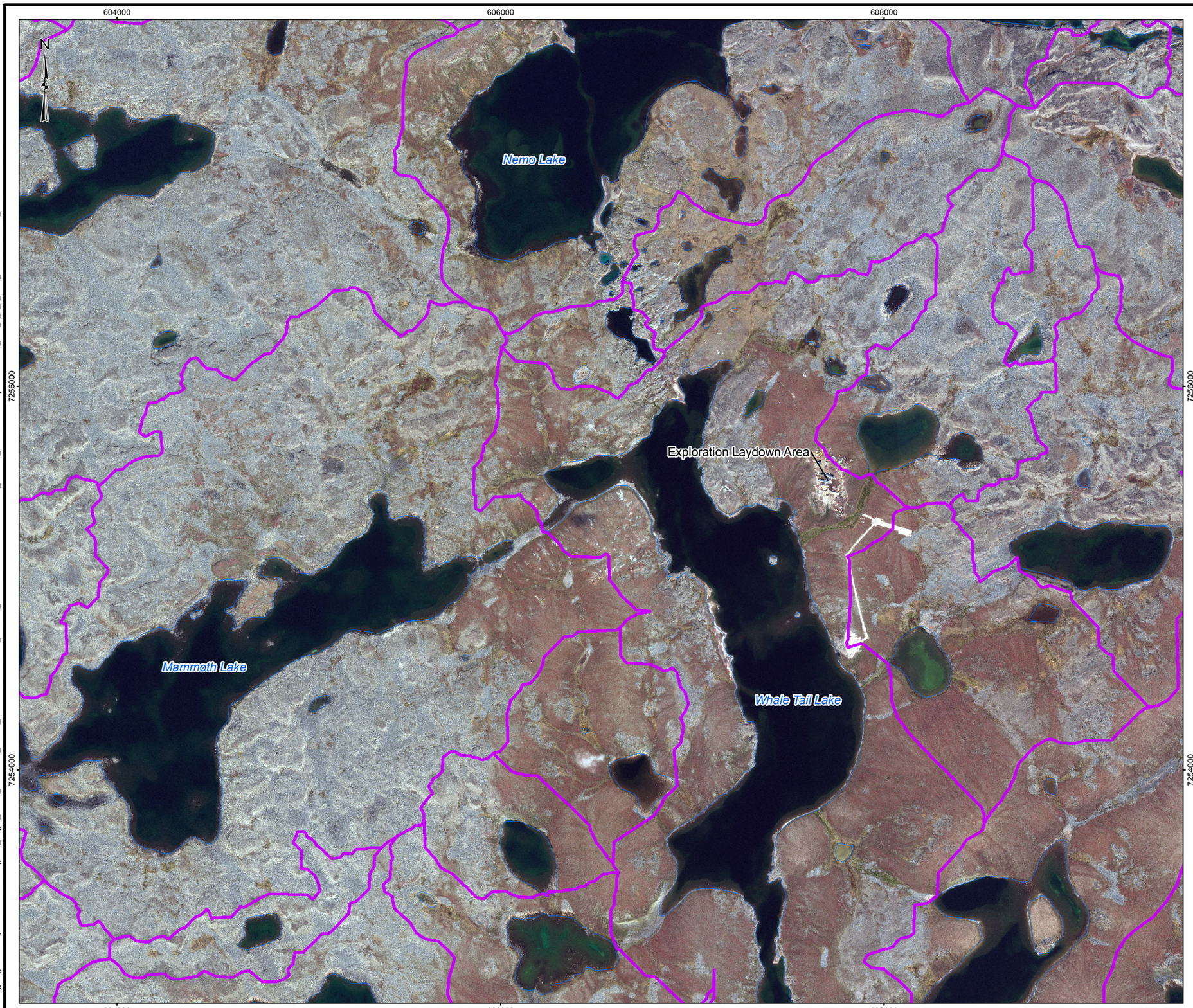


LEGEND

- WATERBODY
- WATERSHED

REFERENCE

1. IMAGERY OBTAINED FROM PHOTOSET, ACQUIRED ON AUGUST 28, 2015
2. WATERBODY DATA OBTAINED FROM PHOTOSAT

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

400 0 400
METRES

PROJECT
AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE
PRE-DISTURBANCE MINE SITE CONDITIONS

Golder Associates

PROJECT		1541520	PHASE		6100
DESIGN	AP	27 May 2016	SCALE AS SHOWN		0
GIS	CDB/CD	5 May 2016			
CHECK	AP	1 June 2016			
REVIEW	IM/KAB	1 June 2016			

FIGURE 5.2-2

\\golder.gds\gal\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\6100_Closure_Reclamation\Report\1541520_FIG_5_2_2_PRE_DISTURBANCE_CONDITIONS.mxd

5.2.2.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the pit mine workings are listed in Table 5.2-1.

Table 5.2-1: Closure Objectives and Criteria – Open Pit Workings

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices for controlling fugitive and exhaust emissions during active reclamation	Implement best practices. Routine air quality monitoring
Land	Minimize the potential for inadvertent access by humans to slopes that are dangerous or unstable during the back-flooding stage	Maintain waste rock berm constructed during operations until pit area is back-flooded	Physical inspection by a qualified engineer
Water	Control contaminated flow from the back-flooded area which includes the pit area	Integrate a water management plan to control contaminated flow from the back-flooded area and have these waters meet site permit water quality objectives	Implement a system to collect and treat these waters, routine monitoring and sampling; water treatment if required
	Ensure outflow from the back-flooded area meets water licence criteria	Prior to breaching the Mammoth Dike, the water quality will be profiled to confirm it is suitable for release. Treatment options will be investigated, if necessary (e.g., in-situ treatment or through the WTP)	Routine monitoring and sampling; in-situ or water treatment at the WTP if required
	Control the rate of back-flooding	The pit will be actively flooded over a period of approximately 4 years. Back-flooding the dewatered area to original water level will take another 4 years.	Construction and operation of the active pit flooding system; routine monitoring and sampling
Wildlife	Discourage access to pit during back-flooding stage	A plan will be developed to allow for reasonable exit should inadvertent access occur	Physical inspection; construction of rock barricades at pit access ramps
		Pit access ramps not used for back-flooding monitoring will be secured	
	Reduce the potential that water in the back-flooded area will affect wildlife health	Prior to breaching of the Mammoth Dike, the water quality will be profiled. Until it is suitable for release, the most appropriate treatment method will be determined if necessary (e.g., in-situ treatment or through the WTP)	Routine monitoring and sampling; in-situ or water treatment at the WTP, if required
Health and Safety	Allow emergency access and exit during back-flooding stage	A plan will be developed to allow for reasonable exit should inadvertent access occur	Physical inspection
	Reduce the potential for inadvertent access by humans to slopes that are dangerous or unstable during back-flooding stage	Maintain waste rock berm constructed during operations until pit area is back-flooded	Physical inspection by a qualified engineer
	Reduce the possibility that water quality in the restored Whale Tail Lake and downstream flows affect human health	The effluent water quality will be profiled. If it is not suitable for release, the most appropriate treatment method will be determined if necessary	Routine monitoring and sampling downstream
Community	Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement
	Consider transition plans	Community programs will be established to transition into closure	Physical inspection

WTP = water treatment plant

5.2.2.4 Consideration of Closure Options and Selection of Closure Activities

Closure activities for the pit were selected in consideration of the closure aspects listed below. This is considered the most appropriate closure plan based on the Meadowbank Mine experience.

Open Pit Perimeter - Wildlife Protection

The pit may be hazardous to wildlife species as wildlife may be injured by inadvertent access into the pit during the operations and back-flooding stages.

Environmental design features and mitigation, as well as current wildlife management practices used in other mining projects (Appendix C), will be implemented at the Project to limit wildlife injury and morbidity during the operations stage. As part of operations, a waste rock berm will be placed as part of the open pit periphery road on the side to the pit.

Based on above, no additional closure activities have been included in this ICRP for the open pit perimeter; only monitoring of the existing berm will be carried out during the back-flooding stage.

Once the original water level has been restored in Whale Tail Lake; the pit area will not represent a hazard to wildlife species as most of the pit area will be inundated.

Open Pit Geotechnical Stability

The pit slopes have been designed to be stable under operating conditions.

No additional closure activities (i.e., re-grading of slopes, erosion protection, re-vegetation, etc.) have been included in this ICRP for the stability of the pit walls after closure as the pit will be back-flooded; therefore, it will not represent a hazard after closure. In areas where the wall may slightly exceed the final water level a berm may be left or setback depending on stability.

Open Pit Back-flooding

A detailed water management multiple account analysis (MAA) was completed on various options for Project water management (FEIS Volume 1; Agnico Eagle 2016). From the options evaluated the Whale Tail Diversion Channel to reroute the water flow towards the Northwest Passage to Mammoth Lake watershed obtained the best score. This option was selected due to lower capital costs and lower operating costs during construction and more likely to be socially accepted as it is a passive water diversion system.

With respect to viability, this option integrates with Meadowbank current operations and allows natural hazards to be better managed. It also proposes a smaller diversion channel and uses a natural boulder-field prior to discharge into Mammoth Lake. In addition, this option is likely to be positively received by regulatory agencies since it uses a passive water management approach and creates additional fish habitat during operation and closure, thus offsetting temporal impacts due to the dewatering of Whale Tail Lake (North Basin). Also, its passive water management will facilitate the

closure and post-closure periods since the water accumulation from Whale Tail Lake (South Basin) will be used to back-flood the completed pit faster.

5.2.2.5 Engineering Work Associated with Selected Closure Activity

Guidance on engineering work options or strategies for the closure of open pits is provided in MVLWB/AANDC (2013). The relevant engineering works associated with the permanent closure activities for the open pit mine workings are discussed below.

Pit access ramps not used during the back-flooding stage will be secured by rock berm barricades during the closure stage, berms will be constructed around the perimeter of the pit at a given setback in accordance with applicable mine regulations and rock mechanics studies conducted for pit stability during the operations stage.

The pit is designed to have stable slopes during the mine life. The pit design and geotechnical stability will be monitored using the same best practices currently applied at Meadowbank Mine.

Following completion of mining, the dewatered Whale Tail Pit area (the isolated area) will be back-flooded to original water level (152.5 masl).

The dewatered Whale Tail Pit area will be back-flooded in two phases:

- Phase 1: back-flood the pit area (Figure 5.2-3) between Year 4 (2022) and Year 7 (2025) and
- Phase 2: back-flood the Whale Tail Lake to 152.5 m between Year 8 (2026) and Year 11 (2029) (Figure 5.2-4).

The dewatered area will be back-flooded with water from four sources:

1) The Whale Tail Lake (South Basin), the water accumulated over the operating years will be pumped into Whale Tail Lake (North Basin) until the original Whale Tail Lake level is reached (this will continue until the end of phase 2).
2) The Northeast Pond will be drawdown and the Northeast Dike breached at the beginning of the back-flooding phase 1 allowing the Northeast watershed to return to their natural water level and drainage patterns and contribute to the back-flooding of the area.
3) The contact water collected in the Attenuation Pond will be treated and discharged in the dewatered area until the end of phase 1. During phase 2 the Attenuation Pond will be reclaimed (back-flooded) and the contact water from the WRSF will be pumped directly to the WTP to be finally discharged in the Whale Tail Lake (North Basin).
4) The North Channel will be re-routed to discharge in the dewatered area at the beginning of phase 2, restoring the original drainage pattern of the north area.

Figure 5.2-3: Phase 1 - Back-flooding Area Diagram

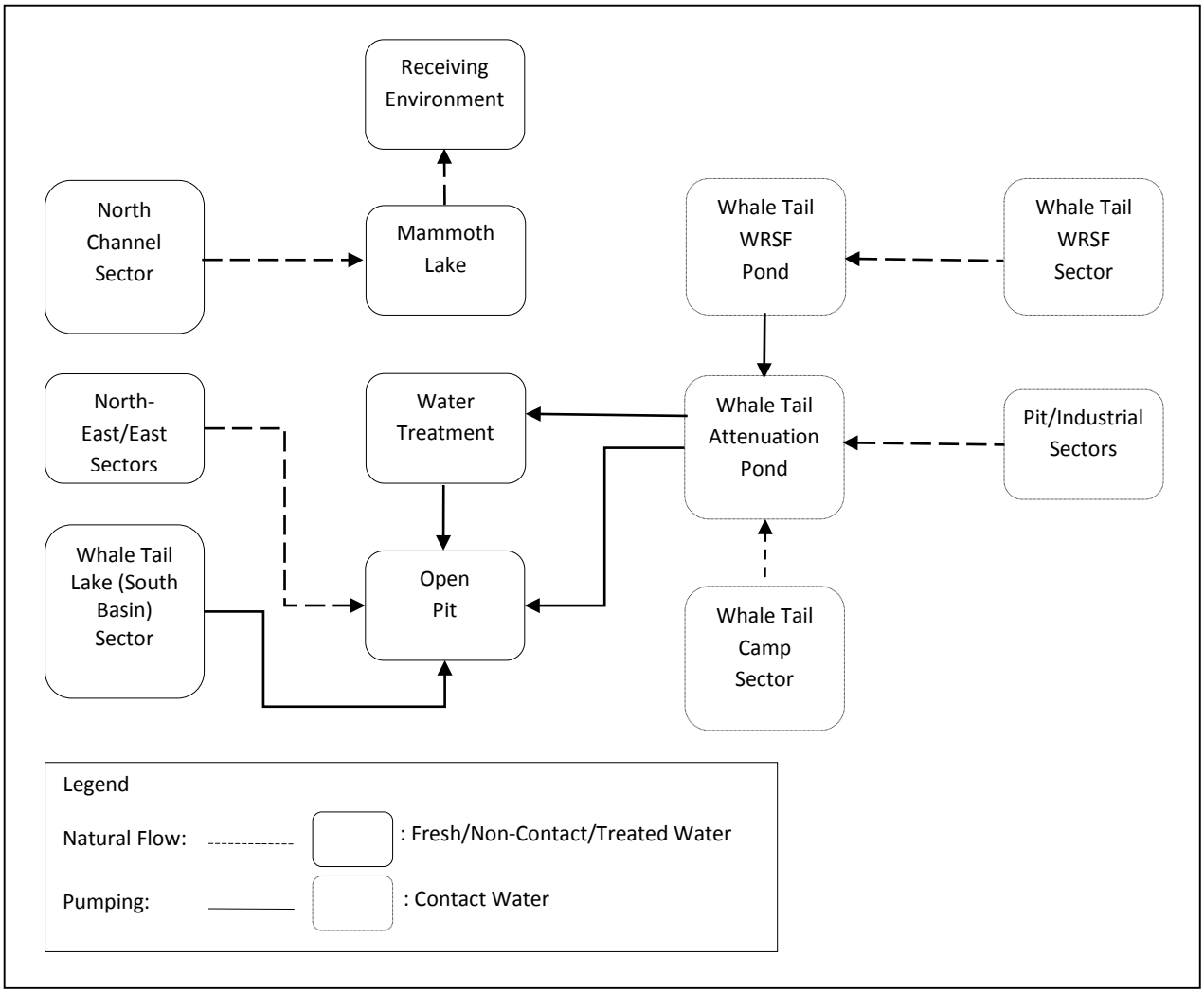
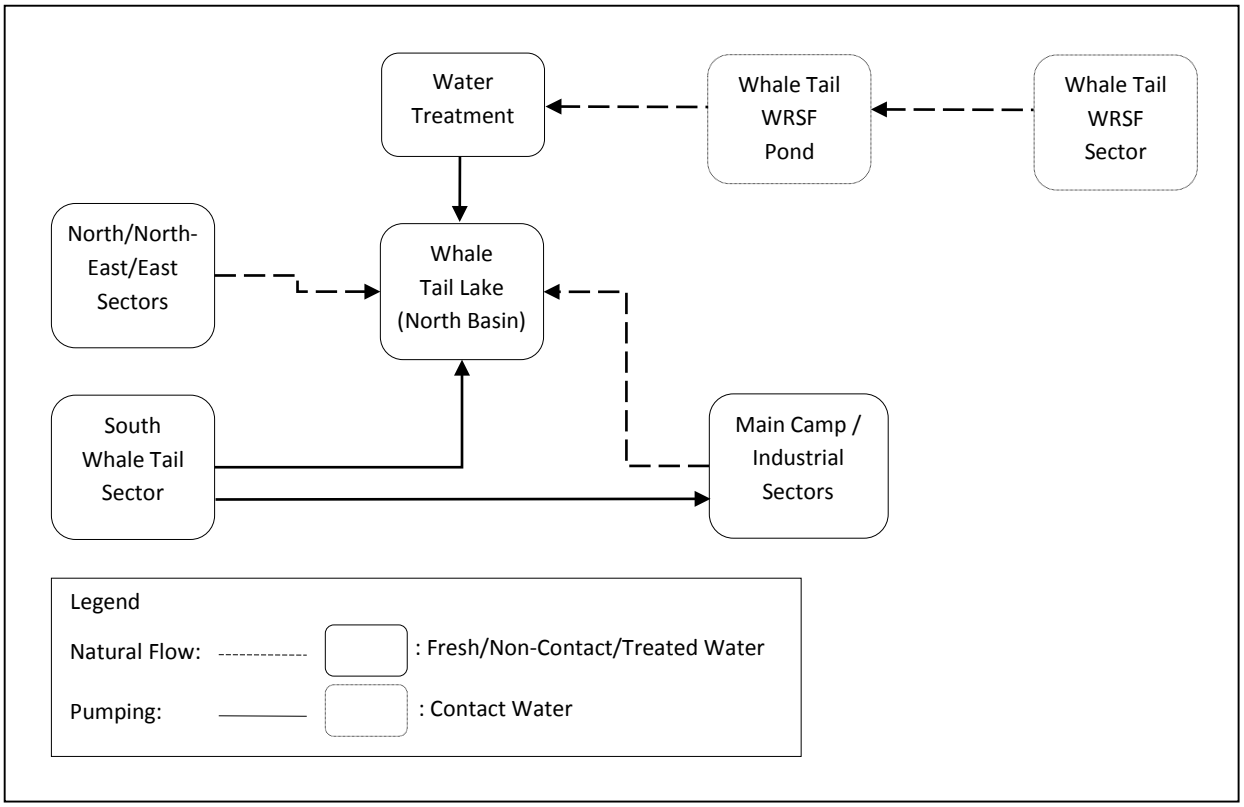


Figure 5.2-4: Phase 2 - Back-flooding Area Diagram



It is anticipated that approximately 24,000,000 m^3 will be required over 8 years to back-flood the mined-out Whale Tail Pit (i.e., approximately 17,000,000 m^3) and Whale Tail Lake (North Basin) (i.e., approximately 7,000,000 m^3) to its original level. The sources of this water will comprise approximately 2,300,000 m^3/year from Whale Tail Lake (South Basin), 120,000 m^3/year from tributaries to Whale Tail Lake (North Basin), and 580,000 m^3/year from direct precipitation to Whale Tail Lake (North Basin).

Pump sizing for back-flooding and a more accurate estimate for the duration of back-flooding will be established during the detailed design phase of the Project to optimize pumping costs and to reduce potential impacts to Mammoth Lake. Agnico Eagle will follow the DFO Water Withdrawal Protocol (DFO 2010) when withdrawing water from Whale Tail Lake (South Basin).

The walls of the open pit will have been exposed for a number of years during mine operational phase, and some weathering may have occurred. As the pit back-floods, the water will contact the weathered rocks, which may affect the water quality by increasing concentrations of dissolved metals. The water quality model results indicated that the concentration of arsenic in the flooded pit may slightly exceed the aquatic life guideline (CCME 1999) and drinking water guideline (Health Canada 2014), and the

concentration of phosphorus may be above the mesotrophic trigger value (CCME 2004). No exchanges have been modelled between the Whale Tail pit water and the overlying water in Whale Tail Lake (North Basin) (Golder, 2016c). Water quality within the flooded pit and the Whale Tail Lake (North Basin) will be monitored during the back-flooding period to verify the prediction of the water quality model. The information will be used to develop a strategy to minimize contamination of the regional surface water system. If required, the back-flooding plan will be adjusted to reduce potential effects to the environment.

Once the water in the back-flooded area is suitable for direct discharge to the environment, the pumping and pipelines systems will be removed. The Whale Tail Dike and Mammoth Dike will then be breached and the back-flooded area would then be restored to the original conditions. The dikes will be breached at selected locations to a depth of approximately 3 m below average water level at Whale Tail Lake to account for ice formation, fish passage and navigable water requirements. Excavated materials (rockfill) will be locally placed to extend shallower areas on the residual sides of the dike and breaches.

5.2.2.6 Predicted Residual Effects

No discharges will occur to the downstream receiving environment during the Phase 1 of back-flooding since all contact waters will be diverted to the open pit and Whale Tail Lake (North Basin) for back-flooding. Accordingly, predictive water quality results are provided for the downstream receiving environment only (Golder 2016c). Given the relatively small volume and small catchment of the first three receiving Lakes (Mammoth Lake, Lake A15, and Lake A12), the water quality in these Lakes averaged over the closure period is predicted to be similar to that of the last year of operations, with similar maximum and average concentrations. It is predicted that arsenic will slightly exceed the aquatic life guideline (Mammoth Lake, Lake A15, Lake A12, and Downstream Node 2) and the drinking water guideline (Mammoth Lake, Lake A15, and Lake A12), and that cadmium and chromium will be at the aquatic life guideline in Mammoth Lake. It is also predicted that phosphorus concentrations will remain in the eutrophic range (Mammoth Lake, Lake A15, and Lake A12), in the mesotrophic range (Downstream Node 2), and in the oligotrophic range (Downstream Node 1).

It is predicted that, during Phase 2 of back-flooding, the dissolved concentration of all parameters in Whale Tail Lake (North Basin) will be less than aquatic life guidelines. The total parameter concentration (based on an addition of 15 mg/L suspended solids) could exceed the aquatic life guidelines for total aluminum, arsenic, chromium, and iron in this Basin.

The quality of Whale Tail WRSF drainage (long-term average, post-closure) is predicted to meet the aquatic life guidelines for all parameters except fluoride, aluminum, arsenic, cadmium, chromium, copper, iron, lead, mercury, selenium, and uranium. See Section 5.2.3.5 for additional details on WRSF expected water quality.

Runoff from the Whale Tail WRSF and discharge from Whale Tail Lake (North Basin) will enter and mix in Mammoth Lake. In general, concentrations in post-closure are predicted to be lower than those in closure, and that these concentrations will continue to decrease through post-closure.

Predicted concentrations of major ions, nutrients, and metals (except arsenic) in Mammoth Lake, and downstream environments, for post-closure are predicted to be lower than aquatic life guidelines. Concentrations of arsenic are predicted to be marginally above the aquatic life guideline (by less than two times) in Lake Mammoth Lake, Lake A15, and Lake A12. By Year 10 of post-closure, concentrations of arsenic are predicted to be lower than the aquatic life guideline, and phosphorus concentrations are anticipated to return to oligotrophic to ultra-oligotrophic concentrations.

5.2.2.7 Uncertainties

The following uncertainties were identified during closure planning for the proposed open pit.

Water Quality

Arsenic release from submerged Whale Tail Pit walls is a source of uncertainty in the prediction of the long-term water quality of the flooded pit lake and Whale Tail Lake (North Basin). The actual interaction between the two water bodies (water within the pit and water above it forming North Whale Tail Lake) as well as possible chemical stratification of the flooded pit lake (which would result in improved water quality in the shallow pit lake) should be investigated.

The source of the uncertainty lies in the occurrence of arsenic in waste rock and its leachability, which is currently being investigated. There is also uncertainty in the hydrogeochemical and hydrological conditions that will occur in the waste stockpiles and pit walls, and in the hydrological conditions in the Pit Lake and Whale Tail Lake, neither of which have been studied in detail. The base-case scenario results presented assume that arsenic diffusion will not be significant post-flooding because the Whale Tail Pit is assumed to act as a groundwater recharge zone. This assumption is based on an overview of area lake water elevations, but disregards the possible effects of differing pit and groundwater densities. This assumption should be verified going forward.

5.2.2.8 Post-Closure Monitoring, Maintenance, and Reporting

The post-closure monitoring and maintenance program for the open pit mine workings is discussed in the following sections, along with the reporting requirements. Some of the sections below are general and apply for the other Project components as well.

The ICRP is a “living” document and includes a commitment to adaptive management and monitoring during all stages of the mine life to demonstrate the safe performance of the mine facilities and to reduce the potential for any contamination on the site or in the adjacent area after mine operations cease. Monitoring during operations and in closure will identify non-compliant conditions; allow timely maintenance and clean up as needed; allow timely planning for adaptive and corrective measures; and enable successful completion of the ICRP. In this way, the Project is not anticipated to

contribute residual contaminants to the environment after closure and reclamation in the post-closure period.

Monitoring programs will be initiated during pre-development and operations to provide additional baseline information on which to base the FCRP document. The adaptive management plans to be used in closure and post-closure will follow the actions completed during operations, and will be co-ordinated with the operational monitoring programs (e.g., the Aquatic Effects Monitoring Plan [AEMP] and the Terrestrial Environment Management Plan [TEMP]) to set appropriate trigger levels, and mitigation plans and actions.

Monitoring and maintenance programs that are implemented during the closure and post-closure phases of the Project life will use the data collected during operational monitoring to assess the performance of the reclamation and closure procedures, and to identify long-term maintenance requirements, if any. The data collected during post-closure monitoring will allow the procedures and activities to be adjusted or modified as necessary to confirm ongoing environmental protection.

Operational Monitoring Strategies

The overall objectives during operations of the AEMP and the TEMP are to provide programs to identify and mitigate potential adverse Project-related impacts so that construction and operational activities do not cause any undue harm to water quality, sediment quality, vegetation, biota, wildlife, and wildlife habitats. Both the AEMP and the TEMP provide the basis for integrating monitoring efforts with future revisions to the Closure and Reclamation Plan to verify compliance with regulatory instruments and agreements, both federally and territorially, as summarized in Section 2.6.

The AEMP and the TEMP will be reviewed and updated in the final year of operations to reflect conditions at the site as the mine approaches closure. The changes would allow the basic portions of the plans to continue to be used to cover the closure period activities.

Closure and Post-Closure Strategies

Development of monitoring and maintenance programs is an iterative process in consultation with communities and regulators as the Project advances. The closure and post-closure monitoring and maintenance programs will be extensions of efforts undertaken during the operations phase and would reflect the success of the management of the site during operations to limit contamination. The actual conditions or impact from the operations within the mine footprint would be understood at closure and this information would be used to modify monitoring plans moving to closure and post-closure.

It is anticipated that monitoring and maintenance will be carried out during the active closure stage at frequencies similar to those required during operations. Post-closure monitoring and maintenance will be carried out at a reduced frequency depending on the results of the monitoring and the measures of success selected for closure.

Guidance on monitoring and maintenance programs for closure and post-closure is provided in MVLWB/AANDC (2013). The frame work for the relevant strategies for the back-flooded area identified at this time is discussed below:

- visual inspections of the reclaimed areas;
- sample surface water and profiles of the back-flooded area; and
- inspect fish habitat in back-flooded area.

As the closure effort is completed and the post-closure period begins, the AEMP and the TEMP would be reviewed and updated again to cover the remaining (post-closure) monitoring period.

It is also anticipated that after several years in the post-closure period, monitoring would no longer be required.

It is planned that the haul road would be maintained for sufficient period to enable access to the site for minor maintenance required in the initial portion of the post-closure period. The haul road will be decommissioned once maintenance requirements at the Project site are anticipated to be minor and could be achieved with small crews sent to site via helicopter in the summer (see Section 5.2.7 for details on haul road closure). It is anticipated that the need for ongoing maintenance would be reduced with time and will not be required once the site is physically and chemically stable.

Reporting

The preparation of the following reports is required by the MVLWB/AANDC (2013) guidelines for closure and reclamation of all components of mine sites:

- **Annual Closure and Reclamation Plan Progress Report:** The general purpose of these annual reports is to provide an opportunity for all parties to track, modify, and report on reclamation. The annual review of research results also provides an opportunity to identify missing research tasks, which allows the research plans to continually evolve. The progress reports keep all parties informed about closure planning and allow the NWB to confirm that the proponent has remained on schedule. Any proposed changes to the CRP should be presented with supporting rationale in these reports for NWB approval.
- **Reclamation Completion Report:** The general purpose of the reclamation completion report is to provide details, including figures, of the actual reclamation work completed, and an explanation of any work that deviated from the original or approved CRP. The report should also provide a preliminary assessment on whether appropriate closure objectives and criteria have been achieved. With each reclamation completion report, there may be an opportunity to revise the financial security estimate depending on the stage of the operation and the current CRP.
- **Performance Assessment Report:** A performance assessment report is prepared at the completion of the reclamation work and following submission of the reclamation completion report. The general purpose of the performance assessment report is to provide a detailed

comparison of conditions at the site against the appropriate closure objectives and closure criteria. With each performance assessment report, there may be an opportunity to revise the security estimate depending on the stage of the operation and the current ICRP.

The timelines for preparation and submission to NWB of the above described reports will be according to the Meadowbank Mine approved license requirements; as the Project is being proposed as a satellite project.

5.2.2.9 Contingencies

The need for water treatment will be determined based on water quality monitoring before the Whale Tail Dike and the Mammoth Dike are to be breached. Prior to back-flooding of the pit, the quality of surface water and any groundwater seepage reporting from the pit walls will be sampled to assess potential for contamination of the pit water during filling. In addition, the surface water and profiles of the back-flooded area will be sampled. If the results of water quality monitoring indicate that water in the back-flooded area is not suitable for direct discharge, the following alternatives will be considered as contingencies for the treatment of the back-flooded area water:

- in-situ treatment; and
- active treatment through the WTP prior to discharge into the receiving environment.

5.2.3 Waste Rock and Overburden Storage Facilities

5.2.3.1 Project Component Description

The proposed WRSF and temporary overburden storage facility are described in Section 4.5.2.

5.2.3.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance site conditions are summarized in Section 3.0. Figure 5.2-2Figure 5.2- presents an aerial photo of the proposed mine site area taken in 2015. Pre-disturbance conditions are based on baseline data collection programs carried out since 2013.

The waterbodies that will be impacted by the WRSF are presented in the Water Management Plan submitted in support of the Type A Water Licence Amendment Application. All mining components have been located to avoid or reduce the impact on the local environment to the extent possible.

The existing conditions at the WRSF area and temporary overburden stockpile is the same as the pre-disturbance conditions.

The ultimate mine development of the Project is shown on Figure 1.1-1. At the end of operations, the proposed WRSF will occupy an area of approximately 110 ha (two piles) and will have a maximum height of approximately 80 m. At the end of operations, it is expected that the material from the temporary overburden storage facility will have been used for different purposes during the construction and operation stages.

5.2.3.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the WRSF are listed in Table 5.2-2.

Table 5.2-2: Closure Objectives and Criteria – Waste Rock Storage Facility

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices for controlling fugitive and exhaust emissions during active reclamation.	Implement best management practices. Routine air quality monitoring
Land	Confirm the WRSF slopes and top are stable	The WRSF will be designed for closure and will account for seismic and permafrost conditions	Physical inspection by a qualified engineer, and monitoring
		A thermal cover to limit acid generating reactions and migration of contaminants	Place thermal cover of NPAG rock on the WRSF surface during progressive reclamation and closure Thermistors to monitor verify that the active layer is less than the thickness of the cover
Water	Confirm runoff and seepage is collected	The runoff and seepage from the WRSF will continue to be collected in the designated collection pond and pumped to Attenuation Pond for treatment in the WTP, as per operational practices, until monitoring results demonstrate that water quality conditions from the WRSF are acceptable for direct discharge	Physical inspection. Routine monitoring and sampling
	Confirm runoff and seepage from the WRSF meet water licence criteria	As above	Routine monitoring and sampling
Wildlife	Ensure the WRSF surfaces are safe for wildlife	WRSF at post-closure will not compromise wildlife safety as the WRSF will be covered	Physical inspection
	Minimize the possibility that water from the WRSF will affect wildlife health	The runoff and seepage from the WRSF will continue to be collected in the designated collection pond and pumped to Attenuation Pond for treatment in the WTP, as per operational practices, until monitoring results demonstrate that water quality conditions from the WRSF are acceptable for direct discharge	Routine monitoring and sampling
Health and Safety	Ensure the WRSF is safe for monitoring and physical inspections	WRSF at post-closure will not compromise people's health	Routine monitoring and physical inspection
Community	Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement
	Consider transition plans	Community programs will be established to transition into closure	Physical inspection

WRSF = waste rock storage facility; WTP = water treatment plant

5.2.3.4 Consideration of Closure Options and Selection of Closure Activities

Construction / development of WRSF with long-term stable slopes and placing the cover in a progressive manner is considered the most appropriate closure plan based on Meadowbank experience.

No other options for the WRSF closure have been considered.

5.2.3.5 Engineering Work Associated with Selected Closure Activity

Much of the closure and reclamation of the WRSF will take place progressively during operations with the placement of the cover over the WRSF slopes. The remaining closure and remediation requirements of the WRSF will be completed after operations cease. Details of the closure activities are provided in the following subsections. The engineering works associated with the progressive closure activities for the WRSF are described in Section 6.2.3. Figure 1.1-1 shows the WRSF progressive reclamation advance by the end of the mine life.

Guidance on engineering work options or strategies for closure of WRSF is provided in MVLWB/AANDC (2013). The relevant engineering works associated with the permanent closure activities for the WRSF are discussed below.

The WRSF will be designed for long-term stability. Thus no additional re-grading of the sideslopes will be required. It will be necessary to contour the top surface to ensure positive drainage and to prevent ponding.

An engineered cover will be progressively placed on the surface of the WRSF as discussed in Section 4.5.2. The design proposed is similar to the approved Vault WRSF at Meadowbank Mine, namely the addition of 2 to 4 m of NPAG waste rock as final surface of the WRSF. The intent of the cover is to contain the yearly active layer inside the thickness of the cover and maintain a temperature below 0° Celsius for the underlying rock. The objective of the cover is the control of acid generating reactions and of migration of contaminants. The segregation of the PAG/NPAG and ML/Non-ML waste rock will occur during the operation of the mine. The covering of the top of the WRSF will be completed during the closure period using a storage of NPAG (and non-ML to the extent possible) waste rock.

Cover design will be finalized during the detailed design phase of the Project and will consider operational experience at other northern mine sites including the Meadowbank Mine, and available design guidelines including MEND Report 1.61.5c – Cold Regions Cover System Design Technical Guidance Document (MEND 2012). Thermistors will be installed to verify the predicted performance of the cover.

The contact water management system for the WRSF will be maintained during the closure period. The water collected from the WRSF will be treated if required until water quality monitoring demonstrates that water flowing from this facility is acceptable for direct release to the environment.

It is predicted that, at the WRSF pond, some parameters will exhibit average concentrations at post-closure that are above the CEQG-AL, including: arsenic, cadmium, copper, fluoride, lead, mercury, selenium, and uranium. All of the predicted average concentrations are within the same order of magnitude as the CEQG-AL guidelines, with the exception of arsenic, fluoride and cadmium.

WRSF pond drainage average water quality is predicted to meet CEQG-AL concentrations for most parameters, except arsenic, cadmium, and fluoride. Sporadic concentrations above CEQG-AL are

predicted for other parameters (e.g., chromium, copper, molybdenum, nickel, silver, lead, mercury, selenium, and uranium), based on the maximum predicted concentrations.

Once water quality is acceptable for direct release based on criteria established through the water licensing process, the WRSF contact water management system will be decommissioned (see Section 5.2.9 for decommissioning details).

5.2.3.6 Predicted Residual Effects

The following residual effects are predicted at the WRSF after reclamation:

- The WRSF will be a permanent feature on the landscape. The vegetation communities which formerly occupied the areas will be permanently lost but it is expected that some of the native community will re-vegetate the WRSF cover surface over time.
- No significant adverse impact on the continued opportunity for traditional and non-traditional use of wildlife in the region is anticipated with the closure of the WRSF or temporary overburden stockpile.
- Runoff from the Whale Tail WRSF and discharge from Whale Tail Lake (North Basin) will enter and mix in Mammoth Lake. In general, it is predicted that concentrations in post-closure will be lower than in those in closure, and that the concentrations will continue to decrease through post-closure. See Section 5.2.2.6 for additional details.

5.2.3.7 Uncertainties

The following uncertainties have been identified during closure planning of the WRSF:

WRSF Cover

As presented in Section 5.2.3.5, it is predicted that, at the WRSF pond, some parameters will exhibit average predicted concentrations at post-closure that are above the CEQG-AL.

The cover of waste rock is assumed to effectively host the active thaw depth in perpetuity over the entire WRSF. The rock type used for the cover is predicted to release arsenic at concentrations that may exceed the Portage effluent limit (Type A Water Licence No. 2AM-MEA1525). Fluoride concentrations are relatively elevated but are predicted to meet CEQG-AL in the receiving environment.

Experience at the Meadowbank Mine (Robert et al. 2012) suggests that field conditions are likely to show much lower concentrations in contact water than predicted. The assumptions used in modelling may be overly conservative and results may represent worst case water quality, should there be any water at all seeping out of the WRSF. Experience at Meadowbank Mine suggest there is likely to be very little water reporting to the base of the WRSF during operations.

The water quality predictions will be further investigated in the next design levels of the Project and during operations stage to confirm the above.

Permafrost Development

The thermal conditions within the WRSF will depend on the actual waste placement plan and schedule, initial waste temperatures when placed, and thermal conditions of the original ground before the waste materials are placed. Therefore, thermistors will be installed in the WRSF to monitor the rate of freeze back and permafrost development progress in the facilities during the operations stage. In addition, shallow thermistor strings will be installed in the cover as it is progressively placed to verify the cover performance, i.e. that the active zone thickness is less than the design cover thickness.

The locations for the thermistors will be determined during the final detailed design stage. Temperature readings will be taken according to Part I Item 9 of the Type A Water Licence to track permafrost development within the WRSF during operations and closure. The monitoring schedule will be reviewed and modified annually, as required, to reflect changes in operations and/or technology. The measured temperature within the WRSF will provide background information for the study of permafrost development within the facility.

Re-vegetation Considerations

The WRSF will be allowed to naturally re-vegetate.

5.2.3.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring and maintenance program for the Project are discussed in Section 5.2.2.8 along with the reporting requirements. The following presents the relevant post-closure monitoring and maintenance strategies for the WRSF (guidance on generic monitoring and maintenance programs for closure and post-closure is provided in MVLWB/AANDC [2013]):

- periodic inspections will be performed by a geotechnical engineer to visually assess stability and performance of the WRSF;
- ground conditions in the WRSF will be monitored to confirm permafrost conditions are being established as predicted;
- thermistor data will be monitored to determine thermal conditions within the WRSF to confirm predicted permafrost aggradation/encapsulation and to verify that the thickness of the active zone is less than the design thickness of the cover;
- water quality from controlled discharge points around the WRSF will be monitored to confirm that drainage is performing as predicted and is not adversely affecting the environment; and
- any seepage areas from the toe of the WRSF will be identified and monitored.

Further details on the contact water management system in closure is presented in Section 5.2.9.

5.2.3.9 Contingencies

On-going monitoring and treatment of seepage from the WRSF will be the primary contingency until water quality meets criteria to direct discharge to the environment.

5.2.4 Tailings Storage Facility

Tailings from the Project will report to Meadowbank Tailings Storage Facility. All tailings produced by Meadowbank Mine will be deposited in accordance with the approved Mine Waste Rock and Tailings Management Plan. Closure of the TSF is covered under the Meadowbank Mine ICRP.

5.2.5 Buildings and Equipment

5.2.5.1 Project Component Description

The proposed buildings and equipment are described in Section 4.5.3.

5.2.5.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance site conditions are summarized in Section 3.0. Figure 5.2-2 presents an aerial photo of the proposed mine site area taken in 2015. Pre-disturbance conditions are based on baseline data collection programs carried out since 2013.

The existing conditions at the buildings area is the same as the pre-disturbance conditions with the exception of a few trailers used for the exploration stage.

The ultimate mine development of the Project is shown on Figure 1.1-1. The expected area of disturbance associated with the proposed on-site and off-site Project facilities including the mine infrastructure described in Section 5.2.6 is approximately 32 ha.

5.2.5.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the buildings and equipment are listed in Table 5.2-3.

Table 5.2-3: Closure Objectives and Criteria – Buildings and Equipment

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices for controlling fugitive and exhaust emissions during active reclamation	Implement best practices. Routine air quality monitoring
	Control dust generation from demolition and active reclamation activities	Best management practices to control dust	Implement controls and routine air quality monitoring
Land	Maintain required site infrastructure during active reclamation	Reduce the use of facilities after closure to promote early decommissioning	Physical inspection
	Clean up and remove machinery, materials and equipment	Machinery, materials and equipment will be removed off-site for salvage where economic to do so	Physical inspection
		Metals will be separated and shipped off-site as scrap if economical to do so or disposed on-site in designated areas for non-hazardous materials	Physical inspection
	Remove all hazardous wastes	Hazardous wastes will be removed for disposal by licensed handler	Physical inspection
	Remove all fuels, chemicals and industrial wastes	During or prior to closure, site inventory of all these products will be updated	Physical inspection

Table 5.2-3: Closure Objectives and Criteria – Buildings and Equipment (continued)

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
		Any unused petroleum products or chemicals will be sold, returned to suppliers or disposed by a licensed handler	
	Remove surface infrastructure	Any above-ground infrastructure will be offered to the Kivalliq Inuit Association (the land owner) at closure for potential re-use elsewhere, or will be dismantled and demobilized from site or disposed in the landfill	Physical inspection
		Remaining concrete foundations and slabs will be cut in pieces and buried or removed and the area re-graded to promote natural drainage	
	Remove contaminated soils	An assessment will be carried out to identify areas where soils may be contaminated by hydrocarbons	Physical inspection
		A more detailed investigations will be carried out of the potential soil contaminated areas (i.e., Phase 1 and 2 ESA investigations) to determine the extent of the contamination	Environmental Site Assessment
		Selected hydrocarbon contaminated soils will be excavated and hauled to Meadowbank Mine landfarm for remediation	Physical inspection
Water	Ensure runoff is channelled through the watershed	Surfaces will be re-graded to promote natural drainage	Physical inspection and monitoring
Wildlife	Ensure the remaining surface areas are safe for wildlife use and access	Remaining areas will be scarified and remaining concrete foundations and slabs will be cut in pieces and buried or removed	Physical inspection
Health and Safety	Ensure reclaimed areas support continuation of human land use activities	Human land use of the reclaimed area at post-closure will not compromise people's health	Routine monitoring and physical inspection
Community	Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement
	Consider transition plans	Community programs will be established to transition into closure	Physical inspection

5.2.5.4 Consideration of Closure Options and Selection of Closure Activities

If not properly reclaimed, wildlife maybe injured by entering reclaimed areas with depressions and if subsidence occurs. Environmental design features and mitigation, as well as current wildlife management practices used in other mining projects will be implemented at the Project to limit wildlife injury such as re-contouring reclaimed areas to reduce hazards to wildlife. Buildings and equipment not required for post-closure activities will be removed from the site.

This is considered the most appropriate closure plan based on the Meadowbank Mine experience; no other closure options were considered.

5.2.5.5 Engineering Work Associated with Selected Closure Activity

Guidance on engineering options or strategies for closure of buildings and general infrastructure is provided in MVLWB/AANDC (2013). The relevant engineering works associated with the permanent closure activities for the supporting building and equipment removal are discussed below.

- Equipment used for closure activities and long-term maintenance (e.g., trucks, backhoes, etc.) will be removed from the Project site once they are no longer required. Most of the mobile equipment will be removed once the closure stage is complete. A small subset of equipment will be retained on-site for a portion of the post-closure stage.
- Phase 1 and 2 ESAs will be carried out to identify areas where soils may be contaminated by hydrocarbons; contaminated soils will be excavated and hauled to Meadowbank Mine landfarm for remediation.
- Salvageable buildings and surface structures will be dismantled and demobilized from the site. The buildings will be offered to the KIA (the land owner) at closure for potential re-use elsewhere.
- Non-salvageable buildings and structures will be dismantled or demolished and inert non-hazardous materials will disposed in the landfill area in the WRSF.
- Hazardous wastes will be removed for disposal by a licensed handler.
- Any above grade concrete structures will be demolished and the rubble will be disposed of in the WRSF landfill. Any slabs on grade will be punctured and then left in place and covered with soil or non-potentially acid generating/non-metal leaching waste rock. Any subgrade foundations will be left in place.
- All disturbed site areas will be re-graded to suit the surrounding topography. In areas where the original ground surface was lowered for site grading or structural requirements, the slopes will be stabilized and contoured. Cover materials may be required for erosion and dust control. It is anticipated that a succession of indigenous plant species will naturally re-vegetate the surface over time.
- Fuel not required during the closure and reclamation activities will be sold, returned to suppliers, disposed by a licensed handler or incinerated.

5.2.5.6 Predicted Residual Effects

No significant residual effects have been identified for after closure of the supporting buildings but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration or loss of plant populations and plant communities.

5.2.5.7 Uncertainties

The pre-disturbance terrain is covered by discontinuous vegetation interspersed with few bedrock outcroppings. The reclamation plan will be designed to encourage a natural succession of indigenous plant species within disturbed site areas. Grading and contouring would be done, where appropriate, to control soil erosion and to promote re-vegetation by natural colonization.

Active revegetation has not been planned at this time as part of the reclamation plan given the cold climate setting of the Project. Additional research on active revegetation may be considered in future iterations of the closure activities.

5.2.5.8 Post-Closure Monitoring, Maintenance, and Reporting

Guidance on generic monitoring and maintenance programs for closure and post-closure is provided in MVLWB/AANDC (2013). The overall post-closure monitoring and maintenance program for the Project are discussed in Section 5.2.2.8 along with the reporting requirements. The following presents the relevant post-closure monitoring and maintenance strategies for the supporting buildings and equipment:

- periodic inspections will be performed to visually assess the reclaimed areas; and
- all buildings and equipment left on-site during closure will be maintained until no longer required, at which time they will be removed from the site or demolished and disposed in the WRSF landfill.

5.2.5.9 Contingencies

There are no activities proposed as contingencies for the closure of the buildings and equipment.

5.2.6 Mine Infrastructure

5.2.6.1 Project Component Description

The proposed mine infrastructure are described in Section 4.5.4.

5.2.6.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance site conditions are summarized in Section 3.0. Figure 5.2-2 presents an aerial photo of the proposed mine site area taken in 2015. Pre-disturbance conditions are based on baseline data collection programs carried out since 2013.

The existing conditions at the two crushing facility areas is the same as the pre-disturbance conditions.

The ultimate mine development of the Project is shown on Figure 1.1-1.

5.2.6.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the mine infrastructure are listed in Table 5.2-4.

Table 5.2-4: Closure Objectives and Criteria – Mine Infrastructure

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices for controlling fugitive and exhaust emissions during active reclamation	Implement best practices. Routine air quality monitoring
	Control dust generation from demolition and active reclamation activities	Best management practices to control dust	Implement controls and routine air quality monitoring
Land	Clean up and remove components or materials	All salvageable components or materials will be cleaned up and removed off-site for salvage	Physical inspection
		Metals will be separated and shipped off-site as scrap if economical to do so or disposed on-site in designated areas for non-hazardous materials	
	Remove surface infrastructure	Above grade concrete such as retaining walls will be demolished and the rubble will be disposed in the WRSF landfill. Remaining concrete foundations and slabs will be cut in pieces and buried or removed and the area re-graded to promote natural drainage	Physical inspection
Water	Ensure runoff is channelled through the watershed	Surfaces will be re-graded to promote natural drainage	Physical inspection and monitoring
Wildlife	Ensure the remaining surface areas are safe for wildlife use and access	Steep surfaces will be regraded. Remaining areas will be scarified and remaining concrete foundations and slabs will be cut in pieces and buried or removed	Physical inspection
Health and Safety	Ensure reclaimed areas support continuation of human land use activities	Human land use of the reclaimed area at post-closure will not compromise people's health	Routine monitoring and physical inspection
Community	Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement
	Consider transition plans	Community programs will be established to transition into closure	Physical inspection

5.2.6.4 Consideration of Closure Options and Selection of Closure Activities

No viable alternative was identified other than the proposed demolition of the crusher facilities. This is considered the most appropriate closure plan based on the Meadowbank Mine experience.

5.2.6.5 Engineering Work Associated with Selected Closure Activity

Guidance on engineering options or strategies for closure of mine infrastructure is provided in MVLWB/AANDC (2013). The relevant engineering works associated with the permanent closure activities for the mine infrastructure are discussed below.

- Salvageable equipment such as the jaw crushers and conveyors will be dismantled and demobilized from the site.

- Non-salvageable structures will be dismantled or demolished and inert non-hazardous materials disposed of in the landfill area in the WRSF.
- Hazardous wastes will be removed for disposal by a licensed handler.
- Any above grade concrete such will be demolished and the rubble will be disposed in the WRSF landfill. Remaining concrete foundations and slabs will be cut in pieces and buried or removed.
- After the crushing facilities are removed, the areas will be re-graded to promote natural drainage. All disturbed site areas will be re-graded to suit the surrounding topography. In areas where the original ground surface was lowered for site grading or structural requirements, the slopes will be stabilized and contoured. Cover materials may be required for erosion and dust control. It is anticipated that a succession of indigenous plant species will naturally re-vegetate the surface over time.

5.2.6.6 Predicted Residual Effects

No significant residual effects have been identified for after closure of the mine infrastructure but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration or loss of plant populations and plant communities.

5.2.6.7 Uncertainties

Refer to Section 5.2.5.7 regarding revegetation.

It is uncertain whether or not it will be economically viable at the time of closure to ship out the jaw crushers and conveyors for salvage. However, given the length the operational period, it is likely they will have some salvage value.

5.2.6.8 Post-Closure Monitoring, Maintenance, and Reporting

Guidance on monitoring and maintenance programs for closure and post-closure is provided in MVLWB/AANDC (2013). The overall post-closure monitoring and maintenance program for the Project are discussed in Section 5.2.2.8 along with the reporting requirements. The following presents the post-closure monitoring and maintenance strategies for the mine infrastructure:

- periodic inspections will be performed to visually assess the reclaimed areas

5.2.6.9 Contingencies

There are no activities proposed as contingencies for the closure of the mine infrastructure.

5.2.7 Transportation Routes

5.2.7.1 Project Component Description

The proposed transportation routes are described in Section 4.5.5.

The haul roads within the open pit and between the open pit and the crusher will become redundant when mining ceases. The haul road to the WRSF will be maintained until the closure of the WRSF is

completed. The internal access roads, as needed, will be active until water quality meets discharge criteria during post-closure.

5.2.7.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance site conditions are summarized in Section 3.0. Figure 5.2-2 presents an aerial photo of the proposed mine site area taken in 2015. Pre-disturbance conditions are based on baseline data collection programs carried out since 2013.

Ten km of roads have been also constructed on-site as part of the exploration activities carried out to date surrounding the camp and communication tower.

The ultimate mine development of the Project is shown on Figure 1.1-1. The expected areas of disturbance are shown on Figure 5.2-1.

5.2.7.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the transportation routes are listed in Table 5.2-5.

Table 5.2-5: Closure Objectives and Criteria – Transportation Routes

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices for controlling fugitive and exhaust emissions during active reclamation	Implement best practices. Routine air quality monitoring
	Control dust generation from decommissioning and active reclamation activities	Best management practices to control dust	Implement controls and routine air quality monitoring
Land	Scarify and re-grade redundant roads to a state compatible with the desired end use	Haul road surfaces will be scarified, culverts and bridges removed, and surfaces will be re-graded to promote natural drainage. Same will be done with internal access roads above flooding level.	Physical inspection
Water	Ensure runoff is channelled through the watershed	Scarified surfaces will be re-graded to promote natural drainage	Physical inspection
Wildlife	Ensure the remaining surface areas are safe for wildlife use and access	Scarified surfaces will be re-graded	Physical inspection
Health and Safety	Ensure reclaimed areas support continuation of human land use activities and do not become a source of contamination	Human land use of the reclaimed area at post-closure will not compromise people's health	Routine monitoring and physical inspection
Community	Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement
	Consider transition plans	Community programs will be established to transition into closure	Physical inspection

5.2.7.4 Consideration of Closure Options and Selection of Closure Activities

Migrating Caribou Protection

Caribou are an important part of the Arctic ecosystem, and a key part of the culture and traditional economy of Nunavut. There are five migratory barren-ground caribou herds identified in the Kivalliq including the Beverly, Ahiak, Wager Bay, Lorillard, and Qamanirjuaq herds (Agnico Eagle 2016). As a result, Inuit traditionally did not live at or near the calving grounds but rather chose to remain at a distance, and set up camps along the migration routes. Elders have stated that there are no caribou calving grounds identified near the Project area (Agnico Eagle 2016), and the nearest calving ground to the Project is over 100 km away.

The RSA appears to be located within a transit corridor during spring and fall migration, predominantly for the Ahiak and Lorillard herds moving between calving and wintering grounds. For spring migration (April to June), areas of high use by collared caribou are more contained (i.e., less spread out), and these corridors are quite clearly delineated on the way to, and in proximity of, calving grounds outside the RSA.

Caribou entering the Project have a high probability of interacting with the Project haul road route. Based on caribou crossing information collected from 1993, there is a 0.6 caribou predicted to cross the proposed Project haul road route per kilometre.

According to the data collected (Agnico Eagle, 2016), individuals do not usually make repeated crossings of the proposed haul road route. The maximum number of crossings per individual for the proposed Project haul road route is predicted to be one to five crossings per individual, however the majority of the individuals still crossed only once.

To avoid disrupting movement patterns of caribou, particularly during the spring and fall migratory period, mitigation includes designing roads with low profiles, avoiding build-up of snowbanks in winter and enforcing speed limits. Agnico Eagle will work, during the operations and closure stages, with the KIA and HTO to monitor areas where the road may be impeding caribou migration.

Similarly, Agnico Eagle will work with the KIA and HTO to identify areas where the proposed haul road is impeding passage of snowmobiles and/or all-terrain vehicles for traditional hunting or fishing purposes and is committed to retrofitting appropriate crossings in such areas.

Heavy traffic on the haul road and on-site roads will cease at closure. Traffic associated with reclamation will continue at a reduced level for the first years of closure. After that, there will be very little vehicle traffic. The Project haul road will be decommissioned when it is no longer required.

Haul Road Decommissioning

Agnico Eagle has committed to decommission the haul road once the Project reclamation has been completed and the site no longer requires ongoing care and maintenance. However the community may want the haul road to remain open to allow public access with minimal restrictions.

Consequently, Agnico Eagle will continue to operate the haul road as privately operated road with unrestricted public access for as long as access is required to the proposed Project site.

For a third party to take over the road(s) following closure of the proposed Project, that third party would have to complete its own arrangements with the landowners (the KIA and the hamlet), and its own environmental assessment and permitting process covering future use. Agnico Eagle does not own the land on which the roads are constructed and, thus, cannot transfer future ownership or use privileges to any third party. Agnico Eagle must complete its obligation to decommission and reclaim all roads unless directed otherwise by a combination of the landowners and other regulatory agencies who issued permits/authorizations for the roads.

5.2.7.5 Engineering Work Associated with Selected Closure Activity

Guidance on generic engineering work options or strategies for closure of transportation routes is provided in MVLWB/AANDC (2013). The relevant engineering works associated with the permanent closure activities for the transportation routes are discussed below.

- The roads not required for post-closure monitoring, and not assumed by the community or by a third party after consultation, will be decommissioned and the terrain will be restored. Decommissioning of the road will start from the site.
- Decommissioning will occur by loosening compacted surfaces and flattening side slopes.
- The road surface will be scarified, allowing the native plant community to naturally establish itself on the former road surface.
- Slopes will be stabilized against erosion potential.
- If necessary, wildlife access will be provided at suitable intervals by re-grading the embankment shoulders to provide flatter slopes.
- All bridges and culverts will be removed and original drainage patterns will be restored.
- Stream crossings will be rehabilitated as they are encountered during the progression of the road decommissioning work.
- Cross-drain structures (cross-ditches) will also be installed where necessary between culvert sites. Where armouring rock (rip-rap) is required, this rock will be non-acid generating and non-metal leaching for the protection of aquatic life. Where affected watercourses are fish bearing, the timing of work will be restricted to within the designated DFO fisheries work window.
- The loosening of compacted surfaces will be accomplished by ripping the road bed using a dozer with a “ripper” attachment on the back. Successive passes with the dozer longitudinally along the road bed will eliminate the level road surface and make travel difficult. It is anticipated that, in this way, the abandoned roads will not be useable by wheeled vehicles (i.e., cars, trucks, and pick-up trucks). The road bed would still be useable by all-terrain vehicle or snowmobile after final reclamation.

5.2.7.6 Predicted Residual Effects

No significant residual effects have been identified for after closure of the transportation roads but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration or loss of plant populations and plant communities. The former haul road will also provide a snowmobile or ATV access corridor. This could results in added hunting pressure along the corridor.

5.2.7.7 Uncertainties

Refer to Section 5.2.5.7 with regards to revegetation.

It may not be visually apparent if potentially acid generating bedrock has been exposed along the corridor of the Project haul road.

5.2.7.8 Post-Closure Monitoring, Maintenance, and Reporting

Guidance on generic monitoring and maintenance programs for closure and post-closure is provided in MVLWB/AANDC [2013]. The overall post-closure monitoring and maintenance program for the Project are discussed in Section 5.2.2.8 along with the reporting requirements. The following presents the post-closure monitoring and maintenance strategies for the transportation routes

- periodic inspections will be performed to visually assess the reclaimed areas; and
- all roads to be used during closure will be maintained until they are no longer required.

5.2.7.9 Contingencies

If exposures on the Project haul road corridor result in acidification of surface water, then such impacts will be assessed and an appropriate mitigation strategy will be put in place.

5.2.8 Landfill and Other Waste Disposal Areas

5.2.8.1 Project Component Description

The proposed landfill and other waste disposal areas are described in Section 4.5.6.

5.2.8.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance site conditions are summarized in Section 3.0. Figure 5.2-2 presents an aerial photo of the proposed mine site area taken in 2015. Pre-disturbance conditions are based on baseline data collection programs carried out since 2013.

The existing waste disposal currently authorized under 2BE-MEA1318 consists of incineration of waste, use of a greywater sump, use of latrine pits, and trench disposal of contaminated water. Any hazardous waste is placed into totes for hauling off site.

The ultimate mine development of the Project is shown on Figure 1.1-1. The expected areas of disturbance are shown on Figure 4.5-1.

5.2.8.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the waste management facilities are listed in Table 5.2-6.

Table 5.2-6: Closure Objectives and Criteria – Waste Management Facilities

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices for controlling fugitive and exhaust emissions during active reclamation	Implement best practices. Routine air quality monitoring
	Control dust generation from decommissioning and active reclamation activities	Best management practices to control dust	Implement controls and routine air quality monitoring
Land	Treat light hydrocarbon contaminated soil in the Meadowbank Mine landfarm	As per operational practices light hydrocarbon contaminated soil will be treated in the Meadowbank Mine landfarm area during the active closure stage	Physical inspection
	Clean up and remove sewage plant materials	Once the active closure stage is completed, all salvageable components or materials will be cleaned up and removed off-site for salvage	Physical inspection
		Metals will be separated and shipped off-site as scrap if economical to do so or disposed on-site in the WRSF landfill	
	Remove all hazardous wastes	Hazardous wastes will be removed for disposal by licensed handler as per operational practices	Physical inspection
	Remove sewage plant infrastructure	Any above-ground infrastructure will be demolished and the non-hazardous debris will be disposed in the WRSF landfill	
	Remove all non-hazardous wastes	Remaining concrete foundations and slabs will be cut in pieces and buried or removed and the area re-graded to promote natural drainage	Physical inspection
	Landfill is encapsulated in the WRSF	The landfill area will be covered at the end of active closure stage	Physical inspection
Water	Ensure runoff is channelled through the watershed	Surfaces will be re-graded to promote natural drainage	Physical inspection
Wildlife	Ensure the remaining areas are safe for wildlife use and access	Keep wildlife out of the landfill while it is active using day covers. The remaining areas will be re-graded to reduce hazards to wildlife	Physical inspection
Health and Safety	Ensure reclaimed areas support continuation of human land use activities	Human land use of the reclaimed area at post-closure will not compromise people's health	Routine monitoring and physical inspection
Community	Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement
	Consider transition plans	Community programs will be established to transition into closure	Physical inspection

5.2.8.4 Consideration of Closure Options and Selection of Closure Activities

Landfill

The landfill for non-hazardous solid waste will be maintained in such a manner that windblown litter will be minimal. Following the example of Meadowbank Mine, the landfill will be located within the

WRSF to avoid the disturbance of additional land area and to centralize waste disposal for monitoring. The concept is similar to that of a landfill in which waste is buried. The surface runoff from the landfill will be managed as part of the WRSF contact water management system.

Wildlife Protection

If not properly reclaimed, wildlife maybe injured by entering reclaimed areas. Environmental design features and mitigation, as well as current wildlife management practices used in other mining projects will be implemented at the Project to limit wildlife injury. This will include re-contouring reclaimed areas to reduce hazards to wildlife and the use of day covers to keep wildlife out while the landfill is in active operation.

This is considered the most appropriate closure plan based on the Meadowbank Mine experience; no other closure options were considered.

5.2.8.5 Engineering Work Associated with Selected Closure Activity

Guidance on generic engineering work options or strategies for closure of waste management facilities is provided in MVLWB/AANDC (2013). The relevant engineering works associated with the permanent closure activities for the waste management facilities are discussed below.

- The leachate from the landfill is anticipated to be of very low ionic strength (dilute) due to controls on materials to be placed in the landfill. Moreover, drainage from the landfill is largely expected to freeze within the WRSF, with little to none reporting to the water collection infrastructure.
- The design, operation, and/or closure of the landfill do not rely on total freezing; however, as an added control strategy, a minimum of 2 m thick NPAG waste rock cover will be placed over the landfill (as with other parts of the surrounding WRSF). The cover thickness is considered sufficient for planning purposes and is based on maintaining the active layer within the waste rock cover so that the materials landfilled will remain frozen. The cover will be placed at closure. The cover is designed to account for potential climate warming and would be modified if required. When finalizing the design for the cover, the need for thermistors to be installed will be evaluated. The surface will be left irregular so as to capture snow, windblown sediment, and plant seeds.
- The hazardous waste and contaminated soil (soil not treated through the Meadowbank Mine landfarm, i.e., soil contaminated with heavy hydrocarbons or other contaminants not suitable for remediation in the landfarm) will be managed continually during operations and closure by sending the soil to a licensed off-site treatment facility. Therefore, there will be little to no accumulation of such wastes during mine operations or closure at the Project site, subject to seasonal shipping considerations.
- Inert, non-combustible wastes will be disposed in the WRSF landfill.
- Domestic waste will be burned in the Meadowbank Mine incinerator during operation and closure as part of camp maintenance.

- Any above-ground structures will be demolished and the non-hazardous debris will be disposed in the WRSF landfill.
- Concrete slabs on grade will be cut in pieces and buried, or moved to the WRSF landfill. Foundations will be left in place and covered with fill.
- The top of the landfill will be contoured to encourage drainage and to prevent ponding. A minimum 2 m thick cover of NPAG rock will be placed on top (as discussed above).

5.2.8.6 Predicted Residual Effects

No significant residual effects have been identified for closure of the waste management facilities but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration or loss of plant populations and plant communities.

5.2.8.7 Uncertainties

Refer to Section 5.2.5.7 with regards to revegetation.

5.2.8.8 Post-Closure Monitoring, Maintenance, and Reporting

Guidance on generic monitoring and maintenance programs for closure and post-closure is provided in MVLWB/AANDC (2013). The overall post-closure monitoring and maintenance program for the Project are discussed in Section 5.2.2.8 along with the reporting requirements. The following presents the post-closure monitoring and maintenance strategies for the waste management facilities

- periodic inspections will be performed to visually assess the reclaimed areas;
- all waste management facilities to be used during closure will be maintained until they are no longer required; and
- visual observations for cracking or slumping of the landfill cover and for underlying waste material pushing its way up through the cover will be completed periodically.

5.2.8.9 Contingencies

There are no activities proposed as contingencies for the closure of the landfill and other disposal areas.

5.2.9 Water Management Facilities

5.2.9.1 Project Component Description

The proposed mine infrastructure are described in Section 4.5.7.

5.2.9.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance site conditions are summarized in Section 3.0. Figure 5.2-2 presents an aerial photo of the proposed mine site area taken in 2015. Pre-disturbance conditions are based on baseline data collection programs carried out since 2013.

The waterbodies that will be impacted by the pit mining activities are presented in the Water Management Plan submitted in support of the Type A Water Licence Amendment Application. All

mining components have been located to avoid or minimize impact on the local environment to the extent possible.

The ultimate mine development of the Project is shown on Figure 1.1-1. The expected areas of disturbance are shown on Figure 5.2-1.

5.2.9.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the water management facilities are listed in Table 5.2-7.

Table 5.2-7: Closure Objectives and Criteria – Water Management Facilities

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Control dust generation from active reclamation activities	Best management practices to control dust	Implement controls and routine air quality monitoring
Land	Maintain surface water drainage control systems	Whale Tail Lake and Nemo Lake fresh water intake and distribution system will be reclaimed	Physical inspection
		Maintain water management components until they are no longer required	Physical inspection
	Ensure dikes and dams are stable	Dikes and dams will be breached once water quality meets licence criteria for direct discharge	Physical inspection by qualified engineer
	Remove surface infrastructure (i.e., pipelines, culverts, pump systems, WTP)	Components or materials will be cleaned up and salvageable materials removed	Physical inspection
		Any above ground pipelines will be dismantled and associated distribution equipment will be salvaged or disposed of in the WRSF landfill	Physical inspection
		Reclaimed areas will be re-graded	Physical inspection
		Any culverts and equipment will be removed from site for salvage or disposed of in the WRSF landfill	Physical inspection
		Any above ground infrastructure will be demolished and the non-hazardous debris will be disposed in the WRSF landfill	Physical inspection
		Any concrete slabs on grade will be perforated and covered or removed and the area re-graded to promote natural drainage. Foundations will be left in place.	Physical inspection
	Remove all hazardous wastes	Hazardous wastes will be removed for disposal by licensed handler as per operation practices	Physical inspection
Water	Ensure runoff is channelled through the watershed	Surfaces will be re-graded to promote natural drainage	Physical inspection
	Ensure collected runoff and seepage meets water licence criteria	Collected runoff and seepage will be treated through the WTP until water quality meets licence criteria for direct discharge	Routine monitoring and sampling
	Remove facilities when treatment is no longer required	When water quality from the mine components is deemed suitable for direct discharge to the environment the dikes and dams will be breached	Routine monitoring and sampling
Wildlife	Discourage wildlife from entering the facilities	Wildlife will be discouraged from entering the facilities until water quality is acceptable	Routine water quality sampling

Table 5.2-7: Closure Objectives and Criteria – Water Management Facilities (continued)

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Health and Safety	Ensure the remaining areas are left in a healthy state that supports continuation of human land use activities	Human land use of the reclaimed areas at post-closure will not compromise people's health	Routine monitoring and physical inspection
Community	Consider community land use expectations and traditional knowledge in the closure planning	Community engagement will continue to be implemented	Public engagement
	Consider transition plans	Community programs will be established to transition into closure	Physical inspection

5.2.9.4 Consideration of Closure Options and Selection of Closure Activities

If not properly reclaimed, wildlife may be injured entering reclaimed areas. Environmental design features and mitigation, as well as current wildlife management practices used in other mining projects will be implemented at the Project to limit wildlife injury. This will include re-contouring reclaimed areas to reduce hazards to wildlife.

This is considered the most appropriate closure plan based on the Meadowbank Mine experience; no other closure options were considered.

5.2.9.5 Engineering Work Associated with Selected Closure Activity

Guidance on generic engineering work options or strategies for closure of water management facilities is provided in MVLWB/AANDC (2013). The relevant engineering works associated with the permanent closure activities for the water management facilities are discussed below.

Freshwater Intake and Potable Water Treatment Plant: The pumps will be removed from the freshwater intake for salvage if economic to do so. The wet wells will be filled in with granular material. Above grade buildings will be demolished and the debris will be disposed in the WRSF landfill. The potable water treatment plant will be dismantled and salvaged or disposed of in the WRSF landfill when it is no longer required. Any slabs on grade from the potable water treatment plant will be perforated and covered, or removed. The areas will be re-graded to promote natural drainage and natural re-vegetation.

WTP and Mammoth Lake Effluent Diffuser: The WTP will be decommissioned once it is no longer required (i.e., when the water quality from the Project components meets licence requirements for direct discharge). The WTP and the Mammoth Lake effluent diffuser will be maintained for 3 water treatment seasons as a contingency before being dismantled and disposed of in the WRSF landfill. Any concrete slabs on grade from the WTP will be perforated and covered, or removed, and the area will be re-graded to promote natural drainage and natural re-vegetation.

Dikes/Dams: The Northeast Dike will be breached in Year 4 (2022). The remaining water retention and dewatering berms/dams will be kept intact to provide a barrier between the facilities and surrounding lakes until the water quality (seepage and runoff collected from facilities, and from the back-flooded area) is considered acceptable for release to the environment without treatment. Once this is achieved, the remaining dikes/dams will be breached.

The dikes/dams will be breached at selected locations to a depth of approximately 3 m below the minimum water level at Whale Tail Lake to account for ice formation, fish passage and navigable water requirements for the dewatering dikes and to the original surface for the other containment structures.

Consideration will be given to breach staging, with above-water portions of the dike/dam in the breach area removed during winter periods, when there will be little surface water flow, thereby minimizing the potential release of sediments to the neighbouring lakes. The remainder of the breach would be completed during the following freshet. Exposed surfaces within the breach opening above normal lake water levels will be covered with erosion protection consisting of NPAG and non-ML materials when needed. These materials will also be used below the water surface.

It is expected that the breaching of the dikes/dams will be sequenced as follows, see Section 5.2.2 for additional details on back-flooding of the Whale Tail Lake dewatered area:

- Year 4 (Year 2022): the Northeast Dike will be breached to allow the Northeast watershed to accelerate the back-flooding of the dewatered area (Figure 1.1-1).
- Year 11 (Year 2029): the Whale Tail Dike and the Mammoth Dike will be breached to re-establish the natural water flow in the Whale Tail Lake area once the Whale Tail Lake level has reached 152.5 m (original water level) and water quality meets licence limits for release to the environment without treatment (Figure 1.1-2).
- Year 14 (Year 2032): the WRSF Dike and Coffer/Saddle Dam will be breached allowing the complete re-establishment of the natural drainage patterns for the Project. It is expected that the WRSF water quality meets licence limits for release to the environment without treatment.

Channels and ponds: The channels and ponds for contact water will be maintained as required in closure until site water quality monitoring results indicate that the water can be released directly to the environment without further treatment. No closure measures are necessary for the fresh water bypass channel from Whale Tail Lake (South Basin) to Mammoth Lake because its invert elevation will be above the final water level in the lake.

All water management infrastructures when they are no longer required will be re-contoured and/or surface-treated according to site-specific conditions to minimize wind-blown dust and erosion from surface runoff to and enhance the site area for natural re-vegetation and wildlife habitat post-closure.

Pipelines, culverts, pumps: Pipes, culverts and pipes will be maintained as required in closure until site water quality monitoring results indicate that the water can be released directly to the environment without further management. All water management infrastructure will be dismantled and salvaged or disposed of in the WRSF landfill when they are no longer required. Reclaimed areas will be re-graded to promote natural drainage and natural re-vegetation.

Diversion channels: The diversion channels will be maintained as required in closure until site water quality monitoring results indicate that the water can be released directly to the environment without further management.

The channels will be re-contoured and/or surface-treated according to site-specific conditions to minimize wind-blown dust and erosion from surface runoff to and enhance the site area for natural re-vegetation and wildlife habitat post-closure.

Water quality predictions: As described in Sections 5.2.2.6 and 5.2.3.5.

5.2.9.6 Predicted Residual Effects

No significant residual effects have been identified for closure of the water management facilities but changes to terrain caused by the construction and subsequent reclamation of the facilities could result in some alteration or loss of plant populations and plant communities.

5.2.9.7 Uncertainties

The following uncertainties were identified during closure planning of the water management facilities:

Natural Re-vegetation

Refer to Section 5.2.5.7.

Water Quality

The water quality predictions provide an estimate of water quality under fully mixed conditions where the effluent and downstream lake overflows are being mixed instantaneously in the downstream receiving water body. In reality, mixing will occur over time and could result in sporadic elevated concentrations at various locations at any given time.

The water quality predictions will be further investigated in the next design levels of the Project and during operations stage.

5.2.9.8 Post-Closure Monitoring, Maintenance, and Reporting

Guidance on generic monitoring and maintenance programs for closure and post-closure is provided in MVLWB/AANDC (2013). The overall post-closure monitoring and maintenance program for the Project are discussed in Section 5.2.2.8 along with the reporting requirements. The following presents the post-closure monitoring and maintenance strategies for the water management facilities

- the water quality in the open pit will be profiled during the back-flooding process;
- water management points (including seepage) that were not anticipated will be identified and monitored;
- ongoing inspection and maintenance of the WTP will be conducted as long as it remains in operation;
- the rate of back-flooding of the open pit and the dewatered area will be monitored and compared with predictions;
- periodic inspections will be performed to visually assess the reclaimed areas;
- unstable areas will be identified and monitored; and
- all water management facilities to be used during closure will be maintained until they are no longer required.

5.2.9.9 Contingencies

Water Quality

The WTP will be decommissioned once water treatment is no longer required on-site; when water quality from the mine components meets licence requirements for direct discharge. The WTP and Mammoth Lake effluent diffuser will be maintained for three water treatment seasons as a contingency before being dismantled and disposed of in the on-site WRSF landfill facility.

It is predicted that the water quality in the dewatered area will be acceptable to allow breaching of the Whale Tail Dike and the Mammoth Dike in Year 11 (2029). If that is not the case, the breaching will be deferred and the water level will be maintained below 152.5 m by pumping to the WTP for treatment and release.

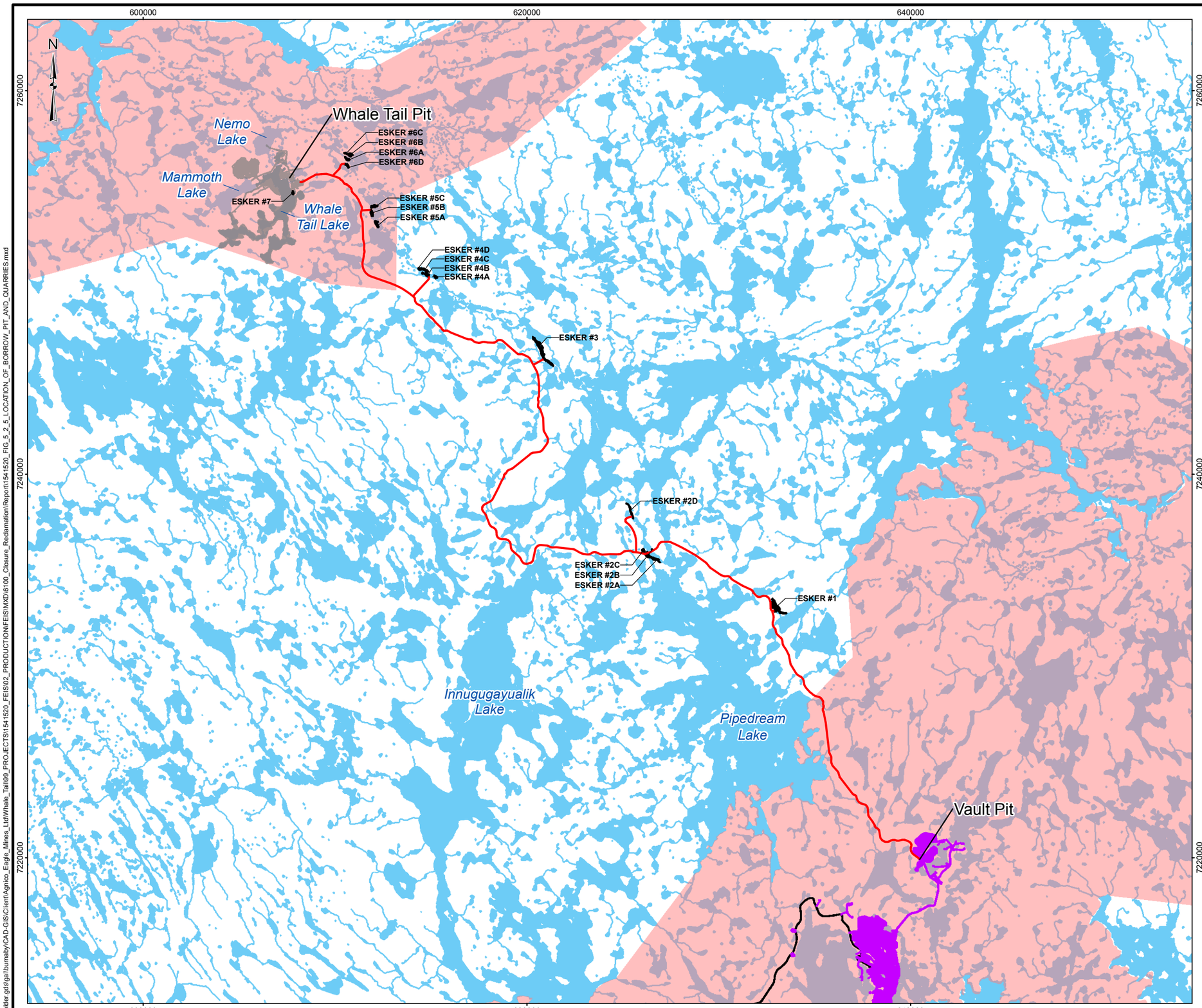
It is also expected that the WRSF water quality will meet licence limits for release to the environment without treatment in Year 14 (Year 2032). If this is not the case; breaching of WRSF Dike and Coffer/Saddle Dam will be deferred and runoff and seepage from the WRSF will continue to be pumped to the WTP for treatment and release.

5.2.10 Quarries and Granular Borrow Sites

Construction of the exploration access road utilized a series of quarry sites from which road construction material is sourced (the exploration road is currently under construction). These quarries will be expanded (first by depth, and if needed in width) to obtain material for haul road construction, and for the Project components if needed. The borrow site locations that have been identified for the road construction are shown on Figure 5.2-5.

Agnico Eagle intends to use suitable open pit waste rock where practical to minimize or eliminate the need for additional rock quarries.

The reclamation of the borrow sites are covered in the Exploration Facilities Conceptual CRPs (Agnico Eagle 2015b, 2015c).



\\golder.gds\gal\burnaby\CAD-GIS\Client\Agnico_Eagle_Mines_Ltd\Whale_Tail\99_PROJECTS\1541520_FEIS\02_PRODUCTION\FEIS\MXD\6100_Closure_Redamation\Report\1541520_FIG_5_2_5_LOCATION_OF_BORROW_PIT_AND_QUARRIES.mxd

LEGEND

- PROPOSED HAUL ROAD
- ALL WEATHER ROAD
- WATERCOURSE
- BORROW SOURCE
- WHALE TAIL INFRASTRUCTURE
- MEADOWBANK INFRASTRUCTURE
- WATERBODY

REFERENCE

1. MEADOWBANK INFRASTRUCTURE AND PROPOSED WHALE TAIL HAUL ROAD ALIGNMENT OBTAINED FROM AGNICO EAGLE MINES LIMITED.
2. INUIT OWNED LANDS OBTAINED FROM THE NUNAVUT-TUNNGAVIK INC.
3. WATERCOURSE AND WATERBODY DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.

DATUM: NAD 83 CSRS PROJECTION: UTM ZONE 14

4000 0 4000
METRES

PROJECT
AGNICO EAGLE MINES LIMITED:
MEADOWBANK DIVISION
WHALE TAIL PIT PROJECT

TITLE
LOCATION OF BORROW PITS AND QUARRIES FOR THE PROJECT

Golder Associates

PROJECT		1541520	FILE No.	
DESIGN	DF	04 Mar. 2015	SCALE AS SHOWN	REV. 0
GIS	MH	18 Apr. 2016		
CHECK	AP	18 Apr. 2016		
REVIEW	IM/KAB	18 Apr. 2016		

FIGURE 5.2-5

6.0 SECTION 6 • PROGRESSIVE RECLAMATION

6.1 Definition of Progressive Reclamation

Progressive reclamation takes place prior to permanent closure to reclaim components and/or to decommission facilities that are no longer required for the Project, because the activity has been completed, or the facilities no longer serve a purpose. Progressive reclamation can be completed during operations with the available resources to reduce future reclamation costs, to reduce the duration of environmental exposure, and to enhance environmental protection. Progressive reclamation may shorten the time for achieving closure objectives and may provide valuable experience on the effectiveness of certain measures that might be implemented during permanent closure (MVLWB/AANDC 2013).

6.2 Opportunities for Progressive Reclamation

The key closure activities that have been identified for progressive reclamation are summarized in the following sections for each individual component of the Project. The components are categorized in sub-sections for clarity. The progressive reclamations activities provided in this CRP will be updated in future versions of the ICRP to include new opportunities for progressive reclamation identified during operations.

6.2.1 Underground Mine Workings

The existing underground workings from the exploration stage are covered by the Type B Water Licence. The Whale Tail Project will involve only open pit mining. There will not be any underground mine workings associated with the Project.

6.2.2 Open Pit Mine Workings

No progressive reclamation activities have been identified for the open pit at this time.

6.2.3 Waste Rock and Overburden Storage Facilities

Closure and reclamation of the WRSF will take place progressively during operations with the placement of the cover over the WRSF sideslopes. See Section 5.2.3.5 for cover design details.

The WRSF will be designed for long-term stability. Thus no additional re-grading or construction will be required for stability.

It will not be possible to progressively reclaim the uppermost bench or the top surface of the WRSF, because these will be active until mine closure occurs.

6.2.4 Tailings Storage Facility

Tailings from the Project will report to Meadowbank Tailings Storage Facility (TSF). Closure of the TSF is covered under the Meadowbank Mine ICRP.

6.2.5 Buildings and Equipment

Potential progressive reclamation activities for the buildings and equipment include:

- demobilize, remove, and decommission equipment and facilities as the facilities are identified as no longer being required for operations; and
- reduce inventories of consumables leading up to the end of operations.

6.2.6 Mine Infrastructure

No progressive reclamation activities have been identified for the crushing facility at this time.

6.2.7 Transportation Routes

No progressive reclamation activities have been identified for the proposed transportation routes at this time.

6.2.8 Landfill and Other Waste Disposal Areas

The landfill will be in active use throughout the mining period and also during the closure period in order to receive debris from decommissioning. The final closure of the landfill will occur at the end of the post-closure stage. It will not be possible to carry out progressive reclamation of the landfill.

No progressive reclamation activities have been identified for the other waste disposal areas identified in Section 5.2.8 at this time.

6.2.9 Water Management Facilities

No progressive reclamation activities have been identified for the water management facilities at this time.

6.2.10 Quarries and Granular Borrow Sites

The quarries and granular borrow sites no longer required for operations will be progressively reclaimed. The closure activities are discussed in Section 5.2.10.

6.3 Completed Progressive Reclamation

Progressive reclamation has not been carried out at the Project site to date.

7.0 SECTION 7 • TEMPORARY CLOSURE

Temporary closure occurs when an advanced mineral exploration or mining operation ceases with the intent of resuming activities in the near future. Temporary closure could be due to an unplanned closure or a planned closure of certain facilities in a complex mining project (MVLWB/AANDC 2013).

The Project operation is planned to be continuous for the full proposed operating period. However, the mine may need to shut down for a short-term or indefinitely (long-term) due to economic, environmental and/or social factors. The plans for both of these closure periods are discussed below. Notification of temporary closure would be presented to the staff and the local population with at least 30 days' notice; if the conditions allow, a longer notice period will be provided where possible.

7.1 Temporary Closure Goal and Closure Objectives

The goal of temporary closure is ongoing protection of the environment, and regulatory compliance during the shutdown period. Temporary closure measures deemed necessary will depend upon the duration and extent of site activities/presence during the temporary closure. It is anticipated that water management and treatment facilities will function at the same level during temporary shutdown periods as during operations.

7.2 Temporary Closure Activities

The following temporary closure scenarios have been considered:

Short-term temporary closure: this would apply to any anticipated short term shut down or closure period of less than one year and could last for a period of weeks or several months (up to 12 months) based on economic, environmental, and social factors.

Long-term temporary closure: or indefinite shutdown is a cessation of mining and processing operation for an indefinite period of time greater than one year. The intention is that the mine will resume operations as soon as possible after the cause for the indefinite shutdown has been addressed. The site must maintain safety and environmental stability during this time. Possible causes for an indefinite shutdown could include prolonged adverse economic conditions or extended labour disputes. A decision on the estimated length of the indefinite shutdown would be made after the initial one year period. Decisions on possible extensions to the indefinite shutdown would be made every 6 months thereafter and would be based on the conditions at that time. At present, the maximum length of time or number of extensions for interim shutdown before moving to final closure has not been defined.

The proposed short-term and long-term temporary closure activities are presented in the following subsections.

Short-term Temporary Closure

The following summarizes the measures that will be taken as required during a short-term temporary closure:

- Warning signs and berms will be erected as needed around the pit perimeter.
- Dewatering of the pit will continue as conducted during operations.
- Environmental monitoring and sampling will continue at regular intervals as set out in the Project operations and monitoring program and in accordance with all applicable licenses, permits, and authorizations.
- Routine geotechnical stability monitoring and maintenance will continue at a reduced rate compared to that conducted during operations. The pit area will be inspected routinely to check for rock falls, changes to groundwater inflows and overall integrity.
- All mobile equipment except for small service equipment required for pit inspections will be removed and placed in secure on-site storage.
- Fuel, lubricants, and hydraulic fluids will be removed from the pit area and stored in designated areas.
- Fluid levels in all fuel tanks will be recorded and monitored regularly for leaks, or fuel will be removed from the site.
- An inventory of chemicals and reagents, petroleum products, and other hazardous materials will be conducted. These materials will be secured appropriately, or the materials will be removed from the site.
- All explosives will be relocated to the main powder magazine and secured, disposed of, or removed from the site.
- Surface water management facilities will be maintained to manage contact water runoff.
- Monitoring of water quality of the collection ponds will continue as per during operations.
- Unused water distribution lines will be drained, but would be left in place.
- Minimum staffing levels will be maintained to carry out care and maintenance.
- The camp will be operated at reduced staffing level.
- Critical facilities (camp) will have nominal heat to prevent freezing of the facilities and possible damage.
- The sewage treatment plant and potable water treatment plant will continue to operate as needed.
- Hazardous wastes on-site will be collected and stored in an appropriate area for annual disposal to a registered disposal facility.
- In most circumstances, the haul road will continue to be open. The status of the road during such periods would be assessed by Agnico Eagle on a case-by-case basis.

Long-term Temporary Closure

The following summarizes the measures that will be taken as required in addition to the short-term temporary closure activities previously mentioned during a long-term temporary closure:

- Environmental and geotechnical monitoring and sampling will continue at the regular level as set out in the mine operations and monitoring program, and in accordance with all applicable licenses, permits and authorizations.
- Pumps in the pit will be relocated and the pit will be allowed to flood passively (from rainfall and groundwater inflow).
- If necessary, the working face of the WRSF slopes will be graded to ensure stability and drainage to the contact water management system adjacent to the waste rock storage facilities. As the WRSF will be designed and operated for long-term stability, it is anticipated that any grading required will be localized and minimal. The WRSF will be monitored to ensure the site stays in compliance with any permits and/or licences.
- The dikes/dams will be monitored and maintained, and none of the dikes/dams will be breached.
- Surface water control structures will be maintained as required. In areas where water quality is suitable for discharge, natural drainage courses may be re-established.
- Unused water distribution lines will be drained. Unused lines on surface will be removed and placed in a secure lay down area to reduce impacts on wildlife.
- Dependent on the cause of the closure, the haul road may be inaccessible during the winter for cars and trucks. If Agnico Eagle requires continued presence on-site, then it is likely Agnico Eagle would maintain the road open in some manner over the winter.

7.3 Temporary Closure Monitoring, Maintenance, and Reporting

Monitoring and reporting during the short-term and long-term temporary closure will continue at the regular level as set out in the mine operations and monitoring program, and in accordance with all applicable licenses, permits and authorizations.

The numbers of personnel on-site would be reduced to reduce operation costs. The staff present at site during temporary closure would be sufficient in number and expertise to successfully carry out care, maintenance and monitoring duties, and to address and remediate any potential problems that may arise. Sufficient equipment and supplies/reagents would be left on-site for any maintenance or reclamation activities that may need to take place.

7.4 Temporary Closure Contingency Program

The key staff present at site during temporary closure would be sufficient in number and expertise to successfully address and remediate any conditions or unforeseen events that may arise through the monitoring programs. The key staff at the site would also have access to external consultants and advisors, as required.

The contingency options and actions for events or incidents defined for operations would be also implemented during the temporary closure (i.e., spill responses and reports).

7.5 Temporary Closure Schedule

The temporary closure schedule would depend on when temporary closure occurs (i.e., what year of the operations stage) and its duration, both of which are commonly uncertain. Therefore, the schedule for the activities presented in Section 7.2 would be developed as temporary closure advances. The sequence of activities for short-term and long-term temporary closure would, in summary, be as follows:

- Restrict access to the site, buildings, and infrastructures to authorized personnel as required.
- Carry out an inventory of chemicals and reagents, petroleum products, and other hazardous materials and secure the inventory appropriately or remove some of it from site.
- Post warning signs and berms as needed around the open pit perimeter.
- Remove all mobile equipment except for small service equipment required for open pit inspections and place them in secure on-site storage.
- Temporary closure of unnecessary facilities and systems.
- Continue with environmental and geotechnical monitoring and sampling required for care, maintenance and monitoring at the regular level as set out in the mine operations and monitoring program, and in accordance with all applicable licenses, permits, and authorizations.

8.0 SECTION 8 • INTEGRATED SCHEDULE OF ACTIVITIES

This ICRP is based on permitting level design for many facilities and correspondingly the proposed closure schedule for the Project is based on the preliminary closure methods and strategies discussed in the above sections. It is anticipated that the schedule will be refined throughout the Project life as the designs are advanced and the closure methods and strategies are further developed. All schedules are subject to changes in mine plans and market conditions.

The proposed preliminary closure schedule for the Project is presented in Table 8.0-1 and includes the following:

- The back-flooding of the dewatered area (open pit area) will start in Year 4 (2022) with pumping of the water accumulated over the operating years in the Whale Tail Lake (South Basin), the contribution of the Northeast watershed area as a result of the Northeast dike breaching, and the pumping of the treated contact water collected in the Attenuation Pond.
- In Year 8 (2026), the North Channel will be re-routed to contribute to the back-flooding of the dewatered area until the original level in Whale Tail Lake is reached.
- In Year 11 (2029), the original water level at Whale Tail Lake will be reached.
- The Attenuation Pond will continue collecting water from the WRSF, the industrial sector, the main camp sector and the Attenuation Pond sector, this water will be pumped to the WTP for treatment to be finally discharged into the dewatered area between Year 4 (2022) and Year 7 (2025).
- The Attenuation Pond will be reclaimed (back-flooded) in Year 8 (2026) and the contact water from the WRSF will be pumped directly to the WTP to be finally discharged into Whale Tail Lake (North Basin).
- The crushing facility will be decommissioned in Year 4 (2022) as the facility will no longer be required.
- The camp and other supporting facilities will be removed in stages.
- The freshwater pipeline, causeway and pumping system from Nemo Lake will be dismantled in Year 4 (2022), after which time freshwater will be obtained from Whale Tail Lake (South Basin).
- The freshwater pipeline, causeway and pumping system from Whale Tail Lake (South Basin) will be dismantled in Year 11 (2029).
- The WTP will be operated for ten years after the WRSF closure has been completed (i.e. Year 5 (2023) to Year 14 (2032)) or until treatment of contact water from the site is found no longer required. This would occur when contact water quality satisfies water licence criteria for direct discharge. The WTP and Mammoth Lake effluent diffuser will be maintained for a further three water treatment seasons (i.e. Year 15 (2033) to Year 17 (2035)) as a contingency before being dismantled and disposed in Year 17 (2035). The treatment plant will be dismantled in Year 17 (2035) and rubble will be disposed of in the on-site landfill facility.

- Monitoring will be carried out for a minimum of 13 years after closure of the WRSF (Year 4 (2022) until Year 17 (2035)).

The schedule will be updated in subsequent Interim Closure and Reclamation Plans but will generally follow the present outline.

Table 8.0-1: Proposed Closure and Post-Closure Main Activities Schedule

Component	Description	Operating Stage (Progressive Reclamation)			Closure Stage								Post-Closure Stage					
		Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)	Year 6 (2024)	Year 7 (2025)	Year 8 (2026)	Year 9 (2027)	Year 10 (2028)	Year 11 (2029)	Year 12 (2030)	Year 13 (2031)	Year 14 (2032)	Year 15 (2033)	Year 16 (2034)	Year 17 (2035)
Machinery and Mobile Equipment	- Decommission machinery and equipment and ship off-site (leaving only on-site equipment required for closure and post-closure activities)				X													
	- Remove equipment used for closure activities (e.g. trucks, backhoes)											X						
	- Remove equipment used for long-term maintenance (e.g. backhoes)[a]																	X
Nemo Lake Freshwater Pumping System	- Decommission system				X													
South Whale Tail Lake Freshwater Pumping System	- Decommission system											X						
Dewatered Area	- Active flooding of pit area from Whale Tail Lake (South Basin), North-East watershed and treated contact water from Attenuation Pond				Year 4 to Year 7													
	- Active flooding of remaining area from Whale Tail Lake (South Basin), North-East watershed and North Channel watershed								Year 8 to Year 10									
	- Place warning signs around Open Pit perimeter and maintain berm from perimeter road.				X													
WRSF	- Cover placement and natural re-vegetation	Year 1 to Year 4																
	- Pump WRSF Pond contact water to the Attenuation Pond prior to treatment and discharge into the dewatered area				Year 4 to Year 7													

Table 8.0-1: Proposed Closure and Post-Closure Main Activities Schedule (continued)

Component	Description	Operating Stage (Progressive Reclamation)			Closure Stage								Post-Closure Stage					
		Year 1 (2019)	Year 2 (2020)	Year 3 (2021)	Year 4 (2022)	Year 5 (2023)	Year 6 (2024)	Year 7 (2025)	Year 8 (2026)	Year 9 (2027)	Year 10 (2028)	Year 11 (2029)	Year 12 (2030)	Year 13 (2031)	Year 14 (2032)	Year 15 (2033)	Year 16 (2034)	Year 17 (2035)
WRSF (continued)	- Pump WRSF Pond contact water directly to the WTP for final discharge into Mammoth Lake								Year 8 to Year 13									
	- Breach WRSF Dike and Saddle Dam - Decommission WRSF Pond														X			
Mine Infrastructure and Support Buildings	- Decommission facilities and re-grade areas as needed				Year 4 to Year 10													
Water Management Facilities	- Breach North-East Dike and reclaim channel and pond areas when no longer needed				X													
	- Remove pumping system from the Attenuation Pond								X									
	- Breach South Whale Tail and Mammoth dikes											X						
	- Decommission WTP and Mammoth Lake effluent diffuser [a]																	X
Haul Road	- Decommission haul road [b]																	X
Long- Term Care and Maintenance (assumed for 10 years after closure)																		
Monitoring					Monitor back-flooded area and contact water reporting from closed mine facilities (post-closure stage duration may be reduced or in-situ treatment may be required)													

[a] Assumed that the WTP and Mammoth Lake effluent diffuser will be maintained for 3 years as a contingency after Year 14.

[b] Assumed for 14 years after operations; however, closure schedule dependent on monitoring results. Activities will occur when contact water quality satisfies water license criteria for direct discharge and/or access to the site is no longer required

9.0 SECTION 9 • POST-CLOSURE SITE ASSESSMENT

As mentioned in Section 5.2.2.8, the ICRP is a "living" document and includes a commitment to adaptive management and monitoring during all stages of the mine life to demonstrate the safe performance of the Project facilities and to reduce any contamination on the site or in the adjacent area after operations cease. Monitoring during operations and in closure will identify non-compliant conditions; allow timely maintenance and clean up as needed; allow timely planning for adaptive and corrective measures; and enable successful completion of the ICRP. In this way, the Project is not anticipated to contribute residual impacts to the environment after closure and reclamation (FEIS Volume 2; Agnico Eagle 2016).

Monitoring programs will be initiated during construction and operations to provide additional baseline information on which to base the Final Closure and Reclamation plan (FCRP) document. The adaptive management plans to be used in closure will follow the actions completed during operations, and will be co-ordinated with the existing operational monitoring programs (e.g., AEMP, TEMP) to set appropriate trigger levels, and mitigation plans and actions.

Monitoring and maintenance programs that are implemented during the closure and post-closure phases of the Project life will use the data collected during operational monitoring. The data collected in operation will assist with defining measures of success at closure and the performance of the reclamation and closure efforts. The data collected during post-closure monitoring will allow the procedures and activities to be adjusted or modified as necessary to confirm ongoing environmental protection, and ultimately will determine when final closure is complete, the closure objectives for the Project have been achieved, and the Project site and affected areas have been returned to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities (Section 2.3).

10.0 SECTION 10 • FINANCIAL SECURITY

A permanent closure and reclamation financial security cost estimate has been prepared to a conceptual level with the present Project layout and infrastructure (Appendix D).

The cost estimate covers the closure and reclamation of all Project facilities as described in this report and was prepared using RECLAIM Version 7.0, March 2014, for permanent closure of the Project.

11.0 SECTION 11 • REFERENCES

AANDC (Aboriginal Affairs and Northern Development Canada). 2002. Mine Site Reclamation Policy for Nunavut. Formerly Indian and Northern Affairs Canada (INAC).

AANDC. 2007. Mine Site Reclamation Guidelines for the Northwest Territories. Formerly Indian and Northern Affairs Canada (INAC). January 2007.

Agnico Eagle. 2015a. Amaruq Dikes PFS – Geotechnical Investigation Report Instrumentation Monitoring and Field Observation Summary. May 2015.

Agnico Eagle. 2015b. Conceptual Closure and Reclamation Plan and Reclaim Estimates. Water Licence 2BE-MEA1318. Amaruq and Meadowbank Exploration Projects. Version 5, March 2015.

Agnico Eagle. 2015c. Amaruq Exploration Access Road - Conceptual Closure and Reclamation Plan. Version 1, February 2015.

Agnico Eagle. 2016. Whale Tail Pit Project, Nunavut. Final Environmental Impact Statement. Submitted to the Nunavut Impact Review Board. 2016.

Azimuth. 2015a. Core Receiving Environment Monitoring Program (CREMP) 2014, Meadowbank Mine. Report prepared by Azimuth Consulting Group, Vancouver, BC for Agnico-Eagle Mines Ltd., Baker Lake, NU. March, 2015

Azimuth. 2016. Whale Tail Pit Core Receiving Environment Monitoring Program (CREMP): 2014-2015 Baseline Studies. Prepared for Agnico Eagle Mines Ltd., by Azimuth Consulting Group Partnership. January 2016.

CCME (Canadian Council of Ministers of the Environment). 1999 (with updates to 2015). Canadian Environmental Quality Guidelines for the Protection of Aquatic Life – Summary Table. Available at: http://st-ts.ccme.ca/. Accessed: February 2016.

CCME. 2002. Canadian Sediment Quality Guidelines for the Protection of Aquatic Life – Summary Table Update 2002.

CESCC (Canadian Endangered Species Conservation Council). 2011. Wild species 2010: The General Status of Species in Canada. National General Status Working Group: 302 pp.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada). 2016. Wildlife Species Search. Available at: www.cosewic.gc.ca. Accessed: January 2016.

Cumberland Resources Ltd. (CRL), 2003. Meadowbank Gold Property Project Description Report. Report submitted to the Nunavut Impact Review Board, March 2003.

CRL. 2005a. Meadowbank Gold Project Baseline Physical Ecosystem Report. Cumberland Resources Ltd. Vancouver, British Columbia.

CRL. 2005b. Meadowbank Gold Project Baseline Terrestrial Ecosystem Report. Cumberland Resources Ltd. Vancouver, British Columbia.

DFO. 2010. DFO Protocol for Winter Withdrawal from Ice-covered Waterbodies in the Northwest Territories and Nunavut.

Gebauer, M., A. Crampton, M. Huntley, J. Boulanger, J. Shaw, and I. Laing. 2013. Meadowbank Mine: 2012 Wildlife Monitoring Summary Report.

Golder (Golder Associates Ltd.). 2002. Summary Report on Summer 2002 Field Geotechnical Studies, Meadowbank Project, Nunavut.

Golder. 2005. Static Test Results for Overburden, Mine Site Infrastructure Rock, Pit Rock, and Tailings, Meadowbank Gold Project, Nunavut, September 2005.

Golder. 2015a. Background Concentrations of Criteria Air Contaminants in Nunavut. Document 035-1524321.1400 Ver 0. Technical Memorandum to Agnico Eagle Mines Ltd. December 16, 2015. 11 p.

Golder. 2015b. Noise Baseline Report. Document 031-1524321.1500 Ver 0. Report to Agnico Eagle Mines Ltd. December, 2015. 48 p.

Golder. 2016a. Hydrology Baseline Report. Document 037-1524321.1300 Ver 1. Report to Agnico Eagle Mines Ltd. January 2016. 216 p.

Golder. 2016b. Evaluation of the Geochemical Properties of Waste Rock, Ore, Tailing, Overburden and Sediment from the Whale Tail Pit and Road Aggregate Materials. Document in progress. Report to Agnico Eagle Mines Ltd. April, 2016.

Golder. 2016c. Mine Site and Downstream Water Quality Predictions. Report to Agnico Eagle Mines Ltd. May, 2016.

Groupe Conseil Nutshimit-Nippour, 2015. Bathymetry of Whale Tail Lake. http://sdei.ca/accueil. Accessed November 2015.

Health Canada. 2014. Summary of Guidelines for Canadian Drinking Water Quality. Prepared by the Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial-Territorial Committee on Environmental and Occupational Health.

Heginbottom, J.A., M.A. Dubreuil and P.A. Harker. 1995. Canada – Permafrost. In, National Atlas of Canada, 5th Edition, National Atlas Information Service, Natural Resources Canada, MCR 4177.

IPCC. 2014. Summary for Policymakers. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32

Knight Piesold. 2015a. Whale Tail Pit - Groundwater Inflow Assessment Technical Memorandum. Document NB101-00622/04-A-01. Technical Memorandum to Agnico Eagle Mines Ltd. October 20, 2015. 10 p.

Knight Piesold. 2015b. Whale Tail Pit - Permafrost and Hydrogeological Characterization. Document NB101-00622/04-A-01. Technical Memorandum to Agnico Eagle Mines Ltd. November 24, 2015. 82 p.

MEND (Mine Environment Neutral Drainage Program). 2012. Report 1.61.5c – Cold Regions Cover System Design Technical Guidance Document.

MVLWB/AANDC (Mackenzie Valley Land and Water Board/Aboriginal Affairs and Northern Development Canada). 2013. Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories. November 2013.

Nagy, J.A., D.L. Johnson, N.C. Larter, M.W. Campbell, A.E. Derocher, A. Kelly, M. Dumond, D. Allaire, and B. Croft. 2011. Subpopulation structure of caribou (Rangifer tarandus L.) in arctic and subarctic Canada. Ecological Applications, 21(6), pp.2334-2348.

National Resources Canada (NRC). 2010. National Building Code of Canada. Seismic hazard calculator. http://www.earthquakescanada.nrcan.gc.ca/hazard-alea/interpolat/index_2010-eng.php. 2010.

Overland, J.E., M. Wang, J.E. Walsh, and J.C. Stroeve. 2013. Future Arctic climate changes: Adaptation and mitigation time scales, Earth's Future, 2, doi:10.1002/2013EF000162.

C. Portt and Associates (Portt). 2015a Amaruq Exploration Access road Aquatics Baseline Report. Agnico Eagle Mines Ltd. – Meadowbank Division.

C. Portt and Associates (Portt). 2015b. Whale Tail Pit 2015 Fish and Fish Habitat Field Investigations: Agnico Eagle Mines Ltd. – Meadowbank Division.

Robert, S. and V. Bertrand. 2012. The Meadowbank Gold Mine – Reclamation Planning in an Arctic Environment. In: 9th International Conference on Acid Rock Drainage (ICARD), May 2012. Ottawa, Ontario.

SNC-Lavalin (SNC). 2015. Geotechnical and Water Management Infrastructure – Whale Tail Project – Permitting Level Engineering. Document 627215-100-40ER-004. Report to Agnico Eagle Mines Ltd. December 11, 2015. 67 p.

Smith, S.L. and M.M. Burgess. 1998. Mapping the response of permafrost in Canada to climate warming. In, Current Research 1998-E, Geological Survey of Canada, p 163-171.

Smith, S.L. and M.M. Burgess. 2004. Sensitivity of permafrost to climate warming in Canada. Bulletin 579, Geological Survey of Canada, Ottawa, ON.

Woo MK. 2011. Linking Runoff to Groundwater in Permafrost Terrain. J.A.A. Jones (ed.), Sustaining Groundwater Resources, International Year of Planet Earth, 119 DOI 10.1007/978-90-481-3426-7_8, Springer Science+Business Media B.V. 2011. Pp 119-129.

APPENDIX A – GLOSSARY OF TERMS AND DEFINITIONS

Glossary of Terms and Definitions

Term	Definition
Acid Base Accounting (ABA)	Acid base accounting; a static test that defines the amounts, and relative balance, of potentially acid-generating and acid-neutralizing (or base) minerals in a sample.
Active layer	The layer of ground above the permafrost which thaws and freezes annually.
Acid rock drainage (ARD)	Acidic pH rock drainage due to the oxidation of sulphide minerals that includes natural acidic drainage from rock not related to mining activity; an acidic pH is defined as a value less than 6.0.
Advanced mineral exploration	Any appurtenant undertaking in which the proponent requires a Type A or Type B water licence in order to carry out the proposed activities.
Quarries and Granular Borrow Sites	Site from where soils and aggregates are obtained for use in earthworks construction.
Care and maintenance	The status of a mine when it undergoes a temporary closure.
Closure goal	The guiding statement that provides the vision and purpose of reclamation. Attainment of the closure goal happens when the proponent has satisfied all closure objectives. By its nature, the closure goal is a broad, high-level statement and not directly measurable.
Closure principles	The four core closure principles are 1) physical stability, 2) chemical stability, 3) no long-term active care requirements, and 4) future use (including aesthetics and values). The principles guide the selection of closure objectives.
Closure objectives	Statements that describe what the selected closure activities are aiming to achieve; they are guided by the closure principles. Closure objectives are typically specific to project components, are measurable and achievable, and allow for the development of closure criteria.
Closure options	A set of proposed alternatives for closing and reclaiming each mine component. The closure options are evaluated to determine the selected closure activity, which must be approved by the NWB.
Closure criteria	Standards that measure the success of selected closure activities in meeting closure objectives. Closure criteria may have a temporal component (e.g., a standard may need to be met for a pre-defined number of years). Closure criteria can be site-specific or adopted from territorial/federal or other standards and can be narrative statements or numerical values.
Contaminant	1) any physical, chemical, biological or radiological substance in the air, soil, or water that has an adverse effect; and 2) any chemical substance with a concentration that exceeds background levels or which is not naturally occurring in the environment.
Effluent	Contact water flows that must be treated before being discharged to the environment.
Engagement	The communication and outreach activities a proponent undertakes with affected communities and Aboriginal organizations/governments prior to and during the operation of a project, including closure and reclamation phases.

Term	Definition
Environmental Site Assessment (ESA)	Phase I ESA: A review of available information to determine the likelihood of actual or potential environmental impacts. Phase II ESA: An intrusive investigation involving sampling and testing to better define the nature and scope of any environmental impacts.
Explosives	Gunpowder, blasting powder, nitroglycerine, gun-cotton, dynamite, blasting gelatine, gelignite, fulminates of mercury or of other metals and every other substance made, manufactured or used with a view to producing a violent effect by explosion.
Humidify cell test (HCT)	A type of kinetic test in which a small sample (about 1 kg) is placed in an enclosed chamber in a laboratory, alternating cycles of moist and dry air is constantly pumped through the chamber, and once a week the sample is rinsed with water; chemical analysis of rinse water yields concentrations of elements and other parameters used to calculate reaction rates.
Kinetic test	A geochemical procedure for characterizing the chemical status of a sample through time during continued exposure to a known set of environmental conditions, such as a humidity cell.
Landfarm	Infrastructure that uses biological and physical processes to treat (remove contaminants) contaminated soil.
Land owner	The responsible authority with administrative control and ownership of a type of land classified as crown land, commissioners land or Inuit Owned Land. a. Crown land is land belonging to Her Majesty or in respect of which Government has the power of disposition. In Nunavut, this power rests with Aboriginal Affairs and Northern Development Canada (AANDC). b. Commissions land is land belonging to the Commissioner for the Government of Nunavut; which typically is land within an established municipality administered by a Municipal Corporation and/or the Department of Community Government and Services (CGS) c. Inuit Owned Land (IOL) are those lands vested in the Designated Inuit Organization (DIO) pursuant the Nunavut Land Claims Agreement. For this Project the DIO is the Kivalliq Inuit Association.
Land use permit	a. For Crown land a Class A Permit or Class B Permit as required by the Territorial Land Use Regulations SOR/82-217, s.1; SOR/88-169, s.2 administered by AANDC Lands Department. b. For IOLs- Land Use Licence I, II or III or Commercial Lease I, II, III as defined by the DIO. c. For Commissioners land - a permit or lease as required by the Municipal Land Administration Policy.
Leachate	Water or other liquid that has washed (leached) from a solid material, such as a layer of soil or water; leachate may contain contaminants.
Long-term active care	A post-closure mine site is in long-term active care when sustained monitoring and maintenance of active facilities is required (e.g., for more than 25 years). This should be avoided whenever possible.

Term	Definition
Metal leaching (ML)	The release of a metal from its solid-phase mineral into mine site drainage; described by concentrations in static tests and by metal release rates obtained from kinetic tests.
Passive long-term care	Occasional monitoring, coupled with infrequent maintenance or repairs that takes place following reclamation in the post closure phase of the mine site. Many mine sites require ongoing passive care, which can be an acceptable practice.
Ore	Rock that is considered economic according to the parameters used in the ore reserve estimate. Ore will be processed at an existing Meadowbank mineral processing plant after it is mined from the Project open pit.
Overburden	A general term referring to soil and broken rock, lying above ore and mine rock, that can usually be removed without blasting; at mines in soft sedimentary rock like coal, overburden can be synonymous with mine rock.
Potentially acid generating (PAG)	Rock with an NP/AP ratio less than 2 as determined by static tests, as defined by MEND (2009). PAG rock can also be operationally defined based on the results of static testing such as ABA and NAG testing.
Permafrost	Bedrock or soil that maintains a temperature at or below 0º C for a continuous period of two years or more.
Progressive reclamation	Selected closure activities that can be taken at advanced mineral exploration and mine sites before permanent closure. Progressive reclamation takes advantage of cost and operating efficiencies by using the resources available from an operation to reduce the overall reclamation costs incurred. It enhances environmental protection and shortens the timeframe for achieving the closure objectives.
Proponent	Applicant for, or a holder of, a water licence and/or land use permit.
Reclamation	The process of returning a disturbed site to its natural state or which prepares it for other productive uses that prevents or minimizes any adverse effects on the environment or threats to human health and safety.
Reclamation research	Literature reviews, laboratory or pilot-scale tests, engineering studies, and other methods of resolving uncertainties. Proponents conduct reclamation research to answer questions pertaining to environmental risks; the design of reclamation research plans aims to provide data and information which will reduce uncertainties for closure options, selected closure activities, and/or closure criteria.
Remediation	The removal, reduction, or neutralization of substances, wastes, or hazardous material from a site in order to prevent or minimize any adverse effects on the environment and public safety now or in the future.
Risk assessment	Analysis of potential threats and options for mitigation for a given site, component, or condition. Risk assessments consider factors such as risk acceptability, public perception of risk, socio-economic impacts, benefits, and technical feasibility. It forms the basis for risk management.
Salvageable Materials	Decommissioned materials which can be sold or reused elsewhere.
Security deposit	Funds held by the Crown (Aboriginal Affairs and Northern Development Canada) or land owner that can be used in the case of abandonment of an

Term	Definition
	undertaking to reclaim the site or carry out any ongoing measures that may remain to be taken after the abandonment of the undertaking.
Selected closure activity	The closure and reclamation activity chosen from the closure options for each Project component.
Stakeholders	Industry, federal agencies, the territorial government, Aboriginal organizations/governments, land owners, affected communities, and other parties with an interest in the Project.
Talik	Unfrozen ground surrounded by permafrost.
Traditional Knowledge	Accumulative, collective body of knowledge, experience, and values built up by a group of people through generations of living in close contact with nature. It builds upon the historic experiences of a people and adapts to social, economic, environmental, spiritual, and political change.
Type A water licence	A Type A water licence is required if the use is of a type set out in column 2 of Schedule 2 and satisfies a criterion set out in column 5 in respect of an undertaking set out in column 1 of the Nunavut Water Regulations SOR/2013-69 *(Note: despite definition of Type B water licence item a), a Type A licence is the appropriate licence for a use of waters if a Type A licence is required for another use of waters, or a deposit of waste, in respect of the same undertaking.)*
Type B water licence	A Type B water licence required if a. The use is of a type set out in column2 of Schedule 2 and satisfies a criterion set out in column 4 in respect of an undertaking set out in column 1, or b. The use satisfies the criterion set out in paragraph 4(1)(a) but does not satisfy one or more criterion set out in paragraphs 4(1)(b) to (d) of the Nunavut Water Regulations SOR/2013-69
Waste rock	All unprocessed rock materials that a mining operation produces.

APPENDIX B – LIST OF ACRONYMS, ABBREVIATIONS, UNITS AND SYMBOLS

Acronym/Abbreviation	Definition
AANDC	Aboriginal Affairs and Northern Development Canada (formerly known as Indian and Northern Affairs Canada)
ABA	Acid-Base Accounting
AEMP	Aquatic Effects Monitoring Plan
Agnico Eagle	Agnico Eagle Mines Limited – Meadowbank Division
ARD	Acid Rock Drainage
ANFO	Ammonium Nitrate/Fuel Oil
AWPAR	All-weather Private Access Road
CNBC	Canadian National Building Code
CESCC	Canadian Endangered Species Conservation Council
CGS	Community and Government Services
CNBC	Canadian National Building Code
Comaplex	Comaplex Mines Corporation
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CP	Collection Pond
CREMP	Core Receiving Environment Monitoring Program
CRL	Cumberland Resources Ltd.
CRP	Conceptual Closure and Reclamation Plan
DFO	Fisheries and Oceans Canada
DIO	Designated Inuit Organization
FCRP	Final Closure and Reclamation Plan
FEIS	Final Environmental Impact Statement
Golder	Golder Associates Ltd.
GCDWQ	Guidelines for Canadian drinking water quality
GN	Government of Nunavut
HADD	Harmful Alteration Disruption or Destruction
HDPE	High-Density Polyethylene
HTO	Hunters and Trappers Organizations
INAC	Indian and Northern Affairs Canada
ICRP	Interim Conceptual Closure and Reclamation Plan
IDF	Intensity-Duration-Frequency
IIBA	Inuit Impact Benefit Agreement
IOL	Inuit Owned Land
IPCC	Intergovernmental Panel on Climate Change
IQ	Inuit Qaujimajatuqangit
ISQG	Interim Sediment Quality Guidelines
KIA	Kivalliq Inuit Association
LSA	Local Study Area
ML	Metal Leaching

MMER	Metal Mining Effluent Regulations
MVLWB	Mackenzie Valley Land and Water Board
NIRB	Nunavut Impact Review Board
NLCA	Nunavut Land Claims Agreement
NML	Non-Metal Leaching
NPAG	non-Potentially Acid-Generating
NRC	Natural Resources Canada
NRI	Nunavut Research Institute
NTI	Nunavut Tunngavik Incorporated
NWB	Nunavut Water Board
NWT	Northwest Territories
PAG	Potentially Acid-Generating
PEL	Probable effect level
PGA	Horizontal peak ground acceleration
PHC	Petroleum Hydrocarbons
Project	Whale Tail Gold Project
PEL	Probable Effect Level
RSA	Regional Study Area
SNC	SNC-Lavalin
TDS	Total Dissolved Solids
TEMMP	Terrestrial Environment Management and Monitoring Plan
TSF	Tailings Storage Facility
TSS	Total Suspended Solids
WRSF	Waste Rock Storage Facility
WTP	Water Treatment Plant

List of Units and Symbols

centimetre	cm	megawatt	MW
cubic centimetre	cm3	metre	m
cubic metre	m^3	metres above sea level	masl
Cubic metre per tonne	m^3/t	metres per minute	m/min
day	d	metres per second	m/s
days per week	d/wk	metric ton (tonne)	t
days per year	d/y	milligram	mg
degrees Celsius	°C	milligrams per litre	mg/L
gram	g	millilitre	mL
grams per litre	g/L	millimetre	mm
grams per tonne	g/t	million	M
greater than	> (use only in tables)	Million cubic meters	Mm^3
hectare (10 000 m^2)	ha	million tonnes	Mt
hour	h (not hr)	month	mo
hours per day	h/d	parts per billion	ppb
hours per week	h/wk	parts per million	ppm
hours per year	h/y	percent	%
inch	"(symbol, not “)	pound	lbs
kilogram	kg	second (time) (not sec)	s
kilograms per cubic metre	kg/m^3	square centimetre	cm^2
kilograms per hour	kg/h	square kilometre	km^2
kilograms per square metre	kg/m^2	square metre	m^2
kilometre	km	Tonnes per day	t/day
kilometres per hour	km/h	Tonnes per cubic metre	t/m^3
less than	< (use only in tables)	week	wk
litre	L	year	y
litres per minute	L/m	watts per square metre per day	$W/m^2/d^1$

APPENDIX C – LESSONS LEARNED FROM OTHER PROJECTS

Development	Activity Which Led to Lesson	Lesson Learned	Adaptive Management Result
Ekati, Diavik, and Snap Lake mine sites	Open pit mining	Wildlife injury or mortality may occur by entering the open pit	A rock berm(s) will be constructed around the open pit during the operations stage
Ekati, Diavik, and Snap Lake mine sites	Mine site infrastructure	Wildlife injury or mortality may occur by entering mine site facilities	Disturbed areas will be re-contoured at closure reducing hazards to wildlife
Meadowbank mine site	Landfill located within RSF	Birds or wildlife injury or mortality by entering the landfill	Landfill will be located within the WRSF and covered at closure reducing hazards to birds and wildlife

APPENDIX D – RECLAIM

Project Name: ***Whale Tail Project***

Reclaim Model - Overview of Program

All users are urged to read the Reclaim Model User Manual - Scroll down for overview description of program.

Important! Reclaim 7.0 works better with no other excel files open.
If other excel files are open ignore run time error and proceed

Reclaim Menu

The default Excel menu bar has an additional tab labelled "Add-Ins" that provides options specific to the Reclaim Model.

Clear	This option deletes all input data, deletes any duplicated elements and blanks out the project name. It also allows for segregation into land costs vs water costs if required.
Duplicate	This option Duplicates components of the project. E.g. if there is more than one Open Pit, use duplicate to add a second Open Pit. Quantities for the new Open Pit are erased, but the Activities and Cost Codes are carried over from the original Open Pit. The new Open Pit subtotal is added to the Summary page.
Unit Costs	This option opens a window of unit costs to provide easy reference. NOTE: the unit cost table has a filter in the 'UNITS' column. You can select to only see a particular unit (eg km) or multiple units (km and m3) or all units.
Print All	This option prints the Summary Worksheet, Unit Cost Worksheet, and the individual component worksheets having non-zero balances. Individual worksheets can be printed directly using standard printing methods, such as Ctl - P.
Quit	Select Quit to exit the program
Help	Redirects user to Instructions worksheet.

WorkSheets

Summary	This worksheet contains a cumulative summary of costs for each component of the project. Associated costs such as engineering and project management are added as a percentage of the component costs.
Components	Costs are derived for individual closure and reclamation activities by multiplying a "quantity" of activity by a "unit cost". An activity can be edited, added, or deleted from worksheet. However, care should be taken not to modify cells that are defined and used elsewhere in the program. ***Do not change the content or column width of the first column of each component worksheet.***
Unit Costs	This worksheet contains a look up table with costs for typical work associated with each closure and reclamation activity

Limitations

The Reclaim Program will NOT work if the worksheets are changed such that the following requirements are not met. Please review the following prior to modifiying worksheets.

WorkSheet Names	*The names of the worksheets must not be changed.*
Defined Names	Certain cells have defined names, which must not be changed. Where the cell is named, the name will appear in the "Name Box" to the left of the formula bar.
First line of data	The first line of data for any component worksheet starts on line 4.***Do not change the first line of a component worksheet, ie the component name.***
Cell A1	Cell A1 on the component sheet MUST always contain the count of that component for the duplicate function to operate.***DO NOT CHANGE.***
Adding Lines	You can add lines to components and the unit cost table, as long as they are not the last lines. The last line might fall outside the named ranges. You can check the size of the named range by selecting the name from the drop down box at the top left of the sheet. Usually this box has a cell reference, or a name.
Printing	A component will only be printed if its sub-total is greater than zero. In addition, a component and the summary sheet cannot be printed if there is an error. Printing has been set to print 1 page per component.

Conditions of Use

The Reclamation Cost Estimating Model was prepared to serve as a guide for Government Agencies, mining companies, and others to estimate the cost of mine reclamation. This model is not intended to replace reclamation planning or to be used to determine the activities required to reclaim a site or to dictate how much should be spent on reclamation.

Reclaim was prepared by Brodie Consulting Ltd. on behalf of AANDC. AANDC and Brodie Consulting Ltd. are not responsible for tl completeness or accuracy of any reclamation estimate made using this model. The user agrees to check and take responsibility for all aspects of any cost estimate made using this model.

The following table provides guidance as to whether water management and treatment is considered short term or long term. Short term closure activities may be costed within a component (eg 'Open Pit' or 'Rock Pile') or 'Water Management'. Long term or post-closure water treatment is costed in 'Water Treatment'.

		Short Term/ Capital Ex.	Long term/ NPV
Open Pit	flood pit - install/operate pumping system	x	
	construct diversion ditches	x	
	treat 1st filling	x	
	install pump/decant system	x	
	passive/biological treatment	x	
	overflow treatment		x
Rock Pile/Heap Leach Facility	construct diversion ditches	x	
	install groundwater collection system	x	
	install toe seepage collection system	x	
	collect and treat groundwater		x
	collect and treat seepage (ARD/ML)		x
	install passive treatment system	x	
	operate and maintain passive treatment system		x
	operate pump and detoxify heap leach pile (cyanide destruction)	x	
Tailings Facility	construct diversion ditches	x	
	pump supernatant (to pit, U/G)	x	
	treat supernatant	x	
	install toe seepage collection system	x	
	collect and treat seepage (ARD/ML)		x
	install passive treatment system	x	
	operate and maintain passive treatment system		x
U/G Mine	accelerate flooding	x	
	install seepage collection system	x	
	install dewatering/pumping system	x	
	operate seepage/dewatering system (ARD/ML)		x
Water Management	refill lakes		
	redirect creeks/streams	x	
	stabilize water management ponds	x	
	stabilize/close sediment ponds	x	
	fresh water supply - breach embankment	x	
	fresh water supply - remove piping system	x	
	construct water treatment plant	x	
	construct sludge pond	x	
	water control in reclamation quarry	x	
	operate/maintain water treatment plant		x

SUMMARY OF COSTS

CAPITAL COSTS	COMPONENT NAME	COST	LAND LIABILITY	WATER LIABILITY
OPEN PIT	Whale Tail Pit	$4,050,038	$0	$4,050,038
UNDERGROUND MINE		$0	$0	$0
TAILINGS FACILITY		$0	$0	$0
ROCK PILE		$2,923,088	$0	$2,923,088
BUILDINGS AND EQUIPMENT		$920,225	$0	$920,225
CHEMICALS AND CONTAMINATED SOIL MANAGEME		$168,853	$0	$168,853
SURFACE AND GROUNDWATER MANAGEMENT		$482,595	-	$482,595
INTERIM CARE AND MAINTENANCE		$0	-	$0
SUBTOTAL: Capital Costs		**$8,544,799**	**$0**	**$8,544,799**
PERCENT OF SUBTOTAL			**0%**	**100%**

INDIRECT COSTS		COST	LAND LIABILITY	WATER LIABILITY
MOBILIZATION/DEMOBILIZATION		$5,420,771	$0	$5,420,771
POST-CLOSURE MONITORING AND MAINTENANCE		$3,131,499	$0	$3,131,499
ENGINEERING	5%	$427,240	$0	$427,240
PROJECT MANAGEMENT	5%	$427,240	$0	$427,240
HEALTH AND SAFETY PLANS/MONITORING & QA/QC	1%	$85,448	$0	$85,448
BONDING/INSURANCE	1%	$85,448	$0	$85,448
CONTINGENCY	20%	$1,708,960	$0	$1,708,960
MARKET PRICE FACTOR ADJUSTMENT	0%	$0	$0	$0
SUBTOTAL: Indirect Costs		**$11,286,606**	**$0**	**$11,286,606**

TOTAL COSTS	**$19,831,405**	**$0**	**$19,831,405**

Note: Existing underground workings from explorations are covered under Type B land and water permits

1 **Open Pit Name:** **Whale Tail Pit** **Pit # 1**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	% Cost Land	Land Cost	Water Cost
CONTROL ACCESS								
Fence,		m		#N/A	$0.00	$0	$0	$0
Signs	Assumed	each	15	SH	$37.08	$556	$0	$556
Berm at crest	In place from perimeter road	m3		#N/A	$0.00	$0	$0	$0
Block roads	Assumed: 3 entrances, each block 5m base, 1 m crest width, 1 m high, 2H:1V slopes and 30m long	m3	270	RB1H	$17.05	$4,604	$0	$4,604
Other				#N/A	$0.00	$0	$0	$0
STABILITY STUDY								
Conduct stability and setback study		allow	1	EA	$20,000.00	$20,000	$0	$20,000
STABILIZE SLOPES								
Off-load crest, soil A		m3		#N/A	$0.00	$0	$0	$0
Off-load crest, soil B		m3		#N/A	$0.00	$0	$0	$0
Doze/trim overburden at crest		m3		#N/A	$0.00	$0	$0	$0
Drill & blast pit crest		m3		#N/A	$0.00	$0	$0	$0
Buttress slope		m3		#N/A	$0.00	$0	$0	$0
Other				#N/A	$0.00	$0	$0	$0
COVER/CONTOUR SLOPES								
Place fill, soil A		m3		#N/A	$0.00	$0	$0	$0
Place fill, soil B		m3		#N/A	$0.00	$0	$0	$0
Rip rap		m3		#N/A	$0.00	$0	$0	$0
Vegetate slopes		ha		#N/A	$0.00	$0	$0	$0
Vegetate pit floor		ha		#N/A	$0.00	$0	$0	$0
Other				#N/A	$0.00	$0	$0	$0
CONSTRUCT DIVERSION DITCHES								
Excavate ditches -soil		m3		#N/A	$0.00	$0	$0	$0
Excavate ditches -rock		m3		#N/A	$0.00	$0	$0	$0
Rip rap in channel base		m3		#N/A	$0.00	$0	$0	$0
CONSTRUCT SPILLWAY								
Excavate channel	Mammoth channel culvert in operations Breach Mammoth Dike in Surface Water Management cost	m3		#N/A	$0.00	$0	$0	$0
Concrete		m3		#N/A	$0.00	$0	$0	$0
Rip rap		m3		#N/A	$0.00	$0	$0	$0
Other				#N/A	$0.00	$0	$0	$0
RECLAIM QUARRIES								
Contour slopes		m3		#N/A	$0.00	$0	$0	$0
Place overburden		m3		#N/A	$0.00	$0	$0	$0
Vegetate		m3		#N/A	$0.00	$0	$0	$0
FLOOD PIT-Captital								
Remove stationary equipment (sump pumps) and dewatering pipeline		Allow	1	AE	$10,000.00	$10,000	$0	$10,000
Remove dewatering pipeline		m		#N/A	$0.00	$0	$0	$0
Remove power lines		each		#N/A	$0.00	$0	$0	$0
Construct diversion ditches		m3		#N/A	$0.00	$0	$0	$0
-Ditch, mat'l A		m3		#N/A	$0.00	$0	$0	$0
-Ditch, mat'l B		m3		#N/A	$0.00	$0	$0	$0
Construct embankment/dam		m3		#N/A	$0.00	$0	$0	$0
Supply/install pump station and piping system (including pump:		Allow	1	AE	$500,000.00	$500,000	$0	$500,000
Supply/install piping system		m		#N/A	$0.00	$0	$0	$0
Remove pump post-closure		each		#N/A	$0.00	$0	$0	$0
Remove pipeline post-closure		m		#N/A	$0.00	$0	$0	$0
FLOOD PIT-Annual Cost								
Operate pumps to flood pit		each	1	AE	$439,359.8	$439,360	$0	$439,360
Maintain pump/pipeline		allow		#N/A	$0.00	$0	$0	$0
Labour:fuel management, comissioning/decom		$/h		#N/A	$0.00	$0	$0	$0
Chemical addition, _____ kg/m3 of water		tonne		#N/A	$0.00	$0	$0	$0
Chemicals, purchase and shipping		tonne		#N/A	$0.00	$0	$0	$0
Passive/biological additives		$/ha		#N/A	$0.00	$0	$0	$0
Passive additives purchase and shipping		tonne		#N/A	$0.00	$0	$0	$0
Other- Pump operation cost		m3		#N/A	$0.00	$0	$0	$0
					Annual pumping costs	$439,360		
Number of years of pump flooding		years	8					
					Total pumping costs	$3,514,878	$0	$3,514,878
					Total	$4,050,038	$0	$4,050,038
					% of Total		0%	100%

Note: No water purchase is needed for back-flooding

1 **Rock Pile Name:**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	% Cost Land	Land Cost	Water Cost
STABILIZE SLOPES								
Flatten slopes with dozer		m3		#N/A	$0.00	$0	$0	$0
Flatten "bubble dump" areas		m3		#N/A	$0.00	$0	$0	$0
Divert runon, ditch mat'l A		m3		#N/A	$0.00	$0	$0	$0
Divert runon, ditch mat'l B		m3		#N/A	$0.00	$0	$0	$0
Toe buttress, drain mat'l		m3		#N/A	$0.00	$0	$0	$0
Toe buttress, fill mat'l A		m3		#N/A	$0.00	$0	$0	$0
Toe buttress, fill mat'l B		m3		#N/A	$0.00	$0	$0	$0
COVER ROCK PILE								
Subgrade preparation - doze surface		m3		#N/A	$0.00	$0	$0	$0
Soil cover - excavate,haul,spread&compact		m3		#N/A	$0.00	$0	$0	$0
non-PAG waste rock cover (4 m thick)	Cover will be 2 to 4 m thick - 4 m was used . Assumes that 80% will be placed during operations and therefore assumed as capital cost as the non-PAG will be placed with the PAG in the facility	m3	668160	SB1L	$4.30	$2,873,088	$0	$2,873,088
Excavate downslope drainage channel & chute		m3		#N/A	$0.00	$0	$0	$0
Rip rap drainage channel and chute		m3		#N/A	$0.00	$0	$0	$0
Vegetate		ha		#N/A	$0.00	$0	$0	$0
Other				#N/A	$0.00	$0	$0	$0
VERY LOW PERMEABILITY COVER (in addition to above)								
Liner subgrade preparation - compact		m2		#N/A	$0.00	$0	$0	$0
Supply geomembrame		m2		#N/A	$0.00	$0	$0	$0
Install geomembrane		m2		#N/A	$0.00	$0	$0	$0
Protective cover - excavate,haul,spread&compact		m3		#N/A	$0.00	$0	$0	$0
Vegetate		ha		#N/A	$0.00	$0	$0	$0
Install infiltration/seepage instrumentation		allow		#N/A	$0.00	$0	$0	$0
CONSTRUCT DIVERSION DITCHES								
Excavate ditches -soil		m3		#N/A	$0.00	$0	$0	$0
Excavate ditches -rock		m3		#N/A	$0.00	$0	$0	$0
Rip rap in channel base		m3		#N/A	$0.00	$0	$0	$0
CONSTRUCT SEEPAGE COLLECTION POND								
Excavate seepage collection pond		m3		#N/A	$0.00	$0	$0	$0
Doze & spread excavated material		m3		#N/A	$0.00	$0	$0	$0
Vegetate spread material		ha		#N/A	$0.00	$0	$0	$0
Bedding layer		m3		#N/A	$0.00	$0	$0	$0
Supply geomembrane		m2		#N/A	$0.00	$0	$0	$0
Install geomembrane		m2		#N/A	$0.00	$0	$0	$0
Erosion protection layer		m3		#N/A	$0.00	$0	$0	$0
INSTALL GROUNDWATER COLLECTION SYSTEM								
Excavate/install sumps		m3		#N/A	$0.00	$0	$0	$0
Install pumping wells		m3		#N/A	$0.00	$0	$0	$0
Install pumps/pipelines/power supply		allow		#N/A	$0.00	$0	$0	$0
RELOCATE DUMPS								
Load, haul, dump or doze		m3		#N/A	$0.00	$0	$0	$0
Add lime		tonne		#N/A	$0.00	$0	$0	$0
Contour reclaimed area		ha		#N/A	$0.00	$0	$0	$0
Other				#N/A	$0.00	$0	$0	$0
SPECIALIZED ITEMS								
Install permanent instrumentation	thermistors	Allow	1	EA	$50,000.00	$50,000	$0	$50,000
Install permanent instrumentation, drilling		each		#N/A	$0.00	$0	$0	$0
TREAT ROCK PILE SEEPAGE - "It is included on Water Treatment Sheet"								
HEAP LEACH SEEPAGE TREATMENT - Cyanide Detox								
Cyanide destruction water treatment pumping		m3		#N/A	$0.00	$0	$0	$0
Reagents		tonnes		#N/A	$0.00	$0	$0	$0
Electrician/mechanic to maintain treatment plant		allow		#N/A	$0.00	$0	$0	$0
Equipment maintenance and parts		allow		#N/A	$0.00	$0	$0	$0
					Annual treatment costs	$0		
Number of years of treatment		years						
					Total treatment costs	$0		$0
HEAP LEACH SEEPAGE TREATMENT - ARD/ML**								
Upgrade/modify pumping system - report to WTP		allow		#N/A	$0.00	$0		$0
					Total	$2,923,088	$0	$2,923,088
					% of Total		0%	100%

* For construction of passive treatment system refer to "Water Management". ARD/ML seepage treatment becomes post-closure water treatment cost

**Heap leach ARD/ML seepage treatment becomes post-closure water treatment cost

1 **Building / Equip Name:** **Bldg / Equip #:**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	% Land	Land Cost	Water Cost
DISPOSE MOBILE EQUIPMENT									
Decontaminate and ship off-site		allow		#N/A	$0.00	$0		$0	$0
Decontaminate and dispose on-site		manhours	300	MECHL	$49.00	$14,700		$0	$14,700
Other				#N/A	$0.00	$0		$0	$0
REMOVE BUILDINGS - see note below									
Accomodation Complex - Main Camp		m2	4668.0	BRS1L	$45.00	$210,060		$0	$210,060
Process Facilities - Crushers		m2	700	BRS1H	$65.00	$45,500		$0	$45,500
Offices, kitchen, ERT		m2	1311.31	BRS1L	$45.00	$59,009		$0	$59,009
Storage Facilites (Main Warehouse)		m2	3699	BRS1L	$45.00	$166,455		$0	$166,455
Water and Wastewater Treatment Facilities		m2	178.44	BRS1L	$45.00	$8,030		$0	$8,030
Power Plant		m2	215.6	BRS1H	$65.00	$14,014		$0	$14,014
Communication Tower		m2	100	BRS1H	$65.00	$6,500		$0	$6,500
U/G Heating Plant		m2		#N/A	$0.00	$0		$0	$0
Emulsion Plant		m2		#N/A	$0.00	$0		$0	$0
AN Storage Facility		m2		#N/A	$0.00	$0		$0	$0
Shops and Other		m2	1222.1	BRS1L	$45.00	$54,996		$0	$54,996
Storage Facility at Laydown/Airstrip		m2		#N/A	$0.00	$0		$0	$0
Fuel tanks on site / Bulk fuel tank		m2	213.09	BRS1H	$65.00	$13,851		$0	$13,851
Fuel Tanks		m2		#N/A	$0.00	$0		$0	$0
Fire protection- Pumping station		m2	29.74	BRS1H	$65.00	$1,933		$0	$1,933
Freshwater intake		m2	200	BRS1L	$45.00	$9,000		$0	$9,000
Reclaim pumps		m2		#N/A	$0.00	$0		$0	$0
Outfall & Diffuser		allow	1	EA	$20,000.00	$20,000		$0	$20,000
Airstrip lighting, navigation, electrician		mandays		#N/A	$0.00	$0		$0	$0
Airstrip lighting, navigation, mechanical		mandays		#N/A	$0.00	$0		$0	$0
Break foundation slabs	total of all buildings	m2	1222.1	BRCS	$6.00	$7,333		$0	$7,333
Consolidate & dump boneyard debris		m3		#N/A	$0.00	$0		$0	$0
Ramp portal		m2		#N/A	$0.00	$0		$0	$0
Workers Dry		m2	667.6	BRS1L	$45.00	$30,042		$0	$30,042
WTP & Fresh water pumping station		m2	832.09	BRS1L	$45.00	$37,444		$0	$37,444
WRSF Pond, Attenuation Pond pumphouses		m2	24.4	BRS1L	$45.00	$1,098		$0	$1,098
Water Intake		m2		#N/A	$0.00	$0		$0	$0
LANDFILL FOR DEMOLITION WASTE									
Place rock cover	in WRSF cover cost	m3		#N/A	$0.00	$0		$0	$0
Place soil cover		m3		#N/A	$0.00	$0		$0	$0
Vegetate		ha		#N/A	$0.00	$0		$0	$0
GRADE AND CONTOUR PADS									
Accomodation Complex - Main Camp		m3	867.35	AE	$8.47	$7,346		$0	$7,346
Process Facilities - Crushers		m3	700	AE	$8.47	$5,929		$0	$5,929
Offices, kitchen, ERT		m3	1203.75	AE	$8.47	$10,196		$0	$10,196
Storage Facilites (Main Warehouse)		m3	3699	AE	$8.47	$31,331		$0	$31,331
Water and Wastewater Treatment Facilities		m3	178.44	AE	$8.47	$1,511		$0	$1,511
Power Plant		m3	215.6	AE	$8.47	$1,826		$0	$1,826
Communication Tower		m2	100	AE	$8.47	$847		$0	$847
U/G Heating Plant		m3		#N/A	$0.00	$0		$0	$0
Emulsion Plant		m3		#N/A	$0.00	$0		$0	$0
Shops and Other		m3	1222.1	AE	$8.47	$10,352		$0	$10,352
Fuel tanks on site / Bulk fuel tank		m3	213.09	AE	$8.47	$1,805		$0	$1,805
Fire protection- Pumping station		m3	29.74	AE	$8.47	$252		$0	$252
Ramp portal	in Type B permit	m3		#N/A	$0.00	$0		$0	$0
Workers Dry		m3	667.6	AE	$8.47	$5,655		$0	$5,655
Place rock cover		m3		#N/A	$0.00	$0		$0	$0
Vegetate		ha		#N/A	$0.00	$0		$0	$0
WTP & Fresh water pumping station		m3	832.09	AE	$8.47	$7,048		$0	$7,048
WRSF Pond, Attenuation Pond pumphouses		m3	24.4	AE	$8.47	$207		$0	$207
PUNCTURE LINED SUMPS									
Puncture liner and place soil cover		m3		#N/A	$0.00	$0		$0	$0
RECLAIM ROADS									
Remove culverts		each		#N/A	$0.00	$0		$0	$0
Remove bridges		each		#N/A	$0.00	$0		$0	$0
Scarify and install water breaks	Account only remain width from exploration road (9.5-6.5)	ha	19.23	SCFYH	$6,030.00	$115,957		$0	$115,957
Scarify airstriip		ha		#N/A	$0.00	$0		$0	$0
Scarify laydown and ore stockpile areas		allow	1	EA	$20,000.00	$20,000		$0	$20,000
Vegetate		ha		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
SPECIALIZED ITEMS									
Dispose of misc. debris and laydown area	refuse			#N/A	$0.00	$0		$0	$0
					Total	$920,225		$0	$920,225
					% of Total			0%	100%

Note
Costs are based on file "6108 Building Listing_RA.xlsx" dated 3/14/2016, total area used for remove buildings section, and ground area for grade and contour pads

1 **Chemicals/Soil Area Name:**

Note: The procedures, equipment and packaging for clean up and removal of chemicals or contaminated soils are highly dependent on the nature of the chemicals and their existing state of containment. Government guidelines should be consulted on an individual chemical basis. Any estimate made here should be considered very rough unless specific evaluations have been conducted.

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	% Land	Land Cost	Water Cost
HAZARDOUS MATERIALS AUDIT									
Hazardous materials audit		mandays		#N/A	$0.00	$0		$0	$0
Phase 1 audit		each	1	CS1L	$7,500.00	$7,500		$0	$7,500
Phase 2 audit		each	1	CS2L	$50,000.00	$50,000		$0	$50,000
BUILDING DECONTAMINATION & CONSOLIDATION OF HAZARDOUS MATERIALS									
Environmental technician/coordinator		mandays		#N/A	$0.00	$0		$0	$0
Decontaminate: oil, fuel		mandays	20	AE	$1,000.00	$20,000		$0	$20,000
Decontaminate maintenance shop		mandays		#N/A	$0.00	$0		$0	$0
Decontaminate power plant		mandays	10	AE	$1,000.00	$10,000		$0	$10,000
Decontaminate bulk fuel storage		mandays		#N/A	$0.00	$0		$0	$0
Decontaminate ANFO plant		mandays		#N/A	$0.00	$0		$0	$0
Decontaminate offices/warehouse/accom		mandays		#N/A	$0.00	$0		$0	$0
Removal of asbestos siding on buildings		m2		#N/A	$0.00	$0		$0	$0
Removal of friable asbestos on equipment		m2		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
HAZARDOUS MATERIALS REMOVAL									
Waste oils	Burn on site	litre		#N/A	$0.00	$0		$0	$0
Waste fuel	Burn on site	litre		#N/A	$0.00	$0		$0	$0
Waste batteries	includes fee and transportation	allow	1	AE	$3,000.00	$3,000		$0	$3,000
Assay & environmental lab reagents		kg		#N/A	$0.00	$0		$0	$0
Machine shop paints, solvents etc	includes fee and transportation	allow	1	AE	$10,000.00	$10,000		$0	$10,000
Glycol	includes fee and transportation	allow	1	AE	$20,000.00	$20,000		$0	$20,000
Process reagents		kg		#N/A	$0.00	$0		$0	$0
Nuclear sources		allow		#N/A	$0.00	$0		$0	$0
Other hazardous materials	includes fee and transportation	allow	1	AE	$20,000.00	$20,000		$0	$20,000
HAZARDOUS MATERIALS									
Transportation to disposal facility		allow		#N/A	$0.00	$0		$0	$0
Disposal fees		allow		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
CONTAMINATED SOILS									
Contam. soil investigation - Phase 1		each		#N/A	$0.00	$0		$0	$0
Contam. soil investigation - Phase 2	in Audit above	each		#N/A	$0.00	$0		$0	$0
CONTAMINATED SOIL REMOVAL									
Excavate and transport to Meadowbank landfarm (Site fuel, power plant,Mine maitenance shop)		m3	495	SC4L	$9.30	$4,606		$0	$4,606
Manage hydrocarbon remediation at Meadowbank landfarm		m3	495	CSRL	$47.00	$23,277		$0	$23,277
Reagents/stabilizing agent		m2		#N/A	$0.00	$0		$0	$0
Excavate and transport to offsite facility		m3		#N/A	$0.00	$0		$0	$0
Contour decontaminated area		m3	495	DSL	$0.95	$470		$0	$470
CONTAMINATED SOIL VERY LOW PERMEABILITY COVER									
Supply geomembrame, HDPE, ES3, GCL		m2		#N/A	$0.00	$0		$0	$0
Upper and lower bedding layers		m3		#N/A	$0.00	$0		$0	$0
Install geomembrane, HDPE, ES3, GCL		m2		#N/A	$0.00	$0		$0	$0
Erosion protection layer		m3		#N/A	$0.00	$0		$0	$0
Vegetate		m2		#N/A	$0.00	$0		$0	$0
Install infiltration/seepage instrumentation		allow		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
OTHER									
				#N/A	$0.00	$0		$0	$0
					Total	$168,853		$0	$168,853
					% of Total			0%	100%

1 **Capital Expenditures and Short Term Water Treatment identified in 'Instructions' worksheet**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
BREACH DYKE EMBANKMENT						
Remove (excavate) fill	Assumed a total of 8 breaches: 3 on Whale Tail Dyke, 2 on Northeast Dyke,1 on Mammoth Dyke, 1 on WRSF Dyke and 1 on Saddle Dam. Total dyke material will be removed and places on the WRSF	m3	20000	SC3L	$8.90	$178,000
Contour water intake area		m3		#N/A	$0.00	$0
STABILIZE SEDIMENT PONDS/WATER MANAGEMENT PONDS						
Place soil cover		m3		#N/A	$0.00	$0
Doze & spread excavated material		m3		#N/A	$0.00	$0
Vegetate spread material		ha		#N/A	$0.00	$0
Rip rap in channel base		each		#N/A	$0.00	$0
Remove sediments from WRSF pond and place them in the landfill	assumed	allow	1	AE	$10,000.00	$10,000
REDIRECT RUNOFF/CONSTRUCT DIVERSION DITCHES						
Excavate ditches -soil	assumed 100 m	m3	720	SC3L	$8.90	$6,408
Excavate ditches -rock		m3		#N/A	$0.00	$0
Stabilize side slopes		m3		#N/A	$0.00	$0
Rip rap in channel base	assumed 100 m	m3	220	RR2L	$14.20	$3,124
BREACH DITCHES						
Excavate breaches		m3		#N/A	$0.00	$0
Backfill/recontour	Assumed - total excavacation volume for channels construction = 147,100 m3 from SNC Lavalin report. 30% of this volume was asssumed for recontour of channels to restore drainage path (remaining assumed that will be filled with sediments with time)	m3	44130	SB3L	$5.10	$225,063
Install flow dissipation		m3		#N/A	$0.00	$0
Vegetate remainder of ditch		m2		#N/A	$0.00	$0
DECOMMISSION FRESH WATER SUPPLY						
Breach embankment		m		#N/A	$0.00	$0
Remove pump	Nemo Lake and Whale Tail (South Basin)	LS	1	EA	$20,000.00	$20,000
Remove pipeline	to Nemo Lake and Whale Tail (South Basin)	LS	1	EA	$40,000.00	$40,000
WATER CONTROL IN RECLAMATION QUARRY						
Install pumping system		LS		#N/A	$0.00	$0
Remove pumping system		LS		#N/A	$0.00	$0
REMOVE PIPELINES						
Remove pipes		m		#N/A	$0.00	$0
Concrete plug deep pipes		m3		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
GROUNDWATER COLLECTION SYSTEM						
Excavate/install sumps		m3		#N/A	$0.00	$0
Install pumping wells		m3		#N/A	$0.00	$0
Install pumps/pipelines/power supply		LS		#N/A	$0.00	$0
CONSTRUCT CONTAMINATED WATER STORAGE POND						
Excavate pond		m3		#N/A	$0.00	$0
Doze & spread excavated material		m3		#N/A	$0.00	$0
Vegetate spread material		ha		#N/A	$0.00	$0
Bedding layer		m3		#N/A	$0.00	$0
Supply geomembrane		m2		#N/A	$0.00	$0
Install geomembrane		m2		#N/A	$0.00	$0
Erosion protection layer		m3		#N/A	$0.00	$0
CONSTRUCT PASSIVE TREATMENT SYSTEM (e.g. Constructed Wetland)						
Construct access roads		km		#N/A	$0.00	$0
Install HDPE piping system from collection pond		m		#N/A	$0.00	$0
Inter-cell flow structures		allow		#N/A	$0.00	$0
Install liners		m2		#N/A	$0.00	$0
Install growth media		m3		#N/A	$0.00	$0
Wetland vegetation		ha		#N/A	$0.00	$0
CONSTRUCT WATER TREATMENT PLANT						
Build treatment plant		LS		#N/A	$0.00	$0
Build sludge containment facility		LS		#N/A	$0.00	$0
					Total	$482,595

For cost of long-term/post-closure water treatment see "WATER TREATMENT" Worksheet"

1 **Post Closure Water Treatment - Identified as long term/post-closure in 'Instructions' worksheet**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
ADDITION OF REAGENTS TO WTP						
H2O2		kg		#N/A	$0.00	$0
lime		kg		#N/A	$0.00	$0
ferric sulphate		kg		#N/A	$0.00	$0
ferrous sulphate		kg		#N/A	$0.00	$0
flocculents		kg		#N/A	$0.00	$0
Other		kg		#N/A	$0.00	$0
LABOUR AND SUPPLIES						
Annual fuel		litres		#N/A	$0.00	$0
Annual power		kW-h		#N/A	$0.00	$0
Electrician/mechanic to maintain treatment plant		allow		#N/A	$0.00	$0
Equipment maintenance and parts		allow		#N/A	$0.00	$0
Misc. supplies, hoses, tools		allow		#N/A	$0.00	$0
Communications		allow		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
WATER MANAGEMENT						
Water Treatment (reagents, equip. Op., labour)		m3	154,740	AE	$0.62	$95,939
Water pumping from sumps and ponds to treatment plant		allow	1	AE	$29,367.83	$29,368
Annual Treatment Plant Servicing (2 Consultants x 7days/year)		manhours	168	LAB-SS	$120.00	$20,160
Treatment Plant Servicing Travel Allowance (Round Trip Flight/person)		visits	2	AE	2500.00	$5,000
WTP WATER SAMPLING AND ANALYSES						
Sampling equipment		allow		#N/A	$0.00	$0
Analyses		allow		#N/A	$0.00	$0
Shipping to laboratory		allow		#N/A	$0.00	$0
Reporting		allow		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
SITE ACCESS						
Road maintenance (incl. snow removal)		allow	1	AE	$50,000.00	$50,000
Winter road tariff		allow		#N/A	$0.00	$0
Truck rental		allow		#N/A	$0.00	$0
Air support		allow		#N/A	$0.00	$0
					Annual water treatment costs	$200,467
Number of years of water treatment		years	11			
					Total	$2,205,133

1 **Interim Care and Maintenance**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
INTERIM CARE & MAINTENANCE						
on-site caretaker		manmonths		#N/A	0	$0
extra personnel		manmonths		#N/A	0	$0
-electrician		manmonths		#N/A	0	$0
-mechanic		manmonths		#N/A	0	$0
annual fuel		litre		#N/A	0	$0
misc. supplies		allow		#N/A	0	$0
pick-up truck		each		#N/A	0	$0
small dozer		allow		#N/A	0	$0
small excavator		allow		#N/A	0	$0
snow machine		allow		#N/A	0	$0
communications		allow		#N/A	0	$0
SNP/AEMP water sampling & reporting		each		#N/A	0	$0
geotechnical assessment		each		#N/A	0	$0
interim water treatment		each		#N/A	0	$0
other		each		#N/A	0	$0
			Annual	Interim C&M Cost		$0
Number of years of ICM		years			**Total**	$0

1 Post-Closure Monitoring & Maintenance:

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
MONITORING & INSPECTIONS						
Annual geotechnical inspection		each	1	VIH	$7,977.79	$7,978
Surface water sampling		each	1	WSH	$10,000.00	$10,000
Ground water sampling		each	1	WSH	$10,000.00	$10,000
Receiving/downstream water sampling		each	1	WSH	$10,000.00	$10,000
Monitoring program	Assumed	ech	1	AE	$100,000.00	$100,000
Survey inspection		each		#N/A	$0.00	$0
Regulatory costs*		each		#N/A	$0.00	$0
Site water monitoring (AEMP and SNP)		each		#N/A	$0.00	$0
- Active closure and flooding		each		#N/A	$0.00	$0
- Post pit flooding		each		#N/A	$0.00	$0
Air Quality Monitoring Program (AQMP)		each		#N/A	$0.00	$0
Wildlife Effects Monitoring Program (WEMP)		each		#N/A	$0.00	$0
Vegetation Monitoring		each		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
COVER MAINTENANCE						
Repair erosion - infill gullies		allow		#N/A	$0.00	$0
Repair erosion - upgrade diversion ditches		allow		#N/A	$0.00	$0
Remove problem vegetation		allow		#N/A	$0.00	$0
Repair animal damage		allow		#N/A	$0.00	$0
Repair/upgrade access controls		allow		#N/A	$0.00	$0
Other				#N/A	$0.00	$0
SPILLWAY MAINTENANCE						
Repair erosion		m3		#N/A	$0.00	$0
Clear spillway		each		#N/A	$0.00	$0
CWTS MAINTENANCE						
Maintain flow, restore vegetation		allow		#N/A	$0.00	$0
WATER TREATMENT						
Water treatment - refer to water treatment tab		each	1	WT tab	$200,466.63	$200,467
POST-CLOSURE WATER TREATMENT						
Subtotal, Annual post-closure costs						$338,444
Discount rate for calculation of net present value of post-closure cost, %				3.00%		
Number of years of post-closure activity				11	years	
Present Value of payment stream						$3,131,499

*Regulatory costs - annual reporting, management plans, progress reports etc

1 **Mobilization/Demobilization:**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
MOBILIZE HEAVY EQUIPMENT						
Excavators		each		#N/A	0	$0
Dump trucks		each		#N/A	0	$0
Dozers		each		#N/A	0	$0
Demolition shears	use of hoe ram and cutting torches	each				
				#N/A	0	$0
Crane		each		#N/A	0	$0
Loader		each		#N/A	0	$0
Compactor		each		#N/A	0	$0
Light duty vehicles		each		#N/A	0	$0
MOBILIZE MISC. EQUIPMENT						
Pump shipping		each		#N/A	0	$0
Pipe shipping		m		#N/A	0	$0
Minor tools and equipment		allow		#N/A	0	$0
Truck tires		allow		#N/A	0	$0
Other				#N/A	0	$0
MOBILIZE CAMP						
Maintain Camp Accomodations		mandays	13748	ACCML	100	$1,374,833
Reclamation activities		allow		#N/A	0	$0
Long term reclamation activities (eg pump flooding)		allow		#N/A	0	$0
MOBILIZE WORKERS						
Reclamation activities - travel time		manhours	21066	AE	80	$1,685,257
Crew transportation (ticket and travel accomodation)		each	585	AE	3300	$1,931,024
Reclamation activities - transport		each		#N/A	0	$0
Long term reclamation activities (eg pump flooding) - travel time		manhours	2503	#N/A	80	$200,229
Long term reclamation activities (eg pump flooding) - ticket and travel accomodation		each	70	AE	3300	$229,429
Monitoring Airfare		each		#N/A	0	$0
WORKER ACCOMODATIONS						
Reclamation activities		manmonths		#N/A	0	$0
Long term reclamation activities (eg pump flooding)		manmonths		#N/A	0	$0
MOBILIZE FUEL						
Fuel freight - reclamation activities		litre		#N/A	0	$0
Fuel freight - long term reclamation activities		litre		#N/A	0	$0
Fuel freight accomodations		litre		#N/A	0	$0
WINTER ROAD						
Construction and operation		km		#N/A	0	$0
Limited winter use		km		#N/A	0	$0
Wintar road tariff		km		#N/A	0	$0
DEMOBILIZE HEAVY EQUIPMENT						
Excavators		km		#N/A	0	$0
Dump trucks		km		#N/A	0	$0
Dozers		km		#N/A	0	$0
Demolition shears		km		#N/A	0	$0
Crane		km		#N/A	0	$0
Loader		km		#N/A	0	$0
Compactor		each		#N/A	0	$0
Light duty vehicles		km		#N/A	0	$0
Other		km		#N/A	0	$0
DEMOBILIZE CAMP						
		allow		#N/A	0	$0
DEMOBILIZE WORKERS						
crew travel time		mandays		#N/A	0	$0
crew transportation		each		#N/A	0	$0
WINTER ROAD						
Construction and operation		km		#N/A	0	$0
Limited winter use		km		#N/A	0	$0
Wintar road tariff		km		#N/A	0	$0
					Total	$5,420,771

Note: Labour costs not included under mobilization - included elsewhere

Assumptions

Stage/description	Duration (years)	2 shifts - day # Staff - permanent	hours/person	days/year	total hours	3 weeks rotation one-way transportation/year	Total crew transportation
Active closure, back-flooding, treatment, monitoring	1	30	12	182.5	65700	261	261
Passive closure, back-flooding, treatment, monitoring	7	8	12	122	81760	46	324
Post-closure, treatment, monitoring	3	4	12	122	17520	23	70
Post-closure - assumed no monitoring will be necessary (walk away condition)	0						
Total	11						

Unit Cost Table (for refining unit costs see "Estimator" worksheet)

Filter by unit

ITEM	Detail	COST CODE	UNITS	LOW $	HIGH $	SPECIFIED $	COMMENTS
Accomodation							
		ACCM	manday	100.00	175.00		
Buildings - Decontaminate							
	Asbestos	BDA	m2	25.60	51.20		Low: removal of asbestos siding & flooring; High: removal of insulated pipes, friable asbestos
Buildings - Remove							Unit costs are based on 3m high, single storey building. Scale areas accordingly.
	Wood	BRW	m2	27.50	41.00		
	Concrete	BRC	m2	40.00	65.00	6.00	Specified: puncture concrete foundation slabs
	Steel - teardown	BRS1	m2	45.00	65.00		
	Steel - for salvage	BRS2	m2	67.00	100.00		
Concrete work							
	Small pour	CSF	m3	426.50	639.75		Low: YK; High=1.5xLow
	Large pour	CLF	m3	353.50	530.25	2,130.00	Specified: concrete crown pillar
Contaminated Soils							
	ESA Phase 1	CS1	each	7500.00			Low: small, "clean" site
	ESA Phase 1	CS2	each	50000.00			Low: small, "clean" site
	Remediate on site	CSR	m3	47.00	146.00		
Dozing							
	doze rock piles	DR	m3	1.05	2.40		Low cost: doze crest off dump
	doze overburden/soil piles	DS	m3	0.95	3.80		High cost: push up to 300 m
Excavate Rock; Low Spec's and QA/QC							
	drill/blast/load/short haul	RB1	m3	11.40	17.05		Low:quarry operations for bulk fill
	drill/blast/load/long haul	RB2	m3	12.05	17.80		
	RB1 + spread and compact	RB3	m3	12.05	17.80		
	RB2 + spread and compact	RB4	m3	12.50	30.75		
	Specified activity	RBS	m3				
Excavate Rock; High Spec's and QA/QC							(e.g. ditch/spillway excavation)
	drill/blast/load/short haul	RC1	m3	12.05	17.80		Low:foundation excavation;High:spillway excavation
	drill/blast/load/long haul	RC2	m3	12.70	18.40		
	RC1 + spread and compact	RC3	m3	12.70	18.40		e,g, cover construction
	RC2 + spread and compact	RC4	m3	13.50	19.20		e,g, cover construction
	Specified activity	RCS	m3			175.00	Specified-drift excavation
Excavate Rip Rap							
	drill/blast/load/short haul/place	RR1	m3	13.50	17.75		High: quarry & place rip rap in channel
	drill/blast/load/long haul/place	RR2	m3	14.20	20.65		
	source is waste dump/short haul	RR3	m3	7.00			cost includes sorting
	source is waste dump/long haul	RR4	m3	7.60			
	Specified activity	RRS	m3				
Excavate Soil; Low Spec's and QA/QC							
	clear & grub	SBC	m2	3.40	5.00		
	excavate/load/short haul	SB1	m3	4.30	5.90		
	excavate/load/long haul	SB2	m3	4.60	7.30		
	SB1 + spread and compact	SB3	m3	5.10	8.90		Low: non-engineered; High:engineered
	SB2 + spread and compact	SB4	m3	5.50	11.00		Low: non-engineered; High:engineered
	Specified activity	SBS	m3	3.20	6.30		Low: rehandle waste rock dump by dozing; High:rehandle waste rock by hauling
	Tailings	SBT	m3	1.35	3.70	15.50	High:contour surface - wet or frozen; Specified:haul/place wet infill
Excavate Soil, High Spec's and QA/QC							
	excavate/load/short haul	SC1	m3	6.80	9.30		
	excavate/load/long haul	SC2	m3	7.10	11.75		
	SC1 + spread and compact	SC3	m3	8.90	14.20		Low: non-engineered; High:engineered
	SC2 + spread and compact	SC4	m3	9.30	23.20		Low: non-engineered; High:engineered (e.g. complex covers, low volume dam construction)
	Specified activity	SCS	m3			18.80	Backfill adit with waste rock
Fence							
		FNC	m	13.55	203.00		
Fuel and Electricity							
	Fuel cost - gas	FCG	litre	1.05	1.40		
	Fuel cost - diesel	FCD	litre	0.99	1.39		
	Fuel mobilization	FCM	litre	0.22	0.42		High: winter road usage
	Electricity	FCE	kW-h	0.17	0.19	0.49	Low and High:Yellowknife; Specified:diesel generator
Geo-Synthetics							
	geotextile	GST	m2	3.44			Supply and install

Unit Cost Table (for refining unit costs see "Estimator" worksheet)

	Filter by unit					
geogrid	GSG	m2	5.75			
liner, HDPE	GSHDPE	m2	7.95			Supply and install; large quantity
liner, ES3	GSES3	m2	20.20			FOB Yellowknife
geosynthetic installation	GSI	m2	3.16	14.00		Low:geotextile; High:ES3 or HDPE
bentonite soil ammendment	GSBA	tonne	308.30	348.50		FOB Edmonton, add shipping & mixing
Grouting (/m3 of rock grouted)						
	grout	m3	236.55	286.75		High: cement, FOB Yellowknife
Laboratory Chemicals						
Remove from site	LCR	pallet	1966.36	2606.83		
Labour & Equipment Rates						
Site manager	sman	$/hr	125.00	152.00		
Supervisor	super	$/hr	52.00	91.84		
Registered engineer	eng	$/hr	95.00	220.00		
Environmental coordinator	envco	$/hr	74.16	130.00		
Evironmental technologist	envtech	$/hr	36.00			
Electrician	elec	$/hr	74.00	95.00		
Journeyman - various	journey	$/hr	44.00	71.79		
Labour - skilled	lab-s	$/hr	41.00	49.60	120.00	Specified - Skilled Manufacturer Mechanic
Labour - unskilled	lab-us	$/hr	31.00	43.98		
Equipment operator	oper	$/hr	41.00	65.00		
Heavy duty mechanic	mech	$/hr	49.00	72.85		
Water treatment plant operator	oper-wt	$/hr	41.00	59.86		
Security / first aid	safety	$/hr	36.00	66.97		
Administative staff	admin	$/hr	38.00	57.89		
Equipment rates include operator and fuel						
Loader - 4 cu.yd (3.06m3)	load-s	$/hr	175.00			
Loader - 7 cu.yd (5.35m3)	load-l	$/hr	315.00			
Excavator - 26.76-30.84 tonnes	exc-s	$/hr	190.00			
Excavator - 68.95+tonnes	exc-l	$/hr	420.00			
Grader	grad	$/hr	190.00			
Dump truck off hwy 30-50 tonnes	truck-s	$/hr	225.00			
Dump truck off hwy 55-75 tonnes	truck-l	$/hr	300.00			
dozer, small	dozers	$/hr	205.00	260.00		
dozer, large	dozerl	$/hr	490.00	565.00		
smooth drum compactor	comp	$/hr	155.00			
scooptram, 6 yd3 bucket	scoop	$/hr	170.00			
flat bed truck with hiab	hiab	$/hr	155.00			
fuel truck	ftruck	$/hr	150.00			
water truck	wtruck	$/hr	58.00	150.00		
Mobilize Heavy Equipment						
Road access	MHER	kmtonne	3.40	10.25		
Air access	MHEA	kmtonne	12.00			cargo rate>500lb
Mobilize Camp						
Road access	MCR	each	50000.00			refurbish existing camp
Mobilize Workers						
flight	MW	each	4500.00	9100.00		Low:e.g. 8 passenger; High: Dash 7
Oil Removal						
oil removal	OR	litre	0.43	1.20		Low:waste oil heater; High: ship offsite
PCB Removal						
Remove from site	PCBR	litre	40.20	46.90		Low: shipping, handling & disposal from Yellowknife
Pipes, small (<6in dia.)						
remove/dispose on site	PSR	m	1.00	24.00		Low: remove/dispose on site; High: remove/re-use
supply	PSS	m	6.10	11.10		Low:supply; High:supply and ship
install	PSI	m	25.00			
Pipes, large (>6in dia.)						
remove/dispose on site	PLR	m	22.00	72.00		Low: remove/dispose on site; High: remove/re-use
supply	PLS	m	129.00	143.00		Low:supply; High:supply and ship
install	PLI	m	50.00			
Power Lines						
remove/dispose on site	POWR	m	25.50			
Process Chemicals						
Remove from site	PCR	kg	0.45	2.50		Low: shipping, handling & disposal from Yellowknife

Unit Cost Table (for refining unit costs see "Estimator" worksheet)

Filter by unit

Pumps						
Pump capital cost	PC	each	195000.00			
Pump shipping	PS	each	2500.00			
Pump operating cost	POC	m3	0.12			pump operating costs should be calculated based on pump capacity, fuel costs, etc.
Pump maintenance	PM	allow	25000.00			
Pump sand BackFill						
	PBF	m3	85.00	300.00		
Scarify - road/mine site						
	SCFY	ha	4300	6030	2150	
Shaft, Raise & Portal Closures						
Shaft & Raises	SR	m2	645.00	2132.00		Low:pre-cast concrete slabs, little site prep. Area=shaft+>1m all around
Portals	POR	m3	18.80	250.00	1200.00	Low:unit cost code SCS;High:excavate & backfill collapsed portal;Spec: installed pressure plug
Signs						
Signs	S	each	12.36	37.08		
Site Inspection Report						
	RPT	each	10000.00	20000.00		
SpillWay - Clear						
	SW	each	3000.00	7000.00		
Survey/Instrumentation						
	SI	each	1800.00	3600.00		2 person crew
Treatment Plant - Construct						
Small (< 1000 m3/d)	TPS	lump sum	9000000	15000000		
Large (> 1000 m3/d)	TPL	lump sum	15000000	46000000		
Constructed Wetland	CWTS	ha	200000	300000		
Treatment Plant - Operate						
	TPO	m3	0.35	2.00		
Treatment Chemicals						
ferric sulphate	ferric	kg	1.19			
ferrous sulphate	ferrous	kg	1.32			
lime	lime	kg	0.56			
hydrogen peroxide, 35%	hperox	kg	1.50			
Sodium Metabisulfate	Nametab	kg	1.18			
Caustic soda, 50%	caustic	kg	0.74			
Sulfuric acid, 93%	sulfuric	kg	0.31			
flocculant	flocc	kg	6.00			
copper sulphate	copper	kg				
shipping	shipping	kg	0.20			
Vegetation						
Hydroseed, Flat	VHF	ha	4000.00			
Hydroseed, Sloped	VHS	ha	4500.00			
Veg. blanket/erosion mat	VB	ha	13000.00			
Tree planting	VT	ha	2600.00	6000.00		
Wetland species	VW	ha			47.72	Specified= /m3, Wetland Growth Media Substrate mixed and installed (sand, biochar and fertilizer, woodchips)
Visual Site Inspection						
Visual site inspection	VI	each	3955.18	7977.79	11000.00	
Water Sampling/Analysis/Reporting						
	WS	each	7000.00	10000.00		
Winter Road						
Construction	WRC	km	2000.00	11500.00		
Usage	WRU	kmtonne	0.29			

Unit Cost Estimator

1 Equipment Productivity Figures and Graphs have been reproduced from Caterpillar Performance Handbook - Edition 42

EXCAVATION

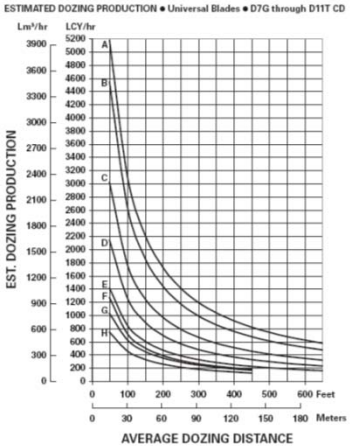
Productivity		
Machine Cat 336EL		
bucket capacity	3.16	m3
fill factor	75%	%
cycle time	45	seconds
operator skill	80%	%
machine availability	83%	%
altitude adjustment	100%	%
Hourly productivity	125.89	m3/hr
Operating Costs		
- Contractor		
Contractor hourly rate	$180.00	$/hr
Excavation cost - contractor rate	1.43	$/m3
- Owner		
ownership, daily		$/day
maintenance		$/hr
fuel		$/hr
consumables (cutters, tires)		$/hr
operator		$/hr
Owner hourly rate	$0.00	$/hr
Excavation cost - owner rate	$0.00	$/m3
Excavation cost - select contractor or owner rate (D22 or D31)		$/m3

HAUL AND DUMPING

Productivity		
Machine Cat 770		
truck capacity	25.1	m3
fill factor	80%	%
load time	6.0	min.
haul distance	1.5	km
average velocity	20.0	km/hr
haul time + return time	9.0	min.
wait time	0.5	min.
dump time	1.0	min.
cycle time	16.5	min.
machine availability	83%	%
altitude adjustment	100%	%
	13.7	/e. min/cycle
Hourly productivity	88.0	m3/hr
Operating Costs		
- Contractor		
Contractor hourly rate	$225.00	$/hr
Haul and Dump - contractor rate	2.56	$/m3
- Owner		
ownership, daily		$/day
maintenance		$/hr
fuel		$/hr
consumables (cutters, tires)		$/hr
operator		$/hr
Owner hourly rate	$0.00	$/hr
Haul/Dumping Cost - owner rate	$0.00	$/m3
Haul/Dumping Cost - select contractor or owner rate (I22 or I31		$/m3

SPREADING/DOZING

Productivity		
Machine Cat D8		
Estimate production using example curves provided or equivalent from other supplier	600	m3/hr
Correction factors (see table provided)		
operator skill	0.75	
material type, see table	0.80	
slot dozing	1.00	
side by side dozing	1.00	
visibility	1.00	
job efficiency	0.83	
altitude adjustment	1.00	
slope adjustment	1.00	
Hourly productivity	298.8	m3/hr
Operating Costs		
- Contractor		
Hourly rate - contractor supplied	$260.00	$/hr
Dozing - contractor rate	0.87	$/m3
- Owner		
ownership, daily		$/day
maintenance		$/hr
fuel		$/hr
consumables (cutters, tires)		$/hr
operator		$/hr
Owner hourly rate	$0.00	
Spreading/Dozing Cost - owner rate	$0.00	$/hr
Spreading/Dozing Cost - select contractor or owner rate (N22 or N31)		$/m3



KEY
A — D11T CD
B — D11T
C — D10T
D — D9T
E — D8T
F — D7E
G — D7R Series 2
H — D7G

NOTE: This chart is based on numerous field studies made under varying job conditions. Refer to correction factors following these charts.

Excavator

	Cat 320	Cat 325B	Cat 375
heaped bucket capacity, m3	1.5	2.2	5.4
	Typical Cycle Times (seconds)		
easy digging, shallow digging, small swing angle	16	18	20
med. to hard digging, rocky soil, swing angle to 90 deg.	23	23	25
tough digging, sandstone, caliche, at max. machine depth, swing angle > 120 deg.	27	29	35

Material	Fill Factor (% of heaped bucket capacity
Moist loam or sandy clay	100 - 110
sand and gravel (not till)	95 - 110
hard tough clay	80 - 90
rock - will blasted	60 - 75
rock - poorly blasted	40 -60

Operator Skill	poor	average	good
Correction factor	0.6	0.75	1

Machine availability	poor	average	good
Correction factor	0.9	0.95	1

Trucking

	Cat 771 D	Cat 777D	Cat 789C
Truck capacity - heaped, m3	27.5	60.5	137

Dozing

JOB CONDITION CORRECTION FACTORS

	TRACK-TYPE TRACTOR
OPERATOR —	
Excellent	1.00
Average	0.75
Poor	0.60
MATERIAL —	
Loose stockpile	1.20
Hard to cut; frozen —	
with tilt cylinder	0.80
without tilt cylinder	0.70
Hard to drift; "dead" (dry, non-cohesive material) or very sticky material	0.80
Rock, ripped or blasted	0.60-0.80
SLOT DOZING	1.20
SIDE BY SIDE DOZING	1.15-1.25
VISIBILITY —	
Dust, rain, snow, fog or darkness	0.80
JOB EFFICIENCY —	
50 min/hr	0.83
40 min/hr	0.67
BULLDOZER*	
Adjust based on SAE capacity relative to the base blade used in the Estimated Dozing Production graphs.	
GRADES — See following graph.	

*NOTE: Angling blades and cushion blades are not considered production dozing tools. Depending on job conditions, the A-blade and C-blade will average 50-75% of straight blade production.