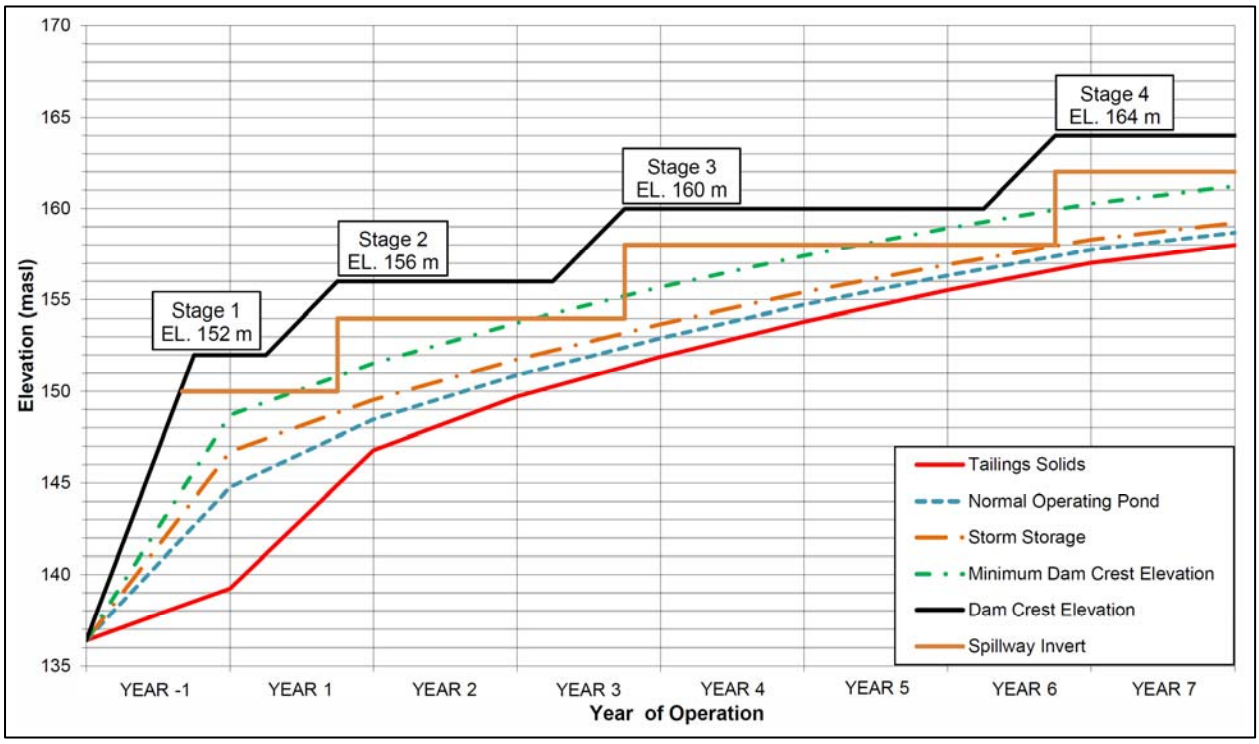


Figure 2.1 TMF General Arrangement



NOTES:

1. TAILINGS TONNAGE AND MILL RAMPUP SCHEDULE BASED ON JUNE 2019 PRODUCTION SCHEDULE.
2. AVERAGE SETTLED TAILINGS DENSITY ASSUMED TO BE 1.3 TONNES PER M^3 DURING OPERATIONS.
3. MINIMUM DAM CREST ELEVATION ASSUMED 2 METRES ABOVE REQUIRED ELEVATION FOR STORM STORAGE (INCLUDES ALLOWANCE FOR SPILLWAY DEPTH).

Figure 2.2 TMF Filling Schedule

2.3.3 DESIGN BASIS AND OPERATING CRITERIA

The design of the TMF has considered the following requirements:

- Permanent, secure, and total confinement of all solid waste materials within an engineered disposal facility
- Control, collection, and removal of free draining liquids from the tailings during the Operation Phase for recycling as process water to the maximum practical extent
- The inclusion of monitoring features for all aspects of the facility to ensure performance goals are achieved and design criteria and assumptions are met

The following factors have been considered in the design of the TMF:

- Assumed physical and chemical characteristics of the tailings material, including metal leaching and acidic drainage potential as well as the potential for liquefaction
- Hydrology and hydrogeology, including local climatic conditions and extreme weather events (including projections of climate variability)
- Availability and characteristics of construction materials
- Topography of the TMF footprint and adjacent areas

The TMF will store runoff from an Environmental Design Flood (EDF) as per Canadian Dam Association (CDA) Dam Safety Guidelines (CDA, 2013 & 2014). The EDF for the facility is equivalent to the total precipitation from a 1-in-200 year 24-hour precipitation event in addition to the estimated maximum monthly precipitation across the entire TMF catchment. Flood events exceeding the EDF, up to a Probable Maximum Flood (PMF) event will be safely conveyed from the TMF through an emergency discharge spillway, located in the southwestern abutment of the TMF embankment.

Non-contact water will be diverted around site facilities to the maximum practicable extent to minimize the impact to local water courses and the unnecessary collection of fresh water. Diversion channels will collect and divert runoff from undisturbed catchment areas for precipitation events up to a 1-in-200-year precipitation event.

Contact water from site facilities will be collected in a system of ditches that convey collected flows to water management ponds. The ponds were designed to store catchment runoff for the 1-in-10 year 24-hour storm event (conveyed by systems of collection ditches) plus direct precipitation for the 1 in 200-year 24-hour storm event on the surface of the ponds.

2.3.4 DAM CLASSIFICATION

The design, construction, operation, and monitoring of dams, including tailings embankments, must be completed in accordance with appropriate provincial and federal regulations and industry best practices. The primary guidance documents for dam classification are the Dam Safety Guidelines published by the Canadian Dam Association (CDA, 2013), and the CDA Technical Bulletin on the Application of the Dam Safety Guidelines to Mining Dams (CDA, 2014).

A key component of these guidelines involves assigning the dam into a classification category (Low, Significant, High, Very High, or Extreme) using the following criteria:

- Population at risk
- Loss of life
- Environmental and cultural values
- Infrastructure and economics

The overall dam classification is defined by the criterion with the highest (i.e., most severe) rating. The dam classification helps to identify appropriate geotechnical and hydrotechnical design criteria. It is important to note that the classification refers to the downstream consequences in the inundation zone of a dam breach.

The Fifteen Mile Stream Project TMF embankments have been assigned a dam classification of **HIGH**. The potential incremental losses are as follows:

- **Population at Risk:** The population at risk was determined based on the likelihood of people being in the potential inundation zone. There is no permanent population downstream of the TMF. Temporary population will be present in the form of mine workers, and users of nearby roads. Therefore, the risk to population was determined to be **Significant**.
- **Loss of Life:** The loss of life factor considers the most probable size of the population at risk if failure occurs. For the Project site, this includes mine workers and users of nearby roads, and is estimated to be fewer than 10 people at any one time. The potential loss of life was therefore determined to be **HIGH**.

- **Environmental and Cultural Values:**
  - Environmental loss considers the potential loss or deterioration of fish and wildlife habitat in the affected area. In the event of a breach of the TMF embankment, tailings and supernatant water will flow north into Seloam Brook and subsequently into the Open Pit. While Seloam Brook has evidence of brown trout and dolly varden populations, it is not critical fish habitat. Therefore, the impact on wildlife was classified as **HIGH**.
  - Cultural losses are based on the potential impact to areas of cultural significance in the inundation zone. No considerable impact on culturally sensitive areas is predicted, therefore potential loss of cultural values was determined to be **Low**.
- **Infrastructure and Economics:** Infrastructure and economic losses consider potential damage to transportation routes, commercial and recreational facilities, other infrastructure, services, and storage facilities. Minor highways and seasonal roads are located downstream of the TMF along potential breach flow paths to the south or the northeast. Therefore, the infrastructure and economic losses were determined to be **Significant**.

2.3.5 INFLOW DESIGN FLOOD

The Canadian Dam Association Dam Safety Guidelines (CDA, 2013 & 2014) states that for tailings dams of a 'HIGH' dam classification, the minimum target design criteria for design flood events corresponds to the following return period events:

- Construction and Operations Phase: 1/3 between the 1/1,000-year return period event and the Probable Maximum Flood (PMF)
- Post-Closure Phase: 2/3 between the 1/1,000-year return period event and the PMF

2.3.6 SEISMICITY

The Canadian Dam Association Dam Safety Guidelines (CDA, 2013 & 2014) states that for tailings dams of a 'HIGH' dam classification, the minimum target design criteria for seismic loading corresponds to the following return period events:

- Construction and Operations Phase: the 1/2,475-year return period seismic event
- Post-Closure Phase: 1/2 between the 1/2,475 year and the 1/10,000-year (or MCE) return period seismic events

The Earthquake Design Ground Motion (EDGM) for the Construction and Operations Phases is the Operating Basis Earthquake (OBE). The OBE is the earthquake that a structure must safely withstand no damage and has a reasonable probability of occurring during the life of the structure.

The EDGM for the Post Closure Phase is the Maximum Design Earthquake (MDE) for the life of the TMF. The MDE is the earthquake that would generate the most critical ground motions for evaluation of the seismic performance of a structure among those loadings to which the structure might be exposed.

2.3.7 TMF EMBANKMENTS

A typical embankment cross-section is shown on Figure 2.3. The main design features of the TMF embankments are as follows:

- Starter dam sized to provide approximately 12 months of tailings and supernatant water storage; starter dam crest elevation of 152 m
- Progressive embankment raises throughout operations using downstream expansion methods
- Low-permeability till (Zone S) liner on upstream TMF embankment face and partial coverage of TMF basin
- Filter (Zone F) and Transition Zone (Zone T) zones on upstream face of embankment to minimize migration of fines using processed NPAG waste rock from Open Pit mining
- Shell zone (Zone C) consisting of NPAG waste rock from Open Pit mining activities

The ponds and ditches downstream of the TMF embankment will also be sized to collect and manage seepage flows through the TMF embankments in addition to runoff and precipitation. The seepage collection ponds were sized to collect flows up to a 1 in 10-year precipitation event falling on the contributing catchment area. Collected flows will be pumped back to the TMF supernatant pond over a 10-day drawdown period.

2.3.8 WATER MANAGEMENT

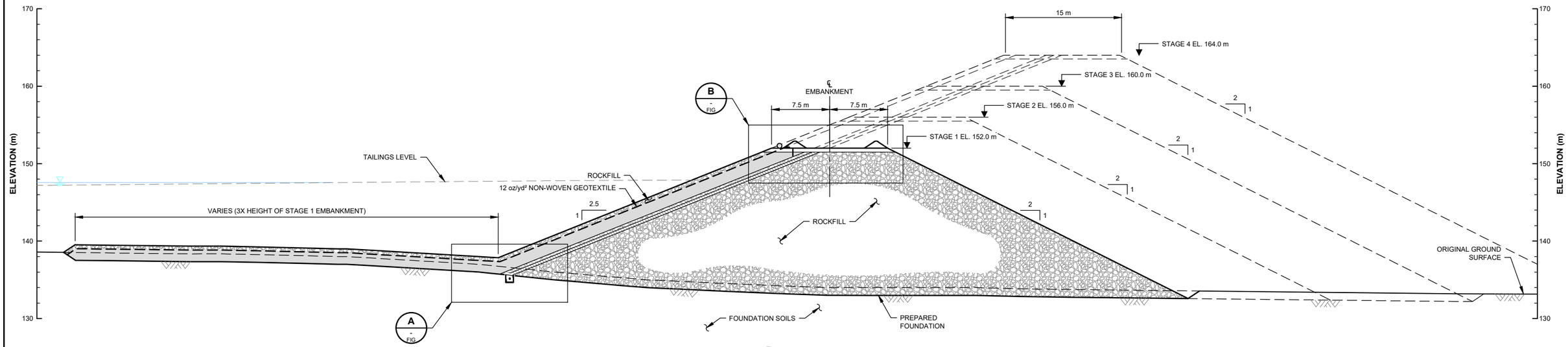
Site water management planning considers the management of surface water at the Project site during the construction, operations, closure, and post-closure phases of the Project. Surface water will be managed by constructing systems of ditches, ponds, berms, and pump and pipeline systems, and by selective grading disturbed surfaces. Two types of surface water are considered in the water management strategy.

- Contact water, which is water impacted by mine workings or disturbed areas (open pit dewatering flows; TMF seepage; runoff from the waste rock stockpile, ore stockpile, till stockpile, topsoil stockpiles, TMF embankments, etc.)
- Non-contact water, which is runoff from undisturbed areas

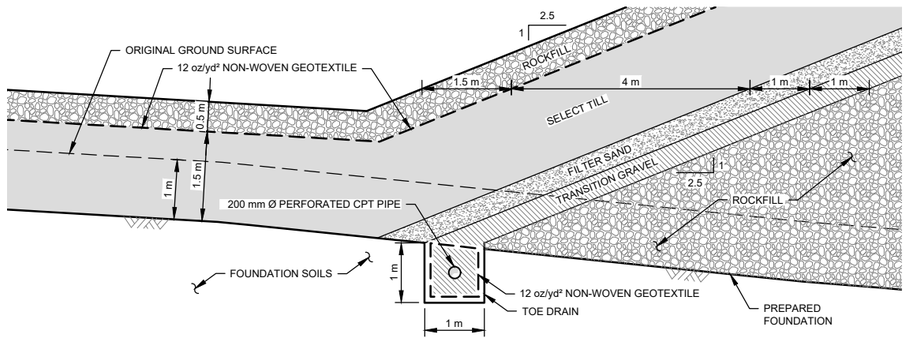
The water management plan forms the basis of a site wide water balance, which has been developed on a monthly basis and considers a range of climatic conditions consistent with historic variability in the project area. The primary goal of the water balance model is to estimate the anticipated volume of surplus water that must be released from the mine site on an annual basis to manage the inventory of water stored in the TMF within a target range consistent with the design basis of the impoundment.

The following water management components are associated with the TMF:

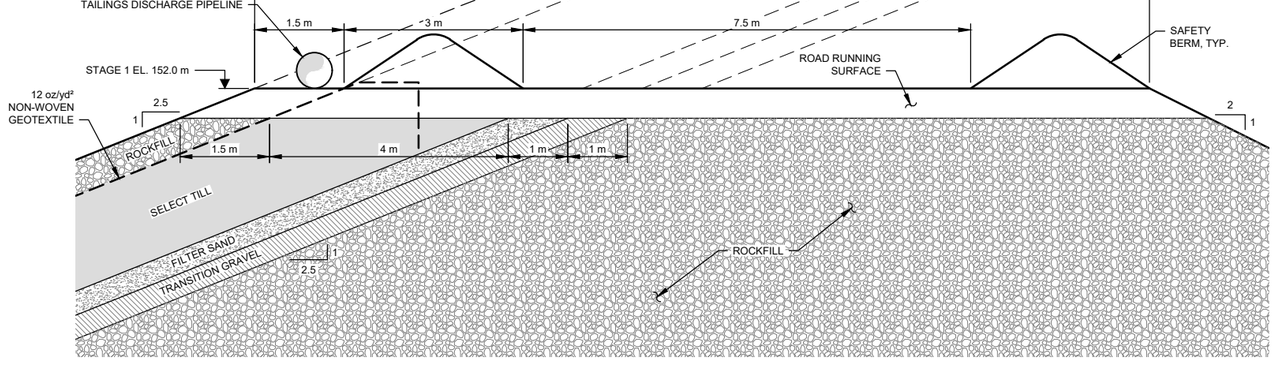
- Flood events will be managed through a combination of embankment freeboard (to contain the EDF event) and an emergency discharge spillway located in the southwestern abutment of the TMF embankment for larger flood events that exceed the EDF (up to the PMF).
- Seepage collection ponds located downstream of the embankment will collect seepage from the TMF embankment and collected seepage will be pumped back to the TMF.
- Tailings supernatant water will be reclaimed using a floating pump/barge and a single overland pipeline to the Process Plant.
- A process water tank located at the Process Plant will store reclaim water from the TMF for processing.
- A Surplus Water Management System (SWMS) will remove surplus water from the TMF supernatant pond.



1 / 1.1 FIG — SECTION
TYPICAL EMBANKMENT DESIGN SECTION
SCALE A



A - FIG — DETAIL
TOE DRAIN
SCALE B



B - FIG — DETAIL
STAGE 1 CREST
SCALE B

FOR INFORMATION ONLY

LEGEND:

- ROCKFILL
- SELECT TILL
- FILTER SAND
- TRANSITION GRAVEL

NOTES:

1. DIMENSIONS AND ELEVATIONS ARE IN METRES, UNLESS NOTED OTHERWISE.

SCALE A: 5 2.5 0 5 10 15 20 25 m
SCALE B: 1 0.5 0 1 2 3 4 5 m

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
1	12JUN'20	ISSUED WITH REPORT	JEF	SC	DDF

ATLANTIC MINING NS CORP.

FIFTEEN MILE STREAM PROJECT

TMF EMBANKMENT SECTION AND DETAILS

Knight Piésold CONSULTING

P/A NO. VA101-708/4 | REF NO. 3

FIGURE 2.3 | REV 1

SAVED: M:\1\101\00708\04\AA\acad\FIGS\B37, 6/11/2020 4:44:20 PM, SCAMMAYO PRINTED: 6/12/2020 10:48:27 AM, FIG 2.3, SCAMMAYO ACAD VERSION: 23.0S (LMS TECH)
XREF FILE(S): IMAGE FILE(S):

The water balance developed for the TMF has indicated that the TMF will operate in a net positive surplus throughout operations for all climatic conditions during the Construction and Operation Phases (Figure 2.4). The Surplus Water Management System (SWMS) allows for the removal of excess water from the TMF supernatant pond during operations to maintain target operating pond volumes, tailings beach length, and minimum freeboard requirements. Surplus water will be removed by pumping water to a Water Treatment Plant (WTP) located near the Plant Site, if required to meet discharge criteria, before being released to Anti-Dam Flowage. The Site Water Management Plan (SWMP) will describe the water management strategies as well as effluent monitoring that will be undertaken.

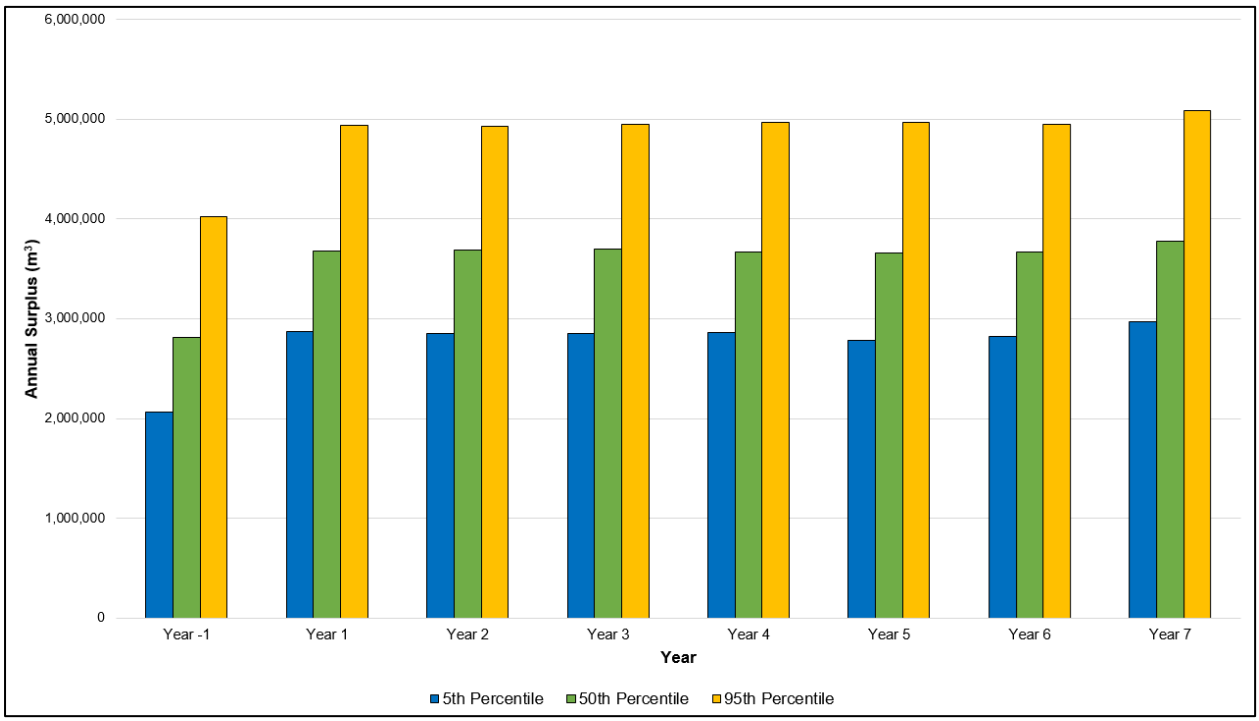


Figure 2.4 TMF Annual Surplus - Operations

3.0 ENVIRONMENTAL PROTECTION MEASURES

Measures will be taken to:

- Minimize exposure of the tailings to the atmosphere, to reduce ML/ARD, and also reduce potential dusting
- Prevent runoff and seepage from interacting with surface or groundwater
- Stabilize the TMF embankments
- Prevent harm to wildlife

These measures are described in more detail below.

3.1 MINIMIZE ML/ARD GENERATION

The potential for the tailings within the TMF to leach metals and generate acid will be minimized by reducing exposure of the tailings to atmospheric conditions. This will be accomplished by strategically depositing new tailings over the existing tailings and by maintaining a supernatant pond to maintain a degree of saturation within tailings stored in the TMF.

3.2 RUNOFF MANAGEMENT

Non-contact water will be diverted around the project site to the maximum practical extent. All non-contact water diversion structures are designed to divert runoff from a 1-in-200 year 24-hr precipitation event.

All direct precipitation on the TMF footprint, up to a volume from the EDF event, will be stored within the TMF. Flood events exceeding the EDF (up to the IDF) will be conveyed through an emergency discharge spillway in the southwest abutment of the TMF embankment.

Site contact water (including open pit dewatering flows) will be managed in a system of collection ditches and management ponds. Contact water collected in the management ponds will be pumped to the TMF supernatant pond.

3.3 SEEPAGE MANAGEMENT

Potential seepage from the TMF will be largely controlled by the low-permeability till liner and low permeability tailings mass. Two seepage collection ponds, the North Seepage Collection Pond, and the East Seepage Collection Pond, will be constructed at topographic low points downstream of the TMF embankment (Figure 2.1).

Seepage collected in the Seepage Collection Ditches, constructed along the toe of the embankment, will convey collected seepage and embankment runoff to the respective ponds. Water collected in the ponds will be continuously monitored and returned to the TMF to ensure it does not adversely affect the receiving environment.

3.4 DUST CONTROL

Selective tailings deposition and management of the operational supernatant pond volume will ensure that the beaches are saturated, thus reducing the potential for dust generation.

Dust generation at closure will be managed be encapsulating the consolidated tailings with an earth and rockfill closure cover, appropriately graded to shed runoff from the TMF.

3.5 SEDIMENT AND EROSION CONTROL

Sediment and erosion control will be a focus during construction of the TMF and subsequent embankment raises. The measures identified in the Sediment and Erosion Control Plan will be applied to facility construction and will minimize erosion and prevent sediment releases into the receiving environment.

3.6 SURPLUS WATER MANAGEMENT

The Surplus Water Management System (SWMS) allows for the removal of excess water from the TMF supernatant pond during operations to maintain target operating pond volumes, tailings beach length, and minimum freeboard requirements. Surplus water will be removed by pumping water to a Water Treatment Plant (WTP) located near the Plant Site, if required to meet discharge criteria. Water will be discharged to Anti-Dam Flowage from the WTP via a gravity discharge pipeline.

Monitoring plans will be implemented to monitor TMF supernatant water quality to determine if water treatment will be required to be acceptable for discharge to the receiving environment at Anti-Dam Flowage.

3.7 TMF CLOSURE

TMF closure and rehabilitation will be carried out progressively during the Operation Phase (where possible) and primarily at the end of economically viable mining. Closure and reclamation activities for the TMF are summarized below and are also discussed in Section 2 of the Project Description.

Opportunities for progressive reclamation of the TMF include reclaiming the downstream faces of the TMF embankments with topsoil cover and revegetation once the final Stage 4 embankments are constructed.

Closure and reclamation of the TMF will involve:

- Removal of supernatant pond water from the TMF to the open pit at closure to aid in the establishment of a pit lake.
- Containing and isolating the tailings and converting the TMF into a physically stable landform by constructing a revegetated closure cover on top of the consolidated tailings (after the pond has been removed) and establishing a permanent spillway and outlet channel to facilitate shedding of runoff from the surface of the reclaimed TMF to the open pit.

The following reclamation activities will be completed during TMF closure:

- Prior to closure, tailings will be selectively deposited around the TMF to establish a final tailings beach that will facilitate construction of the final closure cover.
- Tailings supernatant pond water will be removed and pumped to the open pit.
- Tailings and reclaim delivery systems and all pipelines, structures, and equipment not required beyond mine closure will be dismantled and removed.
- A permanent spillway will be developed by constructing a breach through the southwest abutment of the TMF embankment and establishing an outlet channel to the open pit.
- A combined rock and soil cover will be placed over the consolidated tailings mass in a manner that conveys runoff to the permanent spillway.

- All access roads, ponds, ditches, and borrow areas associated with the TMF that are not required beyond TMF closure will be removed and the areas re-graded.
- Disturbed areas will be revegetated consistent with the re-vegetation strategy.

The TMF embankment slopes are designed at 2H:1V downstream slopes, which are expected to be stable following closure and will not require further modification at closure other than surface preparation with topsoil and revegetation (may be completed concurrently during operations) unless monitoring information indicates otherwise.

Final reclamation of the TMF will be completed after the reclamation activities described above have been completed. The seepage collection system will continue to operate for several additional years past this point until seepage has diminished to negligible quantities and/or is suitable for direct discharge to the environment. The seepage collection systems will be dismantled and removed, and the seepage collection ponds regraded and reclaimed once this has been achieved.

4.0 MONITORING PROGRAM

4.1 MONITORING

Guidelines for monitoring, inspection and reporting on the performance of the TMF are outlined in the Canadian Dam Safety Guidelines (CDA, 2013) and the CDA Technical Bulletin on the Application of the Dam Safety Guidelines to Mining Dams (CDA, 2014).

These documents provide requirements for dam safety inspections and reviews, and the development of an Operations, Maintenance, and Surveillance (OMS) Manual as well as an Emergency Preparedness and Response Plan (EPRP) specific to the TMF. The OMS Manual and EPRP will be prepared as part of an Industrial Approval Application and will be reviewed and revised annually, and as each staged TMF expansion is constructed. Quantitative Performance Objectives (QPOs) for the management and operation of the TMF will be developed and summarized in the OMS Manual.

Geotechnical instrumentation will be installed in the TMF embankments and foundation during construction, and will be utilized during the Operation, Closure and Reclamation, and Post-Closure Phases of the Project.

Instrumentation will be provided during construction, operations, and closure to monitor the TMF and may include:

- Pond level indicator in TMF supernatant pond
- Water management pond inflow weirs
- Vibrating wire piezometers in the TMF embankment
- Survey and surface movement monitoring monuments
- Flow monitoring for seepage collection ditches

Groundwater monitoring wells and select geotechnical instrumentation will be retained post-closure for use as long-term dam safety and downstream groundwater quality monitoring devices. Post-closure monitoring will also include annual inspection of the former TMF and ongoing evaluation of water quality, flow rates, and instrumentation records to confirm design objective for closure have been met.

The instrumentation will be used to monitor and assess embankment performance and to identify any conditions different to those assumed during design and analysis. Amendments to the ongoing design and/or remediation work can be implemented to respond to the changed conditions, should the need arise. Key control and monitoring subject areas will include:

- Construction controls, including the use of a construction management program.
- Performance monitoring inspections of the TMF, including instability indicators, stability monitoring, tailings deposition, supernatant pond levels, water management and control, and quality of effluent.
- Monitoring of the flow rates and water quality in the Seepage Collection System.
- Monitoring of the flow rates and water quality in the Reclaim Water and Surplus Water Management Systems.
- Monitoring of water quality in the Water Treatment Plant (if required) and Surplus Water Discharge System.
- Monitoring of downstream groundwater quality including aquatic effects monitoring on the receiving environment.

- The adequacy of the supernatant pond and tailings deposition strategy as a dust control to minimize onset of ML/ARD, should the tailings be characterized as PAG.
- Quality assurance and quality control (QA/QC) measures for ongoing monitoring and inspections.

The future OMS Manual will clearly document the procedures for operating, maintaining, monitoring, and inspecting the TMF along with the roles and responsibilities of relevant staff. Inspections will include:

- Daily inspections by the Mine Supervisor
- Weekly, or after a major storm event, or change, by the Mine Supervisor
- Annual dam safety inspections will be undertaken by the Engineer of Record (EoR)

Environmental monitoring will consist of regular monitoring of the quality of tailings supernatant, collected seepage, and downstream groundwater as described in the SWMP. The downstream aquatic environment will also be monitored as described in the AEMRP.

4.2 ADAPTIVE MANAGEMENT

Adaptive management may be required if environmental performance monitoring indicates that adverse conditions are prevalent in the ongoing results. Examples of inspections or monitoring that may trigger adaptive monitoring programs to be implemented include:

- Adaptive Geotechnical Stability Management – If annual geotechnical inspections identify stability concerns with the facility.
- Adaptive Seepage Management – If groundwater monitoring suggests that seepage collection measures are inadequate (i.e., seepage flows exceeding design flows).
- Adaptive Reclaim Water / Surplus Water Discharge Quality Management – If monitoring as described in the Site Water Management Plan indicates that supernatant water quality or TSS exceed what is acceptable for recycling to the Process Plant.
- Adaptive Downstream Water Quality Management – If monitoring as part of the Aquatic Effects Management and Response Plan identifies aquatic effects that require further investigation.
- Adaptive Sediment and Erosion Control Management – If regular visual monitoring identifies sediment and erosion control or other issues.

The need for any corrective actions to on-site management of the TMF or installation of additional control measures will be determined on a case-by-case basis, based on monitoring conducted as described above.

4.3 REPORTING

Table 4.1 presents a proposed reporting schedule for relevant reports. The final schedule of reports will be outlined in the IA for the project.

Table 4.1 Reporting Requirements for Tailings Management

Project Phase	Monitoring, Inspection and Reporting Requirement	Frequency
Pre-Development	Dam Classification Study and Dam Break Inundation Study for Significant or higher consequence TMFs.	Prior to Construction
Construction	As-Built Reports	Within 90 days of completion of construction
Operation	As-Built Reports (embankment raises)	Within 90 days of completion of construction for each staged embankment expansion
	Annual Report (includes updates to the TMF Register, if applicable)	Annually
	Dam Safety Inspection Report	Semi-annually
	Independent Tailings Review Board (ITRB) Report	Annually
	OMS Manual Update	Annually
	EPRP Update and Testing	Annually
	Dam Safety Review including Dam Classification Review and Update	Min. 2 over LOM, or every 5 years
Closure	Closure Management Manual	Prior to end of operations
	OMS Manual Update	Annually
	EPRP Update and Testing	Annually
Post-Closure	Annual Report	Annually
	Dam Safety Inspection Report	Annually
	Dam Safety Review including Dam Classification Review and Update	Every 5 years

5.0 ROLES AND RESPONSIBILITIES

Roles and responsibilities with respect to tailings management will be developed and assigned as part of the preparation of the OMS Manual. Prior to conducting any work on the mine site, AMNS will designate a Mill Operations Manager who must be present onsite daily, and who is ultimately responsible for application of all requirements on the site. As such the Mill Operations Manager is ultimately responsible for the safety of the TMF. A proposed organizational structure proposed for the implementation of this Plan is presented in Table 5.1

Table 5.1 Roles and Responsibilities Organizational Chart

Position	Responsibilities
CEO/COO	The CEO or COO, as the lead representative of a Mine Owner, will designate a Mill Operations Manager who must be present onsite daily and who is ultimately responsible for application of all requirements of the Plan on the site. The CEO retains overall accountability for tailings management; responsible for putting an appropriate management structure in place, and for providing assurance to the Company and Communities of Interest that tailings are managed appropriately.
Manager Environment & Community	Responsible for the development and ongoing updates of this Plan, and for ensuring its implementation. The VP Environment and Community, with help from the Mill Operations Manager, will prepare and maintain the OMS Manual. He/she is also responsible for communication with government and community, including Aboriginal Groups, and for ensuring that the Plan reflects the results of these communications.
Mill Operations Manager	The Mill Operations Manager is the individual ultimately responsible for the mine, including the following aspects: • Accountable for all aspects of the performance and management of tailings and water retaining structures • Responsible for compliance with regulatory requirements and relevant guidelines • Responsible to submit all compliance reports to the required regulatory agencies by the due dates • Defines site roles and responsibilities, authority, and accountability • Allocates required human and financial resources • Reports dangerous occurrences including significant TMF or dam safety incidents to NSE The Mill Operations Manager is therefore accountable for the proper implementation and success of this Plan and the OMS Manual at the project site. The Mill Operations Manager will be also responsible for approving monitoring programs and SOPs with support from the Mine supervisor. All compliance reporting with respect to tailings management will be submitted to the Mill Operations Manager.
Engineer of Record (EoR)	An EoR will be designated once construction of the TMF is underway. The EoR must be an individual (not a firm) who is a qualified and competent engineer with experience commensurate with the consequence classification and complexity of the facility. The EoR will: • Hold the professional responsibility for the facility design, and is responsible for evaluating the adequacy of the as-built facility relative to the design as well as applicable standards, criteria, and guidelines • Report on annual Dam Safety Inspections • Participate in Dam Safety Reviews • Participate in risk assessments

Position	Responsibilities
	• Participate in ongoing construction quality assurance in accordance with AMNS's Quality Management Plan (QMP) • Provide QPOs and monitoring frequencies required to ensure the facility is functioning as designed for inclusion in the OMS • Participate in the implementation of a succession plan in the event of a change in the EoR
Independent Tailings Review Board (ITRB)	An ITRB will be established comprised of independent subject matter experts not currently involved in or responsible for the design, operation, or construction of the TMF. The size and make-up of the ITRB will be based on complexity of the tailings system in terms of risk, consequence, and disciplines of substance. AMNS's ITRB will be established to: • Provide an independent assessment to senior mine management and regulators whether the TMF is designed, constructed, and operated appropriately, safely and effectively • Provide the site team with practical guidance, perspective, experiences, and standard/best practices from other operations • Review and comment on the planning and design process, monitoring programs, data analysis methodology and work performed by site team and/or contract consultants • Provide non-binding advice and guidance The ITRB will not direct the work or perform the role of the Engineer of Record.
Mine Supervisor	The Mine Supervisor will have functional responsibility for the implementation of this Plan under the direction of the Mill Operations Manager. This includes communicating with relevant on-site personnel to ensure compliance with the Plan.
Environmental Superintendent	The Environmental Superintendent will direct personnel on site to fulfill environmental management responsibilities and tasks, and audit contractors for compliance with Plan requirements.
Environmental Monitors	Environmental monitor(s) will be responsible for implementing the monitoring measures for this Plan. This includes completing daily tasks such as sample collection, performance monitoring, and reporting.
Inspectorate	An independent inspector, external to AMNS, will review applications and compliance monitoring for completeness and technical reasonableness, and conduct mine inspections to assess and enforce the compliance with plan requirements. The inspectorate will be designated by NSE.

Refinement and confirmation of the organizational structure will continue as the permitting process progresses and AMNS eventually staffs the Project. Any changes to the above will be consistent with the requirements of relevant federal and provincial guidelines.

6.0 REVIEW OF PLAN EFFECTIVENESS

The Mill Operations Manager or designate will conduct regular evaluations of the monitoring activities as needed. This Plan may be updated if additional methods for monitoring are found to be more appropriate.

The QA/QC for relevant monitoring programs will include the preparation of a SOP for each of the activities within the tailings management system, and auditing operations against this plan and any relevant SOPs.

7.0 REFERENCES

Canadian Dam Association (CDA), 2013. *2007 Dam Safety Guidelines – 2013 Revision*.

Canadian Dam Association (CDA), 2014. *Technical Bulletin – Application of Dam Safety Guidelines to Mining Dams*.

Lorax Environmental Services Ltd. (Lorax), 2019. *Fifteen Mile Stream Project – ML/ARD Assessment Report.* Report prepared for AMNS. August 2019.

Knight Piésold Ltd. (KP), 2019. *Fifteen Mile Stream Project – Preliminary Waste and Water Management Design for Submission of the Environmental Impact Statement.* Rev.0. Report prepared for AMNS. September 9, 2019.

Mining Association of Canada (MAC), 2017. *A Guide to the Management of Tailings Facilities.* 3rd Edition.

Mining Association of Canada (MAC), 2019. *Developing an Operation, Maintenance, and Surveillance Manual for Tailings and Water Management Facilities*. 2nd Edition.

Nova Scotia Department of Environment (NSE), 2018. Approval No. 2012-084244-05 under Province of Nova Scotia Environment Act, S.N.S. 1994-95, c.1 s.1. July 18, 2018.

Stantec Consulting Ltd. (Stantec), 2018. *Operations, Maintenance and Surveillance Manual – Touqouy Gold Project – Tailings Management Facility.* Revision 2.

8.0 CERTIFICATION

This report was prepared and reviewed by the undersigned.

Prepared:

Jim Fogarty, P.Eng.
Senior Engineer

Reviewed:

Daniel Fontaine, P.Eng.
Specialist Engineer | Associate

Reviewed:

Richard Cook, P.Geo. (Ltd.)
Specialist Environmental Scientist | Associate

Approval that this document adheres to the Knight Piésold Quality System: DDF