BACK RIVER PROJECT
Interim Closure and Reclamation Plan

October 2017

BACK RIVER PROJECT
MINE CLOSURE AND RECLAMATION PLAN

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Revision Log

Revision (Version)	Date	Section	Page	General Description
G.1	November 2015	All	n/a	Conceptual Mine Closure and Reclamation for the Final Environmental Impact Statement Report (FEIS, Volume 10 of the FEIS)
G.2	August 2017	All	n/a	Draft Interim Closure and Reclamation Plan for the Type A Water Licence Application
	October 2017	All	n/a	Supporting Document for Type A Water Licence Application, submitted to Nunavut Water Board for review and approval

1. Section 1- Plain Language Summary

Sabina Gold & Silver Corp. (Sabina or the Company) is required to submit to the Nunavut Water Board (NWB) a Type A Water Licence Application for a Mining and Milling Undertaking (the Application) in accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (the Act) and *Nunavut Water Regulations* (Regulations) to use water, deposit waste, and conduct associated activities for the development of the Back River Project (the Project). Sabina has prepared the Application to meet the requirements outlined in the Nunavut Agreement (Agreement), the Act, and NWB General Information Guide 4 – Completing and Submitting a Water Licence Application for a New Licence, and the NWB Mining and Milling Supplemental Information Guideline (SIG) for Mine Development MM-3.

The Project is a proposed 27-year gold project owned by Sabina within the West Kitikmeot region of southwestern Nunavut. It is situated approximately 400 kilometres (km) southwest of Cambridge Bay, 95 km southeast of the southern end of Bathurst Inlet, and 520 km northeast of Yellowknife, Northwest Territories (NWT). The Project is located predominantly within the Queen Maud Gulf Watershed (Nunavut Water Regulations, Schedule 4). The closest community areas to the Project are Kingaok, located approximately 160 km north of the Goose Property, and Omingmaktok, located approximately 250 km northeast of the Goose Property.

The life of the Project, from mobilization to post-closure, is 27 years. This consists of: Mobilization and Construction Phase of 4 years (Phase 1: Year -4 to Year -1), Operations Phase of 10 years (Phase 2: Year 1 to Year 10), Closure Phase of 8 years (Phase 3: Year 11 to Year 18), and Post-Closure for 5 years (Phase 4: Year 19 to Year 23). It should be noted that the Operations Phase may be extended beyond 10 years should additional mineral deposits become economical to be developed.

The Project is comprised of two main areas, which will be connected by a winter ice road: the Goose Property (Appendix A, Figure A-02) and the Marine Laydown Area (MLA) (Appendix A, Figure A-03). The MLA will be situated along the western shore of southern Bathurst Inlet. The Project will be supported by year-round resupply by aircraft and by seasonal marine resupply by open water shipping (approximately 3 to 5 vessels per year). Gold doré bars will be shipped out by aircraft.

The mine plan consists of open pits and underground mining operations supporting a 6,000 tonnes per day (t/d) milling operation, which will use standard gravity separation and cyanide leaching circuits to extract the gold. The current plan for combined mine production focuses on achieving average production of 350,000 ounces of gold annually. Four deposits at Goose Property (Umwelt, Llama, Goose Main, and Echo) are planned to be mined using both open pit and underground mining methods. The proposed underground mining methods include post pillar cut-and-fill, drift and fill, and longitudinal open stoping; the proposed open pit mining method is truck and shovel.

Mining will begin with open pits at the Goose Property with pre-stripping and ore stockpiling from Umwelt Open Pit beginning in Year -2. Throughout the mine life, production from open pit mining will be supplemented by the underground deposits starting with production from Llama underground in Year 1. Ore will be stockpiled to optimize mill feed grades and add flexibility to the mine plan. Project development will require establishing a Tailings Storage Facility (TSF), and four waste rock storage areas (WRSAs: Llama, Umwelt, Echo, and TSF [i.e., a WRSA over the TSF]). Tailings (and potentially waste rock) will be deposited in the TSF, and two mined-out open pits: Umwelt Tailings Facility (TF), and Goose Main TF. Water will be reclaimed from the active tailings management facility for use as process water.

Fifty-nine (59) Mt of mining waste rock and 5.3 Mt of overburden are expected to be produced during the life of mine (LOM), for a total of 64.3 Mt of waste. Approximately 19.8 Mt of tailings will be produced.

The Goose Property Potential Development Area (PDA) is predominantly on Inuit Owned Land (IOL). The TSF will be located on crown land with all other infrastructure on IOL.

Sabina has completed extensive baseline studies in support of the environmental assessment and review completed by the Nunavut Impact Review Board (NIRB). Sabina relied on the Naonaiyaotit Traditional Knowledge Project and publicly available information from NWT aboriginal groups for the collection and analysis of Traditional Knowledge (TK) used in the Final Environmental Impact Statement (FEIS) submitted to the NIRB. The data and information from the baseline and TK form the foundation of the FEIS and were instrumental in the identification of mitigation measures and the development of management plans.

Sabina has completed Final NIRB hearings on the FEIS and an FEIS Addendum to identify and assess potential environmental and social effects resulting from the Project. A ministerial decision and NIRB Project Certificate are pending. In accordance with the requirements of the Nunavut Agreement, Sabina anticipates signing an Inuit Impact Benefits Agreement and Compensation Agreement (including a Water Compensation Agreement) with the Kitikmeot Inuit Association prior to a final decision from the NWB on the Application.

Sabina will build a mine which is safe, considers environmental responsibility, and beneficial to all parties involved. Sabina will balance good stewardship with the protection of human health and the natural environment. Sabina confirms with the NWB that the Company has the financial capacity to adequately satisfy legal requirements of the Act for issuance of a Type A Water Licence, to complete the undertaking from construction to closure, and that measures are in place or will be put in place to mitigate any adverse impacts. Sabina is committed to ongoing maintenance and restoration of the mine site in the event of future closing or abandonment of the undertaking, and is confident in assuming its responsibility, taking into account their current, ongoing, and past performance in the Kitikmeot Region, Nunavut, and Canada. This report outlines the Interim Closure and Reclamation Plan (ICRP). It has been submitted to NWB for review and approval in support of the Type A Water Licence. This report is Version G.2 of the ICRP and it supersedes the earlier version (Version G.1).

Sabina currently hold Type B Licenses (2BE-GOO1520 and 2BE-GEO1520) for the Back River Project exploration and site preparation activities. The facilities at the Goose and George properties approved under the Type B Licenses are not covered in this ICRP as they are covered under their respective ICRPs. There are no facilities currently at the MLA.

The total area that will be disturbed during Construction and Operations for the proposed Project is approximately 785 hectares (ha); which corresponds to 758 ha for Goose Property facilities (Appendix A, Figure A-05) and 27 ha for the MLA facilities (Appendix A, Figure A-06). At Closure, 561.6 ha will be reclaimed, while 223.4 ha will not be reclaimed. Non-reclaimed land is associated with residual disturbances derived from the flooded open pits (excepting Llama Pit which will be located in Llama Lake) and the TFs, TSF WRSA, and other WRSAs at Goose Property (Appendix A, Figure A-09).

1.1 CLOSURE AND RECLAMATION ACTIVITIES

This ICRP describes how Sabina will develop, operate, and close the Project; including decommissioning and reclamation. This plan, together with other management plans, is intended to describe the ways in which Sabina will address or mitigate impacts associated with the undertaking. The Plan outlines the approach to closure for both the MLA and the Goose Property.

The "Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories", issued by the Mackenzie Valley Land and Water Board (MVLWB) and Aboriginal Affairs and Northern Development Canada (AANDC) in 2013 (MVLWB/AANDC 2013), were used to prepare the ICRP. The ICRP will be updated through the detailed design and operational phases of the Project, as new information (such as monitoring results) become available.

Economic, environmental and/or social factors could dictate the need to shut down the Project for a short- or long-term. If operations stop temporarily with the intent of resuming mining activities in the near future, the Project site would be placed in a care and maintenance phase. The plans for both of these closure periods are discussed in this ICRP.

Ultimately, the Project site will be permanently closed when mining operations cease with the completion of the open pit and underground mine works. The work that would take place when the Project site is permanently closed is described in this ICRP.

The overall goal of closure is to return the proposed mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities. The overall closure goal is supported by the four closure principles of: physical stability, chemical stability, no long-term active care requirements, and compatibility with future land uses for each component of the Project MVLWB/AANDC (2013).

To achieve the overall goal of Closure, this ICRP is based on the following general objectives and criteria:

- Objective 1: Design the Mine for Closure
- Objective 2: Achieve Physical Stability
- Objective 3: Achieve Chemical Stability
- Objective 4: No Long-Term Active Care
- Objective 5: Consider Future Use and Aesthetics including:
  - Approach to Inclusion of Community Values; and
  - Mine Effluent Discharge Limits and Receiving Water Quality Objectives.

Mine closure is anticipated to be 13 years and consists of three periods:

- Active Closure [Phase 3, Stage 1] – Project Year 11 – 12, (i.e., two years after mining operations cease). During this time, Active Closure activities such as demolition, earth-moving, waste disposal, and rerouting of pipelines will occur. Water treatment will also occur during this time.
- Passive Closure [Phase 3, Stage 2] – Project Year 13 – 18, (i.e., six years following the Active Closure Stage during which seasonal water treatment and monitoring are the primary activities). A final demobilization and demolition of mine facilities will occur at the end of this stage in Year 18.
- Post-Closure [Phase 4] – Project Year 19+, (i.e., a period of time during which confirmatory water quality, stability, aquatic effects, and ecosystem monitoring is conducted in order to ensure closure objectives have been met). This period is expected to be five years.

Table B-09, Table B-011, Table B-013, Table B-015 through Table B-018, Table B-020 and Table B-022 presented in Appendix B provide the interconnection between the closure objectives, closure criteria, and closure actions for each of the Project components. These are divided into valued ecosystem components (Components).

1.2 MONITORING AND MAINTENANCE PLANS

This plan should be read in conjunction with the following key plans submitted as part of the Water Licence Application (Table 1.2-1). Sabina has developed these plans to mitigate, monitor, and report on its environmental performance against the regulatory requirements contained within its operating authorizations, permits, licenses, leases consistent with the legal requirements of applicable Acts and Regulations in Nunavut:

Table 1.2-1. List of Management Programs and Associated Management Plans for the Project

Document	Construction	Operations and Ongoing Maintenance	Temporary Closure / Care and Maintenance	Final Closure	Post-Closure
Infrastructure and Access Management Program					
Road Management Plan (SD-02)	x	x	x	x	
Borrow Pits and Quarry Management Plan (SD-03)	x	x	x	x	
Water Management Program					
Water Management Plan (SD-05)	x	x	x	x	
Waste Management Program					
Ore Storage Management Plan (SD-07)		x	x		
Mine Waste Rock Management Plan (SD-08)	x	x	x	x	
Tailings Management Plan (SD-09)	x	x	x	x	x
Landfill and Waste Management Plan (SD-10)	x	x	x	x	
Incineration Management Plan (SD-11)	x	x	x	x	
Landfarm Management Plan (SD-12)					
Hazardous Materials Management Plan (SD-13)	x	x	x	x	
Emergency Response Program					
Risk Management and Emergency Response Plan (SD-15)	x	x	x	x	
Fuel Management Plan (SD-16)	x	x	x	x	
Spill Contingency Plan (SD-17)	x	x	x	x	
Oil Pollution Emergency Plan (SD-18)	x	x	x	x	
General and Aquatic Effects Monitoring Program					
Environmental Management and Protection Plan (SD-20)	x	x	x	x	x
Aquatic Effects Management Plan (SD-21)	x	x	x	x	
Conceptual Fish Offsetting Plan (SD-22)	x	x		x	
Marine Monitoring Plan (SD-23)	x	x	x	x	
Quality Assurance / Quality Control Plan (SD-24)	x	x	x	x	x
Interim Closure and Reclamation Program					
Interim Closure and Reclamation Plan (including Interim Closure Cost Estimate)		x	x	x	x
Vegetation Monitoring Plan (included within the ICRP) (SD-26)	x	x			
Conceptual Fish Out Plan	x				

1.3 PROPONENT COMMITMENTS

This is a living document and will be updated based on engineering design updates, management reviews, incident investigations, regulatory changes, or other Project-specific protocols. Interim Closure and Reclamation Plans and a Final Closure and Reclamation Plan (FCRP) are required during mining operations (MVLWB/AANDC 2013). The first ICRP is required to be submitted within 12 months of Type A Water Licence issuance and is to be updated every three years. The FCRP is required two years prior to the end of mining operations, and it is to be approved by the NWB by the end of mining operations. It is expected that the closure concepts described herein will be expanded upon during the development of ICRPs and that they will be finalized as closure and reclamation planning approaches the end of operations in the FCRP.

1.4 COST ESTIMATE

Sabina has completed a permanent closure and reclamation financial security cost estimate to a conceptual level with the present mine layout and infrastructure, titled the Interim Closure Cost Estimate (the Cost Estimate). The Cost Estimate covers the closure and reclamation of all Project facilities as described in this ICRP, which includes development works at Goose Property and MLA. The cost estimate was prepared using RECLAIM Version 7.0, March 2014, for permanent closure of the Project. The cost estimate is provided in Appendix G.

Any security associated with the proposed Development Works Type B Water Licence (8BC-BRP----) would be refunded to Sabina if this licence is incorporated in the Type A Water Licence upon issuance such that a "double bonding" for project activities of the same scope does not occur.

Sabina assumed that the associated financial security to the current Type B Licenses (2BE-GOO1520 and 2BE-GEO1520) for the Project exploration and site preparation activities will be maintained under those water licenses.

2. Section 2- Introduction

2.1 BACKGROUND

The Back River Project (the Project) is a proposed gold project owned 100% by Sabina Gold & Silver Corp. (Sabina) within the West Kitikmeot region of southwestern Nunavut, Canada (Appendix A, Figure A-01). The Project is situated approximately 400 km southwest of Cambridge Bay, 95 km southeast of the southern end of Bathurst Inlet, and 520 km northeast of Yellowknife, Northwest Territories. The Project is located predominantly within the Queen Maud Gulf Watershed (Nunavut Water Regulations, Schedule 4) (Appendix A, Figure A-01).

The Project will involve the Construction, Operations, and Closure, including the decommissioning and rehabilitation, of the mine site at the Goose Property. A marine receiving and staging area, Marine Laydown Area (MLA) will also be established at Bathurst Inlet to deliver supplies, via a 160 km winter ice road (WIR) connecting the MLA to the Goose Property.

The Goose Property Potential Development Area (PDA) is predominately located on Inuit Owned Land (IOL), except for the southern portion, which is located on Crown Land, as shown on Appendix A, Figure A-02. The MLA is located on IOL, as shown on Appendix A, Figure A-03. The majority of the WIR connecting the MLA and the Goose Property is located on IOL, with a northern portion and a southern portion on Crown Land.

The Project includes several mineral deposits at the Goose Property; namely: Umwelt, Llama, Echo, and Goose Main. Ore mined from each deposit, using conventional open pit and underground methods, will be trucked to a process plant and will be segregated for either stockpiling or direct feed to processing. The processing rate will be 6,000 tonnes per day (tpd) over an estimated LOM of 10 years. It is estimated that, over the LOM, a total of 59 million tonnes (Mt) of mining waste rock and 5.3 Mt of overburden will be produced for a total of 64.3 Mt of waste. Waste rock and overburden will be stored in several designated waste rock storage areas (WRSAs) on the surface. Some of the waste rock will be used for construction material early in the Project, as well as for backfilling the underground workings for stability purposes. Approximately 19.8 Mt of tailings from the process plant will be stored, first in a Tailings Storage Facility (TSF) located near the process plant, and subsequently in the Umwelt and Goose Main mined out open pits, which will become tailings facilities (TFs).

In addition to the WRSAs, TFs and TSF, other facilities that are proposed at the Goose Property to support the mining and processing activities will include: a Process Plant, an all-weather airstrip, a camp, borrow pits and quarries, power generation facilities, a diesel fuel tank farm, ammonium nitrate and explosives storage facilities, a landfills, an incinerator, and water management infrastructure such as pipelines and a water treatment plant. The infrastructure that will exist at the MLA will include: a winter ice airstrip, a seasonal camp, a floating terminal barge, power generation facilities, a diesel fuel tank farm, a desalination plant, one or more landfills, an incinerator, and various storage pads and laydown areas. A general layout plan of the Project at end of Operations is shown in Appendix A, Figure A-02 and Figure A-03 for the Goose Property and the MLA, respectively.

The Construction and Operations of the Project is estimated to take place over 14 years, followed by periods of reclamation during Closure, and Post-Closure monitoring.

This ICRP (or Plan) has been completed following the "*Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories*" issued by the Mackenzie

Valley Land and Water Board (MVLWB) and Aboriginal Affairs and Northern Development Canada (AANDC) in 2013 (MVLWB/AANDC 2013). These Guidelines are an important tool for confirming responsible closure and reclamation at mine sites. This ICRP has also been completed following Sabina's Closure Plan goals. It also addresses the Guidelines issued by the Nunavut Impact Review Board (NIRB) for the Project to Sabina (NIRB 2013) and the Mine Site Reclamation Policy for Nunavut (AANDC 2002).

2.2 PURPOSE AND SCOPE OF THE CLOSURE AND RECLAMATION PLAN

The Project is regulated by the NWB, which is responsible for approving Closure and Reclamation Plans in the Nunavut region. Sabina currently hold Type B Licenses (2BE-GOO1520 and 2BE-GEO1520) for the Back River Project exploration and site preparation activities. This report outlines the ICRP for the Project and it has been prepared for NWB's review and approval as a requirement for a Type A Water Licence Application for the Project. The facilities at the Goose and George properties approved under the Type B Licenses are not covered in this ICRP as they are covered under their respective ICRPs. There are no facilities currently at the MLA.

An earlier version of this ICRP (FEIS, Volume 10, Version G.1; Sabina 2015a) was provided as a supporting document to the Final Environmental Impact Statement. This report is Version G.2 of the ICRP and it supersedes the earlier version (Version G.1).

Mine closure planning is an iterative process that starts during the permitting process and continues until mine closure is implemented at the end of mine life. According to MVLWB/AANDC (2013), an ICRP is prepared during the initial mine planning prior to Construction and is expected to emphasize the following:

- *"Identification of closure objectives for individual project components;*
- *Realistic descriptions and assessments of closure options related to temporary, unpredicted, or indefinite closure;*
- *Identification of uncertainties related to closure objectives, options, or criteria, and potential reclamation research or engineering studies to address uncertainties;*
- *A review of similar case studies and a description of applicable lessons learned from other sites;*
- *Credible evidence that the selected closure activities can achieve the stated closure objectives;*
- *Photographs depicting what the site looks like before operations begin, conceptions of the maximum extent of disturbance during mining operations, and the post-closure landscape;*
- *Identification of any likely post-closure monitoring requirements and responsibilities for the selected closure activities;*
- *Conceptual projections of the likely post-reclamation risks to environmental, human, and wildlife health (risk assessment); and*
- *Closure and reclamation liability costs and a financial security estimate to a level of detail reflective of the available information."*

This ICRP describes how Sabina will develop, operate, and close the Project; including decommissioning and rehabilitation. This plan and other management plans are intended to describe the ways in which Sabina will address or mitigate impacts associated with the undertaking. The Plan outlines the approach to closure for both the MLA and the Goose Property.

The information presented herein is current as of September 2017. This ICRP revises and expands upon the concepts provided in the earlier version (FEIS, Volume 10, Version G.1; Sabina 2015a). The level of detail provided in the Plan is considered appropriate based on the nature and scale of the Project, and the level of uncertainty with respect to residual effects and impacts following Operations. Further iterations of this ICRP may be an outcome of the NIRB review and water licencing processes.

This is a living document and will be updated based on engineering design updates, management reviews, incident investigations, regulatory changes, or other Project-specific protocols. Interim Closure and Reclamation Plans and a Final Closure and Reclamation Plan (FCRP) are required during mining operations (MVLWB/AANDC 2013). The first ICRP is required to be submitted within 12 months of Type A Water Licence issuance and is to be updated every three years. The FCRP is required two years prior to the end of mining operations, and it is to be approved by the NWB by the end of mining operations. It is expected that the closure concepts described herein will be expanded upon during the development of ICRPs and that they will be finalized as closure and reclamation planning approaches the end of operations in the FCRP.

2.3 GOAL OF THE CLOSURE AND RECLAMATION PLAN

The overall goal of closure is to return the proposed mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities. The overall closure goal is supported by the four closure principles of: physical stability, chemical stability, no long-term active care requirements, and compatibility with future land uses for each component of the Project MVLWB/AANDC (2013).

In order to achieve the overall goal, this ICRP is based on the following general objectives and criteria; specific closure objectives and criteria for each Project component are provided in Section 5.

2.3.1 Closure Objectives and Criteria

This ICRP has been developed to conform to all applicable legislation and guideline documents as listed in Section 2.6 and it is based on the following general closure objectives and criteria. In addition, all of the closure and reclamation activities utilize proven technology, having been applied at other Canadian Arctic mine sites, including Nunavut mines.

Objective 1: Design the Mine for Closure

This involves identifying the processes and forces that may act upon the mine components after mine closure and reclamation so that they can be factored into the design and operation of the mine. This includes adoption of the objectives outlined by MVLWB/AANDC (2013) as follows:

- Design and construct mine components in such a way that they achieve, or can readily be modified to achieve, the reclamation objectives and closure criteria.
- Determine mine reclamation costs as part of the closure planning and provide adequate security to cover the cost of reclamation over the life of the mine to ensure the closure criteria can be met.
- Include reclamation planning in the development and operation of the mine. This planning will ensure that mine operating activities do not unnecessarily increase the amount of reclamation work or effectively compromise what might otherwise be promising reclamation activities.
- Incorporate progressive reclamation activities into operation of the mine.

- Coordinate among Aboriginal, Federal, and Territorial governments; land owners; local communities; regulatory authorities; Sabina; and other impacted parties to ensure that appropriate objectives, closure criteria, and activities are developed.

Objective 2: Achieve Physical Stability

Mine components that will remain after mine closure will be constructed or modified at closure to be physically stable so as to not erode, subside, or move from its intended location under natural extreme events or disruptive forces to which it may be subjected after closure. The objective of physical stability is to not pose a hazard to humans, wildlife, or environment health and safety.

Achieving physical stability includes establishing the conditions post-closure that allow for natural revegetation so that the land returns to productive use by wildlife. As part of this ICRP, potential revegetation of disturbed sites, including active revegetation, seeding, and soil amendment, were reviewed. Active revegetation of the Property as part of closure is not planned given the cold climate setting of the Project as well as the precedent established for mine closure in Nunavut. Additional research in this field may be considered in future iterations of the ICRP.

Objective 3: Achieve Chemical Stability

Mine components including wastes remaining after mine closure will be chemically stable. Chemical constituents released from the mine components should not endanger public, wildlife, or impact environmental health and safety. These constituents should not result in the inability to achieve the water quality objectives in the receiving environment and should not adversely affect long-term soil or air quality. If necessary, appropriate long-term management of potentially acid generating/metal leaching materials and any affected waters will be considered.

Objective 4: No Long-Term Active Care

All practical efforts to ensure that Project components that remain after Closure will not require long-term active care will be made. Any Post-Closure monitoring will only continue for a defined period of time. Objective 1, which proposes designing the mine for Closure, and Objectives 2 and 3 for physical and chemical stability, will help ensure the achievement of this principle.

Objective 5: Consider Future Use and Aesthetics

The site will be compatible with the surrounding lands once reclamation activities have been completed. Consideration of future use and aesthetics involves the following elements:

- Naturally occurring biophysical conditions, including any physical hazards of the area (pre- and post-development);
- Characteristics of the surrounding landscape pre- and post-development;
- Level of ecological productivity and diversity prior to mine development and intended level of ecological productivity and diversity for Post-Closure;
- Local community values and culturally significant or unique attributes of the land; and
- Level and scale of environmental impact.

Approach to Inclusion of Community Values

An important aspect of northern mine closure is the incorporation of community perspectives on closure. This is a stated requirement of the Northwest Territories Mine Closure and Reclamation Guideline (MVLWB/AANDC 2013). It is also a key element of the NIRB environmental review and the NWB water licencing processes.

In the short term, community perspectives are expected to be gathered during the permitting phase through the public environmental review and water licencing processes. Beyond the permitting phase, communities and workers will become more familiar with the Project through the Construction and Operations phases and will be able to provide input into mine closure through both Sabina's worker and community engagement programs, as well as during formal reviews of future ICRPs (part of water licence implementation and renewal).

Mine Effluent Discharge Limits and Receiving Water Quality Objectives

Thresholds identified in the FEIS (Sabina 2015b) will be adopted and applied to this and future iterations of the ICRP. This includes application of the mine effluent limits from Schedule 4 of the Metal Mining Effluent Regulations (MMER) pursuant to the *Fisheries Act* for end of pipe discharges. This includes discharges from open pits, TSF, TFs, and WRSAs.

In addition, receiving water quality guidelines have been adopted, including Site-Specific Water Quality Objectives (SSWQOs) for select parameters (FEIS Volume 6), or the generic criteria presented in the Canadian Environmental Quality Guidelines for the Protection of Freshwater Aquatic Life (CWQG-PAL), developed by the Canadian Council of Ministers of the Environment (CCME 2016). Monitoring during Operations and Closure will confirm whether criteria are being met (Sections 5 and 8).

2.4 CLOSURE AND RECLAMATION PLANNING TEAM

Sabina is committed to environmentally responsible and socially acceptable exploration and mining practices. The Company is dedicated to creating and maintaining a safe environment for both the land it occupies and the people that drive its success. Sabina also subscribes to the principles of sustainable development in mining. While mining cannot occur without an impact on the surrounding natural environment and communities, the company's responsibility is to limit negative environmental and social impacts and to enhance positive impacts. The executive and management team will demonstrate to employees, contractors, government and the community that the company regards excellence in environmental performance a priority.

The proponent of the Project is:	Sabina Gold & Silver Corp. (Sabina)
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The Project site is located at:	latitude 65°32'42" N, longitude 106°25'43" W (Goose Property) latitude 65°32'40" N, longitude 106°25'32" W (MLA) Territory of Nunavut, Canada

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2.5 ENGAGEMENT

Public consultation, government engagement, and traditional knowledge was incorporated during the development of the FEIS and FEIS Addendum. Public consultation and engagement is a legal requirement in Nunavut, an industry best practice, and an important corporate commitment. Effective public consultation and engagement helps ensure that community members are informed and knowledgeable about proposed projects, that community support for those projects is more readily obtained, and sustainable development goals are achieved. A key goal of Sabina's public consultation and engagement program has been to ensure the Company obtains a "social licence to operate", by securing the support of a majority of residents from potentially impacted local communities. To obtain this goal, a number of process goals have been followed: 1) identification and prioritization of communities and community stakeholder groups; 2) developing an understanding of key community and stakeholder views regarding the Project; 3) addressing community and stakeholder issues and expectations; and 4) continuous improvement.

The establishment of open, respectful, and jointly beneficial relationships with local communities and stakeholders have been, and will continue to be, key priorities for Sabina. Sabina further recognizes the unique characteristics of the Inuit lifestyle and has strived to engage local communities in a culturally sensitive and appropriate manner. The Company is committed to maintaining ongoing dialogue with local communities and will continue to be open to suggestions as to how its public consultation and engagement activities can be improved.

Sabina has and will continue to engage with the KIA, which is the primary Inuit organization with rights and responsibilities in the Project area. Kitikmeot Region communities have also been a key focus of Sabina's public consultation and engagement activities. Various levels of consultation and engagement were employed by Sabina depending upon a community's proximity to the Project. The communities that have been the focus of Sabina's public consultation and engagement program include: Cambridge Bay (Ekaluktutiak), Kugluktuk (Coppermine), Kingaok (Bathurst Inlet), Omingmaktok (Bay Chimo), Gjoa Haven (Ursuqtuq), Taloyoak (Spence Bay), and Kugaaruk (Pelly Bay), and Yellowknife as well as number of Northwest Territories Aboriginal organizations have also been engaged for the Project.

Sabina's public consultation and engagement program is multi-faceted. It includes a commitment to cultural sensitivity and inclusiveness, and the use of various community engagement methods and tools. These include public meetings, meetings with key stakeholders and stakeholder groups, meetings with community advisory groups in Cambridge Bay and Kugluktuk, Project site visits, social media (e.g., websites and Twitter/email/RSS feeds), a Project newsletter, other distribution materials, establishment of a Cambridge Bay office, use of local employees and contractors including a Cambridge Bay-based

Community Liaison Officer, execution of TK studies in partnership with the KIA and Kugluktuk Hunters' and Trappers' Organization, execution of various socio-economic/environmental studies, the eventual negotiation of an IIBA with the KIA, other forms of community engagement (e.g., radio shows, trade show participation, cross-cultural training, and community advertisements), and community donations.

Sabina began its public consultation and engagement program in June 2012. Since that time, 328 meetings and major correspondences with Project stakeholders have occurred. Meeting minutes were taken during many of Sabina's public consultation and engagement activities, and have been incorporated into a public consultation database that contains 165 topic directories. This database has been analyzed to identify key issues and concerns amongst communities and stakeholders. These can be categorized under three main themes: community benefits and engagement, employment and training, and environmental management and monitoring.

The Inuit culture and way of life are intrinsically connected with the land. The Inuit people of the Kitikmeot have always depended on Traditional Knowledge (TK) of the land and environment. Subsistence land use such as hunting, fishing, trapping, and gathering take place throughout the region. Approximately 10 to 20 active hunters continue to hunt in the Bathurst Inlet area.

Sabina has undertaken extensive public consultation and TK studies which have guided the development of the Project. During the environmental assessment process, Sabina made a commitment to consider TK in Management Plans for the Project moving forward. As the Project advances through permitting, and if approved, into Construction, Operations, and Closure, Sabina will continue active engagement with local communities and Inuit organizations, and will include additional IQ, as it becomes available, in updates to the design and implementation of Project environmental programs. This will ensure that the combination of science and TK leads to monitoring that meets the expectations of Inuit organizations, local communities, and government.

Ongoing communication with local individuals and communities will be facilitated by regular public meetings and meetings with the Cambridge Bay and Kugluktuk Community Advisory Groups (CAGs), amongst other methods.

2.5.1 Key Consultation Findings

Meeting minutes were taken during many of Sabina's public consultation and engagement activities, and have been incorporated into a public consultation database that contains 165 topic directories. This database has been analyzed to identify key issues and concerns amongst communities and stakeholders.

Key issues and concerns identified through public consultation can be categorized under three main themes: community benefits and engagement, employment and training, and environmental management and monitoring. They are presented in detail along with Sabina's commitments to addressing key issues in Volume 3 of the FEIS (Sabina 2015b).

Of the key issues and concerns identified in the FEIS, the following pertaining to closure were considered during the development of this Plan:

- Inuit culture, harvesting, and livelihoods should not be negatively affected by the Project.
- A comprehensive environmental management and monitoring program should be developed. Key areas of concern for local communities include: caribou, fish, water quality, mine tailings and contaminants, and other wildlife resources.
- Concern that the Project may not be built (e.g., due to economic factors) and/or operate for a long enough period of time. Fears have also been expressed that the Project will prematurely shut down, promised benefits won't be realized, and positive socio-economic effects will not be realized.
- Guarantees must be in place that mine closure will be done properly.

2.6 REGULATORY INSTRUMENTS FOR CLOSURE AND RECLAMATION

2.6.1 Legislation Applicable to Mine Closure

The Project is located within the Nunavut Territory and is thus subject to the regulatory processes established under the applicable laws and regulations of Canada and of Nunavut.

Sabina has completed Final NIRB hearings on the FEIS (Sabina 2015b) and a FEIS Addendum (Sabina 2017) to identify and assess potential environmental and social effects resulting from the Project. A ministerial decision and NIRB Project Certificate is pending.

The MLA is located on IOL, the Goose Property is predominately located on IOL with the southern portion located in Crown Land. A northern portion and a southern portion of the WIR connecting the MLA and the Goose Property are located on Crown Land. Land ownership in relation to the Project is shown on Appendix A, Figure A-02 and Figure A-03 for the Goose Property and MLA, respectively.

Surface rights for IOL are vested in the Kitikmeot Inuit Association (KIA), which administers the access and management of the IOL for the benefit of the Inuit in that region. Access to and use of surface lands requires an Inuit land use permit, licence or commercial lease issued by the KIA. The majority of the Project, including the Goose Property and the MLA, is located on either surface rights, or surface and subsurface rights on IOL administered by the KIA. Sabina anticipates that the majority of financial security posted for mine closure will likely be held by the KIA.

Surface rights on Crown Land are vested in the federal government and are administered by Indigenous and Northern Affairs Canada (INAC). Access to and use of these surface lands requires a land use permit, licence, or commercial lease issued by INAC.

Use of water resources as well as waste disposal in Nunavut is regulated by the Nunavut Water Board (NWB). The Project will require a Type A Water Licence for mine development, pursuant to the *Nunavut Waters Act*, and Sabina's ICRP will require approval under the water licence. An important element of mine closure planning in Nunavut is the establishment of mine closure costs and the posting of financial security. This will be a stated condition of the Type A Water Licence. Financial security is typically posted to the INAC for water-related closure costs and to the landowner(s) for land-based reclamation activities.

In the preparation of this ICRP, Sabina has taken into account the following:

- guidelines issued by NIRB for the Project (NIRB 2013) and specifically those relating to the preparation of a Closure and Reclamation Plan;
- comments received during the public review and public hearings held by the NIRB;
- Mine Site Reclamation Policy for Nunavut (AANDC 2002);
- Mine Site Reclamation Guidelines for the Northwest Territories (AANDC 2007);
- Abandonment and Reclamation Policy for Inuit Owned Land (QIA no date); and
- guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories issued by the MVLWB and AANDC (MVLWB/AANDC 2013);

Selected aspects of closure and reclamation planning completed for other mining operations in the Nunavut region have been reviewed and incorporated, where applicable, in the development of the Plan.

Sabina operates pursuant to its Sustainable Development Policy, presented in the Overall Environmental Management Plan. Sabina also subscribes to the Towards Sustainable Mining (TSM) Initiative, including the implementation of the Mine Closure Framework (MAC 2008).

2.6.2 Current Permits and Approvals

Appendix B, Table B-01 lists the known Federal and Territorial Acts and Regulations applicable to the ICRP. A full list of known Federal and Territorial Acts and Regulations is provided in Appendix D-1 of the Main Application Document. A list of existing authorizations for the Project is found in Appendix B, Table B-02. Appendix B, Table B-03 outlines the list of primary approval requirements for the Project that Sabina has identified to date which are also relevant to this ICRP.

This plan should be read in conjunction with the plans listed in Section 1.2, Table 1.2-1.

3. Section 3-Environment

The Project is located in a remote area within the Kitikmeot Region of Nunavut and is at least 160 km from any community. Virtually no development and little human disturbance have occurred in the area, aside from various mineral exploration campaigns conducted since 1982.

The Project is located in an area of continuous permafrost that extends to a depth of between 490 and 570 m below ground surface (mbgs) (Rescan, 2014). Beneath the permafrost, and where open taliks exist, the regional groundwater is saline. As such, three underground mines; Umwelt underground mine (Umwelt U/G), Llama underground mine (Llama U/G), and Goose Main underground mine (Goose Main U/G), are likely to penetrate through the permafrost and into the saline groundwater. Llama open pit (OP) intersects Llama Lake and is anticipated to be an open talik; saline groundwater is also anticipated from this mine.

This section provides a description of the pre-disturbance conditions and the current development status of the Project based on the information presented in the FEIS (Sabina 2015b).

3.1 ATMOSPHERIC ENVIRONMENT

3.1.1 Climate and Meteorology Conditions

The Project area is located near the northern boundary of the North American Continent in the vicinity of the Arctic Circle. The climate in the area is characterized by extremes. The winter period lasts from October to May, consisting of snow and extremely cold mean monthly temperatures, ranging from -33.0 to -1.3°C, and a cool spring, summer and fall period (June to September), with mean monthly temperatures ranging from -0.3 to 14.5°C. The Project area experiences relatively low amounts of rainfall (summer means ranging from 4 mm to 211 mm), but due to sub-zero temperatures for the majority of the year, also experiences high snow accumulation (annual mean precipitation ranging from 125 mm to 344 mm). Summer is a season of nearly perpetual sunlight, while winter is dominated by night, twilight and extreme cold. Due to the relative absence of obstructions to impede the wind (e.g., trees, buildings, mountains), wind speeds are generally high. An overview of meteorological conditions is provided in the FEIS Volume 2, Section 7.1.4.

3.1.2 Climate Change

An analysis of the effect of climate change on mean climate parameters was carried out for the FEIS. The model and literature review results show that the annual mean temperature will increase about 5.3ºC over the next century. Permafrost will still pervasively exist in the area; however, the active zone will become deeper.

3.1.3 Air Quality

The air quality in the atmospheric Regional Study Area (RSA) is predominantly pristine, reflecting the Project location's remoteness and the lack of, and the localized nature of, sources of anthropogenic air emissions sources. Once Operations cease, the main sources of emissions from the Project will be associated with the initial reclamation activities (i.e., vehicle exhaust emissions, fugitive dust emissions from vehicles travelling on unpaved roads, and aircraft emissions). Eight air quality indicators: nitrogen oxide (NO_x as NO_2); sulphur dioxide (SO_2); carbon monoxide (CO); total suspended particulates (TSP); particulate matter (PM_{10}); respirable particulate matter ($PM_{2.5}$); dust deposition; and acid deposition

were included in the assessment and an air quality modelling study was conducted to characterize the highest concentrations of each air quality indicator.

Mitigation and management activities planned to reduce potential effects on air quality include: energy efficiency measures, measures to reduce fuel use, and the use of water or dust suppressants to reduce dust from unpaved roads. The significance of residual effects for air quality were predicted to be not significant.

3.1.4 Noise and Vibration

The existing noise and vibration environment is pristine with no significant nearby anthropogenic noise or vibration sources. With the exception of readings taken near the current exploration camps, all baseline readings were comparable to estimated baseline levels for quiet, rural areas. Similar to air quality, the main sources of emissions from the Project once Operations cease will be associated with the initial reclamation activities. Noise and vibration sources will largely be in the form of construction equipment, haul vehicles, and vehicle and aircraft traffic. A review of the potential Project interactions with noise and vibration identified nine potential effects that may occur – seven potential effects on humans and two potential effects on wildlife.

Mitigation and management activities planned to reduce potential effects on noise and vibration include: ensuring equipment is fitted with appropriate mufflers and silencers, and limiting activities such as take-off and landing of aircraft to certain times of the day. The significance of any residual effects were predicted to be not significant.

3.2 PHYSICAL (TERRESTRIAL) ENVIRONMENT

3.2.1 Terrain and Soil

The Project is located in an area dominated by gently undulating or rolling landscapes with numerous kettle lakes connected by streams. Terrain elevation ranges between 300 and 700 metres above sea level (masl) and slope gradients rarely exceed 7%. Uplands are typically covered by morainal materials deposited on Precambrian sedimentary, metamorphic or intrusive rocks. Glaciofluvial, organic, marine and lacustrine deposits are less common. Most soils are moderately coarse (loam, sandy loam, fine sandy loam). Exposed bedrock occurs occasionally. The thickness of mineral soils overlaying bedrock (overburden) is the highest in plains and very gently sloping areas (average of 10.6 m) and decreases in rolling and undulating landscapes (average of 4.8 m).

A number of distinct landform types, including eskers, morainal rocky ridges, and boulder fields exist throughout the region. Several soil phenomena are also associated with the permafrost setting. Thermokarst typically occurs in wetlands as a system of very irregular hummocks and hollows, which form as a result of frost heaving and ice accumulation on the bottom of organic horizons. Frost boils are typically circular (1 to 3 m in diameter) upwellings of mud that are created by frost heaving. The Project is located within continuous permafrost (details below). The presence of permafrost and annual cycles of freezing and thawing results in poor development of soils. About 2/3 of the inspected soils have been classified as Static Cryosols and 1/3 as Turbic Cryosols.

3.2.2 Permafrost

The Project is located within the continuous permafrost region of western Nunavut. A seasonally thawed active layer is present immediately beneath ground surface, with a mean maximum depth of approximately 2 m. Subsurface temperatures are perennially below 0ºC at depths up to approximately 500 mbgs, reaching 570 mbgs at some locations. Thaw bulbs are present beneath surface waterbodies with depths exceeding 1.3 m. Through taliks that connect to the deep groundwater are inferred to be

present beneath waterbodies with widths greater than 200 m at the Goose Property. Cryopegs are inferred to be present at the base of the permafrost and adjacent to deep taliks, as the groundwater beneath the permafrost has been shown to be hyper-saline. The basal cryopeg at the Goose Property is estimated to be 100 m thick.

3.2.3 Geotechnical Characteristics

Geotechnical field investigations in the vicinity of the Goose Property and MLA were carried out between 2011 and 2015. Laboratory testing on geotechnical samples confirms that overburden soils at the Goose and onshore MLA generally consist of silty sands with some clay and gravel which are likely the result of the reworked marine and glacial sediments. The physical state (frozen or thawed) will likely define its apparent strength. In a thawed state, the soils will likely have a relatively low strength, whereas in a frozen state the ice will contribute to the cohesive strength so that the soil strength increases with decreasing temperatures (SRK 2015a).

3.2.3.1 Marine Laydown Area

None of the test pits or drillholes completed at the MLA reached bedrock, therefore, the total overburden thickness is not known in this area. Understanding of the permafrost conditions in this area is limited as there have not been any thermistors installed, and test pits and drillholes generally stopped at or above frozen ground. The active layer is at least 0.8 mbgs in some parts of the MLA.

Studies in an adjacent area 13 km south of the MLA indicate that offshore sediments consist primarily of normally consolidated marine clay deposits with occasional silty sand lenses. The soft, weak clays were found to be unfrozen with an average water content of 60% (Nishi-Khon/SNC Lavalin 2001).

3.2.3.2 Goose Property

In general, the overburden thickness ranges from 0 to 25 m across the Property. The thickest overburden deposits are along the airstrip alignment, along the west edge of Goose Main Pit, and along the north western end of the Llama Pit (SRK 2010; SRK 2011).

Thermistors installed in the active layer revealed depth ranges from 1.3 to 4.2 mbgs, with the greatest depths occurring in areas where bedrock forms part of the active layer (Rescan 2014). The porewater salinity across the Goose Property averages approximately 26 parts per thousand (ppt) with a maximum of 85 ppt. High salinity values have the effect of depressing the freezing point, as well as contributing to high unfrozen water content.

The rock quality designation (RQD) values of shallow bedrock underlying soils at the Goose Property are generally ‘good’ with minor occurrences of ‘poor’, ‘fair’, and ‘very good’ rock mass qualities across the site (Knight Piésold 2013; SRK 2015a).

3.2.4 Seismicity

A preliminary assessment of the regional seismicity has been carried out to enable selection of appropriate design earthquake events for the Project facilities. Review of historical earthquake records and regional tectonics indicates that the Project is located in a region of low seismicity surrounded by large regions of sparse, diffuse seismicity.

Seismic parameters were calculated for the Project area using the National Building Code of Canada website which provides ground accelerations and probability of occurrence. A peak ground acceleration (PGA) of 0.036 g for 1:2,475 year event was selected for the design of the Project facilities.

3.2.5 Geology

The Project is located at the intersection of three geological provinces in the West Kitikmeot Region of Nunavut. The majority of the Project (the Goose Property) extends over the northeastern corner of the Slave Geologic Province. The eastern limits of the Project are underlain by the Churchill Geologic Province. The Marine Laydown Area (MLA) are underlain by Lower to Middle Proterozoic sedimentary rocks of the Kilohigok Basin, part of the Bear Geologic Province. Glacial material deposited after the Quaternary Wisconsinan Glaciation covers much of the Archean geological provinces. Glacial deposits are predominantly comprised of moraine type deposits (glacial till), which mostly consist of sand and variable amounts of silt.

3.2.6 Hydrogeology

The Project lies within the continuous permafrost zone of the continental Canadian Arctic, and as such groundwater is present deep below the continuous permafrost layer (e.g., > 400 mbgs). Water present in the active layer above the permafrost, which is thawed during the summer only, can interact with surface waters in general. There is minimal connection between the surface active layer and deep groundwater flow regimes due to the presence of the thick low-permeability permafrost. The deep sub-permafrost groundwater is hydraulically connected with the surface water and the active layer via open taliks (also called through taliks) beneath large lakes, such as below Goose Lake.

Structural features in the bedrock, such as the northwest-southeast trending faults commonly found at the Goose Property, may act as preferential flow pathways for groundwater in taliks and beneath the permafrost. In general, the deep groundwater flows from higher elevation large lakes to lower elevation large lakes, therefore the flow direction can be inferred from the surface elevation of the large lakes that overlie open taliks. Site-specific groundwater data were collected annually from 2012 to 2015 within the Goose Property. Thermistor strings, vibrating wire piezometers, borehole packer testing, and a Westbay well have been used to characterise the groundwater environment. The Westbay well, installed adjacent to the Umwelt deposit in 2013, has been used to conduct groundwater quality sampling. Preliminary results of groundwater sampling indicate that the deep groundwater is more saline than seawater, with total dissolved solid concentrations of 47,000 mg/L and higher, and has elevated levels of chloride and certain trace metals.

3.2.7 Lake Bathymetry

Lakes at the Project area are generally small and shallow, ranging between 5 and 500 ha in surface area and less than 10 m in maximum depth. Lakes shallower than 2 m are usually frozen to the bottom during the winter months. Lakes are usually well mixed from the surface to the sediments during the open-water season due to wind-driven forcing. Some gradients in temperature and density may occur in deeper lakes or in ice-covered lakes in winter, although this is uncommon. The water clarity of lakes is generally high, despite the potential for wind-driven mixing to the sediments. Water temperatures in lakes and streams tend to follow the Arctic climate, with greatest temperatures observed in August at the height of the short summer.

3.2.8 Surface Hydrology

The Project is located within the watershed boundaries of the Queen Maud Gulf Watershed, and the Back River Watershed. The majority of proposed infrastructure at the Goose Property lies within the Queen Maud Gulf Watershed, which flows northwest and enters the ocean on the west side of Bathurst Inlet. The Back River Watershed is located south of the Goose Property and flows east eventually entering the Arctic Ocean south of Gjoa Haven. An overview of hydrological conditions is provided in the FEIS Volume 2, Section 7.1.4.

Surface hydrology is governed by the Arctic nival regime where peak flow discharges during the spring, shortly after air temperature rises above freezing. In small basins, these high flows can last as little as a few days. Peak flow typically occurs immediately after ice break-up in lakes and channel reaches, especially in the smaller basins. Due to the presence of permafrost, small streams do not receive groundwater contributions, and flow discharges from these basins may cease after freshet until the late summer rains begin. For rivers draining larger watersheds, the freshet peak may be delayed relative to smaller drainages as snowmelt from upper portions of the watershed is routed through the drainage network.

Precipitation events in the late summer and early fall may lead to a second hydrographic peak, but this is generally of lower magnitude than the freshet peak. Channel freeze-up typically occurs between late October and early November. In smaller drainage basins, stream channels typically freeze to their bottom, with zero flow occurring in winter. In very large catchments and larger lake outlets, flow energy and water turbulence may sufficiently maintain streamflow and prevent downstream reaches from freezing completely.

Potential Project effects include water use, site water management activities, and WIRs. Mitigation and management measures that will be in place to eliminate or minimize the potential effects include: the design of maximum water use volumes for waterbodies in order to protect fish habitat; following DFO protocols for winter water withdrawal; confinement of infrastructure to local watersheds; management of non-contact, contact, and saline waters separately; and following DFO's measures to avoid causing harm to fish and fish habitat. The significance of residual effects for hydrology was predicted to be not significant.

3.3 CHEMICAL ENVIRONMENT

3.3.1 Freshwater Water and Sediment Quality

Baseline water and sediment quality data have been collected for the Goose Property since 1994, with extensive water sampling programs being carried out from 2010 to 2015. The water of lakes and streams is typical of pristine Arctic surface waters, with low concentrations of anions, suspended material, nutrients, and most metals. Metal concentrations in baseline water quality samples are below CCME guidelines (CCME 2013), with the exceptions of cadmium and copper, and to a lesser extent, aluminum, iron, lead, and nickel. Lake and stream sediments have naturally elevated metal concentrations that are often greater than CCME guidelines for arsenic, cadmium, chromium, copper, and/or zinc (CCME 2001). Geochemical characterizations are provided in the FEIS Volume 2, Section 3.3.4.

Potential Project-related effects during Closure include those related to runoff from disturbed areas, water withdrawals, treated discharge, and aerial dust deposition, which will mainly occur during the initial reclamation activities. The Project will use geochemically suitable material for all roads and pads.

The significance of residual effects for freshwater water and sediment quality was predicted to be not significant.

3.3.2 Marine Water Quality

Baseline studies show that water in southern Bathurst Inlet is typical of pristine Arctic marine waters, with low concentrations of nutrients, suspended solids, and metals.

Potential Project-related effects on the marine water quality that are likely to occur during the initial reclamation activities include: shipping activities; runoff from disturbed areas; accidental release of fuels, oils, and polycyclic aromatic hydrocarbons (PAHs); and dust deposition.

The mitigation and management measures designed to control pathways for Project effects on marine water quality include: reducing vessel speeds and restricting vessels to deeper waters, using geochemically suitable material for all roads and pads, adhering to regulatory guidelines for treated discharges, and using best management practices for the storage, transport, and use of fuels, explosives, and hazardous materials as well as for dust suppression and incineration. The significance of residual effects for marine water quality was predicted to be not significant.

3.3.3 Marine Sediment Quality

The sediment environment in Bathurst Inlet is generally a function of water depth and physical processes. Shallower, near-shore areas are subjected to increased erosion and resuspension due to the interaction of the wind-driven water currents and the seabed. Metal concentrations in marine sediments were strongly correlated to the relative abundance of silt and clay particles, and therefore were generally greater in the deeper waters. Naturally elevated concentrations of arsenic, chromium, and copper were observed in the deeper sediment samples and were often greater than the CCME guidelines (CCME 2001). Sediment metal concentrations near the MLA were observed to be naturally low, as expected because of the relative dominance of sand-size particles.

Potential Project-related effects on marine sediment quality shared the same pathways and mitigation and management measures as outlined for marine water quality. The significance of residual effects for marine sediment quality was predicted to be not significant.

3.3.4 Geochemical Characterization

Geochemical characterization of the waste rock, ore, quarry rock, overburden, tailings, and mine workings has been completed on the Property (Rescan 2013; SRK 2015b).

Results from these characterizations indicated that, after a 75% segregation efficiency is taken into account, approximately 58% of the open pit and underground mine workings and waste rock is potentially acid generating (PAG) and may lead to acidic drainage after a lag time of 14 to 20 years. This lag time is expected to be longer than the amount of time needed for the PAG rock, which will be covered with at least 5 m of non-potentially acid generating (NPAG) rock, will take to freeze. Acidic conditions are expected to occur more rapidly in some of the waste rock, but average pH conditions in seepage and runoff would be expected to remain buffered until WRSA freeze back conditions develop. As such, long-term acid rock drainage and metal leaching are not anticipated.

Samples from the Umwelt Quarry and the Airstrip Quarry have indicated the rock there is NPAG. However, some rocks in the iron formation from the Airstrip Quarry have been characterized as PAG. Elevated concentrations of arsenic have been observed in samples from both quarries. Overburden across the Goose Property has been characterized as NPAG. Further details on waste segregation and management can be found in the Mine Waste Rock Management Plan (SD-08), and the Borrow Pits and Quarry Management Plan (SD-03).

The majority of the tailings samples from the Goose Property have been characterized as PAG (Rescan 2013; SRK 2015b).

Water quality predictions were evaluated in all open pits, tailings facilities, and in predefined locations downstream of the Goose Property. Results were compared to Metal Mining Effluent Regulations (MMER) and Canadian Council of Ministers for the Environment (CCME) water quality guidelines. Water quality predictions indicate that water treatment will be required within the Goose Main Pit, once it becomes the Goose Main TF, for TSS, arsenic, and copper. The water treatment process is coagulation facilitated

by adding ferric chloride. Flocculent is added to enhance settling. The iron hydroxides and the associated metals and sediments will then be separated from the influent by ballasted clarification.

With this proposed water treatment strategy, it is predicted that the water quality of open pit and tailings facility overflows at Closure will meet MMER limits, and that long-term water quality (Post-Closure) will meet CCME guidelines in Goose Lake (SRK 2015c).

3.4 BIOLOGICAL ENVIRONMENT

3.4.1 Vegetation and Special Landscape Features

Vegetated ecosystems, constituting 73% of the Project site, are dominated by mesic tundra, dry-sparse tundra, and moist shrub-dominated tundra. Sparsely-vegetated ecosystems constitute nearly 9% of the total site. The remaining areas are dominated by freshwater lakes and ponds. Special landscape features include esker complexes, cliffs, bedrock outcrop and lichen-dominated ecosystems, riparian ecosystems, wetland ecosystems, and marine beaches and old beach heads.

The mitigation and management measures designed to eliminate or minimize the direct loss or degradation of vegetation or special landscape features include: minimizing the Project footprint, using WIRs, and reducing fugitive dust where possible. The significance of residual effects and residual cumulative effects on vegetation and special landscape features were predicted to be not significant. There were no potential for transboundary effects.

The Vegetation Monitoring Plan (Appendix H) was submitted as part of the FEIS Addendum (February 2017). This plan will be updated to include all commitments discussed throughout the review of the Project, including commitments to consult with the KIA, the Government of Nunavut, and other relevant parties. The updated Vegetation Monitoring Plan will be submitted to the Nunavut Impact Review Board (NIRB) at least 90 days prior to the start of construction of the winter ice road.

3.4.2 Wildlife

There are three barren-ground caribou herds whose ranges interact regionally. Satellite collaring data indicate that the Bathurst herd, the Beverly and Ahiak herds, and the Dolphin and Union herds are found in the region during portions of the year.

Using a DNA mark-recapture analysis, the regional population of bears was calculated to be 72 females and 54 males in 2012, and 64 females and 54 males in 2013. TK indicates that grizzly bears are found throughout the region especially in association with major river systems such as the Western River and coastal areas, including Bathurst Inlet.

Muskox occur at moderate to low densities across the Canadian Arctic and are valued by the Inuit as a source of food, hides, horns, and wool, as well as for the commercial export of meat. TK indicated that muskox populations have been undergoing a long-term recovery from previously low numbers and occur throughout and surrounding the region at low densities.

Wolverine and grey wolves were selected as representative of furbearer species. Baseline studies estimated the local population of wolverine to be very low. However, habitat suitability modeling for wolverine indicates that there is approximately 44.7% high-quality habitat within the region. TK identified eskers as the primary denning habitat for wolves, and eight dens were identified on eskers during denning surveys conducted for grey wolf, of which five dens produced pups.

Aerial surveys were also conducted during the spring moulting period (mid-May through mid-July) between 2007 and 2013 to assess the abundance and distribution of ringed seals. Results indicated that ringed seal abundance was spatially variable in Bathurst Inlet, with moderate densities present in most parts of the inlet except in the southern RSA south of Kingaok where very low densities of adult and 8 to 10-week-old pups were found. Ringed seal lairs were only found further to the north. During the summer, ringed seal density is anticipated to be very low in Bathurst Inlet.

The Wildlife Mitigation and Monitoring Plan describes the measures that will reduce effects on wildlife, including reducing the Project footprint, noise control, speed limits of roads, the use of WIRs to supply the Project, helicopter management, waste management and camp hardening to avoid attracting wildlife, and safe chemical handling to eliminate exposure to contaminants. The Wildlife Mitigation and Monitoring Plan also includes regional and on-site monitoring programs for caribou, as well as a program for staged reductions in project activities whenever caribou are observed on-site, and an activity shutdown procedure should caribou ever choose to use the Project area during the sensitive calving and post-calving periods. Additional information can be found in the Wildlife Mitigation and Monitoring Plan (version 7) which was updated in February 2017 as part of the FEIS Addendum (Sabina 2017).

The significance of residual effects for wildlife was predicted to be not significant.

3.4.3 Birds

Aerial surveys for water birds indicate that Canada geese accounted for 80% to 90% of all detections of water bird species. Additionally, a key staging site was identified in the western region near the Goose Property, where large flocks of geese and ducks were consistently observed during both spring and fall staging surveys. Upland birds were mostly found along the shoreline of Bathurst Inlet. A total of 147 raptor nest sites were mapped on cliffs; nests of the peregrine falcon were the most abundant of all raptor species.

Aerial and ground surveys documented a total of 23 species of seabirds, although no evidence of breeding was recorded during breeding surveys in any years. In spring, staging areas appeared to occur in open-water areas and near major river drainages. In late-summer and fall (mid-July and August), large numbers (> 50 birds) of Canada geese and ducks were observed in the shallow bay southwest of the MLA footprint. The greatest abundances of seabirds and seaducks were observed in late-summer and fall periods.

Mitigation and management measures that will be in place to reduce the potential effects to birds include reducing the Project footprint, noise abatement measures, speed control measures, the use of WIRs only, and waste and chemical handling measures to avoid attracting wildlife to wastes and contaminants. The significance of residual effects for migratory birds was predicted to be not significant.

3.4.4 Freshwater Fish and Aquatic Habitat

Comprehensive baseline studies on freshwater fish and aquatic habitat have been conducted for the Goose Property from 2010 to 2015 with more than 30 streams having been characterized. Lake zooplankton and lake and stream benthic invertebrate communities all showed considerable variation, consistent with the close coupling between trophic levels and the strong local effects. Site-specific baseline information has characterized healthy and robust communities of benthic invertebrates.

Within the Goose Property, there are permanent barriers to fish migration proposed as follows (Figure A-13):

- Umwelt Outflow at the limit of the southern flowing downstream end where the stream connects to eastern flows toward Goose Lake;
- Goose Inflow East (GIE) at the downstream limit where the stream enters Goose Lake; and
- Rascal Stream East (RSE): upstream of the airstrip culverts.

High quality habitat is present at Rascal Outflow within the stream connecting Rascal and Goose lakes. Large lakes such as Propeller, Goose, and Big lakes provide the majority of year-round fish habitat for locally abundant fish species such as Lake Trout (Salvelinus namaycush) and Arctic Grayling. These deep lakes have sufficient oxygenated water to sustain fish populations during the ice-covered season.

Project activities that have the potential to directly affect freshwater fish and aquatic habitat mainly remain from Construction and Operations, including the loss of lentic habitat due to lake dewatering, development of open pits, water management activities, a tailings storage facility, water intake and discharge pipe construction, water withdrawal for domestic and process use, airstrip and road crossings, and WIR construction. Stream habitat may also be lost due to the construction of mine infrastructure.

The primary mitigation measure to avoid potential effects on freshwater fish and aquatic habitat is the Project design of siting infrastructure to avoid freshwater fish habitat wherever feasible. The camp and plant site, ore stockpile, and waste rock storage areas have been located to avoid fish-bearing waters. Another key mitigation measure is the establishment of maximum water volume uses which have been based on protecting sensitive life stages of fish in Goose, Propeller, and Big lakes. Unavoidable losses of fish habitat (e.g., loss of Llama Lake due to Llama Pit) will be compensated through the implementation of a Fish Offsetting Plan. Therefore, no residual effects were anticipated for freshwater fish and aquatic habitat.

3.4.5 Freshwater Fish Communities

The freshwater fish communities around the Goose Property are characteristic of Arctic freshwater ecosystems and include freshwater as well as anadromous species at the MLA. Baseline studies have been conducted from 2010 to 2015. The freshwater fish communities are typical of inland, headwater regions of the Canadian Arctic. Lake Trout was the dominant species, followed by Round Whitefish, Arctic Grayling, Slimy Sculpin, and Ninespine Stickleback. Other species include Burbot and Lake Whitefish. No Arctic Char have been captured at the Goose site, although they are likely present within the region.

Potential Project-related effects on freshwater fish focused on the two abundant freshwater fish species, Lake Trout and Arctic Grayling. The main potential Project-related effects mainly remain from Construction and Operations, including direct mortality or population decreases due to lake dewatering, building of WIRs, construction of the Project footprint, and water withdrawal for domestic and process use or WIR construction. The primary mitigation measure to avoid potential effects on Lake Trout and Arctic Grayling is the Project design of siting infrastructure to avoid freshwater fish habitat wherever feasible. The camp and plant site, ore stockpile, and waste rock storage areas have been located to avoid fish-bearing waters. Another key mitigation measure is the establishment of maximum water volume uses which have been based on protecting sensitive life stages of fish in Goose and Big lakes. Unavoidable losses to these freshwater fish species (e.g., loss of Llama Lake due to Llama Pit) will be compensated through the implementation of a Conceptual Fish Offsetting Plan. No residual effects or significant impact for freshwater fish were anticipated.

3.4.6 Marine Fish and Aquatic Habitat

Based on nearshore surveys and TK, potentially important habitat areas for marine and anadromous fish were identified. The outlets of some rivers are important habitat for Arctic Char.

Project activities that have the potential to directly affect marine fish and aquatic habitat during the initial reclamation activities include shipping effects and the project infrastructure footprint. Mitigation measures to reduce potential effects to the marine fish and aquatic habitat include: enforcing speed limits for ships and implementing measures to reduce potential effects to water quality and sediment quality. The residual effects were predicted to be not significant.

3.4.7 Marine Fish Community

The marine fish community of Bathurst Inlet is characteristic of Arctic marine ecosystems and includes marine, anadromous, and freshwater/estuarine species. Nineteen fish species typically found in the Arctic have been captured during baseline studies. Although no Arctic Char were captured, they are presumed to occur due to favourable habitat and appropriate spawning streams that flow into the Inlet.

Potential Project effects on marine fish community during the initial reclamation activities focused on Arctic Char and include: population effects from introduced species carried by ballast water; vessel propeller wash and underwater noise from shipping activities. Mitigation measures to eliminate or reduce potential effects to the marine fish community include: eliminating ballast water exchange and enforcing speed limits for ships. The significance of the residual effect for marine fish communities as assessed for Arctic Char was predicted to be not significant.

3.5 HUMAN ENVIRONMENT

3.5.1 Archaeological Sites

There are 269 known archaeological sites within the region, of which 64 are within 1,000 m of the Project sites and the road rights-of-way. Archaeological site locations were considered during Project design and were avoided where possible. However, where avoidance is not possible, mitigation of archaeological sites will be conducted.

Residual effects on known archaeological sites were predicted to be not significant.

3.5.2 Human Health and Environmental Risk Assessment

As part of the human health and environmental risk assessment, data were reviewed for air quality; freshwater and sediment quality; marine water and sediment quality; freshwater aquatic resources and fish; marine aquatic resources, fish, and wildlife; soil and vegetation; terrestrial wildlife; country foods; and noise. In particular, SSWQOs were developed for the Closure Phase based on predicted water quality of facilities discharging to the environment (FEIS Volume 6, Section 4.5.4.3).

No residual effects were identified and no health effects to human consumers of country foods are expected as a result of the Project activities or infrastructure during any phase of the Project. For all factors assessed, the project would not contribute negatively to overall human health and environment health.

4. Section 4- Project Description

4.1 LOCATION AND ACCESS

The Project is located in the West Kitikmeot region of Nunavut, as shown in Appendix A, Figure A-01, at approximately 65° to 66° north latitude, and 106° to 107° west longitude. The Project includes the Goose Property Area and a Marine Laydown Area (MLA) in southern Bathurst Inlet. The Project is situated approximately 400 km southwest of Cambridge Bay, 95 km southeast of the southern end of Bathurst Inlet, and 520 km northeast of Yellowknife, Northwest Territories.

The MLA is located on Inuit Owned Land (IOL), the Goose Property is predominately located on IOL, except for the southern portion, which is located on Crown Land. A northern portion and a southern portion of the WIR connecting the MLA and the Goose Property is also located on Crown Land.

The closest communities to the Project are Kingaok, located approximately 160 km to the north of the Goose Property, and Omingmaktok, located approximately 250 km to the northeast of the Goose Property. The communities of Kugluktuk and Cambridge Bay are the closest major regional settlements.

The Back River Property (the Property) comprises 45 federal mineral leases and 19 federal mining claims covering approximately 55,000 ha (Appendix A, Figure A-04). The Property is divided into one main project: Goose, and five exploration prospects: George, Boot, Boulder, Del, and Bath. Exploration prospects are excluded from this plan.

The Project will be accessible year-round through air transportation. There is an existing all-weather airstrip at the Goose Property that will be extended for continued use. The MLA will be serviced by an ice airstrip in the winter and by float planes in the open water season. Crew movements to the Goose Property and the MLA will be facilitated by chartered air service from Edmonton, Yellowknife, Cambridge Bay and Kugluktuk. The current use of helicopters and fixed-wing aircraft to service exploration crews will continue in proportion to Sabina's continued exploration and environmental monitoring efforts during mine Construction and Operations.

Heavy cargo will be shipped by either of two open water marine shipping routes to the MLA on Bathurst Inlet, and then over a WIR between the MLA and the Goose Property. The WIR will be approximately 160 km in length. Ground transportation within the Goose Property and MLA will be by all-weather roads.

Freight will be brought in by sea during summer from either of two ports: from Bécancour, Quebec in the east (by barges and ships) or from Vancouver, BC in the west (by barges). International ports may also be used if necessary. The ships and barges will be self-sufficient for offloading cargo. Lightering barges will be used to transfer cargo from the vessel to the MLA.

Fuel will travel in tanker ships and/or barges and then will be transferred using floating hose to storage tanks on land at the MLA.

Incoming freight and incoming fuel will be staged at MLA while awaiting transfer to the Goose Property site by the WIR. Outgoing cargo will also be staged at the MLA awaiting the appropriate vessel for back-haul.

4.2 SITE HISTORY

Comprehensive summaries of historical work on the Property were compiled in previous technical reports by WGM (2005), Coffey Mining (2009), and Nakai-Lajoie and Cater (2011). In addition, the SRK 2012 PEA Technical Report presents a complete list of historical work. The following information was sourced from these documents and is summarized in Appendix B, Table B-04 and Table B-05.

The Back River Joint Venture (BRJV) owned the Property from 1982-2008. During this time, various companies and individuals acquired and relinquished their interests. At times, these entities were also the operators. A summary of the historical milestones of the Property is presented in Appendix B, Table B-04.

Sabina purchased the Property from Dundee Precious Metals (DPM) in 2009.

The Del claims, which are part of the current Property, were not part of the initial Property staked by the BRJV. In 1986, Bow Valley Industries owned the Del claims but dropped them after a small and unsuccessful drilling program (Cater et al., 2009). The area remained inactive until DPM staked 12 claims in 2008. The Del claims were subsequently sold to Sabina as part of the Property in 2009.

Appendix B, Table B-05 summarizes the exploration work carried out by the operators.

Table B-02 in Appendix B provides a summary of all existing licenses, permits, and authorizations for the Project to date, organized by agencies.

4.3 SITE GEOLOGY

The Property is located in the central-eastern portion of the Slave Structural Province and forms part of the Canadian Shield. The Slave Structural Province is predominantly comprised of metamorphosed greenstone and turbidite sequences and plutonic rock underlain by older gneiss and granitoids. Volcanic-turbidite series rocks are widespread and abundant, consisting of large areas of turbidites flanked by narrow volcanic belts. Iron formations are locally abundant in the volcanic turbidite series and host most of the strata bound gold deposits.

The Goose Property is underlain by a turbidite sequence cut by felsic and gabbroic dikes. The turbidite sequence is comprised of greywacke, iron formations, and mudstones. Most of the gold mineralization is hosted in the central greywacke and lower iron formation units. All units are cross-cut by gabbro dikes.

Regional structural features have been identified from field mapping and from interpretation of geophysical data sets. Deposit scale features such as folding and faulting have been identified from drill core intersections and field mapping. Host rock units exhibit folding; Goose Main Pit sits in an antiform, both Llama and Umwelt sit in antiform/synform sets and Echo sits in the hinge of an open fold. Most faults transecting the deposits have been identified firstly by lithologic offset, and then subsequently supported by observations from drill core and field mapping. The Llama fault trends northwest/southeast and may be coincident with a gabbroic dike. The Umwelt fault trends north-northwest/south-southeast and truncates the deposit on the western limb. Multiple faults are seen at Echo, most of which trend north/south. Multiple faults have also been modelled at Goose Main Pit; one offsets mineralization and trends north/south, one trends north-northeast/south-southwest and the other trends northeast/southwest. All lithologies and fault structures have been modelled in 3D and have been used to assist with the Project design.

Gold mineralization at the Goose Property (Goose Main, Umwelt, Echo, and Llama) is situated within folded silicified and sulphidized oxide iron formations and locally in the underlying greywacke located

within antiform structures. As a result, the mineralization geometry is relatively continuous between sections and down-dip. However, within the interpreted mineralized zones, gold grades can be highly erratic and discontinuous.

The following section provides details on mining resource, extraction methods along with mining working configurations.

4.4 PROJECT SUMMARY

Exploration activities have been carried out at the Property area since 1982 and will continue over the life of the Project. Exploration activities are currently ongoing at the Goose Property and the George Property areas. The George Property is not discussed further herein as it is excluded from the current mining plan.

No facilities currently exist at the MLA.

The exploration activities at the Goose Property area are being carried out in accordance with the approved Type B Water Licence and Land Use Permits. The existing exploration facilities at the Goose Property area include:

- an all-season exploration camp which provides accommodation for 146 people;
- a core processing facility;
- heavy equipment storage facilities;
- a warehouse;
- two maintenance shops;
- a fuel storage facility;
- an all-weather airstrip;
- an all-weather road that connects the Goose Exploration Camp to the airstrip;
- dirt trails around the camp; and
- a quarry (called Airstrip Quarry).

The existing exploration facilities at the Goose Property are not covered in this ICRP as they are covered under the Exploration Facilities ICRP (2BE-GOO1520 and 2BC-GEO1520). With respect to the airstrip and quarry, only the works related to the planned expansion of the airstrip for the Project Operations and further development of the quarry are included in this ICRP.

The Project life is described in Phases as follows:

- Phase 1 – Construction (4 years; Years -4 to -1);
- Phase 2 – Operations (10 years; Years 1 to 10);
- Phase 3 – Closure (8 years; Years 11 to 18); and
- Phase 4 – Post-Closure (5 years; Years 19 to 23).

The Operations Phase (Phase 2) is divided into three Stages as determined by the active tailings management facility and will occur from Year 1 to Year 10.

- Phase 2, Stage 1 – Tailings Storage Facility – For the first two years of Operations (Years 1 and 2), a purpose-built Tailings Storage Facility (TSF) will be utilized;
- Phase 2, Stage 2 – Umwelt Tailings Facility (Umwelt TF) – From Years 3 to 6, the mined-out Umwelt Pit will be used for the tailings deposition; and
- Phase 2, Stage 3 – Goose Main Tailings Facility (Goose Main TF) – From Year 7 onward, tailings will be disposed of in the mined-out Goose Main Pit.

Mine closure is anticipated to be 13years and consist of three periods:

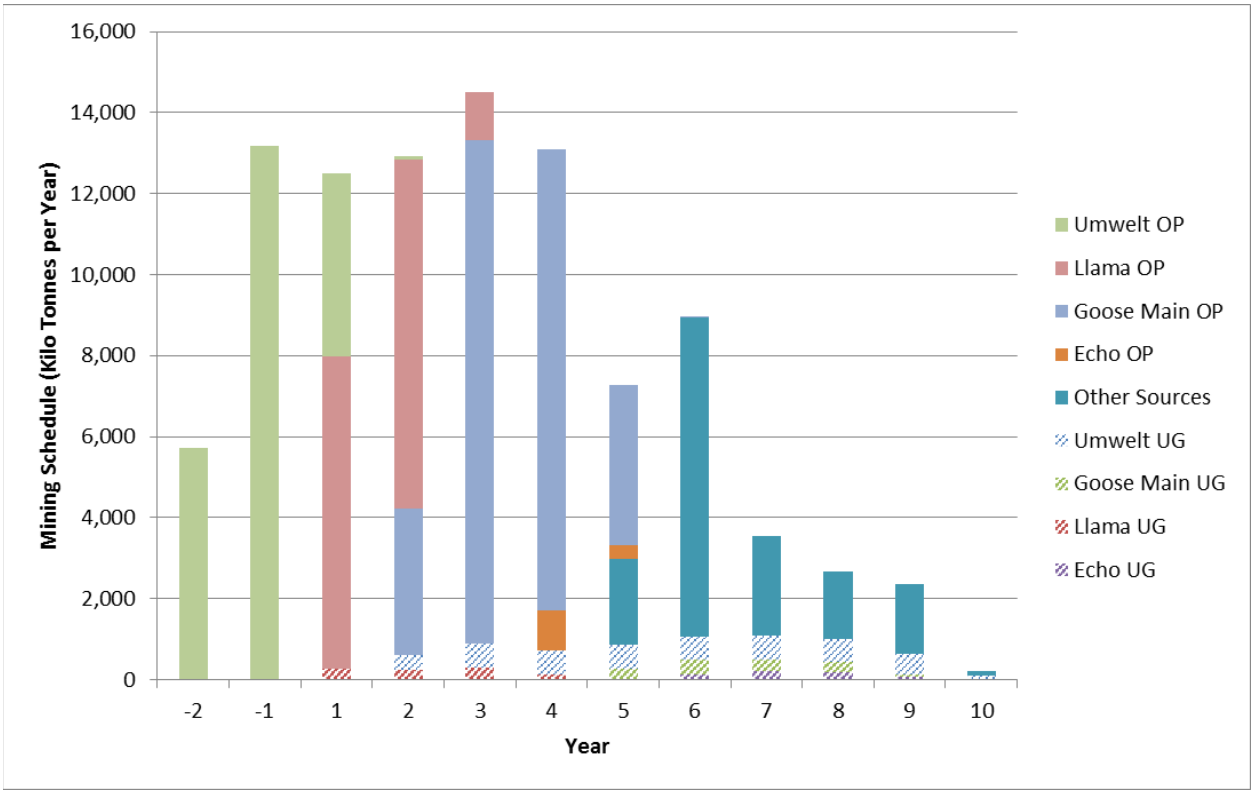
- Active Closure [Phase 3, Stage 1] – Project Year 11 – 12, (i.e., two years after mining operations cease). During this time, Active Closure activities such as demolition, earth-moving, waste disposal, and rerouting of pipelines will occur. Water treatment will also occur during this time.
- Passive Closure [Phase 3, Stage 2] – Project Year 13 – 18, (i.e., six years following the Active Closure Stage during which seasonal water treatment and monitoring are the primary activities). A final demobilization and demolition of mine facilities will occur at the end of this stage in Year 18.
- Post-Closure [Phase 4] – Project Year 19+, (i.e., a period of time during which confirmatory water quality, stability, aquatic effects, and ecosystem monitoring is conducted in order to ensure closure objectives have been met). This period is expected to be five years.

The mine plan consists of open pit mining plus underground (U/G) mining at four (4) deposits as follows:

- Umwelt (Umwelt Pit and Umwelt U/G);
- Llama (Llama Pit and Llama U/G);
- Goose Main (Goose Main Pit and Goose Main U/G); and
- Echo (Echo Pit and Echo U/G).

The complete mine production schedule is presented on Figure 4.4-1.

Figure 4.4-1: Goose Property Mine Production (Ore and Waste) Schedule by Deposit



The ore from all open pits will be recovered using conventional truck and shovel open pit mining methods. The underground mining operations will be carried out using post pillar cut-and-fill, drift and fill, and longitudinal open stoping mining techniques.

Mining will begin with pre-stripping at the Umwelt Pit in Year -2 (i.e., during Construction). Open pit mining will then transition sequentially to the Llama Pit, Goose Main Pit, and Echo Pit. All open pit mining at Goose Property will conclude in Year 6, by which time mining in the Goose Main Pit will be complete. Underground ore production will begin at Llama in Year 1 and then transition to Umwelt, Goose Main, and Echo underground mines. When Llama U/G production ceases at the end of Year 4, Goose Main U/G will start producing, followed by Echo U/G in Year 6. Umwelt U/G, beginning in Year 2, will continue until Year 10. Between Years 5 and 10, it is assumed that, in addition to the underground production, the Goose Process Plant will be fed ore from other deposits, including possibly from the George Property.

Low, medium, and high grade ore stockpiles will be established at the Goose Plant Site. All ore will be processed on-site using conventional gravity concentration and cyanidation techniques. The Process Plants capacity will be 6,000 tonnes of ore per day (t/d). Gold doré bars will be produced on-site and then flown off-site for further refinement.

It is estimated that a total of 59 million tonnes (Mt) of waste rock and 5.3 Mt of overburden will be produced, for a total of 64.3 Mt of mining waste. Waste rock and overburden will be co-disposed in the following Waste Rock Storage Areas (WRSAs):

- Umwelt WRSA;
- Llama WRSA;
- TSF WRSA (servicing the Goose Main Pit); and
- Echo WRSA.

The Umwelt, Llama, and TSF WRSAs will be conventional stockpiles constructed with final side slopes at 3H:1V, and the Echo WRSA will have final side slopes of 2.4H:1V. The WRSAs are expected to be stable over the long-term. The TSF WRSA is a waste rock storage area created on and around the TSF to support mining of the Goose Main Pit after Year 2, once use of the Umwelt TF for tailings disposal has been initiated and the supernatant water has been drained from the TSF.

Results from geochemical characterizations indicated that, after a 75% segregation efficiency is taken into account, approximately 58% of the open pit and underground waste rock is potentially acid generating (PAG) and could potentially produce acidic drainage after a lag time of 14 to 20 years. This lag time is expected to be longer than the amount of time needed for the natural freezing of the PAG rock. In addition, PAG rock will be covered with at least 5 m of non-potentially acid generating (NPAG) rock to reduce oxygen exposure with the PAG material. Geochemical characterization of overburden indicates the material is NPAG.

PAG and NPAG waste rock will be placed concurrently at each WRSA location during Operations such that there will be a 5 m cover of NPAG waste rock over and surrounding the PAG waste rock core. A disposal plan has been developed that maximizes the placement of NPAG waste rock over final PAG lifts during mine operations by using NPAG waste rock sourced directly from the pits. This approach will reduce the amount of dedicated capping that will be required to close out the WRSAs. Overburden will be co-disposed in the WRSAs to minimize the Project footprint, and a portion may also be used for capping material. All WRSAs will be fully constructed and covered with NPAG material by the end of Year 6 such that final reclamation can be undertaken progressively before the end of the Operations Phase.

Geochemical evaluations suggest that runoff from WRSAs during Operations will likely exceed MMER Schedule 4 limits for arsenic and copper (SRK, 2015c). During Operations, runoff from the WRSAs at the Goose Property will be directed to contact water storage ponds, and then to the active tailings management facility. This water will eventually be pumped to the water treatment plant (WTP) for treatment prior to discharge. It is expected that the final WRSAs will be frozen except for an active layer contained within the NPAG cap. Once the WRSAs are capped and permafrost has aggraded into the PAG rock, water quality is expected to improve to acceptable limits for discharge.

Approximately 19.8 Mt of tailings will be generated by the Project. These tailings will be discharged to multiple facilities. The Operations phase is further described in stages according to the tailings storage and water management plans, as follows:

- Stage 1 – Tailings Storage Facility – For the first two years of Operations (Years 1 and 2), a purpose-built Tailings Storage Facility (TSF) will be utilized;
- Stage 2 – Umwelt Tailings Facility (Umwelt TF) – From Years 3 to 6, the mined-out Umwelt Pit will used for tailings deposition; and
- Stage 3 – Goose Main Tailings Facility (Goose Main TF) – From Year 7 onward, tailings will be disposed of in the mined-out Goose Main Pit.

The majority of the tailings samples from the Goose Property have been characterized as PAG (Rescan 2013; SRK 2015b). As such, tailings in the TSF will be covered with waste rock, with a 5-m cover of NPAG material, and the Umwelt TF and Goose Main TF will be flooded with at least 5 m of water to reduce oxidation of the tailings.

Water on the Project will be categorized into three types:

- Contact water – Water which has been impacted by mineralized materials (waste rock, ore stockpile, pits, underground workings, tailings, etc.). Contact water will be contained in event ponds and tailings management facilities, and will be transferred via diversions and pumped pipelines.
- Non-contact water - Water which is runoff from undisturbed areas. Non-contact water will be diverted off-site through event ponds, pumped pipelines, berms, and culverts.
- Saline water – Saline groundwater will flow into the Llama Pit and most of the underground mines. Saline water will be pumped from Llama Pit and the underground facilities, and stored in the Saline Water Pond. This water will ultimately be pumped into mined-out underground mines and the bottom of the mined-out Llama Pit (then called the Llama Reservoir) which will receive a fresh water cover.

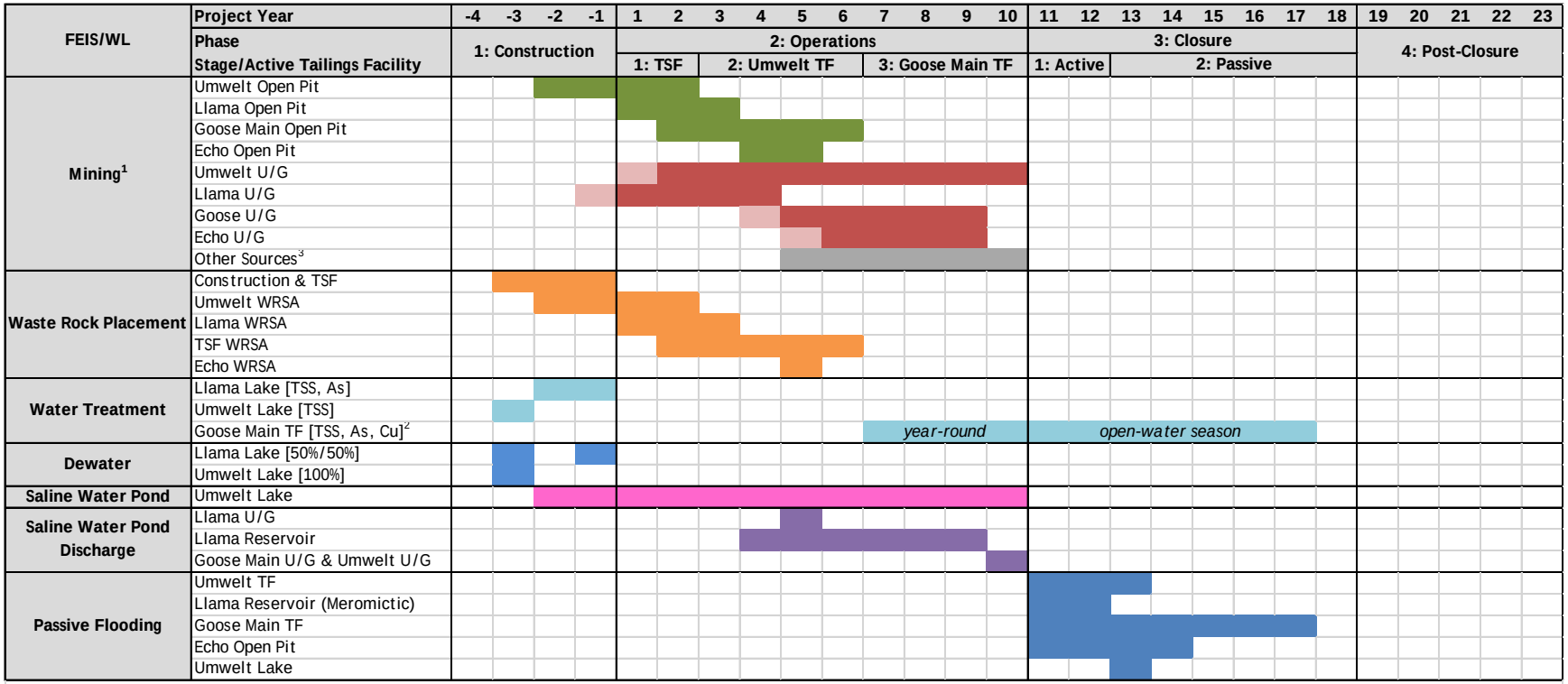
Each type of water will be managed separately throughout each Project phase.

A water treatment plant (WTP) will be operational in the open water season at the Goose Property in the Construction Phase to initially dewater Llama and Umwelt lakes to create storage for contact water and saline water, respectively. Treatment will be inactive between Years 1 and 6, but will begin again year-round from the Goose Main TF in Year 7 to reduce metal and total suspended solids (TSS) loading in the facility. After mining has been completed in Year 10, water treatment will continue during the open water season from the Goose Main TF until Year 17. The Property is finally closed in Year 18.

The MLA does not require any pond or diversion infrastructure for water management purposes, and will remain in the same condition for both the Construction and Operations phase. A desalination plant will produce domestic and industrial water, and greywater will be discharged to the tundra.

Figure 4.4-2 presents the Project phases and stages, along with tailings and waste rock disposal scheduling and key water management activities for each of the deposits.

Figure 4.4-2. Project Phases and Stages



1: Lighter red on undergrounds denotes Development in advance of Production.

2: TSS = total suspended solids, As = arsenic, Cu = copper.

3: Other Sourced are not 43-101 compliant reserves.

The infrastructure proposed at the Goose Property and MLA along with an overview of the infrastructure anticipated at end of Operations are provided in Appendix B, Table B-06 and Table B-07, respectively. See Appendix A, Figure A-02 and Figure A-03 for Project infrastructure locations at the Goose Property and the MLA, respectively.

Further details on milling schedule and mine waste production are provided Section 6.0 of the Main Application Document, in the Ore Storage Management Plan (SD-07), and the Mine Waste Management Plan (SD-08), submitted as part of Application.

The main goal of the ICRP for the Project site is to document the closure activities that will be undertaken to close the Project once mine operations are complete, and eventually achieve self-sustaining ecosystems, with land uses similar to pre-development disturbance conditions, by ensuring physically and chemically stable environments. Progressive reclamation of disturbed areas during Operations will occur once these areas are no longer required.

Throughout the mine planning process, the proposed Project has been designed with final closure in mind. Where possible, the designs of waste rock and tailings disposal areas, dikes/berms/dams and mine water management have been chosen or modified to reduce the potential overall impact of the development. Prior to Closure, research plans will be carried out to better define the engineering and revegetation strategies necessary for closure and reclamation.

The total area that will be disturbed during Construction and Operations for the proposed Project is approximately 785 ha; which corresponds to 758 ha for Goose Property facilities (Appendix A, Figure A-05) and 27 ha for the MLA facilities (Appendix A, Figure A-06). At Closure, 561.6 ha will be reclaimed, while 223.4 ha will not be reclaimed. Non-reclaimed land is associated with residual disturbances derived from the flooded open pits (except for Llama Pit which is located in Llama Lake) and/or TFs, TSF WRSA and other WRSAs at Goose Property (Appendix A, Figure A-09).

The Active Closure Stage (Year 11 and 12) will focus on the bulk of the infrastructure closure activities and water treatment. The Passive Stage (Year 13 to 18) will continue water treatment for an additional six years before final decommissioning and demobilization of the remaining Project elements (Appendix A, Figure A-09). A detailed integrated schedule of activities is provided in Section 8 of this document.

Sabina will undertake significant progressive reclamation activities throughout the mine life. Facilities will be decommissioned and removed at the end of their useful life. This will include encapsulation of mine wastes (potentially acid-generating waste rock and tailings) in the TSF WRSA with non-potentially acid-generating rock, backfilling of the Umwelt Pit and Goose Main Pit with tailings (i.e., becoming the Umwelt TF and Goose Main TF), flooding the open pits/TFs, and Pit treating out-of-compliance water. In order to reduce water treatment requirements, the open pits/TFs will be flooded to mitigate the potential for acid generation and metal leaching.

The Llama Pit will be converted to the Llama Reservoir by pumping saline water from the Saline Water Pond to the bottom of the pit, and allowing site runoff and precipitation to create a freshwater cover on top to create a meromictic lake. The Umwelt TF and the Echo Pit will be passively flooded with site runoff and precipitation such that they can become natural outflow systems. The Goose Main TF will be passively flooded with water from the TSF WRSA in addition to site runoff and precipitation. Water from the Goose Main TF will be pumped to the water treatment plant, treated and pumped back to the Goose Main TF until water quality meets closure criteria for discharge to the environment, which is predicted to occur in Year 17; this coincides with the time when Goose Main TF overflows to the environment. Underground workings at Llama, Umwelt, and Goose Main Pit will be flooded with water from the Saline Water Pond; whereas the Echo U/G will be flooded with site water entering through the Echo Pit and

backfilled Echo portal. The portals to the underground mines will be plugged with waste rock. Vent raises will either be closed with waste rock plugs or concrete caps.

Hazardous materials will be collected for off-site disposal. Equipment stripped of hazardous materials will be disposed of within a closure landfill (constructed in one of the WRSAs) or left in place in the mine workings. Buildings will be demolished and the rubble will be disposed of in the same closure landfill. Culverts will be removed from roads and the natural drainage restored, road surfaces will be scarified to promote natural revegetation but will otherwise remain intact. Any airstrips will remain functional with a gravel surface for use during Post-Closure monitoring. Final closure of the airstrip will be similar to the roads.

The contact water management system will be maintained during the Closure Phase until water quality monitoring demonstrates that water flowing from these facilities is acceptable for direct release to the environment. Once water quality is acceptable for direct release based on criteria established through the water licensing process, dikes/berms/dams will be breached to allow the surface runoff and seepage water to naturally flow to the environment. They will be breached in strategic locations to restore natural surface water drainages. Some berms, such as the main Llama non-contact water diversion berm, will be breached in four locations during the Operations Phase; however the majority of the diversion berms will be breached during Closure. Pipelines will be purged, dismantled, and disposed of in the closure landfill as they become redundant. The decommissioning of the WTP and remaining pipelines will occur once water meets discharge criteria, which is expected to occur in Year 17.

Breached diversion structures will remain in place during the Post-Closure Phase. However, collection ponds will have been breached, liners removed and landfilled, and the areas re-contoured and armoured (if necessary) to allow for passive runoff.

At the MLA, surface infrastructure will be similarly handled; however, all elements designated for landfilling will be shipped off-site for disposal at a designated landfill at Goose Property or near the port of destination. At both the MLA and Goose Property, once all buildings and equipment have been removed, the footprints (whether bedrock or thermal pads) will be re-contoured to allow for sheet flow drainage to the receiving environment (Appendix A, Figure A-08).

Monitoring will be carried out during all phases of the mine life to demonstrate geotechnical stability and the safe environmental performance of the facilities. If any non-compliant conditions are identified, then maintenance and planning for corrective measures will be completed in a timely manner to ensure successful completion of the ICRP.

Closure and 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.

A more detailed description of the Project components along with permanent closure and reclamation measures, and closure components contingencies are provided in the next section.

5. Section 5- Permanent Closure and Reclamation

5.1 DEFINITION OF PERMANENT CLOSURE AND RECLAMATION

Permanent closure is defined as the final closure of a mine site with no foreseeable intent by the existing proponent to return to either active exploration or mining. Permanent closure indicates that the proponent intends to have no further activity on the site aside from Post-Closure monitoring and potential contingency actions. Permanent closure does not, however, preclude the proponent or another party from pursuing opportunities at the existing site or in the area at a time beyond the foreseeable future (MVLWB/AANDC 2013).

An important consideration of permanent closure is the effect of mine closure on employees, contractors, suppliers, and the public. It is Sabina's aim to plan for closure so that adequate notice (if possible, on the order of a year or more) can be given to employees and the public.

Some infrastructure may stay in place should local communities, KIA, GN, federal government bodies, or other appropriate parties choose to take ownership of it. The schedule outlined in this ICRP assumes that all infrastructure associated with the Project will be removed.

5.2 PERMANENT CLOSURE AND RECLAMATION REQUIREMENTS

This sub-section provides the permanent closure and reclamation requirements for each individual component of the Project. The components are categorized in sub-sections for clarity. The specified closure objectives may be revised with subsequent updates to the ICRP, but are considered reasonable at this time to guide the advancement of closure planning. For additional details on the water management, water quality predictions, and the mine waste refer to the Main Application document and associated detailed Water Management Plan (SD-05) and Mine Waste Rock Management Plan (SD-08), submitted with the Application.

See Appendix A, Figure A-02 and Figure A-03 for Project component locations.

5.2.1 Open Pit Mine Workings

5.2.1.1 Project Component Description

There will be four open pits at the Project: Umwelt, Llama, Echo, and Goose Main. The mine production schedule by deposit is shown in Figure 4.4-1. Open pit mining activities will cease by Year 6 of Operations (i.e., 4 years prior to Closure). Approximate dimensions for the four open pits at the end of Operations are provided in Appendix B, Table B-08.

A conventional load-haul (also known as truck and shovel) mining method was selected for all open pits.

For the open pit design, a series of stability analyses have been carried out. The open pit slopes are designed to be stable under operating conditions. Due to the generally good rock mass quality and relatively shallow depth of the pits, the approach has been to limit the bench height to 20 m and to steepen bench face angles while providing sufficient berm widths to contain structurally controlled failure. The design assumes that final pit walls will include pre-split blasting to reduce blasting effects on final pit wall stability.

Bench height in the final pit design will be 20 m for all pits, with an overall slope ranging from 37º to 55º. Aside from some isolated structure hazards (e.g., faults, low angle of rock-to-pit-wall intersection angles, and low quality zones), most walls show very low likelihood of instability due to the strong rock mass and relatively small pit size.

During pit development, a pit wall monitoring program, including geotechnical structural mapping, will be implemented to confirm design assumptions and to rapidly detect any unexpected condition for follow-up and to identify the adaptive measures to be undertaken.

The maximum predicted groundwater inflows for the Llama Pit are 702 m^3/day. The Umwelt Pit, Goose Main Pit and Echo Pit will all be developed entirely within permafrost and as such, no groundwater inflows are expected.

After the open-pit mining is complete, and the potential for an extension of the open pit operations has been dismissed, the open pits will be decommissioned progressively during the Operations phase of the Project. Echo Pit and Llama Pit will be passively flooded, with a portion of the Saline Water Pond pumped to the bottom of Llama Pit to create a meromictic lake (becoming Llama Reservoir). The mined-out Umwelt and Goose Main open pits will be used for tailings storage (i.e., becoming the Umwelt TF and the Goose Main TF), and the deposited tailings will be covered with a water cover at Closure (passively flooded). Further details on tailings deposition at these pits are provided in Section 5.2.4.1. Passive flooding and partial filling with tailings (in the case of Umwelt TF and Goose Main TF) can be expected to increase the physical stability of the open pits.

Further details on permanent closure requirements for the open pits are described in Section 5.2.2.4 and Section 5.2.2.5. See Section 5.2.9 for water management system details.

5.2.1.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance surface area of the Umwelt Pit, Echo Pit and Goose Main Pit are located on land, whereas the Llama Pit will be developed over a portion of Llama Lake. Echo Pit and Goose Main Pit also intersect water courses draining to Goose Lake. The pre-disturbance site conditions based on baseline data collection programs are summarized in Section 3. Appendix A, Figure A-10 presents an aerial photo of the existing site disturbance in the Goose Property area taken in 2013.

Aside from some minor impacts from exploration drilling, the existing conditions at the open pit areas are the same as the pre-disturbance conditions.

A description of site conditions at the end of Operations is provided in Section 5.2.1.1, and Section 5.2.4.1 in the case of Umwelt TF and Goose Main TF. The ultimate mine development of the Project is shown on Appendix A, Figure A-02. At closure, the open pits and TFs will be flooded. Water from the Goose Main TF will be pumped for treatment and returned to the Goose Main TF until Year 17, at which point water will naturally overflow, as shown on Appendix A, Figure A-07. Once closure and remediation activities are complete, the flooded open pits/tailings facilities will be new features on the landscape, as shown on Appendix A, Figure A-09.

5.2.1.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the open pit mine workings are listed in Appendix B, Table B-09.

5.2.1.4 Consideration of Closure Options and Selection of Closure Activities

Several reclamation studies were identified in the preliminary MCRP submitted as part of the DEIS. Several of these studies were addressed during the Feasibility Study (FS) and development of the FEIS. A brief description of the closure activities considered for the open pits is provided below along with the rationale for the selection of the closure activity. For more details see the Project Feasibility Study Report (JDS 2015) and FEIS (Sabina 2015b).

Open Pit Filling and Flooding

The available water for active pit flooding at the Goose Property from Goose, Propeller, and other lakes was evaluated. The study showed that sufficient water would be available for active pit flooding. However, the water balance completed for the Project (FEIS Volume 2, Appendix V2-7H Water and Load Balance Report) confirms that, under average hydraulic conditions, all open pits will be passively flooded during the Closure Phase and that active pumping is not required. During Sabina's Feasibility Study, the financial and technical considerations of active filling were considered and it was decided, due to the limited pumping window (primarily freshet) and the associated costs, active filling was not a preferred option. Sabina is confident that without active pumping, the projected water quality results and the proposed flooding timelines will be met.

During Operations, if water quality and acid rock drainage (ARD)/metal leaching (ML) testing results do not align with the projected water balance results, Sabina may reconsider active pumping. If in the future active pumping were to be considered, Sabina notes that this water would be drawn from local freshwater sources. As such, there could be potential effects associated with significant water withdrawal from freshwater bodies. Sabina will weigh these potential water withdrawal effects with updated water quality projections and work with regulatory bodies to ensure that any potential overall effects were minimized as much as feasible.

The potential to backfill any of the pits with waste rock, and the additional option to backfill one of the pits with tailings (particularly Llama and Umwelt) were also evaluated. Details of this analysis are found in the Multiple Accounts Analysis that was updated in February 2016 as part of the FEIS Information Request Response Package (Sabina 2016).

The above options for filling the pits were evaluated during the Feasibility Study and the waste management strategy selected involves using both Umwelt Pit and Goose Main Pit to hold tailings. Once mining in Umwelt Pit is complete, Umwelt Pit will operate as a tailings facility (Umwelt TF). Tailings will be stored in Goose Main Pit (Goose Main TF) once mining in Goose Main Pit has been completed and the Umwelt TF is at capacity. At Closure of each TF, the deposited tailings will be covered with a water cover which is sufficiently deep to avoid resuspension of tailings solids. Flooding will include passive flooding with site runoff and direct precipitation.

During Operations, the mined-out Llama Pit will be converted to a water reservoir (Llama Reservoir). A portion of the Saline Water Pond will be pumped to the bottom of Llama Reservoir to create meromictic conditions. Llama Reservoir and Echo Pit will be passively flooded during Operations and into Closure with site runoff and precipitation such that they can become natural outflow systems.

The flooding of the Echo Pit and the Llama Pit, as well as the Umwelt TF and the Goose Main TF will reduce the exposure of high pit walls that might otherwise pose an acid generating and metal leaching risk.

Open Pits Geotechnical Stability

The open pit slopes are designed to be stable under operating conditions. During pit development, a pit wall monitoring program, including geotechnical structural mapping, will be implemented to confirm design assumptions and to rapidly detect any unexpected condition for follow-up and identify the adaptive measures to be undertaken. It is also noted that the partial backfilling with tailings (of Umwelt TF and Goose Main TF) and the flooding of all 4 open pits will both increase stability.

Based on the foregoing, no additional closure activities (i.e., re-grading of slopes, erosion protection, revegetation, etc.) have been evaluated for increasing the stability of the pit walls after Closure.

Open Pit Perimeter – People and Wildlife Protection

The open pit may be hazardous to wildlife species as they may be injured by inadvertent access into the open pit.

Environmental design features and mitigation, as well as current wildlife management practices used in other mining projects (Appendix E), will be implemented at the Project to limit wildlife access and injury.

A setback line will be defined in accordance with rock mechanics studies conducted for pit stability. Rock berms will be constructed around each of the open pits outside of the setback line where residual slopes will exist above the final flood levels to reduce inadvertent human and wildlife access to dangerous or potentially unstable slopes. The construction of the rock berms will be mostly completed during Operations as progressive reclamation; the remainder of the perimeter berm will be completed during the Active Closure stage. The rock berms were selected over fences based on feedback received from communities and reviewers in regards to concerns relating to wildlife safety.

5.2.1.5 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.

Mine dewatering infrastructure (i.e., pumps, pipelines and power sources) within the open pits will be either hauled to surface for reuse, or drained of fluids and left in place at the bottom of the pits prior to backfilling with tailings and/or flooding. The open pits and TFs will be passively flooded such that they can become natural outflow systems. Flooding will provide an adequate depth of water cover over tailings deposited in the Umwelt TF and the Goose Main TF. Flooding will also ensure adequate meromictic conditions in Llama Reservoir, and will in all cases reduce the exposure of high walls that might pose an acid generating and metal leaching risk.

In addition, water within the Goose Main TF will be treated to reduce metal and suspended solids loading in the facility starting in Year 7 and ending in Year 17 (i.e., the time at which Goose Main TF will complete flooding). Water treatment will be undertaken year-round during the Operations Phase and seasonally during the Active and Passive Closure phases. Additional details on the water treatment plant are provided in Section 5.2.6.1.

All of the pits will be progressively reclaimed, starting during the Operations Phase if practical, by either flooding or by partially filling with tailings followed by flooding. Passive pit flooding times were estimated by Golder (Golder 2017), assuming flooding commences at closure (i.e., Year 11) as a conservative approach. Based on average hydrological conditions, Llama Reservoir will overflow by Year 12, Umwelt TF will overflow by Year 13, Echo Pit will overflow by Year 14, and Goose Main TF will overflow by Year

17. The engineering works associated with the progressive closure activities for the open pits are described in Section 6.2.1.

The assumptions made in preparing the plan for pit closure include:

- Average hydrologic conditions (based on baseline hydrology and meteorology data) persist into the mining and closure periods;
- About 7.2 Mm^3 of tailings will be stored in Umwelt TF;
- About 6.2 Mm^3 of tailings will be stored in Goose Main TF; and
- Overburden slopes around pit perimeters will be managed for stability during pit development so that additional reclamation work will not be required at Closure. This includes possible cladding of these slopes for thermal stability, if necessary.

Non-contact water diversion berms around Llama Pit and Echo Pit will be breached during Active Closure. There will be no non-contact water diversion berm around the Umwelt Pit. The non-contact water diversion berm around Goose Main TF will be breached at the end of Passive Closure, two years after water treatment is expected to achieve the closure objectives. Spillways will be excavated at Umwelt Pit and Goose Main TF; natural drainages exist at Llama and Echo Pits. Each flooded pit and TF will discharge to the environment on a seasonal basis. Discharge locations for the Goose Property are shown as breach locations on Appendix A, Figure A-07.

Predictions of open pit and TF overflow water quality were developed by SRK (2015c). It is expected that the overflow water discharged from the flooded pits and TFs will meet MMER Schedule 4 limits at the time of flooding. The overflow water from each of the pits and TFs is expected to exceed receiving water quality objectives (CWQG-PAL or SSWQOs) at the point of release. However, these objectives are expected to be met at the point of entry into receiving waters under steady state conditions. Additional details are provided in Section 5.2.9.

Results of the water balance indicate that, based on passive flooding commencing in Year 11, Llama Reservoir, the Umwelt TF, and Echo Pit will be flooded by Year 12, 13, and 14, respectively (see Figure 4.4-2). Based on lag time calculations completed for the waste rock, it is likely that acidic conditions will develop in some of the PAG rock that is exposed in the pit walls. This was taken into account in developing water quality predictions for the flooded pits (SRK 2015b). Nonetheless, results from the water and load balance indicate that water from these pits will meet applicable discharge criteria which will enable passive discharge into nearby watercourses. In addition, passive flooding may start earlier during Operations once each facility is no longer required, potentially reducing exposure durations and cumulative loadings.

Portions of the Goose Main Pit may be exposed long enough that some ML/ARD may develop. Runoff from the TSF WRSA Pond will also be directed into Goose Main TF. Water from Goose Main TF will be treated throughout the Closure Phase until closure objectives have been met, which is expected to be in Year 17. Additional details on geochemical pit wall characterization can be found in the SRK Water and Load Balance Report (SRK 2015c).

In summary, the closure measures for each pit or TF are as follows:

- **Llama Reservoir** – In Year 4, the exhausted Llama Pit will be converted to a water reservoir during the Operations Phase. The bottom of Llama Reservoir will be partially filled with saline water pumped from the Saline Water Pond to form meromictic conditions. The Llama Reservoir

will continue to passively flood, reaching capacity in about Year 12. Overflow from the Llama Reservoir is expected to meet discharge requirements without water treatment.

- **Umwelt TF** – After open pit mining of the Umwelt Pit concludes, it will be used to store tailings in Years 3 to 6. The pit will then be allowed to passively flood and is expected to reach capacity in Year 13. The flooded pit is expected to meet discharge requirements without water treatment.
- **Goose Main TF** – Mining of the Goose Main Pit will conclude in Year 6, after which it will be used for tailings disposal from Year 7 until the end of mining (Year 10). The Goose Main TF will then be allowed to passively flood reaching capacity in about Year 17 (the end of the Closure Phase). Water in the TF will be continuously treated and returned back to the TF starting in Year 7. The Goose Main TF is expected to meet discharge requirements in Year 17 and throughout Post-Closure and beyond.
- **Echo Pit** – Mining of the Echo Pit will occur in Years 4 and 5. Dewatering will continue until Year 9 (i.e., during underground mining), at which time it will be allowed to passively flood, reaching capacity by Year 14. The pit lake is expected to meet discharge requirements without water treatment.

Monitoring of the water quality at control points across the site and in each pit will be important prior to the time at which each pit is expected to overtop in order to establish that the water can be passively discharged. In the unlikely event that the water in Llama Pit, Umwelt TF or Echo Pit is not suitable for discharge, the water could be batch treated in-pit or at the WTP to address any remaining water quality impairments.

5.2.1.6 Predicted Residual Effects

The flooded open pits will be a permanent feature on the landscape. The following residual effects were predicted at the open pits after reclamation:

- The extent of the effect on terrain, soil quantity, and vegetation communities will consist of a total of 25 ha of residual ground disturbance associated with the flooded open pits. This area excludes the majority of Llama Pit, which will be located in Llama Lake.
- Flooding of open pits at Closure will result in the retreat of permafrost away from the flooded pit areas. In the case of Umwelt TF and Goose Main TF, this may result in the formation of through taliks, connecting the surface hydrological regime with the sub-permafrost hydrogeological regime. It is noted that a through talik likely already exists under Llama Lake and will continue to exist after flooding.
- Water quality changes (i.e., increased concentrations of aluminum, arsenic, chloride, copper, iron, mercury, and explosives residues) predicted as part of the FEIS may last into Closure and Post-Closure phases for some waterbodies, although levels will be steadily decreasing.
- Although wildlife species will be discouraged from using the flooded open pits, some may still do so and they could potentially ingest surficial water.

The operation of the mine will have no long-term effect on the surface albedo; therefore, the effect of solar heating will be the same as on the surrounding landscape. No significant long-term residual effects were identified as part of the FEIS for the open pits despite the creation of new waterbodies. The Post-Closure impacts of these features are expected to be negligible.

5.2.1.7 *Uncertainties*

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

Water Quality

While surficial water quality within the flooded open pits (with the exception of Goose Main TF) is predicted to meet requirements for direct discharge to the environment at Closure, actual water quality conditions will not be known with certainty until flooding is complete. Water within the Goose Main TF will be treated until water quality meets requirements for direct discharge, which is predicted to occur in Year 17, but will be confirmed during the Active Closure Stage. In addition, the length of water treatment required for TSF WRSA runoff will not be known with certainty until placement of non-PAG waste rock over the TSF WRSA is complete. However, Section 5.2.1.9 of this ICRP includes contingencies to minimize this potential risk.

Geotechnical Stability

The open pit slopes are designed to be stable under operating conditions but the walls of the open pits will have been exposed for a number of years during mine operations, and some weathering will have occurred and there will be changes to the slope conditions. Therefore, the long-term stability of the open pit walls represents an uncertainty in closure planning design. Nonetheless, the partial backfilling of the Umwelt TF and the Goose Main TF with tailings, together with the flooding of all 4 open pits, will have a positive effect on long-term stability.

A much better understanding of these uncertainties will be gained by observing the behaviour of the slopes during active mining, and also from the physical inspection to be carried out during Operations and Closure. In addition, Closure monitoring will add insight about the likely long-term behaviour of the slopes. If this indicates potential problems, the rock berm(s) wall can be relocated further from the pit rim.

5.2.1.8 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 minimize 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 Phase.

Monitoring programs will be initiated during Construction 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., Aquatic Effects Monitoring Plan [AEMP], Environmental Management and Protection Plan [EMPP]) 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 mine 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 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. The AEMP provides the basis for integrating aquatic 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 would 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. Finally, as the closure effort is completed and the post-closure period begins, the AEMP would be reviewed and updated again to cover the long-term (Post-Closure) monitoring period. It is anticipated in time it may be practical to reduce monitoring to a minimum in the Post-Closure Phase.

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.

Closure and 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.

The following presents the relevant monitoring and maintenance strategies for the proposed open pit facilities (further guidance on generic monitoring and maintenance programs for Closure and Post-Closure is provided in MVLWB/AANDC [2013]):

- visual inspections of the reclaimed areas;
- identify unstable areas;
- check stability of pit walls and overburden slopes above the pit water level at the start of the post-closure period to confirm the slopes are stable and that conditions remain as predicted;
- sample surface water and profiles of flooded pits;
- identify and test water management points (including seepage) that were not anticipated; and
- inspect remaining barriers such as berms.

Water quality monitoring will occur at each open pit/tailings facility until water quality objectives are met. It is anticipated that after five years in the Post-Closure Phase, monitoring would no longer be required. The Closure and Post-Closure monitoring described above will determine the long-term maintenance that would be required for the Post-Closure Phase.

It is planned that the airstrip would be maintained for sufficient period to enable access to the site for minor maintenance required in the initial portion of the Post-Closure Phase. The need for this maintenance will be reduced with time. The airstrip 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 airstrip closure). It is anticipated that the need for ongoing maintenance would be reduced with time or 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 NWB to confirm that the proponent has remained on schedule. Any proposed changes to the ICRP with supporting rationale should be presented 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 ICRP. 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 ICRP.
- **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 anticipated timelines for preparation and submission to NWB of the above described reports are as follows:

- **Annual Closure and Reclamation Plan Progress Report:** Annually during Operations.
- **Reclamation Completion Report:** Upon completion of the Active and Passive Closure components (such as decommissioning and reclaiming mine buildings and infrastructure, commencement of passive pit flooding, etc.).
- **Performance Assessment Report:** Performance assessment reports will be prepared a maximum of five years following the completion of the closure effort and will recur a maximum of every five years until ultimate closure conditions have been met. Performance assessment reporting will be used to determine at what time the effluent quality is of a suitable quality for discharge without the respective management measures (where applicable).

5.2.1.9 Contingencies

Any additional water needed for dilution or water covers for the Goose Main TF or the Umwelt TF will be available from Goose Lake or potentially Big Lake (SRK 2015c).

Although treatment of water in the Goose Main TF is predicted to cease in Year 17, the WTP will be maintained at minimum until discharge criteria are met, complete flooding is achieved, and overflow to the environment occurs.

The need for water treatment will be ultimately analyzed prior to open pit overflow. Prior to flooding of the open pits, 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 flooding. In addition, the surface water and profiles of the flooded pits and tailings facilities will be sampled. If the results of water quality monitoring indicate that water in the flooded open pits is not suitable for direct discharge, the following alternatives will be considered as contingencies for the treatment of the flooded pit water:

- in-pit treatment; and
- pumping to the WTP for active treatment prior to discharge into the receiving environment.

5.2.2 Underground Mine Workings

5.2.2.1 Project Component Description

In addition to the open pits, each of the four deposits will also be mined using underground mining methods. All of the underground mines will be spatially located below the open pits; however access will be from ramps and portals outside of the open pits themselves. Underground mining activities will occur over the entire mine life, as per the mining schedule in Appendix A, Figure 4.4-1. Approximate dimensions for the four underground workings at the end of Operations are provided in Appendix B, Table B-010. Figure A-12, in Appendix A, shows the design of the underground operations.

The underground deposits will be accessed via declines driven from surface, and will typically be 4.5 m wide by 5.0 m high at a -15% gradient. The declines will be used for haulage of ore and waste, access of personnel, equipment, materials, and services. The declines will also be used as an exhaust airway. Underground access portal locations are shown on the Goose Property general arrangement plan provided in Appendix A, Figure A-02. The locations of the portals were chosen such that environmental offset limits from streams and lakes were maintained.

The post pillar cut-and-fill method was selected for the Umwelt deposit. Longitudinal open stoping was selected for Echo. At Llama and Goose Main, drift and fill mining was chosen. All of the selected underground mining methods require backfill to maintain ground stability and to provide a work base for the equipment on the next cut above. The primary source for backfill material is planned to be development waste from the underground mines. At each underground operation, there will be a net shortage of backfill material. The shortfall will be made up by utilizing potentially acid-generating waste rock from the open pit operations.

Ventilation systems, consisting of fresh air raises and main fans, for the underground operations for the Project have been designed to dilute and remove dust, diesel emissions and blasting fumes, and to thus maintain compliance with Nunavut mine regulations. Based on ventilation modelling results, a twinned 4-m diameter Fresh Air Raise (FAR) system would be required at each underground mine. In addition, a 4-m diameter Exhaust Air Raise (EAR) system will be required midway down the Umwelt deposit.

Groundwater inflows are only expected at Umwelt, Llama, and Goose Main underground mines, and these inflows are expected to be saline. Inflows are anticipated where mine workings extend below the base of permafrost, which correlates to about 320 to 350 mbgs. In mining areas above the permafrost, no groundwater inflows are expected. The predicted groundwater inflow rates at the cessation of underground mining at each location are as follows:

- Umwelt U/G: 312 m^3/d at Year 10;
- Llama U/G: 246 m^3/d at Year 4; and
- Goose Main U/G: 64 m^3/d at Year 9.

After the underground mining is completed and the potential for an extension of the underground operations has been dismissed, dewatering will cease and the underground workings at Llama, Umwelt, and Goose Main will be flooded with water from the Saline Water Pond. Underground workings at Echo will be flooded with site contact water entering through the portal and through the connection to Echo Pit. More details on permanent closure requirements for the underground mine workings are presented in Section 5.2.2.4 and Section 5.2.2.5.

5.2.2.2 Pre-Disturbance, Existing, and Final Site Conditions

The surface area associated with the underground workings are limited to the access portals and vent raises. Associated laydown areas for temporary waste rock stockpiling are addressed in Section 0. The pre-disturbance underground site conditions based on baseline data collection programs are summarized in Section 3. Appendix A, Figure A-10 presents an aerial photo of the proposed mine site area taken in 2013.

The existing conditions at the Umwelt, Llama, and Echo portal areas are the same as the pre-disturbance conditions. The existing conditions at the Goose Main portal are disturbed by the existing exploration camp (see Section 5.2.5.2).

A description of site conditions at the end of Operations is provided in Section 5.2.5.1. The ultimate mine development of the Project is shown on Appendix A, Figure A-02. Once closure and remediation activities are complete, there will be no new features due to underground mining on the landscape, as shown on Appendix A, Figure A-09.

5.2.2.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the underground mine workings are listed in Appendix B, Table B-011.

5.2.2.4 Consideration of Closure Options and Selection of Closure Activities

Backfilling the portals with waste rock and capping the vent raises is considered to be the only viable option for eliminating access to the underground mine workings.

As part of the Feasibility Study, water management for the Project was optimized to reduce the surface disturbance footprint, and pumping from the Saline Water Pond to the underground workings was preferred over allowing workings to flood passively with groundwater inflows.

5.2.2.5 Engineering Work Associated with Selected Closure Activity

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

- surface openings will be sealed: the portals will be backfilled with NPAG waste rock, and the vent raises will be capped with concrete to eliminate access to the underground mine workings;
- any equipment or infrastructure left underground will be cleaned, drained of fluids, inspected, and remediated as appropriate to eliminate the risk of contaminant leakage;
- hazardous materials (fuels, oils, glycol, batteries, explosives, etc.) will be removed and disposed at an approved disposal facility;
- contamination associated with vehicle and equipment operations at work areas will be identified and remediated;
- disturbed surface areas will be re-contoured to establish positive natural drainage patterns and blend in with the surrounding topography to the extent possible;
- un-used explosives will be consumed on-site or removed and shipped off-site;
- areas with excessive hydrocarbon contamination will be removed and cleaned in the on-site landfarm if appropriate; and
- the underground mines will be flooded with water from the Saline Water Pond within approximately 1 year. The estimated total flooding volume for the underground workings is approximately 1.47 Mm^3.

5.2.2.6 Predicted Residual Effects

No significant long-term effects have been identified for the underground mine workings. After Closure, the only surface expression of the underground workings will be the closed vent raises, and the backfilled portals and ramps (leading to the portals). It is expected that the temperature of the underground mine workings will return to that of the pre-existing permafrost. The Post-Closure impacts of these features are expected to be negligible.

5.2.2.7 Uncertainties

The long-term stability of crown pillars will be a function of the final dimensions (i.e., stope width and crown pillar thickness) as well as actual local bedrock conditions and the extent of backfilling. A rock mechanics study will be carried out at the end of underground mining to determine if any potentially unstable crown pillars exist and to specify any remedial actions if necessary.

There are currently no other identified uncertainties associated with the closing of the surface openings to the underground or flooding the underground works.

5.2.2.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall Post-Closure monitoring and maintenance program for the Project are discussed in Section 5.2.1.8 along with the reporting requirements. The following presents the relevant monitoring and maintenance strategies for the proposed underground mines (further guidance on generic monitoring and maintenance programs for Closure and Post-Closure is provided in MVLWB/AANDC [2013]):

- visual inspections of the reclaimed areas (specially at and around the backfilled portals and closed vent raises);

- check for surface expression (subsidence) of underground failure;
- periodically backfill areas of subsidence as required; and
- instrumentation for groundwater monitoring will be placed in vent raises or manways as mining operations is completed to allow for Post-Closure monitoring of flooding.

5.2.2.9 Contingencies

If any of the crown pillars or shallow drifts collapse back to surface resulting in subsidence, then the subsidence area will be backfilled to grade with waste rock. If subsidence continues, the area will be delineated with a rock berm and signs will be posted warning of the subsidence area.

5.2.3 Waste Rock Storage Areas

5.2.3.1 Project Component Description

The storage design requirement for the Project is approximately 5.3 Mt of overburden, 34 Mt of PAG waste rock, and 25 Mt of NPAG waste rock. Approximately 3 Mt of PAG waste rock has been slated for use as underground mine backfill. Approximately 58% of the waste material to be generated by the Project is anticipated to be PAG (Section 3.3.4). Suitable NPAG waste rock is also planned to be used for road construction, laydown areas, and for construction of the TSF Containment Dam. The remaining waste rock and the overburden will be co-disposed in the WRSAs. The mine production schedule by deposit is shown in Figure 4.4-1. As with open pit mining activities, hauling of waste rock will cease by Year 6 of Operations (i.e., 4 years prior to Closure).

Proposed WRSA locations are shown in Appendix A, Figure A-02. To reduce haul distances, there will be generally a separate WRSA for each open pit, with the exception of waste rock from Goose Main Pit which will be placed on the decommissioned TSF (TSF WRSA, see Section 5.2.4). The WRSA layouts were designed with the following basic criteria:

- Depending on the potential to generate acid, waste will be segregated into three categories: overburden, NPAG waste rock, and PAG waste rock.
- PAG material will be encapsulated within the WRSA, beneath a 5-m cap of NPAG cover material with some overburden. The intention is that the active zone will remain within the NPAG cover and will not penetrate into the PAG material, which will ultimately remain permanently frozen. A waste rock disposal schedule was developed to confirm there will be sufficient run-of-mine (ROM) NPAG material to achieve the 5-m cap over the PAG waste. There will be minimal rehandling of waste rock during Closure to place the NPAG cover over the PAG materials.
- Overburden on the Property is considered NPAG material, and as such may be segregated for use as a cover material. Overburden which is not structurally suitable (e.g., high silt content) will be co-disposed with waste rock, with ultimate placement at least 20 m from the outer edge of the WRSAs to maintain overall pile stability.
- PAG material has been shown to not react rapidly and thus the need for placing the PAG to achieve seasonal freeze back is not mandatory. As such, placement of PAG material can be driven by reasonable operational lift thicknesses, as defined by hauling equipment.
- Waste rock storage areas will be located to minimize flow-through drainages, and diversions will be constructed to minimize surface runoff entering WRSAs.
- Some PAG material will be placed underground as backfill for ground stability, which will provide containment and ultimate freeze back of the backfilled waste material.

Approximate dimensions for the four WRSAs at the end of Operations are provided in Appendix B, Table B-012.

The waste rock disposal criteria, specifically the PAG waste rock disposal criteria, was developed based on thermal models that considered average freezing and thawing depths of waste rock calculated using climactic inputs from representative regional climate stations, thermistors installed on-site, and typical material parameters. The active freezing layer depth of the storage areas ranges from approximately 1.3 to 4.2 mbgs; due to the presence of salinity of some surficial groundwater, the active layer may take up to 60 days to refreeze in some areas.

PAG and NPAG waste rock will be placed in lifts in a "bottom-up" approach in order to maximize stability and promote aggradation of permafrost. The Umwelt, Llama, and TSF WRSAs will be stockpiles constructed with final overall slopes at 3H:1V, and Echo WRSA will have final overall slopes of 2.4H:1V. The WRSAs are expected to be stable over the long-term, and no additional regrading will be carried out at Closure. It is anticipated that the surface of the facilities will revegetate naturally over time.

All WRSAs will be fully constructed and covered with NPAG material by the end of Year 6 such that final reclamation can be undertaken progressively before the end of the Operations Phase.

Geochemical evaluations suggest that runoff from WRSAs during Operations will likely exceed MMER Schedule 4 limits for arsenic and copper (SRK, 2015c). It is expected that the final WRSAs will be frozen except for an active layer within the NPAG cap. Once the WRSAs are capped and permafrost has aggraded into the PAG rock, water quality is expected to improve to acceptable limits for discharge. Since the final covers will be applied during the Operations Phase, it will be possible to monitor the aggradation of permafrost and improvements in the quality of runoff through the Operations and Closure phases. Runoff and seepage management is described in Section 5.2.9.

Further details on permanent closure requirements for the WRSAs are described in Section 5.2.3.4 and Section 5.2.3.5. Refer to the Mine Waste Rock Management Plan (SD-08) for further details on waste rock scheduling and possible contingency measures.

5.2.3.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance surface areas of the Umwelt, Llama and Echo waste rock storage facilities are located on land. Waste rock from the Goose Main Pit is addressed with the TSF in Section 5.2.4.2. The pre-disturbance site conditions based on baseline data collection programs are summarized in Section 3. Appendix A, Figure A-10 presents an aerial photo of the proposed mine site area taken in 2013.

The existing conditions at the WRSA sites are the same as the pre-disturbance conditions.

A description of site conditions at the end of Operations are provided in Section 5.2.3.1. The ultimate mine development of the Goose Property is shown on Appendix A, Figure A-02. Once closure and remediation activities are complete, the natural re-vegetated WRSAs will be new features on the landscape, as shown on Appendix A, Figure A-09.

5.2.3.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the WRSAs are listed in Appendix B, Table B-013.

5.2.3.4 Consideration of Closure Options and Selection of Closure Activities

As part of the FEIS, a comprehensive Waste Management Multiple Accounts Analysis (MAA) report on the mine waste rock and tailings disposal alternatives was prepared. The detailed report was included as an appendix to the Information Request Responses (Sabina 2016). The criteria used to evaluate the alternatives included closure considerations such as management of ARD/ML potential and landowner opinion and relative preferences. The waste rock management presented in this document is the one recommended in the MAA report.

The proposed 5 m NPAG waste rock cover has been selected based on thermal modelling and water quality predictions carried out to date to assess the chemical stability of the WRSAs in the short and long terms (including long-term predictions of climate change). In the unlikely event that ore stockpiles are present at closure, the ore will be relocated to WRSAs or left in place; in either instance the remaining ore would be capped with NPAG waste rock. The cover design will be confirmed in the next phases of design and during Operations as the covers will be progressively placed.

Construction/development of WRSAs with long-term stable slopes is the most appropriate closure plan for physical stability. No other options were considered.

5.2.3.5 *Engineering Work Associated with Selected Closure Activity*

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

As mentioned in Section 5.2.3.1, the WRSAs will be fully developed by Year 6. A small volume of waste rock will be required as backfill for underground operations in Years 6 to 10, but otherwise, final NPAG waste rock capping can be carried out during the Operations Phase as a progressive reclamation measure.

PAG and NPAG waste rock will be placed concurrently during Operations such that there is a 5-m cover of NPAG waste rock surrounding and over the final PAG waste rock-containing core. A disposal plan has been developed that maximizes the placement of NPAG waste rock over final PAG lifts during mine operations by using NPAG waste rock sourced directly from the open pits. This approach will reduce the amount of dedicated capping that will be required, both during Operations (as progressive reclamation) and in the Closure phase. Overburden will have been co-disposed in the WRSAs and a portion may also be used for capping material.

Based on thermal models, the active layer depth of the WRSAs will range from approximately 1.3 to 4.2 mbgs; the active layer may take up to 60 days to refreeze in some areas.

The WRSAs are expected to be stable over the long-term, and no additional re-grading will be carried out at closure. It is anticipated that the surface of the facilities cover will be naturally revegetated over time.

Runoff and seepage management from the WRSAs is described in Section 5.2.9.

5.2.3.6 Predicted Residual Effects

The WRSAs will be permanent features on the landscape. The vegetation communities which formerly occupied the areas will be permanently lost but it is expected that the native vegetation community will revegetate the WRSA cover surfaces over time.

No significant long-term effects were identified for the WRSAs as part of the FEIS. The Post-Closure impacts of these features are expected to be negligible.

5.2.3.7 Uncertainties

The following uncertainties have been identified during closure planning of the WRSAs, in particular those associated with the Llama and Umwelt deposits which are larger:

Permafrost Development

The thermal conditions within the WRSAs and the performance of the closure cover 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 each WRSA to monitor the rate of freeze back and permafrost development progress in the facilities during the Operations Phase. The locations for the thermistors and monitoring schedule will be determined during the final detailed design stage and confirmed during Operations.

Revegetation Considerations

Active revegetation of the Property as part of closure is not planned given the cold climate setting of the Project as well as the precedents that have been established for mine closure in Nunavut. Additional research in this field may be considered in future iterations of the Plan.

5.2.3.8 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 5.2.1.8 along with the reporting requirements. The following presents the relevant post-closure monitoring and maintenance strategies for the WRSAs:

- periodic inspections will be performed by a geotechnical engineer to visually assess stability and performance of the WRSAs (including the TSF embankments);
- ground conditions in the WRSAs will be monitored to confirm permafrost conditions are being established as predicted;
- thermistor data will be monitored to determine thermal conditions within the WRSAs to confirm predicted permafrost aggradation/encapsulation;
- water quality and water volumes from controlled discharge points around the WRSAs will be monitored to confirm that drainage is performing as predicted and is not adversely affecting the environment; and
- any water discharge areas that were not anticipated will be identified and monitored for seepage volume and quality.

Ground temperature and water quality monitoring will be undertaken at each WRSA throughout Closure. Further details on the contact water management system in closure is presented in Section 5.2.9.

5.2.3.9 Contingencies

It should be noted that conservative estimates of NPAG to PAG ratios were used for designing of WRSAs and for predicting water quality of seepage and runoff. A geochemical model will be developed during Operations to refine water quality predictions for the WRSAs prior to Closure.

Cover design will be confirmed through further modelling and through monitoring of temperatures, completion of energy balance on model inputs during the freeze-back period, permafrost aggradation, active layer thaw in waste rock storage areas, etc. Since the final covers will be applied during the Operations Phase, it will be possible to monitor the aggradation of permafrost and improvements in the quality of runoff through the Operations and Closure phases. While it is expected that the WRSAs will be substantively closed during Operations, a monetary allowance has been made to account for some final WRSA capping.

5.2.4 Tailings Management Facilities

5.2.4.1 Project Component Description

The tailings management system will entail deposition of 19.8 Mt of tailings at three separate locations. The tailings from the initial two years of production will be deposited in a purpose-built Tailings Storage Facility (TSF) located about 2 km south of the Goose Main Pit. Tailings deposition will then transition to in-pit deposition into the mined-out Umwelt Pit (referred to as Umwelt Tailings Facility [Umwelt TF]) for a period of about four years. Finally, tailings deposition will be moved to the mined-out Goose Main Pit (referred to as Goose Main TF), for deposition during the remaining four years of the mine life.

A description of the three tailings management facilities is provided below. The dimensions of each tailings management facility are summarised in Appendix B, Table B-014. See Section 5.2.9 for water management system details. Further details on permanent closure requirements for the TSF and TFs are described in Section 5.2.4.4 and Section 5.2.4.5.

Tailings Storage Facility / Waste Rock Storage Area

Design of the TSF was based on experience from numerous mines which have operated, or currently operate, tailings facilities in cold regions under severe winter (freezing) conditions. From these operational mine experiences, design and operating considerations have been developed for the Project, which include:

- The tailings storage surface will be shaped during summer tailings deposition to provide a winter pond that can be maintained "localized" on the west side of the facility (see details in Section 5.2.9).
- The potential for dust generation can be exacerbated during cold winter conditions as a “freeze drying” process tends to destroy capillary tensions in partially saturated sand materials, making it more susceptible to dusting. Appropriate provisions will be required to prevent dusting, such as covering tailings with a water cover, increasing the freeboard height or installing sediment control fencing along the embankment crests downwind of the prevailing wind.

The TSF will store tailings solids and process water as well as waste rock from the Goose Main Pit. The TSF will be situated south of the Goose Main Pit, and will be composed of two embankments:

- the TSF Containment Dam will be a 1,744-m long embankment at its centerline, 14 m high; this will be situated at the very north end of the facility and will be oriented east-west; and
- the South Dike will be a 200-m long embankment at its centerline, with a maximum height of 3m; this will be situated at the very south end of the facility.

The TSF Containment Dam will be constructed as a frozen foundation rockfill dam (built from ROM NPAG waste rock) with a geosynthetic liner. The liner will be frozen into the key trench permafrost; thermal modelling has confirmed that, over the life of the structure, the foundation will not thaw deep enough to compromise this seal.

A seepage analysis through the TSF liner was completed, which concluded that, if the TSF was at full supply level, seepage of up to 1,210 m^3/year could occur. Seepage will be collected using a downstream berm with an impermeable liner keyed into the permafrost. Depending on the quality of the water, seepage may be directed to sumps from where it will be pumped back into the TSF or discharged to the environment, as appropriate (see Section 5.2.9 for details).

Tailings geochemical characterization confirms that the tailings are PAG, albeit with very slow reaction rates. It also indicates that most of the tailings are metal leaching, with the exception of some samples from the Goose Main deposit. Exposed tailings beaches are likely to be an ongoing source of sulphate and arsenic leaching, and if they are left exposed for an extended period of time (estimated to be decades), pH changes may result in increased concentrations of other trace elements. However, the development of acidic conditions is expected to be delayed considerably by the cold temperatures, with the alkalinity from the deposition of fresh tailings helping to maintain neutral pH conditions (Geochem Characterization Report, FEIS Appendix V2-7D).

The TSF will be converted to a WRSA in Year 2 (TSF WRSA), once use of the Umwelt TF for tailings disposal has been initiated and the supernatant water has been drained from the TSF. The TSF WRSA will be a waste rock storage area created on and around the pre-existing TSF. The placement of the waste rock at the TSF WRSA along with the closure measurements will be as described in Section 5.2.4.5; a 5 m NPAG cover will be progressively placed over the PAG rock and tailings in the facility to encapsulate these materials and to promote freezing conditions. The TSF WRSA will be closed out by completing the NPAG cap and by pumping out the TSF WRSA collection pond into Goose Main TF for treatment.

Once closure criteria are met, the TSF WRSA diversion berms will be breached and water will be allowed to flow to the Goose Main TF.

Umwelt and Goose Main Tailings Facilities

Once the deposition of tailings at the Umwelt TF has ceased, the Umwelt TF will be allowed to flood with water from precipitation, runoff and groundwater inflows, and it is expected that water quality will meet closure criteria without treatment (SRK, 2015c).

At Closure, Goose Main TF will contain tailings, water from precipitation, runoff and groundwater inflows, and also water pumped during operations from Umwelt TF and the TSF WRSA pond. Water will be treated until closure criteria for water quality are met, which is expected to be in Year 17.

Once closure criteria are met at each of these tailings facilities, spillways will be excavated and water will be allowed to flow to the environment.

With Llama Lake already considered for use as a temporary saline water holding pond at the beginning of Operations, and considering that Llama Lake is connected to the already affected Umwelt pit, Sabina may opt to also use Llama Reservoir/OP as a contingency for tailings or waste rock management.

5.2.4.2 Pre-Disturbance, Existing, and Final Site Conditions

The TSF WRSA is the only facility at the Goose Property which is on crown land (as opposed to IOL). The majority of pre-disturbance surface area of the TSF WRSA is located on land; however, four small ponds and streams also exist within the future TSF WRSA footprint. The pre-disturbance site conditions based on baseline data collection programs are summarized in Section 3. Appendix A, Figure A-10 presents an aerial photo of the proposed mine site area taken in 2013.

The existing conditions at the TSF WRSA areas are the same as the pre-disturbance conditions. The existing conditions at the Umwelt TF and Goose Main TF are also the same as the pre-disturbance conditions, as mentioned in Section 5.2.1.2.

A description of site conditions at the end of Operations are provided in Section 5.2.4.1. The TSF WRSA Pond is described in Section 5.2.9. The ultimate mine development of the Goose Property is shown on Appendix A, Figure A-02. Once closure and remediation activities are complete, the natural revegetated TSF WRSA and flooded TFs (as mentioned in Section 5.2.1.2) will be new features on the landscape, as shown on Appendix A, Figure A-09.

5.2.4.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the TF and TSF WRSA are covered under Appendix B, Table B-09 and Appendix B, Table B-013, respectively.

5.2.4.4 Consideration of Closure Options and Selection of Closure Activities

As part of the FEIS, a comprehensive Waste Management Multiple Accounts Analysis (MAA) report for the mine waste rock and tailings disposal alternatives was prepared. The detailed report was included as an appendix to the Information Request Responses (Sabina 2016). The criteria used to evaluate the alternatives included closure considerations such as management of ARD/ML potential and landowner opinion and relative preferences. The tailings management plan presented in this document is the one recommended in the MAA Report.

The current state of technology for tailings disposal indicates the most commonly used disposal options are conventional slurry tailings, thickened tailings, paste tailings, and filtered tailings. The current alternatives analysis concluded conventional slurry tailings is the most appropriate method for the Project, with an expected solids content of about 50%. Filtered (i.e., “dry stack”) tailings was not considered in this analysis because the process grind size is 50 microns, making it impractical to filter the tailings. Thickened and paste tailings were excluded due to the higher complexity associated with water management and challenges of such complex water management in the Arctic environment.

Placement of waste rock over the decommissioned TSF is beneficial in that it will prevent erosion, reduce oxygen flux to the tailings and will promote aggradation of permafrost into the tailings. The use of water covers over the tailings placed in the Umwelt TF and the Goose Lake TF will prevent wind erosion and will limit oxygen flux to the tailings. Furthermore, the depth of the water covers will be sufficient to reduce wave erosion of the placed tailings.

5.2.4.5 Engineering Work Associated with Selected Closure Activity

Guidance on engineering options or strategies for closure of TSF and TFs are provided in MVLWB/AANDC (2013). The relevant engineering works associated with the permanent closure activities for these facilitates are discussed below.

The Tailings Storage Facility (TSF) will be closed out by removing the tailings discharge infrastructure upon reaching TSF capacity and switching to tailings storage in Umwelt TF in Year 3. The TSF will then be converted to a WRSA. Waste rock will be placed into the TSF WRSA until the end of open pit mining in Year 6. A 5 m NPAG cover will be progressively placed over the PAG rock and tailings in the facility. The TSF WRSA will be closed out by completing the NPAG cap and by pumping out the TSF WRSA collection pond into Goose Main TF for treatment. Once all the water in the TSF WRSA collection pond has been pumped into the in Goose Main TF, pumping infrastructure will be dismantled and landfilled, and the remaining portion of the TSF dam which has not been covered with NPAG waste rock will be breached by excavating a spillway in the left abutment, thereby directing flow towards Goose Main TF. This is expected to occur in Project Year 18.

The Umwelt Tailings Facility (Umwelt TF) will be closed by actively pumping water into Goose Main TF until the end of Operations. Water quality modelling completed during the FEIS indicated that, if allowed to flood in Closure, water quality in Umwelt TF will meet closure criteria without treatment (SRK, 2015c). Therefore, during the Active Closure Stage, Umwelt TF pumping infrastructure will be dismantled and Umwelt TF will be allowed to flood during the Closure Phase. Umwelt TF will be breached at its northwest side at Post-Closure, leaving a minimum water cover depth of at least 5 m over the tailings.

Goose Main Tailings Facility (Goose Main TF) will be closed by removing tailings deposition infrastructure during Operations and by actively treating the water in the TF until it meets closure criteria. Goose Main TF will contain water from Umwelt TF, Goose Main TF, and the TSF WRSA Pond at Closure. Water will be pumped from Goose Main TF to the WTP, and treated water will be pumped back to Goose Main TF in a parallel pipeline. Once closure criteria for water quality is met in Goose Main TF, which is expected to be in Year 17, pipeline infrastructure will be maintained as a contingency until flooding of the TF is complete. Pipeline infrastructure would then be dismantled and landfilled, and Goose Main TF will be breached on its northeast side. The expected residual depth of water cover over the tailings in the TF is at least 5 m.

It is anticipated that recirculation treatment during the open water season at a rate of 8,500 m^3/d will continue from Goose Main TF until Year 17. Under average hydrologic conditions, the Goose Main TF is predicted to overflow in Year 17 and water quality monitoring has confirmed that SSWQO's have been met (Appendix E-1 of the MAD). The Closure Phase may be extended if SSWQO's are not satisfied, thus necessitating further treatment. Once closure criteria for water quality is met in Goose Main TF, pipeline infrastructure will be dismantled and landfilled, and Goose Main TF will be breached on its northeast side.

5.2.4.6 Predicted Residual Effects

The Umwelt TF and Goose Main TF are addressed in Section 5.2.1.6. The TSF WRSA will be a permanent feature on the landscape. The vegetation communities which formerly occupied the TSF WRSA area will be permanently lost but it is expected that the native vegetation community will naturally revegetate the TSF WRSA cover over time.

No significant long-term effects were identified for the TSF WRSA as part of the FEIS. The post-closure impacts of these features are expected to be negligible.

5.2.4.7 Uncertainties

The uncertainties identified during Closure planning for the TFs and the TSF WRSA are presented in Sections 5.2.1.7 and 5.2.3.7, respectively.

5.2.4.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall Post-Closure monitoring and maintenance program for the Project are discussed in Section 5.2.1.8 along with the reporting requirements. The relevant Post-Closure monitoring and maintenance strategies for the TFs and TSF WRSA are presented in Sections 5.2.1.8 and 5.2.3.8, respectively.

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

5.2.4.9 Contingencies

As described in Sections 5.2.1.9 and 5.2.3.9 for the TF and TSF WRSA, respectively.

5.2.5 Buildings and Equipment

The main supporting facilities for the proposed Project development described in the following sections include:

- Goose Property: explosives and ammonium nitrate storage facility; fuel tank farm; maintenance and service buildings; laydown area including heated, unheated and outdoor storage; operations center at the airstrip; Goose camp; two water intakes; potable water treatment facility; diesel power plant and power utility building; and machinery and mobile equipment.
- MLA: floating terminal barge; explosives and ammonium nitrate storage pad; fuel storage facility; maintenance and service buildings; laydown area; MLA camp; modular desalination water treatment system; diesel power plant and power utility building; and machinery and mobile equipment.

The Process Plant is addressed in Section 5.2.6. Buildings and equipment related to waste and domestic wastewater management are addressed in Section 5.2.8. See Appendix A, Figure A-02 and Figure A-03 for Project infrastructure locations.

5.2.5.1 Project Component Description

Floating terminal barge

Incoming ships and barges to MLA will be self-sufficient for offloading cargo. Lightering barges will be used to transfer cargo from the vessel to the lighter barge terminal at the MLA barge landing area. The terminal barge is designed to be removed at the end of each sea-lift season and reinstalled prior to the arrival of the first sea-lift vessel the following year.

Explosives and ammonium nitrate storage

The main storage of ammonium nitrate will be located at the Goose Property at the AN Facility laydown pad. A temporary storage area (for transit) will also be developed at the MLA. Packaged explosives and explosive detonators will be stored in approved explosive magazines located on separate pads at the Goose site. No packaged explosives will be stored at the MLA. Bulk AN will be stored in one-tonne tote bags within seacans. Fuel oil will be stored in a 20,000-litre double-wall fuel tank also located on the AN Facility pad. ANFO required for mining will be manufactured in the AN Facility.

Fuel tank farms

There will be 75,000 L seacans situated throughout the Goose Property that will be utilized as day tanks at the underground mine portals, incinerator, Explosives Storage and ANFO Plant, boilers, and power plants. Fuel storage at the MLA will consist of a 60 ML tank farm (four steel tanks of 15 ML) and six 90,000 L seacans.

The fuel tank farms will be designed to have bermed spill containment and an impervious HDPE liner membrane. Fuel will be delivered to the MLA in the summer and transported to the Goose Property in the winter. The floating hose method will be used to transfer fuel to the o- land storage tanks.

Laydown areas

An estimated 30 and 20 hectares of laydown areas will be required at the Goose Property and at the MLA, respectively, to store equipment, materials and supplies for the Project. In addition, small laydown areas will be located in the vicinity of each portal to the underground workings, for temporary stockpiling of

waste rock prior to use as backfill material. By the end of Operations, all waste rock on these laydown areas will have been hauled back underground.

Laydown areas will be constructed with run-of-quarry rock placed directly onto the tundra to preserve the permafrost. As per the road construction, a layer of graded surfacing material will be placed to provide a protective trafficking layer.

Accommodation Camps

The Goose Property accommodations will expand from the 146-person existing exploration camp to include a new camp located at the Goose Plant Site to accommodate the expected 465 people required for the Operations Phase. The 465-man camp used during the Operations Phase will be decommissioned during the Active Closure Stage, and replaced with a 20-man camp for on-going closure activities.

A new 75-person seasonal camp will be established at the MLA for the Operations Phase.

Potable water treatment facilities

Freshwater required for the Goose Camp will be pumped from Big Lake. The domestic (potable) water supply will be treated and disinfected. The treatment plant will consist of multimedia filtration and activated carbon filtration, followed by UV disinfection and chlorination.

Water for the MLA camp will be drawn from Bathurst Inlet and a desalination facility will be constructed as part of the Project.

Diesel power plant

A single power plant will be used to meet the electrical power demand necessary to support the complete Goose Property operation including the underground mines. The main power plant will consist of a bank of three 6.6 MW plus two 5.1 MW diesel generators which will provide redundancy through an N+1 configuration. In order to maximize overall efficiency and energy conservation, the power plant will operate as a combined heat and power plant. Only the airstrip will have a back-up generator.

Power at the MLA will be generated on-site with the use of three 500 kW diesel generators. In order to maximize overall efficiency and energy conservation, this power plant will also operate as a combined heat and power plant.

Other power equipment and materials including oil-filled transformers will be drained and disposed of on-site. The transformer oil will be incinerated on-site or removed for off-site disposal with other hazardous wastes (Section 5.2.8).

Machinery and mobile equipment

The main production equipment and earth-moving machinery that will be used during Operations includes various drills, hydraulic shovels, loaders, haulage trucks, forklift, fuel truck, lube trucks, water truck, dozers, surface graders, shotcreting machine, portable welder, light duty service trucks, and mobile pit dewatering pumps. A fleet of mobile site support equipment is utilized to provide support to operations at each of the sites. Equipment lists are provided in the FEIS Volume 2, Section 7.3.

5.2.5.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance surface areas of all buildings and equipment are located on land. The pre-disturbance site conditions based on baseline data collection programs are summarized in Section 3. Appendix A, Figure A-10 and Figure A-11 present aerial photos of the proposed Goose Property and MLA, respectively, taken in 2013 and 2012.

The existing exploration camp and supporting facilities, listed in Section 4.4, are located at the future Goose Main laydown area and the Goose Main portal. The existing site disturbance area is 3 ha. The existing conditions at all other buildings and laydown areas are the same as the pre-disturbance conditions.

A description of site conditions at the end of Operations are provided in Section 5.2.5.1. The ultimate mine development of the Goose Property and MLA are shown on Appendix A, Figure A-02 and Figure A-03, respectively. Once closure and remediation activities are complete, there will be no new features on the landscape of either Project sites as a result of buildings and laydown areas, as shown on Appendix A, Figure A-08 and Figure A-09, respectively.

5.2.5.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the buildings and equipment are listed in Appendix B, Table B-015.

5.2.5.4 Consideration of Closure Options and Selection of Closure Activities

An option at the end of Project life is for part, or all, of the infrastructure to remain in place for other use. Sabina will consider transferring the facilities to a third party should there be such interest. The Plan assumes that all infrastructure associated with the Project will be removed.

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. Equipment not required for Post-Closure activities will be landfilled or removed from the site. Buildings will be demolished and buried in a landfill.

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.

- The salvage value of equipment and machinery is expected to be limited due to the remoteness of the site and consequently, high backhaul transport costs. As such, it has been assumed that all buildings, machinery, and equipment will be disposed of in an on-site landfill when they are no longer needed and after any hazardous material has been removed.
- Sabina will consider transferring the facilities to a third party should there be such interest.
- Equipment used for closure activities and long-term maintenance (e.g., trucks, backhoes, etc.) will be disposed once they are no longer required. Most of the mobile equipment will be disposed once the closure stage is complete. A small subset of equipment will be retained on-site for the Post-Closure Phase.

- Fluid hydrocarbons drained from equipment will be burned in generators or incinerated where approved. Other fluids will be removed from site for recycling or disposal at a licenced facility.
- Above grade concrete structures will be demolished to ground level and broken up, and the rubble will be disposed of in an on-site landfill. Concrete slabs on grade will be perforated and covered with waste rock or overburden. Rebar will be cut so that it is flush with grade and cut rebar will be disposed of in an on-site landfill. Subgrade concrete structures will be infilled with NPAG waste rock, if needed.
- Developed areas at each of the Project sites will be re-graded and contoured to remove uneven ground for public and wildlife safety, to reduce the potential for erosion, and to blend with the surrounding landscape. Cover materials may be required for erosion and dust control. It is anticipated that a succession of native plant species will naturally re-vegetate the surface over time.
- Any unused petroleum products will be burned in the generators or incinerated where approved. Unused chemicals will be sold, returned to suppliers or shipped offsite for disposal at a licensed facility
- All hazardous wastes will be removed from the site and transported to a licenced facility for disposal.
- Explosives and inert components still in their original packing may be returned to vendors for restocking, if economic to do so. All other explosives will be used up or destroyed on-site.
- Fuel tanks will be steam cleaned, cut up, and landfilled. The rinse water will be treated before disposal.
- An assessment will be carried out to identify areas where soils may be contaminated by hydrocarbons; contaminated soils will be excavated and hauled to the landfarm area for remediation.
- Fuel not required during the closure and reclamation activities will be sold, returned to suppliers, or incinerated.
- A new 20-man camp will be established to support ongoing activities during the Passive Closure Stage and Post-Closure Phase.

5.2.5.6 Predicted Residual Effects

There will be no permanent features on the landscape of either the Goose Property or MLA as a result of buildings and laydown areas. 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; however, the disturbed surfaces are expected to naturally re-vegetate over time.

No significant long-term effects were identified for buildings or laydown areas as part of the FEIS. The post-closure impacts of these features are expected to be negligible.

5.2.5.7 Uncertainties

Grading and contouring would be done at the reclaimed facility areas, where appropriate, to control soil stability and to promote revegetation by natural colonization.

Active revegetation of the Project sites as part of Closure is not planned given the cold climate setting of the Project as well as the precedent established for mine closure at other sites in Nunavut. Additional research in this field may be considered in future iterations of the Plan.

5.2.5.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall Post-Closure monitoring and maintenance program for the Project are discussed in Section 5.2.1.8 along with the reporting requirements. The following presents the relevant post-closure monitoring and maintenance strategies for the supporting buildings and equipment (guidance on generic monitoring and maintenance programs for Closure and Post-Closure is provided in MVLWB/AANDC [2013]):

- Periodic inspections will be performed to visually assess the reclaimed areas.
- All buildings left on-site during Closure will be maintained until they are no longer required, after which they will be demolished and disposed of in an on-site landfill.
- Mobile equipment left on-site during Closure will be maintained until they are no longer required, after which they will be landfilled or removed from the site.

5.2.5.9 Contingencies

Wherever possible, mobile equipment will be salvaged and shipped off-site for reuse. Likewise, materials will be sold and shipped off-site for scrap where possible. Given the remoteness of the site, the extent of such salvage and scrap sales is expected to be limited by economics. Once mobile equipment has been drained of fluids, they may be disposed of in one of the flooded open pits in the event the landfill active at Closure is at capacity.

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

5.2.6 Mine Infrastructure

Aside from the buildings and laydown areas discussed in Section 0, the key mine infrastructure at the Goose Property will include: ore stockpiles, a crusher plant, and a Process Plant.

5.2.6.1 Project Component Description

Ore will be hauled from the open pit and underground mines to the Process Plant, and sorted based on ore grade into one of three stockpiles: low grade (LG), mid-grade (MG), or high grade (HG). The three stockpiles will be located on the same pad northwest of the Process Plant. At the end of Operations, all ore stockpiles will be processed at the Process Plant. Foundation design of the ore stockpiles will follow the site-wide infrastructure foundation design criteria to achieve short- and long-term thermal stability of underlying permafrost.

Ore will be fed by front end loader from the stockpiles to the primary crusher, a vibrating grizzly - primary jaw crusher system. The size of the ore will be further reduced in secondary crushing circuit using a cone crusher. The resulting fine ore will be transported in a covered conveyor to the enclosed Fine Ore Stockpile. Reclaim belt feeders located underneath the fine ore stockpile will draw material from the stockpile to onto a covered conveyor, which feeds the Process Plant. Crushing and screening operations will be conducted in fully enclosed units to prevent dust dispersion.

The ore will be ground in a ball mill and a fine ore mill. After crushing and grinding, gold will be recovered by leaching followed by a carbon-in-pulp (CIP) circuit. The gold recovery will continue with carbon elution, electrowinning and smelting to produce gold bullion.

The Process Plant has been designed to process 6,000 t/d of ore and it will include a cyanide detoxification plant that will reduce the cyanide concentration in tailings prior to release to the tailings facilities. Sodium metabisulphite (SMBS) will be fed into two agitated tanks to produce SO_2, which will

be sparged into the bottom of the tanks before the slurry reports to the final tailings tank. The cyanide detoxification tanks will be located outdoors.

The reagents used in the process will include:

CIP and Gold Recovery:

- slaked or hydrated lime ($Ca(OH)_2$);
- sodium cyanide (NaCN);
- activated carbon;
- sodium hydroxide (NaOH);
- lead nitrate ($PbNO_3$);
- hydrochloric acid (HCl);

Cyanide Destruction:

- sodium metabisulphite (SMBS);
- copper sulphate ($CuSO_4$);
- slaked lime ($Ca(OH)_2$);

Others:

- flocculant; and
- anti-scalant.

All the reagents will be prepared in contained areas in proximity to the points of application but also close to available storage for the feed stock.

5.2.6.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance surface areas of all supporting mine infrastructure are located on land. The pre-disturbance site conditions based on baseline data collection programs are summarized in Section 3. Appendix A, Figure A-10 presents and aerial photos of the proposed mine site area taken in 2013.

The existing conditions are the same as the pre-disturbance conditions.

A description of site conditions at the end of Operations are provided in Section 5.2.6.1. The ultimate mine development of the Goose Property is shown on Appendix A, Figure A-02. Once closure and remediation activities are complete, there will be no new features on the landscape as a result of supporting mine infrastructure, as shown on Appendix A, Figure A-09.

5.2.6.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the mine infrastructure are listed in Appendix B, Table B-016.

5.2.6.4 Consideration of Closure Options and Selection of Closure Activities

Refer to Section 5.2.5.4.

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.

- The salvage value of components and materials is expected to be limited due to the remoteness of the site. As such, it has been assumed that all mine infrastructure components and materials will be disposed of in an on-site landfill at Closure.
- Sabina will consider transferring the facilities to a third party should there be such interest.
- Above grade concrete structures will be broken up and the rubble will be disposed of in an on-site landfill. Concrete slabs on grade will be perforated and covered with waste rock or overburden. Rebar will be cut so that it is flush with grade and cut rebar will be disposed of in an on-site landfill. Subgrade concrete structures will be infilled with NPAG waste rock, if needed.
- Developed areas at the Goose Property and MLA will be regraded and contoured to remove uneven ground for public and wildlife safety, to reduce the potential for erosion, and to blend with the surrounding landscape. Cover materials may be required for erosion and dust control. It is anticipated that a succession of native plant species will naturally revegetate the surface over time.
- Any unused petroleum products will be burned in the generators or incinerated where approved. Unused chemicals will be sold, returned to suppliers or shipped offsite for disposal at a licensed facility.
- All hazardous wastes will be removed from the site and transported to a licenced facility for disposal.
- An assessment will be carried out to identify areas where soils may be contaminated by hydrocarbons; contaminated soils will be excavated and hauled to the landfarm area for remediation.
- Fuel not required during the closure and reclamation activities will be sold, returned to suppliers, or incinerated.

5.2.6.6 Predicted Residual Effects

There will be no permanent features on the landscape of the Goose Property as a result of supporting mine infrastructure. 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; however, the disturbed surfaces are expected to naturally revegetate over time.

No significant long-term effects were identified for supporting mine infrastructure as part of the FEIS. The post-closure impacts of these features are expected to be negligible.

5.2.6.7 Uncertainties

Refer to Section 5.2.5.7.

5.2.6.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall Post-Closure monitoring and maintenance program for the Project are discussed in Section 5.2.1.8 along with the reporting requirements. The following presents the post-closure

monitoring and maintenance strategies for the mine infrastructure (guidance on monitoring and maintenance programs for Closure and Post-Closure is provided in MVLWB/AANDC [2013]):

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

5.2.6.9 Contingencies

Wherever possible, process equipment will be salvaged and shipped off-site for reuse. Likewise, materials will be sold and shipped off-site for scrap where possible. Given the remoteness of the site, the extent of such salvage and scrap sales is expected to be limited by economics.

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

5.2.7 Roads and Airstrips

The Project sites will be accessible year-round through air transportation. There is an existing all-weather airstrip at the Goose Property that will be extended for continued use. The MLA will be serviced by an ice strip in the winter and by float plane in the open water season, so there will not be an airstrip at the MLA. Freight will be brought in by sea during the summer and hauled over an ice road to the Goose Property during the winter. See Section 4.1 for further details on Project sites access.

5.2.7.1 Project Component Description

The existing all-weather exploration airstrip at the Goose Property will be upgraded for use during Construction and Operations. The proposed upgrade mainly entails extending the airstrip from the current length of 914 m to 1,524 m and widening the airstrip from the current 30 m to 45 m. It will be equipped with lights, communications equipment, and instrumentation in accordance with appropriate Federal regulations. The airstrip will include an operations center and stand-alone power supply (generator including back-up), as described in Section 5.2.5.1. During Operations, up to four fixed wing aircraft flights are expected per week which will decrease during the Closure and Post-Closure phases. Up to three fixed wing aircraft flights are expected per week during the Closure Phase, decreasing to once per month during the summer months in the Post-Closure Phase.

Freight and fuel will be transported from the MLA to the Goose Property annually on the WIR. It is expected that vehicle traffic will begin in January and end in April annually. The WIR will be approximately 160 km long and travel over 42% land and 58% water. An emergency shelter will be located mid-way along the length. The WIR will be designed to the following general criteria (informed by expertise from other winter roads in the area including the Tibbitt-Contwoyto Winter Road):

- Project Development Area: 200 m wide corridor (100 m to each side of road centerline);
- road width:
  - land: 10 m;
  - water: 30 m, typically but as required depending on ice quality, length of season, amount of snow drifting, etc.;
- maximum grade: 5%; and
- design vehicle: Super B-train - legal highway load capacity.

Construction of the WIR is not anticipated to require quarry material. Should quarry material be required, the development and subsequent reclamation of quarries along the WIR would be subject to regulatory approvals, and are assumed to be consistent with activities presented in Section 5.2.10 of this Plan. The

site roads within the Goose Property and MLA will be constructed as all-weather roads. Goose Property will have 4 km of service roads and 9 km of haul roads. The MLA will have 1.35 km of service roads and no haul roads. Construction materials will be sourced from locally developed geochemically suitable locations. Rock will be placed directly onto the tundra to preserve the permafrost, and a layer of graded surfacing material will be placed to provide a protective trafficking layer. Haul roads will be constructed in accordance with mine haul road specifications, which require safety barricades. Roads will be utilized for Sabina operations and not for public use.

5.2.7.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance site conditions based on baseline data collection programs are summarized in Section 3. Appendix A, Figure A-10 and Figure A-11 present aerial photos of the proposed Goose Property and MLA, respectively, taken in 2013 and 2012. In particular, the creek which flows from Gander Pond to Goose Lake, located between the Echo area and the airstrip at the Goose Property, includes fair spawning and good rearing habitat for Arctic Grayling and was rated as important overall.

The existing on-site roads, listed in Section 4.4, and the existing airstrip at the Goose Property currently occupy approximately 3.5 ha of land. The rest of the road areas at both Project sites and the airstrip expansion area at the Goose Property are the same as the pre-disturbance conditions.

A description of site conditions at the end of Operations is provided in Section 5.2.7.1. On-site access roads would require crossing of the Gander Outflow and installation of a culvert. The ultimate mine development of the Goose Property and MLA are shown on Appendix A, Figure A-02 and Figure A-03, respectively. Once closure and remediation activities are complete, there will be no new features on the landscape of either the Goose Property or MLA as a result of roads and airstrips, as shown on Appendix A, Figure A-08 and Figure A-09, respectively.

5.2.7.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the transportation routes are listed in Appendix B, Table B-017.

5.2.7.4 Consideration of Closure Options and Selection of Closure Activities

An option at the end of Project life is for part, or all, of the infrastructure to remain in place for other use. Sabina will consider transferring the facilities to a third party should there be such interest. The Plan assumes that all roads and airstrip associated with the Project will be decommissioned.

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 roads and airstrip are discussed below.

- Once the all-weather roads are no longer required for Closure and Post-Closure activities, the culverts will be removed from and the natural drainage will be restored.
- The remaining all-weather road sections (with no culverts) will be scarified, but will otherwise remain intact to ensure preservation of permafrost.
- The airstrip will remain functional with a gravel surface for use during post-closure monitoring. Final closure of the airstrip will be similar to the all-weather roads.
- It is anticipated that a succession of native plant species will naturally revegetate the roads and airstrip surface over time.

5.2.7.6 Predicted Residual Effects

As discussed in Section 5.2.7.5, the granular fill from the airstrip and the roads will be scarified and left in place. The granular fill pads will remain as permanent features on the landscape at both the Goose Property and the MLA. Changes to aquatic habitat caused by water crossings could result in some alteration or loss of some aquatic populations; however, the disturbed surfaces are localized and are expected to regenerate over time. Changes to terrain caused by the construction and subsequent reclamation of the Goose airstrip could result in some alteration or loss of plant populations and plant communities; however, the disturbed surfaces are expected to naturally revegetate over time.

No significant long-term effects were identified as part of the FEIS for roads and the airstrip. The post-closure impacts of these features are expected to be negligible.

5.2.7.7 Uncertainties

Active revegetation of the Project Sites as part of closure is not planned given the cold climate setting of the Project as well as the precedents established for mine closure at other sites in Nunavut. Additional research in this field may be considered in future iterations of the Plan.

5.2.7.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring and maintenance program for the Project are discussed in Section 5.2.1.8 along with the reporting requirements. The following presents the post-closure monitoring and maintenance strategies for the transportation routes (guidance on generic monitoring and maintenance programs for Closure and Post-Closure is provided in MVLWB/AANDC [2013]):

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

5.2.7.9 Contingencies

There are no activities proposed as contingencies for the closure of the roads and airstrip.

5.2.8 Waste Management Sites

5.2.8.1 Project Component Description

The waste management infrastructure at the Goose Property will consist of:

- a sewage treatment plant;
- an incinerator for combustion of nonhazardous and combustible wastes;
- a landfarm for the treatment of contaminated soils, ice and snow;
- a waste sorting facility;
- landfills for disposal of non-hazardous solid wastes; and
- a hazardous waste storage area.

The waste management infrastructure at the MLA will consist of:

- Pacto or incinerating toilets;
- an incinerator for combustion of nonhazardous and combustible wastes;
- a landfarm for the treatment of contaminated soils, ice and snow;
- a waste sorting facility; and
- a hazardous waste transfer laydown area.

Sewage at the Goose Property will be treated using a packaged Wastewater Treatment Facility (WWTF), such as a Membrane Bioreactor, or similar. The WWTF will be located in the Goose Plant Site area and, during Construction, effluent will be discharged to the tundra (see Appendix A, Figure A-02); during Operations, effluent will be discharged to the active tailings facility. During Closure and Post-Closure, the Goose Camp will convert to Pacto or incinerating toilets and effluent discharge will not be necessary. Sludge will be incinerated or landfilled.

The waste management philosophy on-site will be to reduce, reuse, recycle or recover material where practical. Non-salvageable, non-degradable solid waste material generated during Construction, Operations, and Closure will be disposed of in inert, non-hazardous solid waste landfills within the Umwelt WRSA and TSF WRSA. Approximately 5,000 t of non-hazardous waste is expected to be disposed of in the landfills over the mine life, including Closure (Waste Management Plan). As the various WRSAs are closed progressively during Operations, some of the landfills within them may also be closed, if they have reached capacity. Additional closure landfills could be established within other WRSAs, if an alternative location is more suitable or if the Operations Phase landfills reach capacity. The landfills will be closed by applying a 5 m cover of NPAG waste rock as a final cover. Non-hazardous waste may also be deposited within the open pits, covered with granular day cover material if needed and then flooded with at least 5 m of water.

An industrial incinerator will be located at each of the Goose Property and the MLA. Incinerators selected for the Project will incorporate technologies capable of satisfying the criteria set forth in Environment Canada's Technical Document for Batch Waste Incineration (EC 2010). The incinerator will accept waste such as organic matter, containers and wrappings, medical waste, and used oils and waste fuel.

Hazardous waste will be hauled to the MLA and later backhauled by sealift during the open water season to authorized waste disposal areas in southern Canada (Hazardous Materials Management Plan). A 5,000 m^2 dedicated lined storage pad will be constructed at the MLA to receive and temporarily store hazardous wastes pending the sealift. All waste material will be handled, stored and transported in accordance with the Canadian and Territorial waste regulations. Hazardous waste will include the following:

- lubricants, etc.: lubricants, greases, antifreeze, and solvents used for equipment operation and maintenance, used oil and fuel filters, used sorbents and rags, hydraulic fluid;
- waste process plant consumables: sodium cyanide, sulphur (or metabisulphide), hydrochloric acid, lime, flocculants, and anti-scalants used in mineral extraction;
- waste explosives: ammonium nitrate and high explosives used for blasting in the mine;
- laboratory wastes: various by-products classified as hazardous waste and chemicals used in the assay laboratory; and
- other wastes such as solvents, paints, fluorescent light tubes, batteries, medical waste and kitchen grease.

Hydrocarbon contaminated soil, snow, and ice will be treated within dedicated landfarms to be located at both the Goose Property and MLA. Landfarming is a widely used bioremediation treatment that uses naturally occurring microorganisms to metabolize and breakdown petroleum hydrocarbons in soils. The Goose landfarm will be located adjacent to the Goose Plant Site. The MLA landfarm will be located at the construction laydown area. The landfarm at the Goose Property will consist of three soil cells and one snow/ice cell so that soil can be segregated and treated based on level on petroleum hydrocarbon (PHC) impact. The landfarm at the MLA Property will consist of one soil cell and one smaller snow/ice cell. The facilities will be bermed and lined with an HDPE liner. The berm height will be approximately 1.5 m above the bottom of the treatment area. A rock structural pad will be constructed below the landfarm cells. Non-woven geotextile fabric will be placed on either side of the liner, with compacted granular fill also placed above and below the liner to protect it from tears.

Soil will be considered remediated and removed from the landfarm when sampling demonstrates that soils meet Nunavut's Environmental Guideline for Site Remediation (Government of Nunavut, 2010). At the Goose Property, the remediated soil may be used for construction of the WRSAs cover if needed or disposed of in one of the non-hazardous solid waste landfills. At the MLA, the remediated soil may be used for closure site grading.

5.2.8.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance surface areas of the waste management facilities at both Project sites are located on land. The pre-disturbance site conditions based on baseline data collection programs are summarized in Section 3. Appendix A, Figure A-10 and Figure A-11 present aerial photos of the proposed Goose Property and MLA, respectively, taken in 2013 and 2012.

The existing conditions at the waste management facilities at both Project sites are the same as the pre-disturbance conditions.

A description of site conditions at the end of Operations are provided in Section 5.2.8.1. The ultimate mine development of the Goose Property and MLA are shown on Appendix A, Figure A-02 and Figure A-03, respectively. The impact on the landscape of the landfills located within the WRSAs at the Goose Property are addressed in Section 5.2.3.2. Once closure and remediation activities are complete, there will be no other new features on the landscape of either the Goose Property or MLA as a result of the waste management facilities, as shown on Appendix A, Figure A-08 and Figure A-09, respectively.

5.2.8.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the waste management facilities are listed in Appendix B, Table B-018.

5.2.8.4 Consideration of Closure Options and Selection of Closure Activities

Refer to Section 5.2.5.4.

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 closure schedule will allow for substantial closure of landfills and removal of most hazardous materials off-site during the Active Closure Stage. The Project will continue for another 6 years of Passive Closure while treatment of the water in Goose Main TF continues and monitoring occurs. After closure

criteria have been met in Goose Main TF and the contingency period for water quality has finalized (WTP will be maintained for two additional water treatment seasons), a final decommissioning operation at the WTP and Closure camp will be required. The final camp, mobile equipment, pipelines, and pumping systems will require landfilling, and any remaining hazardous wastes will require removal from site. Post-Closure monitoring will continue in Year 19; however there is not expected to be significant landfilling necessary after Passive Closure concludes. If necessary, a designated area of the landfill will be maintained for Post-Closure activities and it will be closed when it is no longer required. The landfills at both Project sites will be covered with 5 m NPAG waste rock.

The landfarms at both Project sites will be managed as long as it is efficient for the overall Project closure activities and closure schedule. After removal of all remediated material and prior to closure and reclamation of each landfarm, the berm and base of will be sampled to determine if these soils are free from Petroleum Hydrocarbons (PHC) contamination. If the soils meet the required criteria, the landfarm area would then be regraded to confirm positive surface drainage. The HDPE liner will be left in place and covered with overburden. If they do not meet the required criteria, the landfarm will be covered with 2 m of waste rock or other material used for reclamation. The surrounding berm will be breached to avoid water accumulation on the landfarm.

Domestic waste will be burned in the incinerator located at each property during Operations and Closure as part of camp maintenance.

Used oils and waste fuel will be burned in the generators or incinerated if approved.

Hazardous wastes will be removed and shipped off-site for disposal at a licensed facility.

Developed areas at each of the Project sites will be regraded and contoured to remove uneven ground for public and wildlife safety, to reduce the potential for erosion, and to blend with the surrounding landscape. Cover materials may be required for erosion and dust control. It is anticipated that a succession of native plant species will naturally revegetate the surface over time.

5.2.8.6 Predicted Residual Effects

At the MLA, a closed landfarm will remain after Closure. At the Goose Property, non-hazardous landfills will remain; however these will be integrated into the closed, covered WRSAs. A closed, covered landfarm may also remain. Changes to terrain caused by the Construction and subsequent reclamation of the waste management facilities could result in some alteration or loss of plant populations and plant communities; however, the disturbed surfaces are expected to revegetate naturally over time.

No significant long-term effects were identified as part of the FEIS for the closure of waste management facilities. The post-closure impacts of these features are expected to be negligible.

5.2.8.7 Uncertainties

The length of time it will take to bio-remediate and treat materials in the landfarms is dependent on the final quantity of contaminated materials at closure. The landfarms at both Project sites will be managed as long as it is efficient for the overall Project closure activities and closure schedule.

Active revegetation of the Project sites as part of Closure is not planned given the cold climate setting of the Project as well as the precedent established for mine closure in Nunavut. Additional research in this field may be considered in future iterations of the Plan.

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 5.2.1.8 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 and Post-Closure will be maintained until they are no longer required; and
- visual observations will be completed periodically for cracking or slumping of the landfill cover and for underlying waste material pushing its way up through the cover.

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 Systems

5.2.9.1 Project Component Description

A site-wide water and load balance for the Goose Property is provided in Appendix E-2 and Appendix F-7 to the Main Application Document.

Freshwater Intake and Discharge Pipelines

At the Goose Property, water intake structures will be constructed in Goose and Big lakes to supply domestic, industrial, and process make-up water. An effluent discharge pipeline to Goose Lake will also be installed. The selected locations for these intake and discharge pipelines are deep and close to shore. These structures are expected to consist of an insulated PVC pipe installed into the lake on a small rockfill base to keep the pipe off the lake bottom. Washed, rock armour will be placed over the pipelines to provide ice scour protection. Insulated HDPE pipelines will convey all freshwater from the intakes to dedicated pumphouses for the Goose Process Plant and Goose Camp. A potable water treatment plant will be constructed at the end of the domestic supply pipeline.

At the MLA, ocean water will be drawn from Bathurst Inlet and will be desalinated using a reverse osmosis plant (or equivalent) to achieve appropriate criteria, to supply freshwater. The desalination facility will discharge brine as a by-product of the desalination process. Discharge of brine water from the desalination plant will meet the CCME salinity guideline for the protection of marine life and will not cause the salinity of the receiving environment to fluctuate by more than 10% of the natural expected salinity (CCME 2016).

Goose Property Water – Contact, Non-Contact, and Saline

Contact water is water that must be managed after being in contact with mine workings, ore or mine wastes. This includes discharges from the TSF, runoff from ore and waste rock storage areas, and water that has been pumped from open pits during mine operations. Details on water management along with expected water quality predictions for the open pits, and the TSF and the TFs during Operations and Closure are provided in Section 5.2.1 and Section 5.2.4, respectively.

Saline water stored in the Saline Water Pond (SWP) during Operations will generate sediments that will likely require management during Closure. During the Active Closure Stage, sediments that have

accumulated in the SWP will be tested and, if necessary, will be excavated and deposited in Goose Main TF once the SWP has been dewatered to the underground mines. The metals in the sediments will primarily be in the solid particles. Sediment solids excavated from the SWP and placed in Goose Main TF will settle once deposited. Based on average hydraulic conditions, Goose Main TF will take seven years to fill (i.e., the facility is expected to overflow to Goose Lake in Year 17). As such, the SWP sediments will have seven years to settle in the Goose Main TF prior to discharge to the environment. Seven years is ample time for these solids to settle and/or be removed via treatment from the facility.

Goose Main TF water will be treated year-round during Operations (Year 7 to Year 10), and then seasonally for the Closure Phase (Year 11 to Year 17) until the TF overflows to Goose Lake in Year 17. Treated water will be recirculated back to Goose Main TF for the entire treatment period (approximately 11 years). The purpose of this water treatment is to remove copper, arsenic, and TSS from the Goose Main TF water prior to the facility overflowing to Goose Lake. The water treatment process is coagulation facilitated by adding ferric chloride. The ferric iron in the ferric chloride will precipitate as ferric hydroxide. Copper, arsenic, and suspended solids will adsorb to, become occluded within, or co-precipitate with, the iron hydroxide. Flocculent will be added to enhance settling. The iron hydroxides and the associated metals and sediments will then be separated from the influent by ballasted clarification. Treatment sludge will be landfilled on-site if sampling demonstrates that the sludge is not considered a hazardous waste; otherwise the treatment sludge will be shipped off-site for disposal at a licensed facility. Details of the water treatment strategy are provided in Table 5-1 of the Water and Load Balance Report (Appendix E-2 of the Main Application Document).

At the Goose Property, mine contact water will be treated to levels specified in the MMER or site-specific water quality objectives prior to release at the final discharge point. Sabina will meet water quality objectives for entry into receiving waters (Goose Lake). The water quality objectives will be consist with the Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME 2013) and SSWQOs developed in line with the CCME (2007) framework. Sabina committed to derive a SSWQO for arsenic and a memo has outlining proposed value for Arsenic has been provided in the Main Application Document, Appendix E-1. Sabina will be providing a SSWQO for copper in advance of the NWB technical meeting.

A summary of the mine water management infrastructure at end of Operations and throughout Closure is provided as follows.

- The Saline Water Pond will be dewatered by pumping into Llama, Umwelt, and Goose Main underground mines. The SWP will also be dewatered into the mined-out Llama pit. The SWP diversion berms and dams will then be breached allowing Umwelt Lake to re-establish.
- The Primary Pond, which will contain contact water from Umwelt Pit development, Ore Stockpile Pond, Umwelt WRSA and Llama WRSA will be breached once mining in Umwelt is complete and tailings deposition begins there allowing water to flow by gravity directly into the Umwelt TF.
- Various small ponds will exist at end of Operations as follows:
    - Llama WRSA Pond, located east of Llama Pit, upstream of the diversion berm;
    - Umwelt WRSA Pond, located east of the Umwelt U/G portal and laydown area;
    - Ore Stockpile Pond, located north of the ore stockpile;
    - Echo WRSA Pond, located north of the Echo U/G portal and laydown area; and
    - Echo Diversion Pond, a non-contact water pond, located south of the Echo Pit;
- Various culverts under haul roads and the Goose Airstrip.

Stream Diversions

The majority of Project infrastructure has been located to avoid fish bearing waters and, wherever possible, to avoid encroaching on freshwater fish habitat. Additional mitigation to avoid adverse effects on fish is required for streams that may experience reduced discharge resulting in the potential for increased fish and egg stranding. In these cases, all potential fish use (migration, spawning, rearing, and egg incubation) will be prevented by creating fish barriers at migratory pathways into channels prior to ice melt. This includes permanent barriers constructed at the following locations (Figure A-13):

- Umwelt Outflow at the limit of the southern flowing downstream end where the stream connects to eastern flows toward Goose Lake; and
- Goose Inflow East (GIE) at the downstream limit where the stream enters Goose Lake.
- Rascal Stream East (RSE): upstream of the airstrip culverts.

Blocking fish access to these locations will involve creating a permanent impassable fall or cascade barrier to prevent fish access to upstream water management areas.

Since fish passage will be blocked at GIE, adequate fish passage between Goose Lake and spawning habitat in upper Rascal Stream East will be maintained by constructing a permanent migratory Fishway, connecting the natural spawning habitat in upper Rascal Stream East to Gosling Pond 1; this is called the Rascal Stream East Fishway. The flow from Rascal Stream East into Gosling Pond 1 will be engineered such that flow is sufficient to promote migration through the entire route from the Gosling Ponds 1 and 2, through Gander Pond and ultimately to Goose Lake. Increasing flows from Rascal Lake to Rascal Stream East has the potential to divert flow away from the upper most section of Rascal Stream West, reducing suitable habitat in that stream under low flow conditions; this potential habitat loss will be offset as part of the Fish Offsetting Plan. Additional details are presented in the Water Management Plan (SD-05).

MLA Contact Water

The MLA does not require any ditches or ponds for water management purposes. Roads and pads will be designed to have runoff disperse as sheet flow to minimize channelized flow. As described in the Fuel Management Plan (SD-16), water which accumulates within the tank farm bund will be tested and then released on surface. Runoff from pads will discharge towards Bathurst Inlet along the same flow paths as the predevelopment topography. Site contact water that reaches the marine environment is predicted to meet the CCME water quality guidelines for the protection of marine aquatic life.

5.2.9.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance site conditions based on baseline data collection programs are summarized in Section 3. Appendix A, Figure A-10 and Figure A-11 present aerial photos of the proposed Goose Property and MLA, respectively, taken in 2013 and 2012.

The existing conditions at the water management areas are the same as the pre-disturbance conditions.

A description of site conditions at the end of Operations are provided in Section 5.2.9.1. The ultimate mine development of the Goose Property and MLA are shown on Appendix A, Figure A-02 and Figure A-03, respectively.

The flooded pits and WRSAs are addressed in Section 5.2.1.2 and Section 5.2.3.2, respectively. The permanent fish barriers, Rascal Stream East Fishway, and breached diversion/containment berms will be new features on the landscape as shown on Appendix A, Figure A-09. There will be no new features on

the landscape of the MLA as a result of water management facilities, as shown on Appendix A, Figure A-08.

5.2.9.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the water management facilities are listed in Appendix B, Table B-020.

5.2.9.4 Consideration of Closure Options and Selection of Closure Activities

Refer to Section 5.2.5.4.

Diversion structures will be required around the main facilities to divert non-contact water away from mining areas. This strategy will reduce the total amount of contact water generated by the Project. Mine water runoff management has been optimized based on the plans assessed in the FEIS. The management strategies will continue to evolve and will be finalized during detailed design.

5.2.9.5 Engineering Work Associated with Selected Closure Activity

Water management will be an important element of the Active Closure Stage at the Goose Property. Discharge infrastructure associated with the TSF will be decommissioned in Year 2, and capping of PAG rock with NPAG rock will be largely completed prior to cessation of mining as described in Section 5.2.4. Runoff collected in the TSF WRSA Pond will be pumped to Goose Main TF for treatment at the WTP throughout the Closure Phase until closure criteria are met. Pumping and pipeline infrastructure will then be dismantled and landfilled and the remaining portion of the TSF Containment dam that has not been covered with NPAG rock will be breached by excavating a spillway on the left abutment at the end of the Passive Closure Stage.

Water from Goose Main TF will be treated at the WTP for arsenic and copper during the Active and Passive Closure stages, with treated water being routed back to Goose Main TF, until closure criteria are met, as described in Section 5.2.1. Effluent treatment sludge from the WTP during the Closure Phase will be placed in the designated landfill if sampling demonstrates that the sludge is not considered a hazardous waste; otherwise the treatment sludge will be shipped off-site for disposal at a licensed facility. Pumping and pipeline infrastructure from the WTP will then be dismantled and landfilled once they are no longer required; as a contingency, the WTP will be maintained for two additional water treatment seasons after water quality from the mine site meets licence criteria for direct discharge which is expected to happen in Year 17. It is expected that approximately 23 Mm^3 of water will be treated from Goose Main TF in total during the Operations and Closure phases. Approximately 7.5 Mm^3 of water will be treated from Goose Main TF during the Closure Phase.

The Saline Water Pond (SWP) will be dewatered to multiple locations using separate pumping and pipeline infrastructure at the beginning of Active Closure; these locations include: the bottom of the Llama Reservoir, and the underground mine workings at Umwelt, Llama, and Goose Main. Once the SWP has been dewatered, sediments will be tested and if the chloride content is too high, it will be removed and placed in the Goose Main TF. The SWP diversion berms and dams will then be breached allowing Umwelt Lake to re-establish.

Upon decommissioning pumping and pipeline infrastructure during the Active Closure Stage, water management berms will also be breached in strategic locations to restore natural surface water drainages. Some berms, such as the main Llama non-contact water diversion berm, will be breached in four locations during the Operations Phase; however the majority of the diversion berms will be breached during Closure. Appendix B, Table B-021 outlines the berm/dam breaching schedule during the Closure Phase.

Llama, Umwelt, and Echo pits will be allowed to flood naturally in order to submerge as much of the pit walls as possible. Goose Main TF will be allowed to fill naturally once water quality has been improved through water treatment.

Throughout both the Active and Passive Closure stages, water quality monitoring will occur at strategic control points to ensure closure criteria are being met. Monitoring locations at flooding mined-out pits will include the closed-out Llama Reservoir, Umwelt TF, Echo Pit, and Goose Main TF. Monitoring will also occur in Goose Lake to ensure that discharge requirements are being met.

Breached diversion structures will remain in place during the Post-Closure Phase. Collection ponds will have been breached, liners removed and landfilled, and the areas re-contoured and armoured (if necessary) to allow for passive runoff.

At Closure, all pumphouses will be drained, decommissioned, and landfilled. All water intake and discharge pipelines will be cut at the shoreline, decommissioned, and landfilled (Goose Property) or removed from site (MLA). The pipelines extending into the water, along with the surrounding rock armour and rock bases, will be left in place and capped at the substrate so not as to disturb the in-water environment.

5.2.9.6 Predicted Residual Effects

No significant long-term effects were identified as part of the FEIS for the water management facilities but changes to terrain caused by the construction and subsequent reclamation of the facilities, including the residual breached diversion berms, could result in some alteration or loss of plant populations and plant communities; however, the disturbed surfaces are expected to revegetate naturally over time.

Flooded pits and WRSAs are addressed in Section 5.2.1.2 and Section 5.2.3.2, respectively. The permanent fish barriers, Rascal Stream East Fishway, and breached diversion/containment berms will be new features on the landscape as shown on Appendix A, Figure A-09. There will be no new features on the landscape of the MLA as a result of water management facilities, as shown on Appendix A, Figure A-08. The Post-Closure impacts of these features are expected to be negligible at both Project sites.

5.2.9.7 Uncertainties

Water quality modeling predicts that seasonal water treatment in the Goose Main TF will result in water quality that is suitable for discharge by Year 17. The actual time required may vary depending on actual water quality and treatment efficiency.

Active revegetation of the Project sites as part of Closure is not planned given the cold climate setting of the Project as well as the precedent established for mine closure in Nunavut. Additional research in this field may be considered in future iterations of the Plan.

Active water quality monitoring will occur at strategic control points during Operations to track trends in the site water quality and to provide additional information for future closure water quality prediction and planning modifications.

5.2.9.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring and maintenance program for the Project are discussed in Section 5.2.1.8 along with the reporting requirements. The following presents the post-closure monitoring and maintenance strategies for the water management facilities (guidance on generic monitoring and maintenance programs for closure and post-closure is provided in MVLWB/AANDC [2013]):

- surface and groundwater will be sampled if site-specific conditions dictate during the Closure Phase;
- water management points (including seepage) that were not anticipated will be identified and monitored;
- ongoing inspection and maintenance of passive or active water treatment facilities associated with non-compliant mine water or runoff discharge will be conducted;
- 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 it is no longer required on-site. Once water quality from the mine components meets licence criteria for direct discharge, the WTP will be maintained for two additional water treatment seasons (i.e., until Goose Main TF reaches capacity and overflows to the environment) as a contingency before being dismantled and disposed of in an appropriate landfill facility.

Water Flow

At select water crossings, pumping or siphoning may be employed to facilitate the transfer of water from one side of the structure to the other side. Pumping may be required at crossings where culverts were not installed, culverts were improperly installed, or culverts were installed with insufficient capacity. Pumping can also serve as a temporary solution during freshet or prior to a culvert installation.

5.2.10 Quarries and Borrow Sites

5.2.10.1 Project Component Description

At Goose Property, an estimated 5 Mt of aggregate will be required for construction. Of this 5 Mt, 1.5 Mt will be required to construct the Main TSF Dam and 3.5 Mt will be required for the other Goose infrastructure, including:

- Haul roads connecting to mine workings;
- Pads for mine infrastructure and laydown;
- Goose Airstrip (upgrade of existing exploration airstrip);
- Tailings Storage Facility;
- Fuel storage and other containment areas; and
- Water management berms and structures.

During the 2013 season, rock material was quarried from a site approximately 750 m west of the existing Goose Exploration Camp for the construction of some of the existing exploration facilities listed in Section 4.4. Specifically, the material was used for: expansion of the all-weather airstrip, expansion of the fuel storage facility and surfacing of the all-weather road that connects the Goose Exploration Camp to the airstrip. All other facilities existed on-site prior to 2013 and quarry material from the Airstrip Quarry was

not required for their development. It is estimated that there are approximately 550,000 m^3 (1.5Mt) of available material remaining within this quarry area, 125,000 m^3 of which is currently permitted (permit KTP11Q001). This quarry, which is referred to as the Airstrip Quarry, will be expanded from the currently permitted 0.36 ha to approximately 10 ha, and for construction of the facilities located at the Goose Property. Figures of existing and proposed quarries can be found in the Borrow Pits and Quarry Management Plan (SD-03).

Additional material necessary for construction will be sourced from the cut/fill balance of the Goose Plant Site area and from open pit mining. Quarrying of the Umwelt Pit will begin in Year -3. Overburden removal will occur during the preparation of mining and construction activities. The site overburden material and excavated material will either be handled as run of mine waste and stored in WRSAs, or it will be segregated and used where possible in reclamation activities.

At the MLA, an estimated 1.3 Mt of aggregate will be required for construction of service roads, laydown pads, infrastructure foundations, and fuel storage and other containment areas. All of this material will be sourced from the excavation for the fuel storage laydown foundation. Cut material will be used to fill all other infrastructure areas.

During the life of the Project, it could become necessary to develop additional borrow areas and rock quarries. These will be determined and approved as needed and all will meet the requirements of the Borrow Pits and Quarry Management Plan (SD-03).

Borrow areas and quarry sites will be operated and closed as per the Borrow Pits and Quarry Management Plan (SD-03). A setback of at least 31 m will be established between the quarry operations and associated workings and any local waterbody. Quarry operations will likely use explosives, and blasted rock will be loaded into haul trucks using either a loader or a hydraulic shovel/excavator. The run of quarry (ROQ) material will then be hauled to the construction area, dumped, and placed using a tracked dozer and/or a motor grader. Some of the ROQ will be moved to a crusher to produce aggregate of various sizes. The crusher will be offset from local waterways and may be shielded from the prevailing wind. All final borrow areas and quarry sites will be graded to drain and will not result in topographic low points.

5.2.10.2 Pre-Disturbance, Existing, and Final Site Conditions

The pre-disturbance surface areas of the quarries are located on land. The pre-disturbance site conditions based on baseline data collection programs are summarized in Section 3. Appendix A, Figure A-10 and Figure A-11 present aerial photos of the proposed Goose Property and MLA, respectively, taken in 2013 and 2012.

The Airstrip Quarry is an expansion of the existing quarry located directly northeast of the Echo WRSA. The existing site disturbance area is 0.36 ha. The existing conditions at all other borrow pits and quarries are the same as the pre-disturbance conditions.

A description of site conditions at the end of Operations are provided in Section 5.2.10.1. The ultimate mine development of the Goose Property and MLA are shown on Appendix A, Figure A-02 and Figure A-03, respectively. The footprints of the Umwelt Quarry and cut and fill locations at the MLA will have been used for other Project facilities during Operations, and are addressed in previous sections. Once closure and remediation activities are complete, the excavated areas will be contoured and they will be graded so that they drain naturally, as shown on Appendix A, Figure A-09 and Figure A-08, respectively.

5.2.10.3 Closure Objectives and Criteria

The closure objectives and closure criteria for the quarries and granular borrow sites are listed in Appendix B, Table B-022.

5.2.10.4 Consideration of Closure Options and Selection of Closure Activities

If not properly reclaimed, wildlife may be injured by steep slopes in borrow or quarry 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. Such measures may include flattening steep slopes, constructing boulder walls and re-contouring reclaimed areas to reduce hazards to wildlife.

5.2.10.5 Engineering Work Associated with Selected Closure Activity

The relevant engineering works associated with the permanent closure activities for the quarries and granular borrow sites are discussed below. While reclamation and closure will depend on the individual site conditions and may commence prior to the end of mining, proposed closure activities for quarries and granular borrow pits will generally include the following:

- All mobile and stationary equipment will be removed;
- An excavator will be used to trim and flatten any backslopes;
- When Operations are complete, the overall reclamation objective for the quarry/borrow areas is to return the site to a condition that blends in with the existing topography and surrounding landscape. It is anticipated that a succession of native plant species will naturally revegetate the surface over time.
- Final closure of the quarry areas will include water quality monitoring. Since no extraction will occur below water level and the areas will be contoured to drain positively, there will be no residual ponds once the sites are closed.

5.2.10.6 Predicted Residual Effects

Development of borrow pits and quarries will form depressions in the landscape at both the Goose Property and MLA; however these areas will be contoured and graded to drain positively. 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; however, the disturbed surfaces are expected to revegetate over time.

No significant long-term effects were identified as part of the FEIS for the borrow pits and quarries. The post-closure impacts of these features are expected to be negligible.

5.2.10.7 Uncertainties

Samples will be collected for geochemical testing during quarry operations to confirm the material will be suitable for construction.

Active revegetation of the Project sites as part of Closure is not planned given the cold climate setting of the Project as well as the precedent established for mine closure in Nunavut. Additional research in this field may be considered in future iterations of the Plan.

5.2.10.8 Post-Closure Monitoring, Maintenance, and Reporting

The overall post-closure monitoring and maintenance program for the Project are discussed in Section 5.2.1.8 along with the reporting requirements. The following presents the post-closure monitoring and maintenance strategies for the quarries and granular borrow sites:

- periodic inspections will be performed to visually assess the reclaimed areas; and
- all quarries and granular borrow sites will be maintained until they are no longer required.

5.2.10.9 Contingencies

In addition to the sampling and testing that will be required to identify and segregate NPAG quarry rock for use in construction, further QA/QC sampling and testing will be completed to verify that the geochemical characteristics of quarry rock used in construction are within expected ranges. Should acid-generating bedrock be exposed, this material will either be handled as with all other PAG waste rock on-site, or, if left in place at the end of quarry operations, these areas will be covered with a minimum of a 2 m thick layer of non-acid generating soil or rock.

Quarry material is currently intended to be withdrawn from both the Umwelt Pit area (Umwelt Quarry) and the Airstrip Quarry. In an effort to reduce the Project footprint, Sabina will try to minimize the use of the Airstrip Quarry where feasible and source NPAG material from active mining areas and the Plant Site.

6. 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 ongoing operation of the mine. Progressive reclamation can be initiated during the mine operations once a particular activity has been completed (e.g., the TSF, quarries and borrows), or when the facilities no longer serve a purpose (e.g., starting to flood disused underground mine workings and open pits). Progressive reclamation is defined as the opportunistic reclamation activities completed during the operational phase of a project before permanent closure (MVLWB/AANDC, 2013). Progressive reclamation can increase efficiencies by utilizing available mining resources to conduct reclamation activities during the revenue-generating phase of the Project. Progressive reclamation typically reduces risks, final closure costs, and the time frame for achieving closure objectives.

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 progressive reclamation activities provided in this ICRP will be updated in future versions to include new opportunities for progressive reclamation identified during Operations.

6.2.1 Open Pits and Tailings Facilities (TFs)

Following completion of mining at each of the open pits, progressive reclamation will commence. In summary, the progressive closure measures for each pit or TF are as follows:

- **Llama Reservoir** – In Year 4, the exhausted Llama Pit will be converted to a water reservoir. Water from the Saline Water Pond will be pumped into Llama Reservoir between Year 4 and Year 9. The Llama Reservoir will continue to passively flood with site runoff and direct precipitation through the remainder of Operations and into the Closure Phase, reaching capacity in about Year 12.
- **Umwelt TF** – After open pit mining of the Umwelt Pit concludes, it will be used to store tailings from Year 3 to Year 6. Umwelt TF will then passively flood with site runoff and direct precipitation through the remainder of Operations and into the Closure Phase, reaching capacity in about Year 13.
- **Goose Main TF** – Mining of the Goose Main Pit will conclude in Year 6 and it will then be used for tailings disposal from Year 7 until the end of mining (Year 10). Goose Main TF will then passively flood with site runoff and direct precipitation through the Closure Phase, reaching capacity in about Year 17.
- **Echo Pit** – Once mining of the Echo Pit concludes in Year 5, dewatering will continue until Year 9 (i.e., the end of Echo U/G mining) as the two mines will be connected. Starting in Year 10, Echo Pit will passively flood with site runoff and direct precipitation through the remainder of Operations and into the Closure Phase, reaching capacity in Year 14.

In addition, the following generic reclamation activities will occur:

- Establishing partial or full boulder fences around open pits and TFs, where physical barriers are required to reduce the likelihood of entry by people or animals;
- Installing proper signage around mine openings and TFs; and
- Constructing open pit outflow structures, where necessary.

Boulder fencing and signage are not necessary in areas that do not represent a physical hazard, such as pit walls that will be submerged after flooding. The engineering works presented in Section 5.2.1.5 will be carried out to the extent possible prior to Closure.

6.2.2 Underground Mines

Underground workings will be backfilled with waste rock during the mining process for underground support and to reduce the quantity of exposed PAG waste rock on surface. Once underground mining and backfilling is complete, the remaining void volume will be filled with water as follows:

- **Llama U/G** – In Year 5, the exhausted Llama U/G will be flooded with water pumped from the Saline Water Pond, with saline water pumping occurring within approximately one year.
- **Umwelt U/G and Goose Main U/G** – In Year 10, the exhausted Umwelt U/G and Goose Main U/G will also be flooded with water pumped from the Saline Water Pond, with complete flooding occurring within less than one year.
- **Echo U/G** – In Year 10, the exhausted Echo U/G will be passively flooded with site water, including water from the Echo Pit, which will be connected to the Echo U/G. Complete flooding is expected to occur within a few months.

The engineering works presented in Section 5.2.2.5 will mainly be carried out during progressive reclamation.

6.2.3 Waste Rock Storage Areas (WRSAs)

PAG waste rock within the WRSAs, including the TSF WRSA, will be progressively capped using NPAG waste rock and overburden sourced from adjacent or nearby active open pit operations. All WRSAs will be fully developed by the end of Year 6, such that the final cover of NPAG over PAG waste rock can be completed during the Operations Phase. Application of a final cover over PAG waste rock using NPAG waste rock and overburden from active pit operations represents the most substantial progressive reclamation effort proposed. As such, the engineering works presented in Section 5.2.3.5 will mainly be carried out during progressive reclamation.

6.2.4 Tailings Storage Facility (TSF)

Tailings deposition in the TSF will cease in Year 2 of Operations. Tailings in the TSF will be progressively capped using PAG rock during waste rock deposition in the converted TSF WRSA. Ultimately, a 5 m NPAG cover, composed of NPAG rock and overburden, will be placed over the tailings and PAG rock. The NPAG rock will originate from active open pit mining activities, which cease in Year 6. As such, the engineering works presented in Section 5.2.4.5 will mainly be carried out during progressive reclamation, with the exception of water management facilities.

This covering of the TSF WRSA, along with all WRSAs, represents the most substantial progressive reclamation effort proposed.

6.2.5 Buildings, Equipment, and Infrastructure

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 Contaminated Materials and Waste Disposal

Materials (e.g., soil, snow, ice) that may become contaminated during Construction and Operations due to fuel or other spills will be cleaned up immediately following the spill. Soil will be remediated on-site in lined landfarms. Final disposal of remediated soil will be in a WRSA or other reuse on-site, if appropriate, once the soil meets Nunavut Site Remediation criteria for industrial land use. At the MLA, the remediated soil may be used for closure site grading.

Inert, non-hazardous landfills will be established within WRSAs at Goose Property during the Construction and Operations phases. As the various WRSAs are closed, so may some of the landfills within them, if they have reached capacity. The engineering works presented in Section 5.2.8.5 will be carried out to the extent possible prior to Closure.

Hazardous wastes will be shipped off-site periodically to reduce the amount of waste requiring removal at Closure.

6.3 COMPLETED PROGRESSIVE RECLAMATION

Progressive reclamation has not been carried out at either the Goose Property or MLA to date. Progressive reclamation measures will be considered successful if they are completed as described in this section and monitoring confirms that the completed work is consistent with the stated closure objectives.

7. Temporary Closure

Temporary closure (also termed Care and Maintenance) is defined as the cessation of mining and processing operations for a finite period of time with the intention of resuming operations upon resolution of the cause of the cessation (MVLWB/AADNC 2013). Possible reasons for implementing temporary closure measures include economic factors (severely depressed gold price, major mechanical failure, late delivery of critical supplies), environmental factors (investigation following unintentional discharge to the environment), or social factors (labour conflict). Temporary closure could last for several weeks or as long as several years depending on the nature of the contributing factor(s).

It is also possible that temporary closure could lead to permanent closure without resumption of mining. This unlikely event would be triggered by a commercial decision by Sabina not to continue operating. This decision would require the Final Closure Plan to be filed with the NWB, or a notification to the NWB that the company intends to execute the latest ICRP as its Final Closure Plan. Following any required NWB approval, the final closure and reclamation measures described in Section 5 would be executed.

The Project operations is planned to be continuous for the full proposed operating period. If temporary closure of the mine is needed, 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

Temporary closure is focused on the care and maintenance activities that are required during the cessation of a mining operation. Temporary closure could occur during the Construction or Operations phases for the Project and, as such, temporary closure activities are phase-dependent.

The overall objective of temporary closure is to ensure that the Project facilities are kept in a manner that is safe for humans, wildlife and the environment, and will include physically and chemically stabilizing mine components. The success of the temporary closure provisions will be monitored by conducting routine physical and chemical inspections. Additional details are provided in the following sections.

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. This includes potential for Planned Operational Shutdown as defined under the Wildlife Mitigation and Management Plan Program (FEIS Addendum, Sabina 2017).
- **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.

7.2.1 Short-term Temporary Closure

The following short-term temporary closure activities will be implemented as needed depending on the phase at which the cessation of Operations takes place.

- **Access and Security:** Adequate staffing levels will be maintained to carry out care and maintenance. Mechanical, hydraulic, and electrical systems will be locked out and maintained in a secure state (i.e., in a no-load condition) if they are not required to operate through the temporary closure phase. Mobile heavy equipment that is not required during temporary closure will be stored in appropriate areas in a no-load condition.
- **Mine Openings:** Warning signs will be posted around open pits and other mine openings. Mine openings will be barricaded.
- **Monitoring Programs:** All physical, chemical, and biological treatment and monitoring programs according to applicable management plans, water licenses, land use permits, and land lease conditions will be continued, if appropriate, in order to maintain compliance. Routine geotechnical stability monitoring and maintenance will continue at a reduced rate compared to that conducted during Operations. The details of any such monitoring will be communicated to the affected parties.
- **Hazardous Materials:** An inventory of hazardous materials will be completed, including process chemicals, reagents, and petroleum products. Fuel, lubricants, and hydraulic fluids will be removed from the open pit and underground areas and stored in designated areas. Hazardous materials and other chemicals will be properly stored or removed from site.
- **Bulk Fuel Storage:** Fluid levels in all fuel tanks will be recorded and the tanks will be routinely inspected for leaks or potential hazards.
- **Explosives:** Explosives will be relocated to the main magazine and secured, disposed of, or removed from site.
- **WRSAs and Stockpiles:** WRSAs and ore stockpiles will be maintained such that they are physically stable. The WRSAs and stockpiles will be routinely inspected to ensure their stability or to implement any required mitigation measures.
- **Water Management:** Surface water management measures, including mine dewatering, will continue through temporary closure, and will be monitored to ensure proper operation. Surface water quality will be monitored to ensure that regulatory requirements are being met. Depending on the stage at which temporary closure occurs, the water level in the active tailings facility at the time will need to be monitored, as there will be a net buildup of water because no water is being removed for processing. Any unused water distribution lines will be drained, but would be left in place.
- **Infrastructure:** Access roads will be maintained, including plowing snow from roads and the airstrip, repairing culverts, employing erosion and sediment control measures, etc. Infrastructure, including ditches and spillways, will be routinely inspected to ensure proper operation or to implement contingency measures. Camp facilities will be operated for reduced

staffing levels; however all camp facilities will be maintained. Critical facilities (plant and camp) will have nominal heat to prevent freezing of the facilities and possible damage.

7.2.2 Long-term Temporary Closure

In addition to the short-term closure activities presented previously, the following long-term temporary closure activities will be implemented as needed depending on the phase at which the cessation of Operations takes place.

- **WRSAs and Stockpiles:** WRSAs and ore stockpiles will be maintained such that they are physically stable. As the WRSAs will be designed and operated for long-term stability, it is anticipated that any grading required will be localized and minor. The WRSAs and stockpiles will be routinely inspected to ensure their stability or to implement any required mitigation measures.
- **TSF and/or TFs:** Minimum 0.75 to 1 m cover of non-potentially acid generating waste rock will be placed over the exposed tailings to control dust. Where feasible, a shallow water cover may be allowed to form as an alternative to a rock fill cover.
- **Water Management:** Depending on water levels, it may be necessary to begin pumping from the active tailings facility and treating the excess water for discharge. Surface water control structures will be maintained as required. Any unused water distribution lines will be drained.
- **Infrastructure:** Depending on circumstances, the decision may be made to not construct the WIR in a particular winter season. In such a case, access to the Goose Property would be via air only.

7.3 TEMPORARY CLOSURE MONITORING, MAINTENANCE, AND REPORTING

The numbers of personnel on-site would be reduced from operational levels. 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.

Programs will be conducted to monitor the physical and chemical stability of mine components, to maintain security of the site, to continue reclamation studies, and to carry out compliance and aquatic effects monitoring. Physical inspections will be conducted to ensure that infrastructure, including embankments, berms, dikes, access roads, surface water management measures, etc., are all performing as designed.

Monitoring, maintenance, and reporting records that will be kept include the following:

- Recordings of pond water levels and pumping volumes;
- Recordings of meteorological and hydrological data;
- Physical inspections of TSF embankments, pipelines, intake structures, and progressively reclaimed areas;
- Ongoing water quality monitoring (as prescribed in the Type A Water Licence and other applicable approvals);
- Regular site inspections by the Environmental Superintendent or designate for potential issues;
- Annual dam safety inspections of the TSF and physical inspections of the WRSAs by a qualified Geotechnical Engineer to observe that the embankments and stockpiles are performing as designed and that the TSF is being operated in accordance with the design intent;

- Ongoing maintenance of access roads;
- Enforcement of security and access protocols;
- Site inspections by the Environmental, Health and Safety (EHS) Coordinator to assess any less obvious signs of potential problems; and
- Detailed site inspections by the Environmental Superintendent or designate following any extreme events, including freshet. These inspections are needed to identify and assess any damage caused by erosion or settlement that requires attention.

The inspections will be formally recorded and will include details on the inspection results. A brief summary following each inspection will be provided to Sabina management in order to identify any urgent concerns or maintenance measures. Monitoring reports will be prepared to present the findings of the inspections in accordance with licence requirements. Recommendations for maintenance and any suggested modifications to the monitoring program will be included in the reports.

Physical and chemical monitoring and the associated maintenance activities will be conducted until the Project changes status by either resuming operation or advancing to final closure.

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 what time of year) and its duration, which are commonly uncertain. Therefore, the schedule for the activities presented in Section 7.2 would be developed as temporary closure advances. In summary, the sequence of activities for short-term and long-term temporary closure would 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 either secure these materials appropriately or remove them from site.
- Post warning signs and berms as needed around the open pit perimeters.
- 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. Section 8- Integrated Schedule of Activities

Mine closure is anticipated to be 13 years and consist of three periods:

- Active Closure [Phase 3, Stage 1] – Project Year 11 – 12, (i.e., two years after mining operations cease). During this time, active closure activities such as demolition, earth-moving, waste disposal, and rerouting of pipelines will occur. Water treatment will also occur during this time.
- Passive Closure [Phase 3, Stage 2] – Project Year 13 – 18, (i.e., six years following the Active Closure Stage) during which seasonal water treatment and monitoring will be the primary activities. A final demobilization and demolition of any remaining mine facilities will occur at the end of this stage in Year 18.
- Post-Closure [Phase 4] – Project Year 19+, (i.e., a period of time during which confirmatory water quality, stability, aquatic effects, and ecosystem monitoring will be conducted in order to ensure closure objectives have been met). This period is expected to be about five years.

In Project Year 13, once Active Closure has been completed at the Goose Property, a "CAT train" may be operated during the winter to remove any materials and equipment (including hazardous wastes) over the WIR to the MLA. A sealift from the MLA would occur the following summer to remove any hazardous materials and salvaged equipment that have been transported to the MLA.

From this point, for the Passive Closure Stage (i.e., Project Year 13 to Year 18), a smaller crew will occupy a small camp at the Goose Property to oversee seasonal water treatment operations. This camp will be supported entirely by aircraft instead of the MLA; this includes the delivery of fuel. After Year 18, when the closure objectives are achieved, it will be necessary to dispose of the pumping equipment, pipelines, the small fleet of mobile equipment, and the small camp. Remaining equipment will be landfilled at site or backhauled by air or CAT-trained to the MLA for subsequent sealift off-site.

The proposed preliminary closure schedule for the Project is presented in Appendix B, Table B-023. The schedule will be updated in subsequent Closure and Reclamation Plans but will generally follow the present outline.

9. Section 9- Post-Closure Site Assessment

As mentioned in Section 5.2.1.8, 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 mine facilities and to reduce any contamination on the site or in the adjacent area after mine operations cease. Monitoring during Operations and in Closure will: identify any 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.

Post-Closure monitoring is expected to be required for five years after completion of Active and Passive Closure activities in Year 18. Five years of Post-Closure monitoring has been selected at this stage of Project planning based on the following:

- The TSF will be decommissioned and converted into a WRSA after Year 2;
- All WRSAs will be fully constructed by the end of Year 6 and will be progressively reclaimed prior to the end of the Operations Phase;
- The TSF WRSA and other WRSAs will be frozen and covered with NPAG material; and
- The Closure Phase (inclusive of Active and Passive Closure stages) is sufficiently long as to have allowed for considerable post-closure monitoring prior to the formal 5-year Post-Closure Phase.

As discussed in Section 6.0, a number of project components will be closed out progressively during the Operations Phase or during the Active Closure Phase. At the end of the 5-year Post-Closure monitoring period, WRSAs will have been monitored for about 13years, and all pits/TFs will have been monitored for 9 years after passively filling, with the exception of the Goose Main TF, which will be treated and monitored until the end of the Passive Closure Phase (i.e., Year 18).

The proposed Post-Closure timeframe may be revisited in future versions of this plan. Post-Closure monitoring is expected to include:

- Geotechnical inspections of the TSF embankments, WRSAs, pit walls, and other areas for physical stability and to ensure that permafrost encapsulation of PAG waste rock and tailings is occurring as expected.
- Water quality sampling at mine effluent discharge locations in accordance with MMER discharge limits and applicable receiving water quality objectives.
- Final Environmental Effects Monitoring (EEM) studies in accordance with the water quality objectives needed to obtain status from Environment Canada as a recognized closed mine.

The Post-Closure Phase final discharge locations at the Goose Property are shown in Appendix A, Figure A-09.

Adaptive management is proposed through this ICRP. This includes:

- Carrying out Post-Closure monitoring beyond the stated 5-year Post-Closure monitoring period if closure objectives have not been met;
- Carrying out water treatment for longer (or shorter) time periods than initially planned should water quality not meet (or sooner meet) closure criteria within specific timeframes; and
- Modification to the Plan as a result of the findings of the reclamation studies identified in Appendix F.

10. Section 10- Financial Security

The NWB requires that, concurrent with a closure and reclamation plan, Sabina provide financial assurance intended to cover potential environmental liabilities associated with the Project. The principles regarding financial assurance for mine site reclamation are provided in MVLWB/AANDC 2013 and AANDC 2002.

Sabina has completed a permanent closure and reclamation financial security cost estimate to a conceptual level with the present mine layout and infrastructure, titled the Interim Closure Cost Estimate (Cost Estimate). The Cost Estimate covers the closure and reclamation of all Project facilities as described in this plan and was prepared using RECLAIM Version 7.0, March 2014, for permanent closure of the Project. The cost estimate is provided in Appendix G.

Any security associated with the proposed Development Works Type B Water Licence (8BC-BRP----) would be refunded to Sabina if this licence is incorporated in the Type A Water Licence upon issuance such that a "double bonding" for project activities of the same scope does not occur.

Sabina assumed that the associated financial security to the current Type B Licenses (2BE-GOO1520 and 2BE-GEO1520) for the Back River Project exploration and site preparation activities will be maintained under those water licenses.

11. Section 11- References

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Appendix A. Figures

105°0'0"W

N

Ekaluktutiak (Cambridge Bay)

Kugluktuk

Omingmaktok (Bay Chimo)

Kingaok (Bathurst Inlet)

Marine Laydown Area

Nunavut

Northwest Territories

Main Map

Goose Property Area

Yellowknife

1:7,000,000

68°0'0"N

Koignuk River

Angimajuq River

1:60,000

Tahikafalok Nahik (Propeller Lake)

Attituq (Goose Lake)

Tahikyuak (Big Lake)

1:85,000

67°0'0"N

Kingaok (Bathurst Inlet)

Ayapakpaktovik (Burnside River)

Marine Laydown Area

Queen Maud Gulf Watershed

George Exploration Camp

Goose Property Area

Hanningayok (Beechey Lake)

Back Watershed

66°0'0"N

Community/Settlement

Existing Exploration Camp

BIPR Winter Road Connector

Winter Ice Road

Watershed Boundary

Potential Development Area (PDA)

Water Shed Areas

(NWR, Sched. 4)

Queen Maud Gulf

Back

1:1,050,000

0 25 50

Kilometres

Projection: NTKP Lambert Conformal Conic

105°0'0"W

Figure A-01

Sabina GOLD & SILVER CORP.

General Project Site Layout Location Plan

425050 430050 435050

7270500

Goose PDA = 5,358 ha
Goose Infrastructure Footprint = 560 ha

- Culvert
- Existing Exploration Camp
- Treated Effluent Water Discharge
- Underground Portal
- 10 m Contour Interval
- Service Road
- Haul Road
- Water Diversion Structure
- Winter Ice Road
- Water Intake Pipeline
- Water Discharge Pipeline
- Airstrip
- Laydown Area
- Other Infrastructure
- Open Pit
- Camp/Plant Site
- Ore Stockpile
- TSF Containment Dam
- TSF South Dyke
- Tailings Storage Facility/ Waste Rock Storage Area
- Water Management Structure
- Landfarm
- Tailings Emergency Pond
- Potential Development Area (PDA)
- Inuit Owned Land (IOL)
- IOL and Crown Land Border
- Crown Land

1:32,500
0 0.5 1
Kilometres

Projection: NAD 1983 UTM Zone 13N

Mam Lake
Llama Lake
Llama Pit
Llama WRSA
Llama Portal
Primary Water Pond
Pipeline and Access Trail
Umwelt WRSA
Umwelt Pit
Umwelt Portal
AN Storage and AN Facility
Saline Water Pond
Water Intake Pipeline
Effluent Discharge Pipeline
Ore Stockpile
Goose Plant Site
Treated Effluent Water Discharge
Tahikyuak (Big Lake)
Giraffe Lake
Giraffe Outflow
Attituq (Goose Lake)
Tahikafalok Nahik (Propeller Lake)
Goose Outflow
Water Intake Pipeline
Goose Portal
Goose Main Pit
Echo WRSA
Gander Pond
Airstrip
Echo Portal
Echo Pit
Echo Lake
IOL
CROWN LAND
TSF WRSA Water Pond
TSF/TSF WRSA
Fox Lake
Rascal Lake

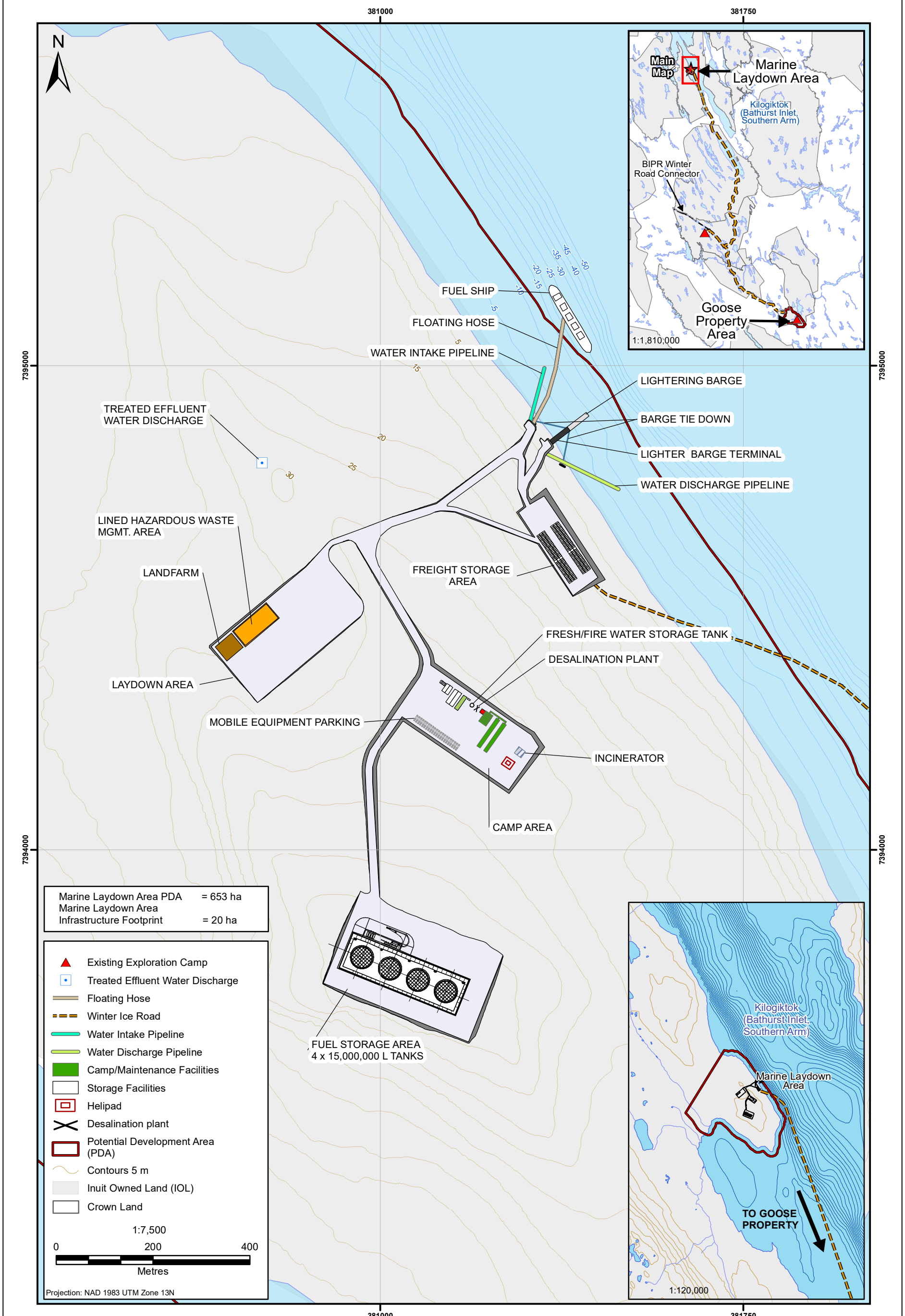
TO MARINE LAYDOWN AREA
Goose Property Area
IOL
CROWN LAND
1:270,000

Figure A-02

Sabina GOLD & SILVER CORP.

Goose Property
General Arrangment Plan at End of Project Operations

GIS # BR_FEIS_NA_tab_ICRP_MLASiteLayout_WL W:\BackRiver\04_Exploration\BackRiverRegion\GIS_Products\ESRI_MXD\Water_Permitting\BR_FEIS_NA_tab_ICRP_MLASiteLayout_WL.mxd September 25 2017



NOTE: All roads at the MLA are service roads

Sabina GOLD & SILVER CORP.

Figure A-03

Marine Laydown Area
General Arrangement Plan at End of Project Operations

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N

Marine Laydown Area

Bath

1:60,000,000

Tahikafalok (Bathurst Lake)

George

BACK RIVER

Tikigak

Boulder

Boot

WISHBONE

Wishbone

Tahikafolak Nahik (Propeller Lake)

Goose

Hanningayuk (Back River)

Del

Hanningauk (Beechey Lake)

Malley

Needle

Claim

Lease

Subsurface Rights

Surface

Surface and Subsurface

Waterbody

1:550,000

0 10 20

Kilometres

Projection: NAD 1983 UTM Zone 13N

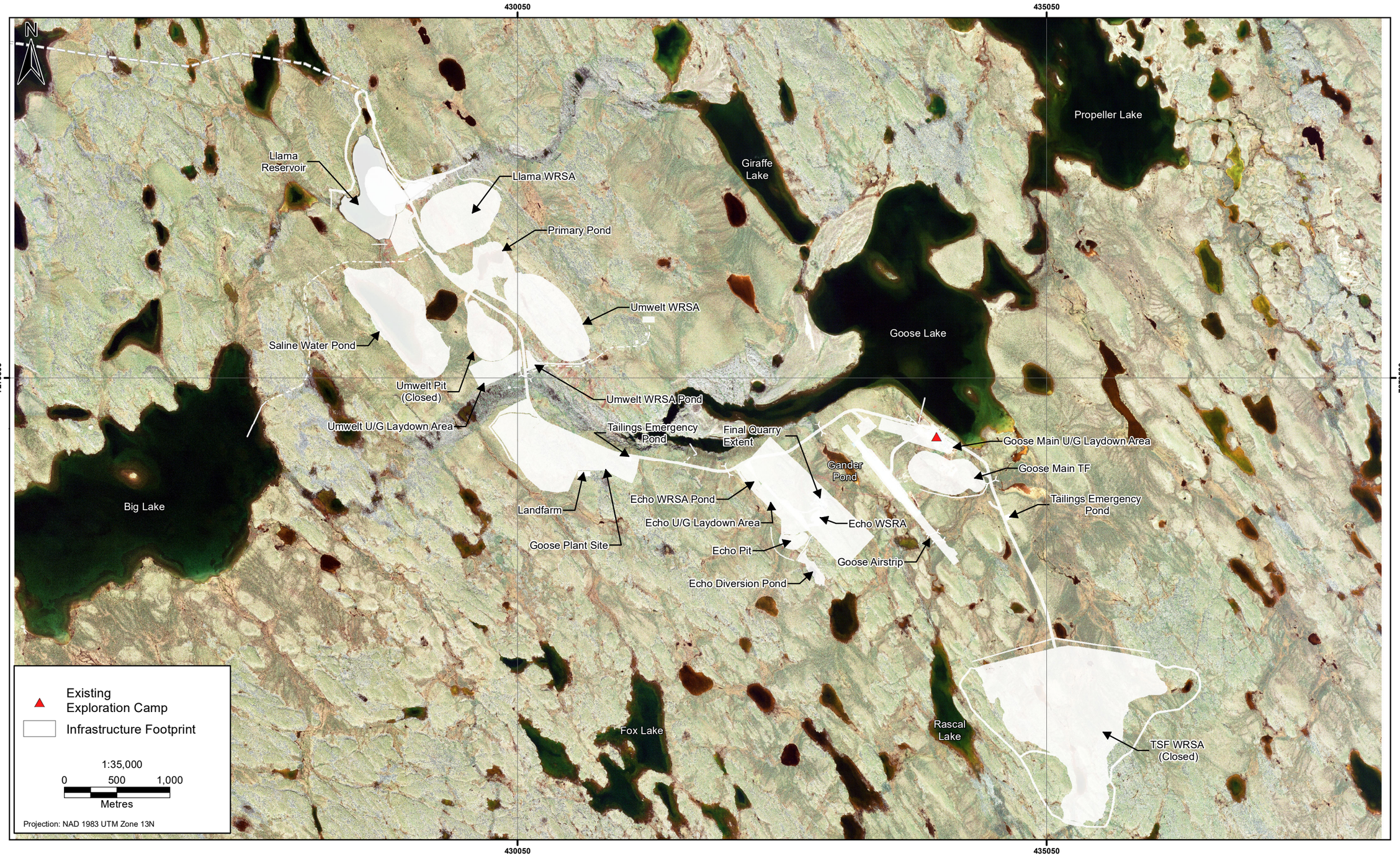
7400000 7350000 7300000 7250000

350000 400000 450000

Sabina GOLD & SILVER CORP.

Figure A-04

Sabina Mineral Tenure Map



Sabina GOLD & SILVER CORP.

Goose Property Area
Disturbance Footprint

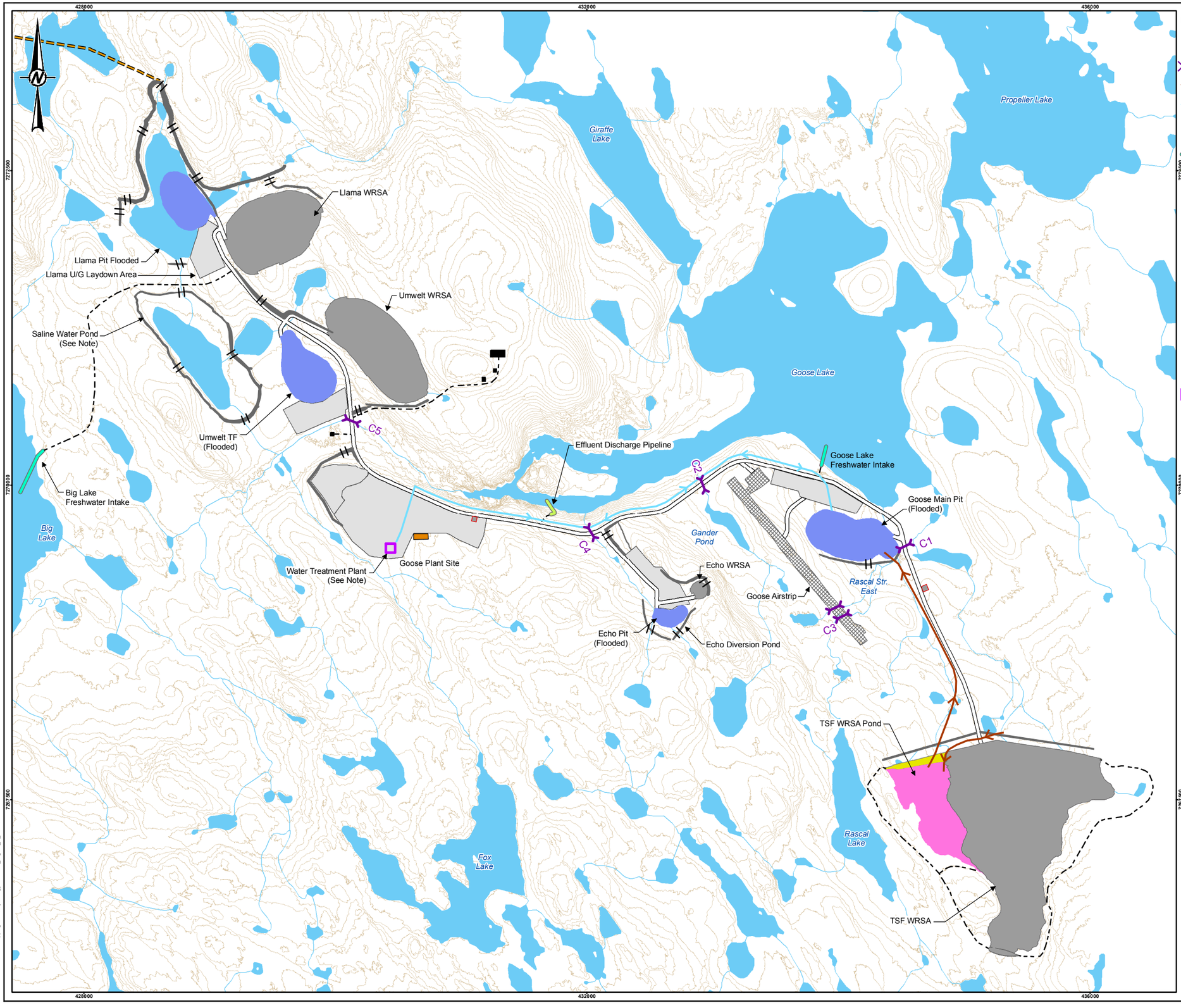
Figure A-05

GIS # BAC-50-017_WL_A W:\BackRiver\04_Exploration\BackRiverRegion\GIS_Products_FEIS\ESRI_MXDs\Water Permitting _Back Up Figures and MXDs\BackRiverRegion Water_Permitting\BAC-50-017_WL_A.mxd September 18, 2017

Sabina GOLD & SILVER CORP.

Figure A-06

Marine Laydown Area
Disturbance Footprint



LEGEND

- BREACH BERM LOCATION
- CONTOUR (2 m)
- CULVERT
- PUMPED CONTACT WATER PIPELINE
- WATER TREATMENT PIPELINE
- SERVICE ROAD
- WINTER ICE ROAD
- WATER INTAKE PIPELINE
- EFFLUENT DISCHARGE PIPELINE
- WATERCOURSE
- BERM
- PROPOSED AIRSTRIP
- DECOMMISSIONED PADS
- OTHER INFRASTRUCTURE
- TSF CONTAINMENT DAM EMBANKMENT
- TSF SOUTH DYKE
- HAUL ROAD
- INACTIVE WASTE ROCK STORAGE AREA
- LANDFARM
- TAILINGS EMERGENCY POND
- PIT LAKE (CLOSED)
- WATERBODY
- WATER TREATMENT PLANT

ISSUED FOR PERMITTING

0 750 1,500
1:30,000 METRES

NOTE(S)
1. TREATED WATER FROM GOOSE MAIN TF IS PUMPED BACK IN PARALLEL PIPELINE.

REFERENCE(S)
FOOTPRINT OBTAINED FROM CLIENT. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 13 DATUM: NAD 83

YYYY-MM-DD	2017-10-03
DESIGNED	SRK
PREPARED	SG
REVIEWED	DRW
APPROVED	PC

CLIENT: Sabina Gold & Silver Corp.

CONSULTANT: Golder Associates

PROJECT
SABINA BACK RIVER PROJECT, WATER LICENCE PHASE, NUNAVUT CANADA

TITLE
GOOSE PROPERTY GENERAL ARRANGEMENT PLAN AT END OF CLOSURE (YEAR 18)

PROJECT NO.	FIGURE	REV.
1776921	A-07	B

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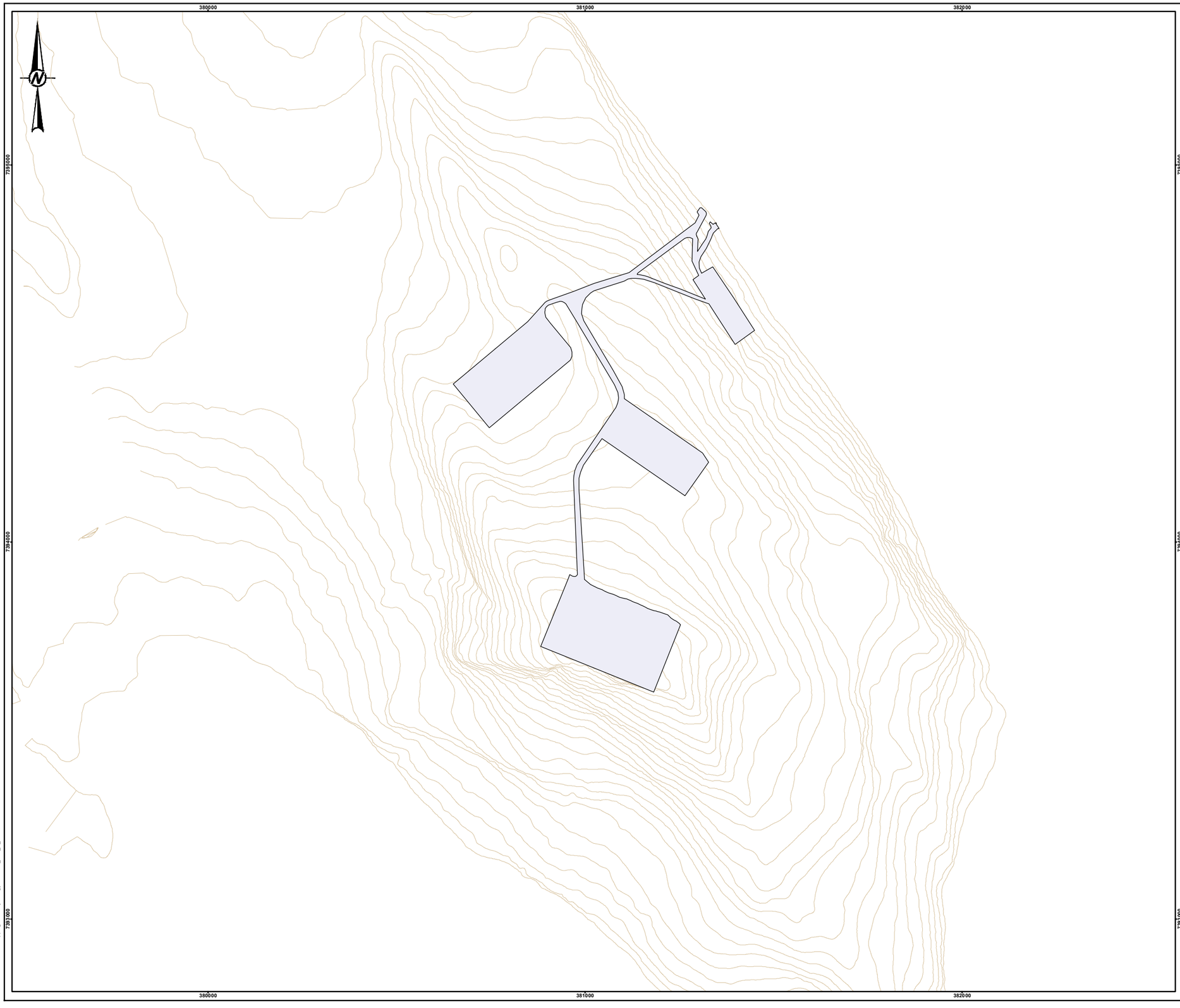

LEGEND

- CONTOUR (1 m)
- DECOMMISSIONED PAD

ISSUED FOR PERMITTING

0 250 500

1:10,000 METRES

REFERENCE(S)

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PROJECTION: UTM ZONE 13N DATUM: NAD 83

YYYY-MM-DD	2017-10-03
DESIGNED	SRK
PREPARED	MM
REVIEWED	DRW
APPROVED	PC

CLIENT: Sabina Gold & Silver Corp.

CONSULTANT: Golder Associates

PROJECT
BACK RIVER PROJECT, WATER LICENCE PHASE
NUNAVUT, CANADA

TITLE
MLA GENERAL ARRANGEMENT PLAN AT END OF CLOSURE (YEAR 11+)

PROJECT NO.	FIGURE	REV.
1776921	A-08	B

PATH: I:\2017\1774-320\Mapping\MXD\Hydrology\1776921_FIG_A_10.mxd PRINTED ON: 2017-10-03 AT: 1:04:30 PM

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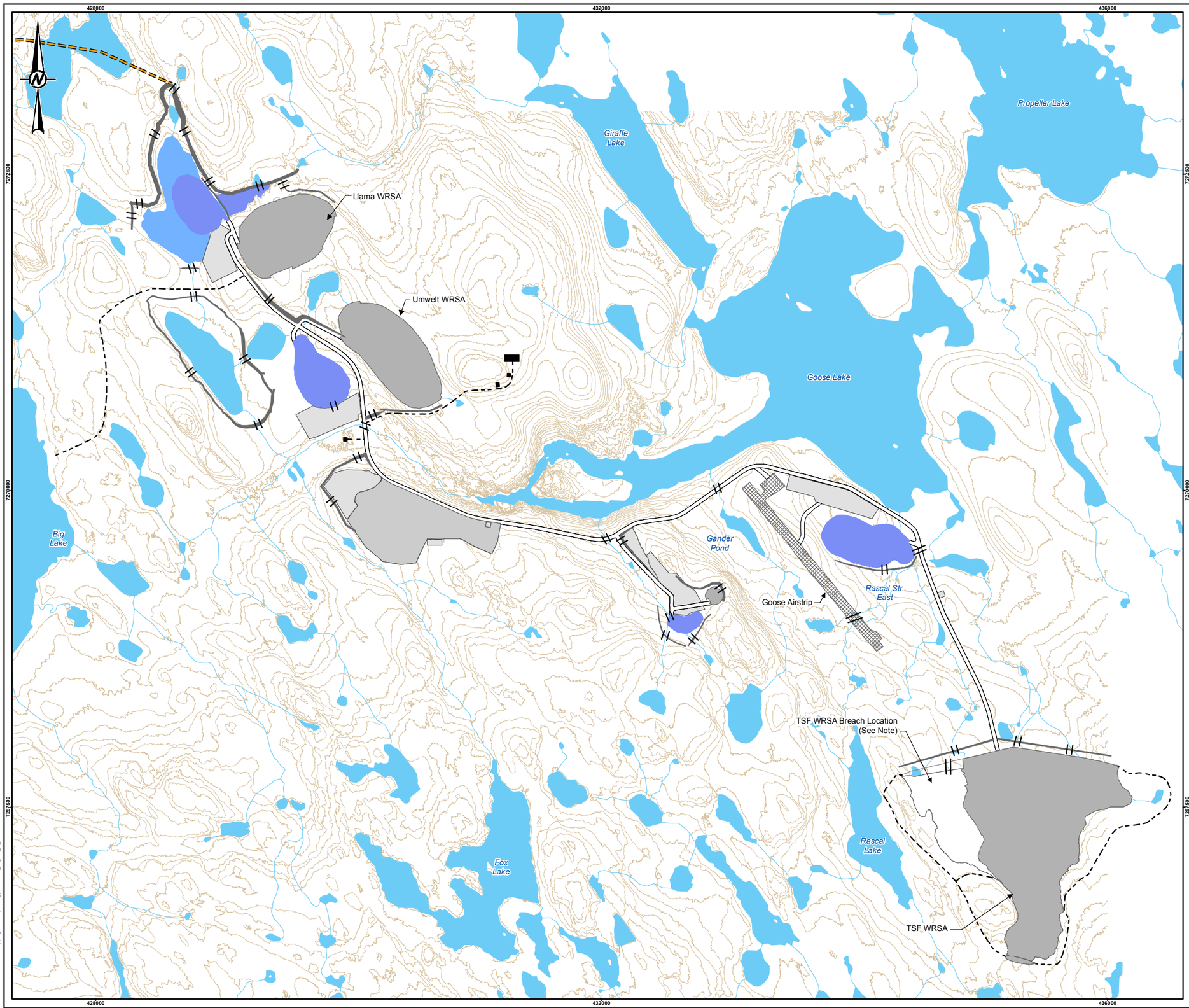

LEGEND

- BREACH BERM LOCATION
- SERVICE ROAD
- WINTER ICE ROAD
- WATERCOURSE
- BREACHED BERM

GOOSE LAYOUT

- PROPOSED AIRSTRIP
- DECOMMISSIONED PADS
- OTHER INFRASTRUCTURE
- TSF CONTAINMENT DAM EMBANKMENT
- TSF SOUTH DYKE
- HAUL ROAD
- INACTIVE WASTE ROCK STORAGE
- GOOSE PLANT
- TAILINGSEMERGPOND_LANDFARM
- PIT LAKE (CLOSED)
- WATERBODY

ISSUED FOR PERMITTING

0 750 1,500

1:30,000 METRES

NOTE(S)

1. TSF WRSA POND BREACHED TO GOOSE MAIN TF.

REFERENCE(S)

FOOTPRINT OBTAINED FROM CLIENT. HYDROGRAPHY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 13N DATUM: NAD 83

YYYY-MM-DD	2017-10-03
DESIGNED	SRK
PREPARED	SG
REVIEWED	DRW
APPROVED	PC

CLIENT: Sabina Gold & Silver Corp.

CONSULTANT: Golder Associates

PROJECT

SABINA BACK RIVER PROJECT, WATER LICENCE PHASE, NUNAVUT CANADA

TITLE

GOOSE PROPERTY POST-CLOSURE GENERAL ARRANGEMENT PLAN (YEAR 19+)

PROJECT NO.	FIGURE	REV.
1776921	A-09	B

PATH: I:\2017\1774320\Mapping\MXD\Hydrology\1776921_Figure_A_08.mxd PRINTED ON: 2017-10-03 AT: 1:02:38 PM

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0 25mm

GIS # **BAC-50-020_WL_A**

May 11, 2016

430050

435050

7270500

N

Giraffe Lake

Propeller Lake

Goose Lake

Helipad

Gander Pond

Shop and Laydown Area

Existing Quarry

Existing Airstrip

Big Lake

Fox Lake

Rascal Lake

Existing Exploration Camp

1:35,000

0 500 1,000

Metres

Projection: NAD 1983 UTM Zone 13N

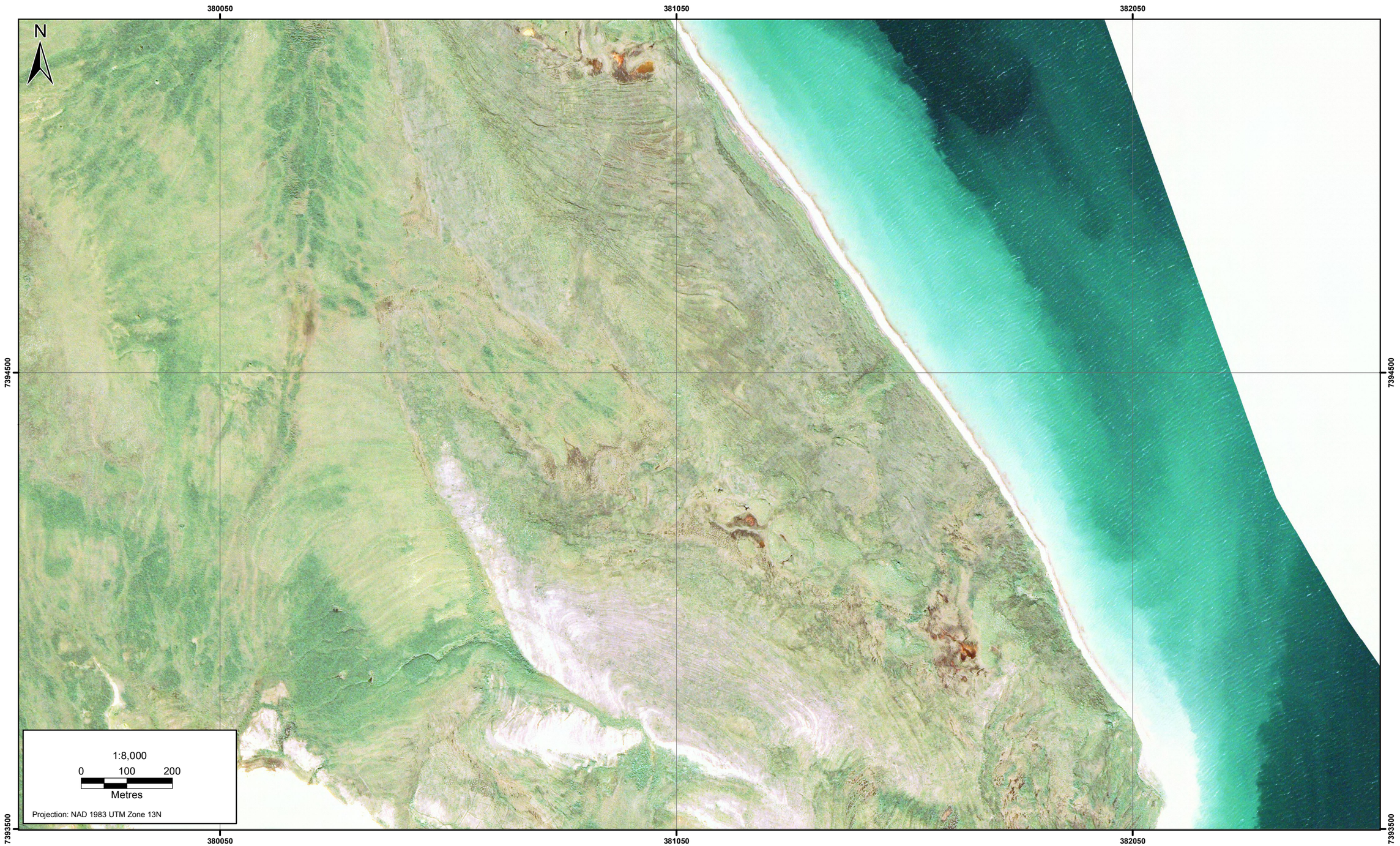
Sabina GOLD & SILVER CORP.

Figure A-10

Goose Property Area
Orthophoto of Existing Conditions

GIS # **BAC-50-019_WL_A**

May 5, 2016

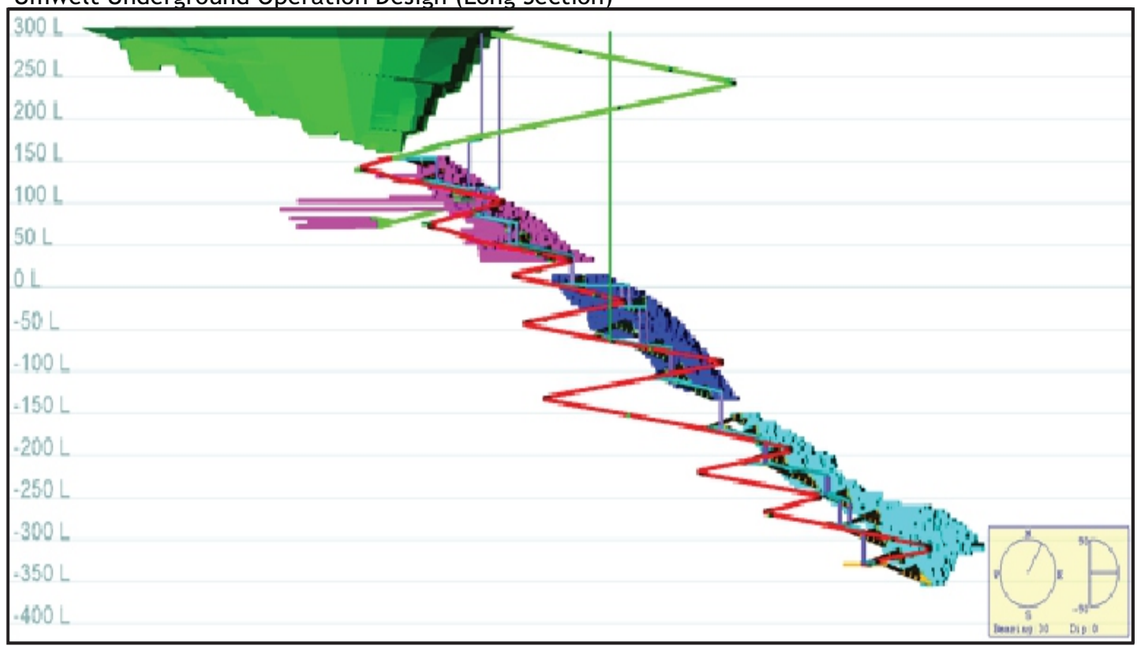


Sabina
GOLD & SILVER CORP.

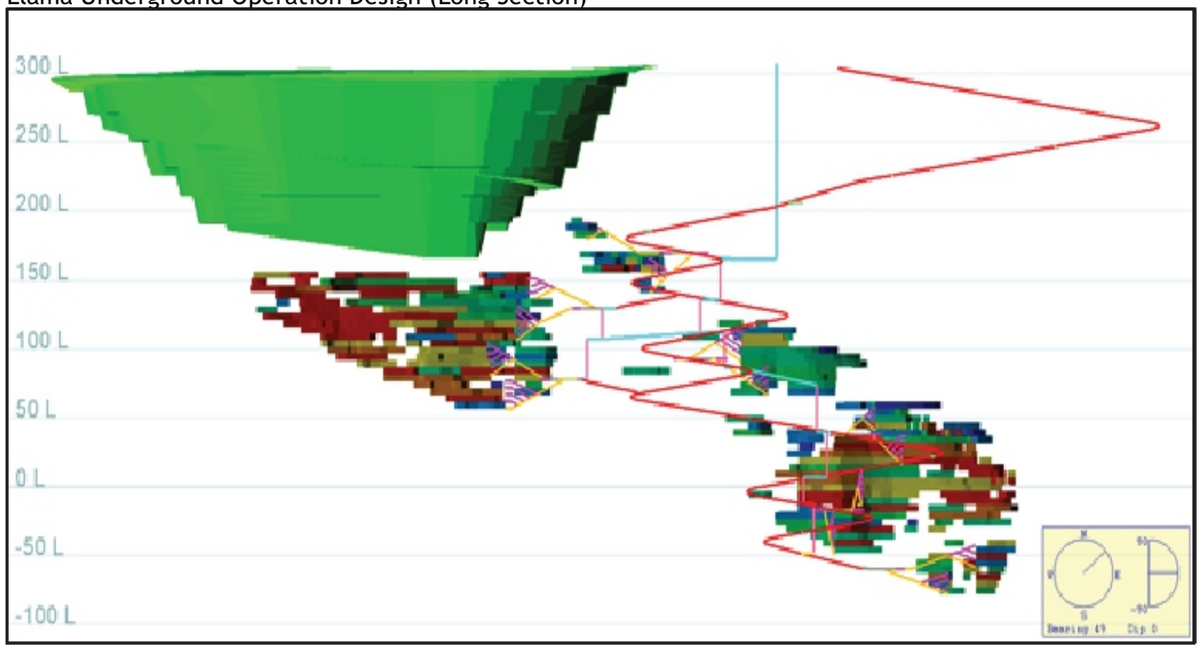
Figure A-11

Marine Laydown Area
Orthophoto of Existing Conditions

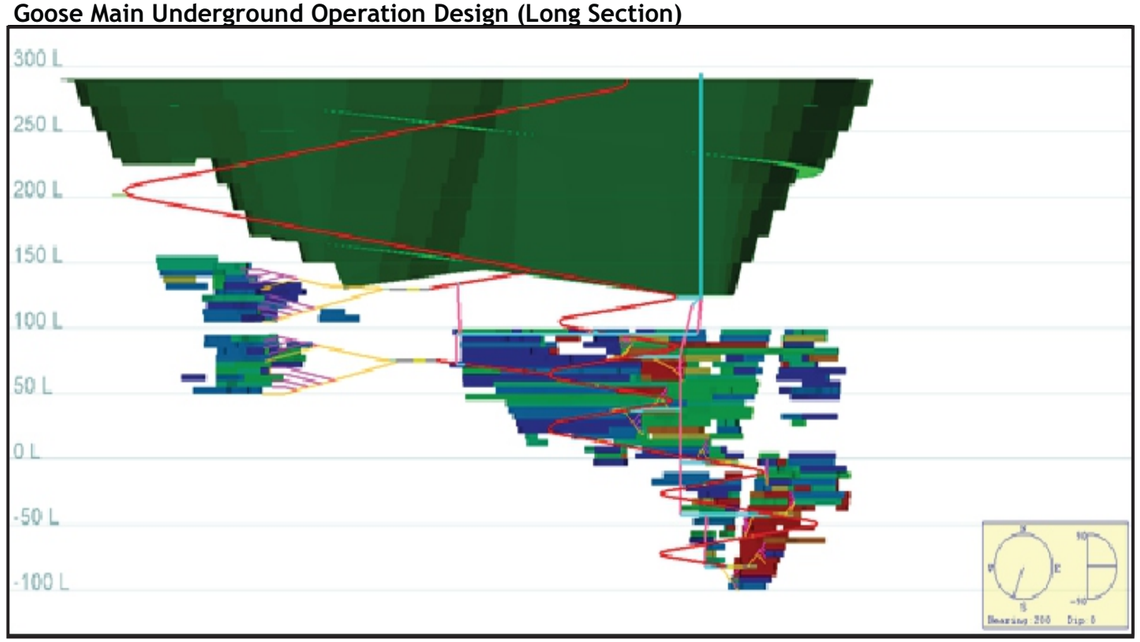
Umwelt Underground Operation Design (Long Section)



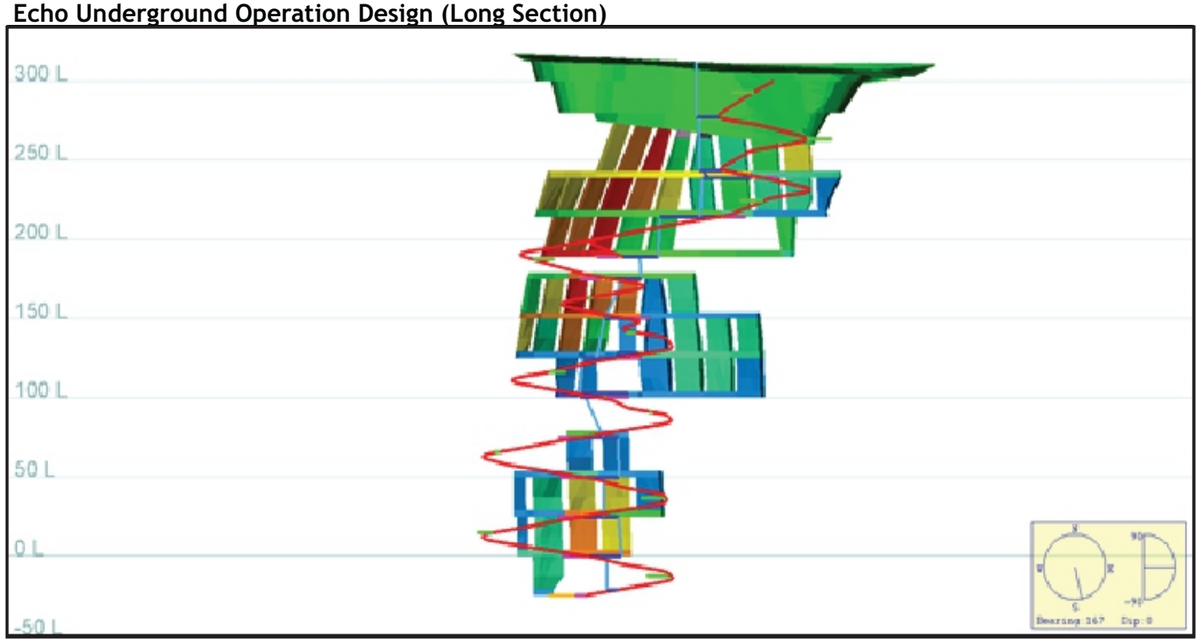
Llama Underground Operation Design (Long Section)



Goose Main Underground Operation Design (Long Section)



Echo Underground Operation Design (Long Section)



Source: JDS 2015

Sabina Gold & Silver Corp.

Figure A-12

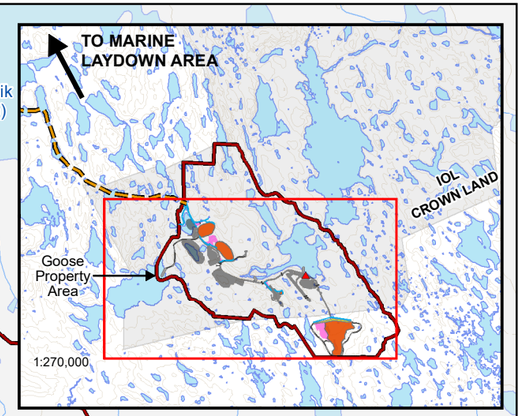
Goose Property Underground Operation Design

425050 430050 435050

7270500

N

Llama WRSA Pond
Llama WRSA Diversion Channel
Llama Pit
Llama WRSA
Llama Lake
Primary Pond
Umwelt WRSA
Umwelt Pit
Umwelt WRSA Diversion Berm
Umwelt WRSA Pond
Giraffe Lake
Tahikafalok Nahik (Propeller Lake)
Attituq (Goose Lake)
Tahikyuak (Big Lake)
Echo WRSA Diversion Berm
Gander Pond
Goose Main Pit
Echo WRSA
Echo Pit
TSF WRSA Diversion Berm
IOL
CROWN LAND
TSF WRSA Pond
TSF/TSF WRSA
Fox Lake
Rascal Lake
IOL
CROWN LAND



Goose PDA = 5,358 ha
Goose Infrastructure Footprint = 560 ha

- Culvert
- Existing Exploration Camp
- Treated Effluent Water Discharge
- Underground Portal
- 10 m Contour Interval

Fish Management Infrastructure

- Rascal Stream East Fishway
- Fish Barriers
- Potential Diversion Berm
- Potential Development Area (PDA)
- Inuit Owned Land (IOL)
- IOL and Crown Land Border
- Crown Land

1:32,530
0 0.5 1
Kilometres

Projection: NAD 1983 UTM Zone 13N

425050 430050 435050

Sabina GOLD & SILVER CORP.

Figure A-13

Goose Property Area
Fish Management Infrastructure

Appendix B. Tables

Table B-01. Primary Applicable Acts, Regulations, and Guidelines Applicable to Closure and Reclamation

Acts	Regulations	Guidelines
Federal		
Canadian Environmental Protection Act (1999 c.33)	*Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (SOR/2008-197)* *Environmental Emergency Regulations* (SOR/2003-307) *Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (SOR/2002-301) *Release and Environmental Emergency Notification Regulations* (SOR/2011-90)	*Canadian Council of the Ministers of Environment - Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products* Notice with respect to substances in the National Pollutant Release Inventory Canada-Wide Standards for Particulate Matter (PM) and Ozone Canada-Wide Standards for Petroleum Hydrocarbons (PHC) In Soil
Canada Wildlife Act (1985 w9)		
Species at Risk Act (2002 c.29)		Species at Risk Policies
Canadian Transportation Accident Investigation and Safety Board Act (S.C. 1989, c. 3)	*Transportation Safety Board Regulations* (SOR/92-446)	
Navigable Waters Protection Act (R.S. 1985 c. N-22)	*Navigable Waters Works Regulations* (C.R.C., c. 1232) *Navigable Waters Bridges Regulations* (C.R.C., c. 1231)	
Fisheries Act (R.S.C. c. F-14) 35. (1) No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery. Projects that have the potential to obstruct fish passage, modify flow or result in the entrainment of fish may also cause serious harm to fish. In these situations, an authorization under Subsection 35(2) is required. Proponents are responsible for avoiding and mitigating serious harm to fish that are part of or support commercial, recreational or Aboriginal fisheries. When proponents are unable to completely avoid or mitigate serious harm to fish, their projects will normally require authorization under Subsection 35(2).	*Metal Mining Effluent Regulations* (SOR/2002-2222) *Marine Mammal Regulations* (SOR/93-56)	The Policy for the Management of Fish Habitat The Fisheries Protection Policy Statement, 2013 Fisheries Productivity Investment Policy: A Proponent's Guide to Offsetting
Canada Labour Code (R.S.C., 1985, c. L-2)	*Canada Labour Standards Regulations* (C.R.C., c. 986)	

Acts	Regulations	Guidelines
	Canada Occupational Health and Safety Regulations (SOR/86 304)	
Territorial Lands Act (R.S. 1985, c. T-7)	*Northwest Territories and Nunavut Mining Regulations* (C.R.C., c. 1516) *Territorial Land Use Regulations* (C.R.C. 1524) *Territorial Quarrying Regulations* (C.R.C. c. 1527)	
Nunavut Waters and Nunavut Surface Rights Tribunal Act (2002, c. 10)	*Northwest Territories Waters Regulations* (SOR/93/303)	
Nunavut Act (1993 c.28)	*Nunavut Archaeological and Paleontological Sites Regulations* (SOR/2001-220)	
Nunavut Agreement Act (1993, c. 29)		
Territorial – Nunavut		
Environmental Protection Act (RSNWT (Nu) 1988, c E-7)	*Spill Contingency Planning and Reporting Regulations* (NWT Reg (Nu) 068-93)	Guideline on Dust Suppression Guideline for the General Management of Hazardous Waste in Nunavut Environmental Guideline for Waste Asbestos Guideline for Industrial Waste Discharges in Nunavut Guideline for Industrial Projects on Commissioner's Land
Historical Resources Act (RSNWT (Nu) 1988, c H-3)		
Territorial Parks Act (RSNWT (Nu) 1988, c T-4)	*Territorial Parks Regulations* (RRNWT (Nu) 1990 c T-13)	
Wildlife Act (RSNWT (Nu) 1988, c W-4)	*Wildlife General Regulations* (NWT Reg (Nu) 026-92) *Wildlife Licenses and Permits Regulations* (NWT Reg (Nu) 027-92) *Wildlife Management Barren-Ground Caribou Areas Regulations* (NWT Reg (Nu) 099-98) *Wildlife Management Zones Regulations* (RRNWT (Nu) 1990 c W-17) *Wildlife Regions Regulations* (NWT Reg (Nu) 108-98)	
Commissioner's Land Act (RSNWT 1988, c C-11)	*Commissioner's Land Regulations* (RRNWT 1990, c C-13)	
Mine Health and Safety Act (SNWT (Nu) 1994, c 25)	*Mine Health and Safety Regulations* (NWT Reg (Nu) 125-95)	

Table B-02. Summary of Land and Water Access Permits/Licenses for the Project (as of July 2017)

Permit	Expiry (year-mo-day)	Agency	Description
KTL204C012	2017-12-12	KIA	Boulder: Staking/prospecting, exploration (ground/air geophysics), geophysical survey, gridding and drilling.
KTL204C020	2017-12-12	KIA	Boot: Exploration (air/ground geophysics), staking, prospecting, fly/survival camp and drilling.
KTL304C017	2017-12-12	KIA	Goose: Staking/prospecting, exploration (ground/air geophysics), drilling, bulk sampling, bulk fuel storage, camp, winter road, all-weather airstrip and connecting road.
KTL304C018	2017-12-12	KIA	George: Staking/prospecting, exploration (ground/air geophysics), drilling, bulk sampling, bulk fuel storage, camp, winter road, all-weather airstrip.
KTL312C004	2017-12-12	KIA	Wishbone/Malley: Exploration (air/ground geophysics), staking, prospecting, fly/survival camp and drilling
KTL304F049	2017-12-12	KIA	Winter road connecting Bathurst Inlet - Goose and George.
KTP11Q001	2017-12-12	KIA	Goose rock quarry.
KTP12Q001	2017-12-12	KIA	Goose Airstrip borrow area.
KTP12Q002	2017-12-12	KIA	George borrow quarry.
N2011F0029	2018-12-13	INAC	Winter Road connecting George-Goose.
N2017F0016	2022-07-20	INAC	Winter Road connecting Bathurst Inlet - Back River Project.
N2012C0003	2019-02-06	INAC	Wishbone-Malley Mineral Exploration activities on Crown Land
N2016C0011	2021-10-26	INAC	Back River Exploration activities.
2BE-GOO1520	2020-02-18	NWB	Goose water licence.
2BE-GEO1520	2020-05-29	NWB	George water licence.
2BE-MLL1722	2022-06-29	NWB	Wishbone-Malley water licence.

Table B-03. Primary Project Approval Requirements

Responsible Authority	Legislation	Authorization	Project Activity	Permitting Strategy/Timeline
Nunavut Impact Review Board	Nunavut Agreement Article 12 Nunavut Planning and Project Assessment Act (S.C. 2013, c. 14, s. 2)	Project Certificate	Required to obtain requisite permits and approvals to proceed with Project	Sabina aims to obtain a Project Certificate from NIRB by Q2/Q3-2016
Kitikmeot Inuit Association	Nunavut Agreement Article 26	Inuit Impact and Benefits Agreement	Required to proceed with Project	Sabina aims to conclude successful negotiation of an IIBA after receiving a Project Certificate. Compensation agreements may form part of the IIBA.
	Nunavut Agreement Article 20	Inuit Water Rights Compensation Agreement	May be required	
	Nunavut Agreement Article 6	Wildlife Compensation Agreement		
	Nunavut Agreement	Inuit Owned Lands - Commercial Land Use Lease	Access surface IOL to develop mine	Sabina intends to submit its commercial land use and quarry concession permit applications to the KIA once NIRB has issued a positive final hearing report to the Minister. Submission timing: mid-2016
		Inuit Owned Lands - Quarry Concession Licenses	Extract aggregate on IOL	
Nunavut Water Board	Nunavut Agreement Article 13 *Nunavut Waters and Nunavut Surface Rights Tribunal Act* Nunavut Waters Regulations	Type A and B Water Licenses	Required for water use and waste disposal	Sabina intends to submit its Type A Water Licence in Q2/Q3 of 2016. Sabina plans to utilize its existing Type B Water Licenses or new licenses with already screened activities for initial construction activities, if necessary.
Indigenous and Northern Affairs Canada	*Territorial Lands Act* Canadian Mining Regulations	Prospector License Mineral leases	To obtain and hold subsurface mineral rights	Sabina intends to submit its land use and quarry permit applications to INAC once NIRB has issued a positive final hearing report to the Minister. Sabina plans to utilize its existing land use permits and/or will apply for new interim land use permits to support initial construction, to address delays in receipt of leases, if necessary.
	Territorial Land Use Regulations	Crown Land - Class A and Class B Land Use Permits	Access surface Crown lands for initial Project development, prior to obtaining leases	
		Crown Land - Land lease and Waterlot lease	Access surface Crown lands for the Project life	
	Territorial Quarrying Regulations	Crown Land - Quarry Lease/Permit	Extract aggregate on Crown Land	

Table B-03: Primary Project Approval Requirements (continued)

Responsible Authority	Legislation	Authorization	Project Activity	Permitting Strategy/Timeline
Transport Canada	*Navigation Protection Act*	Approval and/or Exemption	Construction of works in navigable water to protect navigation channels	Sabina will seek feedback from Transport Canada on potential impacts to navigation during review of the FEIS, and will submit formal applications under the *Navigation Protection Act* for relevant in-water works once detailed engineering has been completed. Submission timing: 2016
	Canada Shipping Act Response Organizations and Oil Handling Facilities Regulations		Approved Oil Pollution Emergency Plan (OPEP)	Conceptual OPEP included with this FEIS for Transport Canada comment. Formal submission of the OPEP to Transport Canada for approval will follow detailed engineering.
	Canada Shipping Act Response Organizations and Oil Handling Facilities Regulations		Approved Ship Oil Pollution Emergency Plan (SOPEP)	Formal submission of the SOPEP to Transport Canada for approval prior to shipping
Fisheries and Oceans Canada	*Fisheries Act* (Section 35(2))	Authorization under Paragraph 35(2)(b) of the *Fisheries Act*; required if serious harm to fish cannot be avoided. In instances in which serious harm to fish can be avoided, DFO may provide a letter of authorization in addition to compliance with Measures to Avoid Causing Harm to Fish and Fish Habitat.	Project activities directly removing or altering fish habitat: full lake dewatering, culvert installations, dam construction in watercourses, stream flow reductions and potential water and sediment quality changes.	Sabina's application for an Authorization under the *Fisheries Act* presented as Appendix V12-1D of the DEIS will be finalized after receiving a Project Certificate.
Environment Canada	*Fisheries Act (Section 36)* Metal Mining Effluent Regulations	Schedule 2 Amendment	Deposit of tailings in fish-bearing waters	Should Sabina require a Schedule 2 Amendment Sabina intends to submit its request in the first half of 2016.

(continued)

Table B-03: Primary Project Approval Requirements (continued)

Responsible Authority	Legislation	Authorization	Project Activity	Permitting Strategy/Timeline
Natural Resources Canada	*Explosives Act* and Regulations Blasting Permits Explosive Magazine Permits Radio Licensing	Licence for a Factory and Magazine	Required for construction of explosives factories and magazines and storage of explosives	Sabina's explosives contractor (once contracted) will obtain the requisite licence(s).
GN Culture and Heritage	Nunavut Archaeological and Palaeontological Sites Regulations (Nunavut) *Nunavut Historical Resources Act*	Archaeology Permit	Required to conduct archaeology surveys and to mitigate cultrual/heritage resources	Archaeological permit applications will be submitted to the GN-CH by March 31 by Sabina's consulting archaeologist for survey or mitigation field work planned for the upcoming summer.
Nunavut Research Institute	*Scientist Act* (Nunavut)	Scientific Licenses: Land and Water Social and Traditional Knowledge	Undertake non-biological and non-cultural heritage baseline and monitoring studies	Sabina or its consultants will obtain the requisite scientific licenses as required prior to and during the life of the Project.
GN Environment	*Environmental Protection Act* (Nunavut) Spill Contingency Planning and Reporting Regulations(Nunavut)	Approval of Spill Contingency Plan		Sabina will submit its Spill Contingency Plan for approval as part of the Type A Water Licence Application. Submission timing: mid-2016
	Environmental Protection Act (Nunavut)	Hazardous Waste Generator		Sabina is currently registered as a hazardous waste generator
	Wildlife Act (Nunavut)			Sabina or its consultants will obtain the requisite wildlife research permits as required prior to and during the life of the Project.
GN Health and Social Services	*Public Health Act* (Nunavut) Camp Sanitation Regulations (Nunavut)	Approval of camp facilities	Construction and operation of camp, medical facilities, buildings and propane storage	Prior to construction and occupancy
	Emergency Medical Aid Act (Nunavut)	Medical facilities approval		

(continued)

Table B-03: Primary Project Approval Requirements (completed)

Responsible Authority	Legislation	Authorization	Project Activity	Permitting Strategy/Timeline
GN Community and Government Services	Building Codes (Nunavut)	Building Permits	Construction and operation of camp, medical facilities, buildings and propane storage	Prior to construction and occupancy
	Fire Prevention Act (Nunavut) Fire Prevention Regulations (Nunavut) Propane Cylinder Storage Regulations	Approval of camp facilities and propane storage		
Worker's Safety and Compensation Commission of Nunavut - Mine Health and Safety	*Explosives Use Act* (Nunavut) Explosive Use Regulations (Nunavut)	Authorization to store and use explosives	Required to store detonators in a magazine	Sabina's explosives contractor (once contracted) will obtain the requisite authorization(s).
	Mine Health and Safety Act (Nunavut) Mine Health and Safety Regulations (Nunavut)	Authorization to store and use explosives	Required to store detonators in a magazine	
	Worker's Compensation Act (Nunavut) Workers Compensation Regulations (Nunavut)	Authorization for Activities	Required to proceed with Project activities	Sabina is currently authorized to conduct business in Nunavut. Confirmation will be sought from WSCC if changes to this authorization are required for mine development. Sabina's contractors will be required to seek approval to work in Nunavut.

Notes:
IOL = Inuit Owned Land

Table B-04. Historical Ownership Milestones

Dates	Milestones
1982	BRJV formed.
1985	F.W. Hill (Hill) and Esso Minerals Canada (Esso) was investor and operator.
1985 to 1986	Kerr-McGee Corp. acquired interest in BRJV and was operator in 1986.
1987 to 1996	Homestake Mineral starts to earn into BRJV and becomes operator in 1991.
1997 to 1998	Arauco (later changed name to Kit Resources) acquires BRJV.
1999 to 2002	Kinross starts to earn into BRJV and becomes operator.
2003 to 2004	Miramar starts to earn into BRJV and becomes operator.
2005 to 2008	Dundee Precious Metals (DPM) starts to earn into BRJV and becomes operator.

Source: Summary by AMC Mining Consultants (Canada) Ltd. based on table provided by Sabina Gold & Silver Corp. 2015

Table B-05. Historical Exploration Summary

Operator	Period	Exploration Completed	Drill Holes Completed	Reports or Studies Completed
TWOCL on behalf of BRJV	1982	Reconnaissance exploration	-	-
Back River Joint Venture	1983-1985	Gridding, geological mapping, sampling, exploration drilling, and aeromagnetic surveys	36	-
Hill and Esso	1985	Airborne magnetics and electromagnetic surveys	-	-
Bow Valley	1986	Soil sampling at Del prospect, trenching, exploration drilling	11	-
Kerr-McGee Corp.	1986	Exploration drilling	31	-
Homestake Mineral	1987-1996	Geological mapping, panel and till sampling, exploration and infill drilling, geochemical study, geophysics, legal surveying	656	Prefeasibility and Feasibility Study (George)
Kit Resources	1997-1998	Geological mapping, sampling, exploration and infill drilling	184	Resource Estimate (George)
Kinross	1999-2002	Spectral induced polarization (IP)/resistivity survey, till sampling, geological mapping, channel sampling, soil sampling, exploration and infill drilling	126	Resource Estimate and Conceptual Study (Goose)
Miramar	2003-2004	Exploration and infill drilling	41	NI 43-101 Report
Dundee Precious Metals	2005-2008	Trench sampling, geological mapping, exploration and infill drilling, structural analysis, airborne magnetic, electromagnetic, and radiometric surveys, geochemistry and rock samples	186	NI 43-101 Report

Note: Trigg, Woollett, Olsen Consulting Limited (TWOCL) was the founder of the BRJV.

Table B-06. Characteristics of the Infrastructure Constructed at the Goose Property

Potential Development Area	PDA is 5358 ha with ~15% of area being waterbodies Footprint of facilities is 560 ha
Site Roads	All-weather roads (service road widths of 4.5 m or 8 m; haul road widths of 20 m) will be constructed with run-of-quarry rock placed directly onto the tundra to preserve the permafrost. Construction materials are from locally developed, geochemically suitable rock quarries. Roads will be private and not for public use.
Quarry Sites and Borrow Areas	Estimated aggregate extracted: 5 Mt Number of rock quarries: two Number of borrow areas: none
Water Management	Water supply sources: Big Lake (domestic) and Goose Lake (industrial) Umwelt Lake used as Saline Water Pond (footprint 50 ha) Saline Water pumped back underground to flood Umwelt, Llama and Goose Main U/G workings, and bottom of mined-out Llama Pit Water management ponds (excluding TSF) at Llama (1), Umwelt (2), Echo (2) and Process Plant (1)
Fuel Storage	On-site fuel tank farm consists of 3 steel tanks at 15 ML capacity. Seacans at each underground mine portal, AN facility, incinerator, boilers, and power plant.
Power Generation	Combined heat and power plant consisting of five (N + 1) diesel fired reciprocating engine generator sets. Three generators will be rated for continuous duty 6.6 MW and two generators will be rated for continuous duty 5.1 MW. Seasonal open pit dewatering will be handled by diesel pumps.
Process Plant	Ore production: 19.8 million tonnes of mill feed over 10 years. Standard gravity separation and cyanide leaching circuit.
Explosives	Ammonium nitrate/fuel oil (ANFO) facility Bulk storage area for ammonium nitrate (AN): with capacity for up to 3,900 tonnes of inert AN in seacans Explosive magazines with capacity for 32 tonnes of packaged explosives and 600 cases of detonators within 40-ft and 20-ft magazines, respectively. Bulk ANFO mixing truck. During Closure, unused explosives will be consumed on-site or removed and shipped off-site.
Laydown and Storage Area	General laydown area for material and supplies. Secure seacans for hazardous materials, e.g., mill reagents. Cold storage building.
Waste Management (other than waste rock and tailings)	Waste sorting facility – adjacent to the Process Plant. Landfill(s) – for disposal of non-hazardous, non-leaching, inorganic garbage, located in one or more Waste Rock Storage Areas. Landfarm – for treatment of hydrocarbon contaminated soils or snow. Incinerator – at camp for incineration of camp combustible waste including sewage treatment plant sludge /pacto waste (3.0 kg/person/day). Hazardous waste: temporary storage area at site. Dispose off-site in an approved facility. Used tires and machinery: Remove hazardous waste from equipment not being salvaged, clean and dispose of in active landfill or mine workings.

(continued)

Table B-06. Characteristics of the Infrastructure Constructed at the Goose Property (completed)

Airstrip	An all-weather airstrip and aprons capable of servicing passenger and large cargo aircraft will be constructed at the Goose Property Area. Ice airstrips will continue to be used as required. Dimensions: up to 1,524 m long, 45 m wide. Expected number of flights: Construction: 3-4 per week Operations: 2-3 per week Closure: 2-3 per week Post-closure: 1 per month (summer season) An operations center and automated weather observation station (AWOS) will be located at the airstrip. An emergency back-up diesel generator will be located at the operations center.
Wastewater Treatment	Sewage Treatment Plant provided for 465-person camp. Membrane bioreactor plant housed in 20 ft. container with a separate sludge drying system housed in a 40-ft container. Treated effluent discharged to active tailings facility during Operations. If effluent discharge from the STP meets discharge criteria, effluent will be discharged to land. Oily water treatment plant. For light vehicle and mine maintenance shops – water treated and recycled within shop. Oil to be collected and either burned in an approved waste-heat generator or drummed and removed from site as hazardous waste.
Buildings	Process Plant and crusher buildings; Assay laboratory; explosives magazines; Detonator magazines; AN facility; Reagent storage; Core logging facility; Warehousing facility; Emergency facilities (fire and ambulance station); General maintenance building (site services); Mine maintenance and dry building; Waste management building; Light vehicle maintenance workshop; Heavy equipment maintenance workshop; Wash bay; 465-person camp complete with kitchen, Recreational facilities; Administration complex; Modular potable water treatment system; Modular sewage treatment system; Diesel power plant; Power utility building.
Tailings Management	Tailings Storage Facility (TSF) (footprint 119.1 ha, excluding pond) TSF WRSA Pond (footprint 55 ha) Tailings storage in Umwelt and Goose Main open pits (TFs)
Overburden, Waste Rock Areas and Ore stockpiles	Waste rock storage areas (WRSAs) for Umwelt (39.5 ha), Llama (37.5 ha), and Echo (1.4 ha). WRSA for Goose Main included in TSF. Overburden from quarry and mining areas to be placed in the WRSAs Ore stockpile at the Goose Plant Site. Small temporary stockpiles located at each U/G laydown.
Water Crossings	Up to five water crossings (culverts) with diameters ranging from 1.0 to 2.5 m.

Table B-07. Characteristics of the Infrastructure Constructed at the Marine Laydown Area

Potential Development Area	653 ha Footprint of facilities = 20 ha
Site Roads	All-weather roads (all are service roads, widths of 4.5 m or 8 m) will be constructed on the site. Construction materials are from locally developed, geochemically suitable rock quarries. Roads will be private and not for public use.
Quarry Sites and Borrow Area	Estimated aggregate extracted: 1.3 Mt Number of rock quarries: none, cut from MLA Fuel Storage area used as fill for remaining pads. Number of borrow areas: none
Water Management	Water supply source: Bathurst Inlet - Desalination unit No water management ponds
Fuel Storage	On land storage of 60 ML (four tanks at 15 ML) Fuel delivered by sealift during open water season. Seacans as required (camp/shop facility)
Power Generation	Combined heat and power plant consisting of three (N + 1), 500 kW diesel fired reciprocating engine generator sets.
Laydown and Storage Area	Ammonium nitrate storage area: up to 3,900 tonnes inert AN in seacans
Waste Management	Landfarm – for treatment of hydrocarbon contaminated soils or snow Incinerator – at camp for incineration of combustible waste including sewage Pacto waste Hazardous waste: lined hazardous waste storage area. Hazardous waste temporarily stored then shipped off-site for ultimate disposal during annual sealift season.
Airstrip	Airstrip capable of accepting aircraft constructed on ice during winter. Access by floatplanes during open water, if necessary.
Wastewater Treatment	Oily water treatment plant. Oil to be collected and either burned in an approved waste-heat generator, or drummed and removed from site as hazardous waste.
Sewage Treatment	Waste collected from Pacto systems will be incinerated.
Buildings	Laydown areas; Explosives magazines; Reagent storage; Warehousing facility; Emergency facilities (fire and ambulance station); General maintenance building (site services); Waste management building; 75-person camp and Administration complex (workforce with contingency) complete with kitchen, dry and recreational facilities; Administration complex; Modular desalination water treatment system; Diesel power plant; Power utility building.
In Water Construction	Floating terminal barge that will accept lightering barges. There are no permanent in-water works.

Table B-08. Dimensions of Open Pits at End of Operations

Open Pit	Footprint (ha)	Depth (m)	Volume (Mm^3)
Umwelt	16	135	7.8
Llama	13	135	5.6
Echo	33	45	0.4
Goose Main	24	150	10.8

Table B-09. 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 will be implemented	Routine air quality monitoring
Land	Reduce the potential for inadvertent access by humans to slopes that are dangerous or unstable – mostly completed during Operations as progressive reclamation	Stabilize all slopes to the extent possible. It is noted that the partial backfilling with tailings (Umwelt TF and Goose Main TF) and flooding will both increase stability.	Physical inspection by a qualified engineer; construction of the safety berms during Operations as progressive reclamation to extent possible
		Define a setback line in accordance with rock mechanics studies conducted for pit stability	
		Berms will be constructed around the open pit outside of the setback lines where slopes will exist above final water levels	
	Meet appropriate design levels for engineered structures for closure	The pit overflow structures and pipeline to WTP (Goose Main TF and other pits if needed) will be designed and constructed according to the extreme precipitation event selected for its design	Design and construction of the overflow structures and pipeline
Water	Reduce and control contaminated drainage from the flooded pits	Integrate a water management plan to reduce and control contaminated drainage from the flooded pits	Routine monitoring and sampling; water treatment if required
		Implement a system to manage these waters, and to treat as necessary to meet site permit water quality objectives before release	
	Ensure outflow from the flooded open pits meets water licence criteria	Prior to overflow, the water quality will be profiled and the most appropriate treatment method will be determined if necessary (e.g., in-pit treatment or through the WTP)	Routine monitoring and sampling; in-pit or water treatment at the WTP if required

(continued)

Table B-09. Closure Objectives and Criteria – Open Pit Workings (complete)

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
	Control pit flooding	The bottom of Llama Pit will be partially filled with saline water to form meromictic conditions. Umwelt Pit and Goose Main OP will be partially filled with tailings. After that, all 4 pits will be passively flooded with natural runoff and precipitation such that they can become natural outflow systems.	Routine monitoring and sampling; in-pit water treatment or water treatment at the WTP as necessary prior to release of open pit water
Wildlife	Discourage access to open pit - – mostly completed during Operations as progressive reclamation	A plan will be developed to allow for reasonable exit should access occur	Physical inspection; construction of rock barricades during Operations as progressive reclamation
		All pit access ramps will be secured by rock berm barricades	
	Reduce the possibility that water in the flooded open pits will affect wildlife health	Prior to overflow, the water quality will be profiled and the most appropriate treatment method will be determined if necessary (e.g., in-pit treatment or through the WTP)	Routine monitoring and sampling; in-pit water treatment or water treatment at the WTP, if required
Health and Safety	Allow emergency access and exit from flooded pits – mostly completed during Operations as progressive reclamation	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 – mostly completed during Operations as progressive reclamation	Define a setback line in accordance with rock mechanics studies conducted for pit stability. Berms will be constructed around the open pit outside of the setback line where slopes will exist above the final water line	Physical inspection by a qualified engineer; construction of the berms during Operations as progressive reclamation to extent possible
	Reduce the possibility that water quality of downstream flows will affect human health	The effluent water quality will be monitored and the most appropriate treatment method will be determined if necessary	Routine monitoring and sampling downstream of the decommissioned pits; in-pit water treatment or water treatment at the WTP as necessary prior to release of open pit water
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

Table B-010. Dimensions of Underground Workings at End of Operations

	Depth (mbgs)			
Deposit	**From**	**To**	**# Vent Raises**	**Volume* (Mm^3)**
Umwelt	135	650	2	0.76
Llama	135	380	1	0.32
Echo	45	325	1	0.15
Goose Main	150	390	1	0.39

*Note: mbgs: meters below ground surface; * open volume after backfilling (required ground stability)*

Table B-011. Closure Objectives and Criteria – Underground Mine Workings

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	N/A	N/A	N/A
Land	Eliminate access to underground mine workings and surface openings	The portals will be backfilled with waste rock and the vent raises will be capped to eliminate the access to the underground mine workings	Physical inspection and monitoring
	Remove hazardous materials from the underground mine	Fuels, oils, chemicals, etc. will be removed for disposal offsite at a licensed facility prior to flooding	Physical inspection and monitoring
Water	Eliminate access to underground mine workings and surface openings	The portals will be backfilled with waste rock and the vent raises will be capped to eliminate the access to the underground mine workings	Physical inspection and monitoring
	Allow underground to flood.	The Llama U/G, Umwelt U/G and Goose Main U/G workings will be flooded with water from the Saline Water Pond. Echo U/G workings will be flooded with site contact water.	Initial physical monitoring to check flooding, but limited once ventilation is turned off.
Wildlife	Eliminate access to underground mine workings and surface openings	The portals will be backfilled with waste rock and the vent raises will be capped to eliminate the access to the underground mine workings	Physical inspection and monitoring
Health and Safety	Eliminate access to underground mine workings and surface openings	The portals will be backfilled with waste rock and the vent raises will be capped to eliminate the access to the underground mine workings	Physical inspection

(continued)

Table B-011. Closure Objectives and Criteria – Underground Mine Workings (complete)

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
	Ensure the stability of underground workings after closure	The underground will be designed and mined to be physically stable; it will be back-filled as needed during Operations	Meet appropriate design levels, physical inspection and crown pillar stability assessment by a qualified engineer and monitoring
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

Table B-012. Dimensions of Waste Rock Storage Areas at End of Operations

WRSA	Footprint (ha)	Height (m)	Tonnage (Mt)
Umwelt	39.5	34	20
Llama	37.5	30	16
Echo	3.3	15	1.2
TSF WRSA	119.1	14	27

Table B-013. Closure Objectives and Criteria – Waste Rock Storage Areas

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices for controlling fugitive and exhaust emissions will be implemented during active reclamation	Routine air quality monitoring
Land	Confirm the WRSA slopes and top are stable	The WRSAs will be designed for closure and will account for seismic and permafrost conditions	Physical inspection by a qualified engineer, and monitoring
		A thermal cover of NPAG rock will be placed on the WRSAs surface during progressive reclamation and closure to limit acid generating reactions	Thermistors to monitor verify that the piles are frozen throughout except for the predicted active layer
Water	Confirm runoff and seepage is collected	The runoff and seepage from the WRSAs will continue to be directed to the contact water storage ponds or the active TF and eventually pumped for treatment in the WTP, as per operational practices, until monitoring results demonstrate that water quality conditions from the WRSAs are acceptable for direct discharge	Physical inspection. Routine monitoring and sampling
	Confirm runoff and seepage from the WRSAs meet water licence criteria	As above	Routine monitoring and sampling
Wildlife	Ensure the WRSA surfaces are safe for wildlife	WRSAs at post-closure will not compromise wildlife safety	Physical inspection
	Reduce the possibility that water from the WRSAs will affect wildlife health	The runoff and seepage from the WRSAs will continue to be directed to the contact water storage ponds or the active TF and eventually pumped for treatment in the WTP, as per operational practices, until monitoring results demonstrate that water quality conditions from the WRSAs are acceptable for direct discharge	Routine monitoring and sampling
Health and Safety	Ensure the WRSAs are safe for monitoring and physical inspections	WRSAs 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

WRSA = waste rock storage area; WTP = water treatment plant

Table B-014. Dimensions of Tailings Storage Facilities at End of Operations

Tailings Facility	Footprint (ha)	Height (m)	Tonnage (Mt)	Volume (Mm^3)
Tailings Storage Facility (TSF)	119.1*	14	3.8**	3.1**
Umwelt Tailings Facility (TF)	within mined-out Umwelt Pit	5 (mbgs)	8.6	7.2
Goose Main Tailings Facility (TF)	within mined-out Goose Main Pit	31.3 (mbgs)	7.4	6.2

*Notes: * Includes capacity for storage of waste rock from Goose Main OP; ** TSF only*

Table B-015. Closure Objectives and Criteria – Buildings and Equipment

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices reclamation will be implemented for controlling fugitive and exhaust emissions during active	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 will be disposed of in an on-site landfill	Physical inspection
		Fluid hydrocarbons drained from equipment will be burned in generators or incinerated where approved. Other fluids will be removed from site for recycling or disposal at a licenced facility	Physical inspection
	Remove all hazardous wastes	Hazardous wastes will be shipped offsite for disposal at a licensed facility	Physical inspection
	Remove all fuels, chemicals and industrial wastes	During or prior to closure, a site inventory of all these products will be updated	Physical inspection
		Any unused petroleum products will be burned in generators or incinerated where approved. Other chemicals will be sold, returned to suppliers or shipped offsite for disposal at a licensed facility.	
	Remove surface infrastructure	Any above-ground infrastructure will be offered to third parties at closure for potential reuse elsewhere, otherwise it will be dismantled and buried in a landfill	Physical inspection

(continued)

Table B-015. Closure Objectives and Criteria – Buildings and Equipment (completed)

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
		Remaining concrete structures at grade will be perforated and covered or removed to a landfill. The area will be 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 the landfarm area 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 structures at grade will be perforated and covered and rebar will be cut in pieces and buried or removed to a landfill	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

Table B-016. Closure Objectives and Criteria – Mine Infrastructure

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices will be implemented for controlling fugitive and exhaust emissions during active reclamation	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 components and materials will be disposed of in an on-site landfill	Physical inspection
		Fluid hydrocarbons drained from components will be burned in generators or incinerated where approved. Other fluids will be removed from site for recycling or disposal at a licenced facility	Physical inspection
	Remove all reagent and hazardous wastes	Unused reagents will be returned to suppliers or shipped off-site by a licenced handler	Physical inspection
		Hazardous wastes will be removed for disposal at a licensed facility	
	Remove all fuels, chemicals and industrial wastes	During or prior to closure, a site inventory of all these products will be updated	Physical inspection
		Any unused petroleum products will be burned in generators or incinerated where approved. Other chemicals will be sold, returned to suppliers or removed for disposal at a licensed facility	
	Remove surface infrastructure	Any above-ground infrastructure will be offered to third parties at closure for potential reuse elsewhere; otherwise, it will be dismantled buried in an on-site landfill	Physical inspection
		Remaining concrete structures at grade will be perforated and covered or removed to a landfill. The area will be 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 the landfarm area 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

(continued)

Table B-016. Closure Objectives and Criteria – Mine Infrastructure (completed)

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Wildlife	Ensure the remaining surface areas are safe for wildlife use and access	Remaining areas will be scarified and remaining concrete structures at grade will be perforated and covered or removed to a landfill	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

Table B-017. Closure Objectives and Criteria – Roads and Airstrips

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices will be implemented for controlling fugitive and exhaust emissions during active reclamation	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	Ensure preservation of permafrost	Culverts will be removed and the natural drainage restored. Roads and the airstrip will be scarified when they become redundant; they will otherwise remain intact for preservation of permafrost	Physical inspection
Water	Ensure drainage is restored	Culverts will be removed and the natural drainage restored	Physical inspection
Wildlife	Ensure the remaining surface areas are safe for wildlife use and access	The roads and airstrip will be designed to be safe for wildlife use and access for Operations - no additional work is expected at closure except for scarification and the removal of the culverts	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

Table B-018. Closure Objectives and Criteria – Waste Management Facilities

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
Air	Meet Canadian Ambient Air Quality standards	Best management practices will be implemented for controlling fugitive and exhaust emissions during active reclamation	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 contaminated soils, ice and snow in the landfarm areas	As per operational practices contaminated soils, ice and snow will be treated in the landfarm areas during the active closure stage	Physical inspection
		Remediated soils will be hauled and disposed of in landfills or used for construction of the WRSAs cover	Physical inspection
	Clean up and remove waste management system components or materials	All components or materials will be cleaned up and disposed in the on-site landfill when they are no longer required	Physical inspection
		Metals will be separated and shipped off-site as scrap if economical to do so or disposed of in the on-site landfill	
	Remove all hazardous wastes	Hazardous wastes will be removed for disposal at a licensed facility Used oils and waste fuel could be burned in the on-site incinerators if required and approved	Physical inspection
	Remove surface infrastructure	Any above-ground infrastructure will be demolished/dismantled and the non-hazardous debris will be disposed in the on-site landfill or within the mined-out open pits	Physical inspection
		Remaining concrete structures at grade will be perforated and covered. Any rebar will be cut in pieces and buried or removed and the area re-graded to promote natural drainage	
	Landfills are encapsulated	The landfill areas will be covered with 5 m NPAG waste rock when they are no longer required	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 landfills as per operational practices. Place the 5 m NPAG cover when they are no longer required 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

Table B-019. Site-Specific Water Quality Objectives for Arsenic and Copper

Parameter	MMER (mg/L)	CCME (mg/L)	Site-Specific Water Quality Objective (mg/L)
Total Arsenic	0.5	0.005	0.01
Total Copper	0.3	0.002	0.0042

Table B-020. 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	Fresh water intakes and distribution system will be reclaimed after active closure	Physical inspection
		Maintain water management components until they are no longer required	Physical inspection
	Ensure berms and dams are stable	Berms and dams will be breached once water quality meets licence criteria for direct discharge. TSF dam will only be breached on left abutment (i.e., north of TSF WRSA pond) by excavating a spillway in the berm.	Physical inspection by qualified engineer
	Remove surface infrastructure (i.e., pipelines, culverts, pump systems, WTP)	All components or materials will be cleaned up and disposed in the on-site landfill when they are no longer required	Physical inspection
		Any above ground pipelines will be dismantled and associated distribution equipment will be disposed in the on-site landfill	Physical inspection
		Reclaimed areas will be re-graded	Physical inspection
		Any culverts and equipment will be removed and will be disposed in the on-site landfill	Physical inspection
		Any above-ground infrastructure will be demolished/dismantled and the non-hazardous debris will be disposed in the on-site landfill or within the mined-out open pits	Physical inspection
		Remaining concrete structures at grade will be perforated and covered. Any rebar will be cut in pieces and buried or removed and the area re-graded to promote natural drainage	Physical inspection

(continued)

Table B-020. Closure Objectives and Criteria – Water Management Facilities (completed)

Component	Closure Objectives	Closure Criteria	Actions/ Measurements
	Remove all hazardous wastes	Hazardous wastes will be removed for disposal at a licensed facility	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	Runoff and seepage collected in the Goose Main TF 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 berms 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	Physical inspection
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

Table B-021. Water Management Structure Breach Schedule during Closure Period

Berm	Timing of Breach	Number of Breach Locations
Llama Non-Contact Water Diversion (Southwest, South)	Active Closure	1
SWP Contact Water Diversion	Active Closure	4
Ore Stockpile Pond Contact Water Diversion	Active Closure	2
Echo Non-Contact Water Diversion	Active Closure	2
Echo WRSA Contact Water Diversion	Active Closure	1
Echo WRSA Pond Contact Water Diversion	Active Closure	1
Llama Reservoir	Passive Closure	1
Llama WRSA Contact Water Diversion	Passive Closure	1
Umwelt TF	Passive Closure	1
Umwelt WRSA Contact Water Diversion	Passive Closure	1
Goose Main TF	Passive Closure	1
Goose Main TF Non-Contact Water Diversion	Passive Closure	1
TSF Contact Water Diversion	Passive Closure	3
TSF WRSA Pond Dam	Passive Closure	1

Table B-022. Closure Objectives and Criteria – Quarries and Granular Borrow Sites

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	Surfaces are stabilized	Quarries and granular borrow sites will be contoured to achieve gentle side slopes	Physical inspection
Water	Channel runoff through the watershed	Surfaces will be re-graded to promote natural drainage, new surface drainage patterns will be established if needed	Physical inspection
	Meet Water Licence criteria for runoff	A water management strategy will be implemented to control the transport of sediments out of borrow and quarry areas should it be encountered.	Physical inspection
Wildlife	Ensure surfaces are safe for wildlife use and access	Quarries and granular borrow sites will be re-contoured to reduce hazards to wildlife	Physical inspection
Health and Safety	Ensure surfaces are left in a healthy state that supports continuation of human land use activities	Land use of the 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

Table B-023. Proposed Closure and Post-Closure Main Activities Schedule

Component	Description	Operation Phase (Progressive Reclamation)									Closure Phase								Post-Closure Phase	
		Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19+	Year 23
											Active Stage		Passive Stage							
Open Pits	- Flooding of Llama Pit			Flooding with water pumped from Saline Water Pond							Passive flooding with site runoff and precipitation [a]									
	- Filling and flooding of Umwelt Pit		Filling with tailings								Passive flooding with site runoff and precipitation [a]									
	- Filling and flooding of Goose Main Pit						Filling with tailings Active flooding with water pumped from TSF WRSA Pond				Active flooding with water pumped seasonally from TSF WRSA Pond; Passive flooding with site runoff and precipitation Treated in WTP and recirculated to Goose Main TF									
	- Flooding of Echo Pit										Passive flooding with site runoff and precipitation [a]									
	- Place warning signs around Open Pits perimeter and replace as needed, construct rock berm(s)	X (as needed)																		
Underground Mine Workings	- Active flooding of Llama U/G with water pumped from Saline Water Pond				X															
	- Active flooding of Umwelt U/G and Goose Main U/G with water pumped from Saline Water Pond									X										
	- Passive flooding of Echo U/G with site runoff									X										
	- Backfilling with waste rock (for ground support and additional PAG waste rock storage)		Ongoing during mining (mainly completed by Year 6)																	
	- Backfilling portal and capping vent raises				X (Llama U/G)					X (Echo U/G)	X (Umwelt & Goose U/G)									
WRSAs	- Cover placement with NPAG waste rock	Ongoing during mining																		
TSF WRSA	- Cover placement with NPAG waste rock	Ongoing during Operations (mainly completed by Year 6)																		
Machinery and Mobile Equipment	- Decommission machinery and equipment; drain of fluids and leave in OP or U/G. Leave equipment required for closure and post-closure activities in service.										X									
	- Drain fluids from equipment used for closure activities (e.g., trucks, backhoes, etc.) and dispose in landfill																		X	
	- Drain fluids from equipment used for long-term maintenance (e.g., excavators)[b] and dispose in landfill																			X
Mine Infrastructure	- Decommission facilities and re-grade areas as needed										X									

Component	Description	Operation Phase (Progressive Reclamation)									Closure Phase								Post-Closure Phase	
		Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19+	Year 23
											Active Stage		Passive Stage							
Roads and Airstrip	- Decommission all-weather roads										X (partial)									X
	- Decommission all-weather airstrip																			X
Waste Management Facilities	- Decommission landfill(s)	Simultaneous with WRSAs if capacity reached																X		
	- Remediate contaminated soils in land farms		Ongoing (may continue into Closure and Post-Closure)																	
	- Decommission Sewage Treatment Plant at Goose Property (Pactos used in Closure and Post-Closure)										X									
Water Management Facilities	- Construct spillway on left abutment of TSF Embankment. Breach dams/berms and reclaim channel and pond areas										X			X	X			X		
	- Decommission WTP																		X	
MLA Facilities	- Decommission all infrastructure										X									
Long-term Care and Maintenance (assumed for 13 years)[b]																				
Monitoring							Monitor flooded open pits and contact water reporting from closed mine facilities (post-closure stage duration may be reduced or in-pit treatment may be required)													

[a] *Passive flooding may start earlier during Operations once each facility is no longer required.*
[b] *Assumed for 13 years after end of Operations; however, Closure schedule dependent on monitoring results. Activities will occur when contact water quality satisfies water licence criteria for direct discharge and/or access to the site is no longer required.*

Appendix C. 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	Water flows 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.
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.

Term	Definition
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. 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 Indigenous and Northern Affairs Canada (INAC). 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) Inuit Owned Land (IOL) are those lands vested in the Designated Inuit Organization (DIO) pursuant the Nunavut Agreement. For this Project the DIO is the Kitikmeot Inuit Association.
Land use permit	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 INAC Lands Department. For IOLs- Land Use Licence I, II or III or Commercial Lease I, II, III as defined by the DIO. 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.
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.
Long-term passive 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 the mineral processing plant after it is mined from the Project underground mine and open pits.
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.
Passive treatment	Treatment technologies that can function with little or no maintenance over long periods of time (e.g., use of wetlands).
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.

Term	Definition
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 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, proponent, and other parties with an interest in the Project.
Tailings	Material rejected from a mill after the recoverable valuable minerals have been extracted.
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 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 4 in respect of an undertaking set out in column 1 of the Nunavut Water Regulations SOR/2013-69, or 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)
Waste rock	All unprocessed rock materials that a mining operation produces.

Appendix D. List of Acronyms, Abbreviations, Units, and Symbols

List of Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AANDC	Aboriginal Affairs and Northern Development Canada (formerly known as Indian and Northern Affairs Canada, now known as Indigenous and Northern Affairs Canada)
ABA	Acid-Base Accounting
AEMP	Aquatic Effects Monitoring Plan
ARD	Acid Rock Drainage
ANFO	Ammonium Nitrate/Fuel Oil
AWAR	All-weather Access Road
BIF	Banded Iron Formation
CCME	Canadian Council for Ministers of the Environment
CLARC	Community Lands and Resources Committee
CLEY	Culture, Language, Elders and Youth
CGS	Community and Government Services
CP	Collection Pond
ICRP	Interim Closure and Reclamation Plan
DFO	Fisheries and Oceans Canada
FCRP	Final Closure and Reclamation Plan
FEIS	Final Environmental Impact Statement
Golder	Golder Associates Ltd.
GN	Government of Nunavut
HADD	Harmful Alteration Disruption or Destruction
HTO	Hunters and Trappers Organizations
INAC	Indigenous and Northern Affairs Canada
ISQG	Interim Sediment Quality Guidelines
KIA	Kitikmeot 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
NPAG	non-Potentially Acid Generating
NRC	Natural Resources Canada
NWB	Nunavut Water Board
PAG	Potentially Acid-Generating
Project	Back River Project
PEL	Probable Effect Level
RSA	Regional Study Area
SFE	Shake Flask Extraction
TDS	Total Dissolved Solids
TF	Tailings Facility

TSF	Tailings Storage Facility
TSS	Total Suspended Solids
WRSA	Waste Rock Storage Area
WTP	Water Treatment Plant

List of Units and Symbols

Units/Symbols	Definition
%	percent
°	degrees
°C	degrees Celsius
bgs	below ground surface
dBA	Decibels (A-weighted)
g	gram
H:V	horizontal to vertical
ha	hectares
km	kilometre
km/h	kilometres per hour
km^2	square kilometres
m	metres
m^2	square metres
m^3	cubic metres
m^3/day	cubic metres per day
masl	metres above sea level
mm	millimetres
mm/year	millimetres per year
mg/L	milligrams per litre
mg/kg	milligrams per kilogram
m^3	cubic metres
Mm^3	million cubic metres
Mt	million tonnes
t	tonnes
tpd	tonnes per day

Appendix E. 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 pits
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 WRSA	Birds or wildlife injury or mortality by entering the landfill	Landfill will be located within the WRSAs and covered at closure reducing hazards to birds and wildlife

Appendix F. Ongoing Reclamation Studies

To address the uncertainties in the closure and remediation activities, the below ongoing reclamation studies will be considered. These studies will be reviewed on an ongoing bases and considered during Operations to allow potential modifications to be incorporated during progressive and final reclamation. The Table 1 below presents an update to the proposed reclamation studies presented in the Feasibility Study.

Table 1. Updated Proposed Reclamation Studies

Study No.	Description
1	Additional geochemical characterization to characterize the ARD/ML potential of the pit walls that will be above the final pit lake elevations.
2	Confirm cover designs are appropriate through further modelling and monitoring of temperatures, completion of energy balance on model inputs during freeze-back period, permafrost aggregation, active layer thaw in waste rock storage areas, etc.
3	Acquire an estimate of creep parameters for WRSA foundations and perform long-term deformation modelling for physical stability closure objective.
4	Develop an improved estimate of the runoff coefficient from the WRSAs. This will have an impact operationally on pump and pond sizing, and during closure on treatment volume and environmental loading estimates.
5	Collect additional water quality data during the winter to permit less conservative water quality modelling assumptions during the under-ice period.
6	Identify opportunities to locate the saline reservoir outside of Umwelt Lake in order to avoid an MMER Schedule II application for Umwelt Lake. Possible opportunities include building a ring dike containment structure or transporting the connate water to Bathurst Inlet and discharging via a diffuser.
7	Revegetation research focused on large footprint areas which will significantly improve long-term stability and usability of the site follow Closure.

Appendix G. Interim Closure Cost Estimate

SUMMARY OF COSTS

CAPITAL COSTS	COMPONENT NAME	COST	TOTAL LIABILITY
OPEN PIT	Umwelt	$35,187	$35,187
	Llama	$18,846	$18,846
	Echo	$18,625	$18,625
	Goose Main	$53,390	$53,390
QUARRY (under OPEN PIT TAB estimate)	Airstrip Quarry	$3,800	$3,800
UNDERGROUND MINE	Umwelt	$310,467	$310,467
	Llama	$89,886	$89,886
	Goose Main	$157,010	$157,010
	Echo	$96,206	$96,206
TAILINGS FACILITIES	TSF	$186,719	$186,719
ROCK PILE	Umwelt, Llama, Echo and TSF	$14,400,000	$14,400,000
BUILDINGS AND EQUIPMENT		$1,939,431	$1,939,431
CHEMICALS AND CONTAMINATED SOIL MANAGEMENT		$1,385,630	$1,385,630
SURFACE AND GROUNDWATER MANAGEMENT		$158,608	$158,608
INTERIM CARE AND MAINTENANCE		$592,201	$592,201
	SUBTOTAL: Capital Costs	**$19,446,004**	**$19,446,004**
	PERCENT OF SUBTOTAL		**100%**

INDIRECT COSTS		COST	TOTAL LIABILITY
MOBILIZATION/DEMOBILIZATION		$4,165,738	$4,165,738
POST-CLOSURE MONITORING AND MAINTENANCE		$5,565,651	$5,565,651
ENGINEERING	5%	$972,300	$972,300
PROJECT MANAGEMENT	5%	$972,300	$972,300
HEALTH AND SAFETY PLANS/MONITORING & QA/QC	1%	$194,460	$194,460
BONDING/INSURANCE	1%	$194,460	$194,460
CONTINGENCY	20%	$3,889,201	$3,889,201
MARKET PRICE FACTOR ADJUSTMENT	0%	$0	$0
	SUBTOTAL: Indirect Costs	**$15,954,111**	**$15,954,111**

TOTAL COSTS	**$35,400,115**	**$35,400,115**

5 **Open Pit Name:** **Umwelt** **Pit #** **1** **1**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	Total Cost
CONTROL ACCESS							
Fence		m		#N/A	$0.00	$0	$0
Signs	Assumed	each	4	Sabina	$75.00	$300	$300
Berm at crest	Estimated for continous berm with 1m diameter boulders, no spacing between boulders - 0.52 m3/m - assumed 50 % done during Operations	m3	426	RB1H	$17.05	$7,263	$7,263
Block roads	Temporary gate installation to allow water monitoring. It includes decommissioning of gate when no longer required. Exposed area after gate has been decommissioned will be blocked with boulders (exposed area along with block of roads with boulders included in berm cost above)	allow	1	Sabina	$5,000.00	$5,000	$5,000
Other				#N/A	$0.00	$0	$0
STABILITY STUDY							
Conduct stability and setback study		allow	1	Sabina	$10,000.00	$10,000	$10,000
STABILIZE SLOPES							
Off-load crest, soil A		m3		#N/A	$0.00	$0	$0
Off-load crest, soil B		m3		#N/A	$0.00	$0	$0
Doze/trim overburden at crest		m3		#N/A	$0.00	$0	$0
Drill & blast pit crest		m3		#N/A	$0.00	$0	$0
Buttress slope		m3		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
COVER/CONTOUR SLOPES							
Place fill, soil A		m3		#N/A	$0.00	$0	$0
Place fill, soil B		m3		#N/A	$0.00	$0	$0
Rip rap		m3		#N/A	$0.00	$0	$0
Vegetate slopes		ha		#N/A	$0.00	$0	$0
Vegetate pit floor		ha		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
CONSTRUCT DIVERSION DITCHES							
Excavate ditches -soil		m3		#N/A	$0.00	$0	$0
Excavate ditches -rock		m3		#N/A	$0.00	$0	$0
Rip rap in channel base		m3		#N/A	$0.00	$0	$0
CONSTRUCT SPILLWAY							
Excavate channel	200 m long, 6 m wide and 1 m deep	m3	1,200	SB1L	$4.30	$5,160	$5,160
Concrete		m3		#N/A	$0.00	$0	$0
Rip rap		m3	400	RR1L	$13.50	$5,400	$5,400
Other	Geotextile	m2	600	GSTL	$3.44	$2,064	$2,064
RECLAIM QUARRIES							
Contour slopes		m3		#N/A	$0.00	$0	$0
Place overburden		m3		#N/A	$0.00	$0	$0
Vegetate		m3		#N/A	$0.00	$0	$0
FLOOD PIT-Capital							
Remove stationary equipment (sump pumps) and Pipeline	Umwelt TF will be used to store tailings in Years 2 to 6 and it will then passively flood with site runoff and direct precipitation through the remainder of Operations and into the Closure Phase. Pipelines/pumps will be relocated for use in the other active pits (Llama Pit and Goose Main Pit) and removed to closure landfill once they are no longer needed. Dispose of fuel in diesel day tank and oil from pump and landfill cleaned pump. Remove of pumps and pipelines will occur during Operations.	m		#N/A	$0.00	$0	$0
Remove dewatering pipeline		m		#N/A	$0.00	$0	$0
Remove power lines		each		#N/A	$0.00	$0	$0
Construct diversion ditches		m3		#N/A	$0.00	$0	$0
-Ditch, mat'l A		m3		#N/A	$0.00	$0	$0
-Ditch, mat'l B		m3		#N/A	$0.00	$0	$0
Construct embankment/dam		m3		#N/A	$0.00	$0	$0
Supply/install pump station		each		#N/A	$0.00	$0	$0
Supply/install piping system		m		#N/A	$0.00	$0	$0
Remove pump post-closure		each		#N/A	$0.00	$0	$0
Remove pipeline post-closure		m		#N/A	$0.00	$0	$0
FLOOD PIT-Annual Cost							
Operate pumps (power)		m3		#N/A	$0.00	$0	$0
Maintain pump/pipeline		allow		#N/A	$0.00	$0	$0
Labour:fuel management, comissioning/decom		$/h		#N/A	$0.00	$0	$0
Chemical addition, _____ kg/m3 of water		tonne		#N/A	$0.00	$0	$0
Chemicals, purchase and shipping		tonne		#N/A	$0.00	$0	$0
Passive/biological additives		$/ha		#N/A	$0.00	$0	$0
Passive additives purchase and shipping		tonne		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
					Annual pumping costs	$0	
Number of years of pump flooding	passive pit flooding	years	0				
					Total pumping costs	$0	$0
					Total	$35,187	$35,187
					% of Total		100%

Open Pit Name:	Llama				Pit #	2	2
ACTIVITY/MATERIAL	**Notes**	**Units**	**Quantity**	**Cost Code**	**Unit Cost**	**Cost**	**Total Cost**
CONTROL ACCESS							
Fence		m		#N/A	$0.00	$0	$0
Signs	Assumed	each	4	Sabina	$75.00	$300	$300
Berm at crest	Estimated for berm with 1m diameter boulders, no spacing between boulders - 0.52 m3/m; berm needed only where pit edge will not abute the final flooded lake footprint.	m3	208	RB1H	$17.05	$3,546	$3,546
Block roads	Temporary gate installation to allow water monitoring. It includes decommissioning of gate when no longer required. Exposed area after gate has been decommissioned will be blocked with boulders (exposed area along with block of roads with boulders included in berm cost above)	allow	1	Sabina	$5,000.00	$5,000	$5,000
Other				#N/A	$0.00	$0	$0
STABILITY STUDY							
Conduct stability and setback study		allow	1	Sabina	$10,000.00	$10,000	$10,000
STABILIZE SLOPES							
Off-load crest, soil A		m3		#N/A	$0.00	$0	$0
Off-load crest, soil B		m3		#N/A	$0.00	$0	$0
Doze/trim overburden at crest		m3		#N/A	$0.00	$0	$0
Drill & blast pit crest		m3		#N/A	$0.00	$0	$0
Buttress slope		m3		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
COVER/CONTOUR SLOPES							
Place fill, soil A		m3		#N/A	$0.00	$0	$0
Place fill, soil B		m3		#N/A	$0.00	$0	$0
Rip rap		m3		#N/A	$0.00	$0	$0
Vegetate slopes		ha		#N/A	$0.00	$0	$0
Vegetate pit floor		ha		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
CONSTRUCT DIVERSION DITCHES							
Excavate ditches -soil		m3		#N/A	$0.00	$0	$0
Excavate ditches -rock		m3		#N/A	$0.00	$0	$0
Rip rap in channel base		m3		#N/A	$0.00	$0	$0
CONSTRUCT SPILLWAY							
Excavate channel	Spillway not required; will follow natural drainage to Umwelt Lake.	m3		#N/A	$0.00	$0	$0
Concrete		m3		#N/A	$0.00	$0	$0
Rip rap		m3		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
RECLAIM QUARRIES							
Contour slopes		m3		#N/A	$0.00	$0	$0
Place overburden		m3		#N/A	$0.00	$0	$0
Vegetate		m3		#N/A	$0.00	$0	$0
FLOOD PIT-Captital							
Remove stationary equipment (sump pumps) and Pipeline	In Year 6, the exhausted Llama Pit will be converted to a water reservoir. Water from the Saline Water Pond will be pumped into Llama Reservoir between Year 4 and Year 9. The Llama Reservoir will continue to passively flood with site runoff and direct precipitation through the remainder of Operations and into the Closure Phase. Pipelines/pumps will be relocated for use in the other active pits (Goose Main Pit and Echo Pit) and removed to closure landfill once they are no longer needed. Dispose of fuel in diesel day tank and oil from pump and landfill cleaned pump. Remove of pumps and pipelines will occur during Operations.	m		#N/A	$0.00	$0	$0
Remove dewatering pipeline		m		#N/A	$0.00	$0	$0
Remove power lines		each		#N/A	$0.00	$0	$0
Construct diversion ditches		m3		#N/A	$0.00	$0	$0
-Ditch, mat'l A		m3		#N/A	$0.00	$0	$0
-Ditch, mat'l B		m3		#N/A	$0.00	$0	$0
Construct embankment/dam		m3		#N/A	$0.00	$0	$0
Supply/install pump station		each		#N/A	$0.00	$0	$0
Supply/install piping system		m		#N/A	$0.00	$0	$0
Remove pump post-closure		each		#N/A	$0.00	$0	$0
Remove pipeline post-closure		m		#N/A	$0.00	$0	$0
FLOOD PIT-Annual Cost							
Operate pumps (power)		m3		#N/A	$0.00	$0	$0
Maintain pump/pipeline		allow		#N/A	$0.00	$0	$0
Labour:fuel management, comissioning/decom		$/h		#N/A	$0.00	$0	$0
Chemical addition, _____ kg/m3 of water		tonne		#N/A	$0.00	$0	$0
Chemicals, purchase and shipping		tonne		#N/A	$0.00	$0	$0
Passive/biological additives		$/ha		#N/A	$0.00	$0	$0
Passive additives purchase and shipping		tonne		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
					Annual pumping costs	$0	
Number of years of pump flooding	passive pit flooding	years	0				
					Total pumping costs	$0	$0
					Total	$18,846	$18,846
					% of Total		100%

Open Pit Name:	Echo				Pit #	3	3
ACTIVITY/MATERIAL	**Notes**	**Units**	**Quantity**	**Cost Code**	**Unit Cost**	**Cost**	**Total Cost**
CONTROL ACCESS							
Fence		m		#N/A	$0.00	$0	$0
Signs	Assumed	each	4	Sabina	$75.00	$300	$300
Berm at crest	Estimated for continous berm with 1m diameter boulders, no spacing between boulders - 0.52 m3/m - assumed 50 % done during Operations	m3	195	RB1H	$17.05	$3,325	$3,325
Block roads	Temporary gate installation to allow water monitoring. It includes decommissioning of gate when no longer required. Exposed area after gate has been decommissioned will be blocked with boulders (exposed area along with block of roads with boulders included in berm cost above)	allow	1	Sabina	$5,000.00	$5,000	$5,000
Other				#N/A	$0.00	$0	$0
STABILITY STUDY							
Conduct stability and setback study		allow	1	Sabina	$10,000.00	$10,000	$10,000
STABILIZE SLOPES							
Off-load crest, soil A		m3		#N/A	$0.00	$0	$0
Off-load crest, soil B		m3		#N/A	$0.00	$0	$0
Doze/trim overburden at crest		m3		#N/A	$0.00	$0	$0
Drill & blast pit crest		m3		#N/A	$0.00	$0	$0
Buttress slope		m3		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
COVER/CONTOUR SLOPES							
Place fill, soil A		m3		#N/A	$0.00	$0	$0
Place fill, soil B		m3		#N/A	$0.00	$0	$0
Rip rap		m3		#N/A	$0.00	$0	$0
Vegetate slopes		ha		#N/A	$0.00	$0	$0
Vegetate pit floor		ha		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
CONSTRUCT DIVERSION DITCHES							
Excavate ditches -soil		m3		#N/A	$0.00	$0	$0
Excavate ditches -rock		m3		#N/A	$0.00	$0	$0
Rip rap in channel base		m3		#N/A	$0.00	$0	$0
CONSTRUCT SPILLWAY							
Excavate channel	Spillway not required; will follow natural drainage to Goose Lake.	m3		#N/A	$0.00	$0	$0
Concrete		m3		#N/A	$0.00	$0	$0
Rip rap		m3		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
RECLAIM QUARRIES							
Contour slopes		m3		#N/A	$0.00	$0	$0
Place overburden		m3		#N/A	$0.00	$0	$0
Vegetate		m3		#N/A	$0.00	$0	$0
FLOOD PIT-Captital							
Remove stationary equipment (sump pumps) and Pipeline	Once mining of the Echo Pit concludes in Year 5, dewatering will continue until Year 9 (i.e., the end of Echo U/G mining) as the two mines will be connected. Starting in Year 10, Echo Pit will passively flood with site runoff and direct precipitation through the remainder of Operations and into the Closure Phase. Pipelines/pumps will be removed to closure landfill. Dispose of fuel in diesel day tank and oil from pump and landfill cleaned pump. Remove of pumps and pipeline will occur during Operations.	m		#N/A	$0.00	$0	$0
Remove dewatering pipeline		m		#N/A	$0.00	$0	$0
Remove power lines		each		#N/A	$0.00	$0	$0
Construct diversion ditches		m3		#N/A	$0.00	$0	$0
-Ditch, mat'l A		m3		#N/A	$0.00	$0	$0
-Ditch, mat'l B		m3		#N/A	$0.00	$0	$0
Construct embankment/dam		m3		#N/A	$0.00	$0	$0
Supply/install pump station		each		#N/A	$0.00	$0	$0
Supply/install piping system		m		#N/A	$0.00	$0	$0
Remove pump post-closure		each		#N/A	$0.00	$0	$0
Remove pipeline post-closure		m		#N/A	$0.00	$0	$0
FLOOD PIT-Annual Cost							
Operate pumps (power)		m3		#N/A	$0.00	$0	$0
Maintain pump/pipeline		allow		#N/A	$0.00	$0	$0
Labour:fuel management, comissioning/decom		$/h		#N/A	$0.00	$0	$0
Chemical addition, _____ kg/m3 of water		tonne		#N/A	$0.00	$0	$0
Chemicals, purchase and shipping		tonne		#N/A	$0.00	$0	$0
Passive/biological additives		$/ha		#N/A	$0.00	$0	$0
Passive additives purchase and shipping		tonne		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
					Annual pumping costs	$0	
Number of years of pump flooding	passive pit flooding	years	0				
					Total pumping costs	$0	$0
					Total	$18,625	$18,625
					% of Total		100%

Open Pit Name:	Goose Main				Pit #	4	4
ACTIVITY/MATERIAL	**Notes**	**Units**	**Quantity**	**Cost Code**	**Unit Cost**	**Cost**	**Total Cost**
CONTROL ACCESS							
Fence		m		#N/A	$0.00	$0	$0
Signs	Assumed	each	4	Sabina	$75.00	$300	$300
Berm at crest	Estimated for continous berm with 1m diameter boulders, no spacing between boulders - 0.52 m3/m - assumed 50 % done during Operations	m3	494	RB1H	$17.05	$8,423	$8,423
Block roads	Temporary gate installation to allow water monitoring. It includes decommissioning of gate when no longer required. Exposed area after gate has been decommissioned will be blocked with boulders (exposed area along with block of roads with boulders included in berm cost above)	allow	1	Sabina	$5,000.00	$5,000	$5,000
Other				#N/A	$0.00	$0	$0
STABILITY STUDY							
Conduct stability and setback study		allow	1	Sabina	$10,000.00	$10,000	$10,000
STABILIZE SLOPES							
Off-load crest, soil A		m3		#N/A	$0.00	$0	$0
Off-load crest, soil B		m3		#N/A	$0.00	$0	$0
Doze/trim overburden at crest		m3		#N/A	$0.00	$0	$0
Drill & blast pit crest		m3		#N/A	$0.00	$0	$0
Buttress slope		m3		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
COVER/CONTOUR SLOPES							
Place fill, soil A		m3		#N/A	$0.00	$0	$0
Place fill, soil B		m3		#N/A	$0.00	$0	$0
Rip rap		m3		#N/A	$0.00	$0	$0
Vegetate slopes		ha		#N/A	$0.00	$0	$0
Vegetate pit floor		ha		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
CONSTRUCT DIVERSION DITCHES							
Excavate ditches -soil		m3		#N/A	$0.00	$0	$0
Excavate ditches -rock		m3		#N/A	$0.00	$0	$0
Rip rap in channel base		m3		#N/A	$0.00	$0	$0
CONSTRUCT SPILLWAY							
Excavate channel	100 m long, 6 m wide and 1 m deep	m3	600	SB1L	$4.30	$2,580	$2,580
Concrete		m3		#N/A	$0.00	$0	$0
Rip rap		m3	200	RR1L	$13.50	$2,700	$2,700
Other	Geotextile	m2	300	GSTL	$3.44	$1,032	$1,032
RECLAIM QUARRIES							
Contour slopes		m3		#N/A	$0.00	$0	$0
Place overburden		m3		#N/A	$0.00	$0	$0
Vegetate		m3		#N/A	$0.00	$0	$0
FLOOD PIT-Captital							
Remove stationary equipment (sump pumps) and Pipeline	At closure, pump will be at top of TF and pipeline leads to WTP. Remove pipeline to closure landfill; dispose of fuel in diesel day tank and oil from pump and landfill cleaned pump.	m	4,325	Sabina	$5.40	$23,355	$23,355
Remove dewatering pipeline		m		#N/A	$0.00	$0	$0
Remove power lines		each		#N/A	$0.00	$0	$0
Construct diversion ditches		m3		#N/A	$0.00	$0	$0
-Ditch, mat'l A		m3		#N/A	$0.00	$0	$0
-Ditch, mat'l B		m3		#N/A	$0.00	$0	$0
Construct embankment/dam		m3		#N/A	$0.00	$0	$0
Supply/install pump station		each		#N/A	$0.00	$0	$0
Supply/install piping system		m		#N/A	$0.00	$0	$0
Remove pump post-closure		each		#N/A	$0.00	$0	$0
Remove pipeline post-closure		m		#N/A	$0.00	$0	$0
FLOOD PIT-Annual Cost							
Operate pumps (power)		m3		#N/A	$0.00	$0	$0
Maintain pump/pipeline		allow		#N/A	$0.00	$0	$0
Labour:fuel management, comissioning/decom		$/h		#N/A	$0.00	$0	$0
Chemical addition, _____ kg/m3 of water		tonne		#N/A	$0.00	$0	$0
Chemicals, purchase and shipping		tonne		#N/A	$0.00	$0	$0
Passive/biological additives		$/ha		#N/A	$0.00	$0	$0
Passive additives purchase and shipping		tonne		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
					Annual pumping costs	$0	
Number of years of pump flooding	passive pit flooding	years	0				
					Total pumping costs	$0	$0
					Total	$53,390	$53,390
					% of Total		100%

Quarry Name:	Airstrip Quarry				Quarry #	1	1
ACTIVITY/MATERIAL	**Notes**	**Units**	**Quantity**	**Cost Code**	**Unit Cost**	**Cost**	**Total Cost**
CONTROL ACCESS							
Fence		m		#N/A	$0.00	$0	$0
Signs		each		#N/A	$0.00	$0	$0
Berm at crest		m3		RB1H	$17.05	$0	$0
Block roads		allow		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
STABILITY STUDY							
Conduct stability and setback study	Not required for quarry	allow		#N/A	$0.00	$0	$0
STABILIZE SLOPES							
Off-load crest, soil A		m3		#N/A	$0.00	$0	$0
Off-load crest, soil B		m3		#N/A	$0.00	$0	$0
Doze/trim overburden at crest		m3		#N/A	$0.00	$0	$0
Drill & blast pit crest		m3		#N/A	$0.00	$0	$0
Buttress slope		m3		#N/A	$0.00	$0	$0
Other	Backhoe to pull down loose rock on bedrock backslope - assumed	hrs	20	exc-sL	$190.00	$3,800	$3,800
COVER/CONTOUR SLOPES							
Place fill, soil A		m3		#N/A	$0.00	$0	$0
Place fill, soil B		m3		#N/A	$0.00	$0	$0
Rip rap		m3		#N/A	$0.00	$0	$0
Vegetate slopes	Allow to revegetate naturally	ha		#N/A	$0.00	$0	$0
Vegetate pit floor		ha		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
CONSTRUCT DIVERSION DITCHES							
Excavate ditches -soil		m3		#N/A	$0.00	$0	$0
Excavate ditches -rock		m3		#N/A	$0.00	$0	$0
Rip rap in channel base		m3		#N/A	$0.00	$0	$0
CONSTRUCT SPILLWAY							
Excavate channel	Not required. Quarry base will be graded for sheet drainage.	m3		SB1L	$4.30	$0	$0
Concrete		m3		#N/A	$0.00	$0	$0
Rip rap		m3		RR1L	$13.50	$0	$0
Other		m2		GSTL	$3.44	$0	$0
RECLAIM QUARRIES							
Contour slopes	Quarry will not be flooded - development will occur below water level and the areas will be contoured to drain positively	m3		#N/A	$0.00	$0	$0
Place overburden		m3		#N/A	$0.00	$0	$0
Vegetate		m3		#N/A	$0.00	$0	$0
FLOOD PIT-Capital							
Remove stationary equipment (sump pumps) and Pipeline		m		#N/A	$0.00	$0	$0
Remove dewatering pipeline		m		#N/A	$0.00	$0	$0
Remove power lines		each		#N/A	$0.00	$0	$0
Construct diversion ditches		m3		#N/A	$0.00	$0	$0
-Ditch, mat'l A		m3		#N/A	$0.00	$0	$0
-Ditch, mat'l B		m3		#N/A	$0.00	$0	$0
Construct embankment/dam		m3		#N/A	$0.00	$0	$0
Supply/install pump station		each		#N/A	$0.00	$0	$0
Supply/install piping system		m		#N/A	$0.00	$0	$0
Remove pump post-closure		each		#N/A	$0.00	$0	$0
Remove pipeline post-closure		m		#N/A	$0.00	$0	$0
FLOOD PIT-Annual Cost							
Operate pumps (power)		m3		#N/A	$0.00	$0	$0
Maintain pump/pipeline		allow		#N/A	$0.00	$0	$0
Labour:fuel management, comissioning/decom		$/h		#N/A	$0.00	$0	$0
Chemical addition, _____ kg/m3 of water		tonne		#N/A	$0.00	$0	$0
Chemicals, purchase and shipping		tonne		#N/A	$0.00	$0	$0
Passive/biological additives		$/ha		#N/A	$0.00	$0	$0
Passive additives purchase and shipping		tonne		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
					Annual pumping costs	$0	
Number of years of pump flooding	No flooding	years	0				
					Total pumping costs	$0	$0
					Total	$3,800	$3,800
					% of Total		100%

4 **Underground Mine Name Umwelt** **UG Mine # 1** **1**

ACTIVITY/MATERIAL	Notes	Unit	Qty	Cost Code	Unit Cost	Cost	Total Cost
CONTROL ACCESS							
Fence		m		#N/A	$0.00	$0	$0
Signs		each		#N/A	$0.00	$0	$0
Block roads		m3		#N/A	$0.00	$0	$0
Berm		m3		#N/A	$0.00	$0	$0
Backfill Portal (NPAG waste rock plug)	At least 5 m deep into 5x4.5m portal and slope at least 2:1 outside of portal	m3	150	PORL	$18.80	$2,820	$2,820
Backfill portal #2		m3		#N/A	$0.00	$0	$0
Cap raise # 1	Concrete plug over 4m-dia. vent raise	m3	28	SRH	$2,132.00	$60,336	$60,336
Cap raise #2	Concrete plug over 4m-dia. vent raise	m3	28	SRH	$2,132.00	$60,336	$60,336
Cap shaft #1	Concrete plug over 4m-dia. fresh air vent	m3	28	SRH	$2,132.00	$60,336	$60,336
Cap shaft #2		m3		#N/A	$0.00	$0	$0
Backfill adits		m3		#N/A	$0.00	$0	$0
Backfill open stope		m3		#N/A	$0.00	$0	$0
Concrete cap over open stope		m3		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
REMOVE HAZARDOUS MATERIALS							
Remove hazardous materials, U/G labor	Two shifts with loader, incl. operator and fuel	manhour	20	load-s	$175.00	$3,500	$3,500
Remove/decontam. stationary & elect. equip		mandays		#N/A	$0.00	$0	$0
Remove/decontam. mobile equipment		each		#N/A	$0.00	$0	$0
Remove misc. haz. mat & explosives	Dispose of up to 1 week's inventory of explosives	kg	100	Sabina	$50.00	$5,000	$5,000
Decommission Pipeline	Clean Umwelt UG to SWP pipeline, decommission and landfill	m	1,200	Sabina	$4.90	$5,880	$5,880
INSTALL BULKHEADS							
Bulkheads to control water flow		each		#N/A	$0.00	$0	$0
Grout bulkhead		m3		#N/A	$0.00	$0	$0
FLOOD MINE							
Supply/install pump	UG mine is expected to be flooded in Year 10 and active flooding will take about a year, relocation of pipelines and flooding will occur as part of operations but cost is provided as a conservative approach	each		#N/A	$0.00	$0	$0
Relocate Pipeline	Move SWP-Llama UG pipeline discharge to Umwelt UG	m	800	Sabina	$4.73	$3,780	$3,780
Operate pumps to flood workings		m3	763,134	Sabina	$0.13	$98,480	$98,480
Decommission of pipeline				#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
INSTALL GROUNDWATER COLLECTION SYSTEM							
Excavate/install sumps		m2		#N/A	$0.00	$0	$0
Install pumping wells		m3		#N/A	$0.00	$0	$0
Install pumps/pipelines/power supply		LS		#N/A	$0.00	$0	$0
SPECIALIZED ITEMS							
Install water quality monitoring pipes		each		#N/A	$0.00	$0	$0
Install permanent pumping system		each		#N/A	$0.00	$0	$0
Assess underground stability	Rock mechanics inspection before closure	each	1	Sabina	$10,000.00	$10,000	$10,000
					Total	$310,467	$310,467
					% of Total		100%

Underground Mine Name **Llama** **UG Mine # 2** **2**

ACTIVITY/MATERIAL	Notes	Unit	Qty	Cost Code	Unit Cost	Cost	Total Cost
CONTROL ACCESS							
Fence		m		#N/A	$0.00	$0	$0
Signs		each		#N/A	$0.00	$0	$0
Block roads		m3		#N/A	$0.00	$0	$0
Berm		m3		#N/A	$0.00	$0	$0
Backfill Portal (NPAG waste rock plug)	At least 5 m deep into 5x4.5m portal and slope at least 2:1 outside of portal	m3	150	PORL	$18.80	$2,820	$2,820
Backfill portal #2		m3		#N/A	$0.00	$0	$0
Cap raise # 1	Concrete plug over 4m-dia. vent raise	LS	28	SRH	$2,132.00	$60,336	$60,336
Cap raise #2		m3		#N/A	$0.00	$0	$0
Cap shaft #1		m3		#N/A	$0.00	$0	$0
Cap shaft #2		m3		#N/A	$0.00	$0	$0
Backfill adits		m3		#N/A	$0.00	$0	$0
Backfill open stope		m3		#N/A	$0.00	$0	$0
Concrete cap over open stope		m3		#N/A	$0.00	$0	$0
Other							
REMOVE HAZARDOUS MATERIALS							
Remove hazardous materials, U/G labor	Two shifts with loader, incl. operator and fuel	manhour	20	load-s	$175.00	$3,500	$3,500
Remove/decontam. stationary & elect. equip		mandays		#N/A	$0.00	$0	$0
Remove/decontam. mobile equipment		each		#N/A	$0.00	$0	$0
Remove misc. haz. mat & explosives	Mining will cease before closure	kg		#N/A	$0.00	$0	$0
Decommission Pipeline	Clean Llama UG to SWP pipeline, decommission and landfill	m	2700	Sabina	$4.90	$13,230	$13,230
INSTALL BULKHEADS							
Bulkheads to control water flow		each		#N/A	$0.00	$0	$0
Grout bulkhead		m3		#N/A	$0.00	$0	$0
FLOOD MINE							
Supply/install pump	UG mine is expected to be flooded in Year 5 and active flooding will take about a year, relocation of pipelines and flooding will occur as part of operations	each		#N/A	$0.00	$0	$0
Supply/install piping system		m		#N/A	$0.00	$0	$0
Operate pumps to flood workings		m3		#N/A	$0.00	$0	$0
Decommission of pipelines				#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
INSTALL GROUNDWATER COLLECTION SYSTEM							
Excavate/install sumps		m2		#N/A	$0.00	$0	$0
Install pumping wells		m3		#N/A	$0.00	$0	$0
Install pumps/pipelines/power supply		LS		#N/A	$0.00	$0	$0
SPECIALIZED ITEMS							
Install water quality monitoring pipes		each		#N/A	$0.00	$0	$0
Install permanent pumping system		each		#N/A	$0.00	$0	$0
Assess underground stability	Rock mechanics inspection before closure	each	1	Sabina	$10,000.00	$10,000	$10,000
					Total	$89,886	$89,886
					% of Total		100%

Underground Mine Name	Goose Main	UG Mine # 3	3

ACTIVITY/MATERIAL	Notes	Unit	Qty	Cost Code	Unit Cost	Cost	Total Cost
CONTROL ACCESS							
Fence		m		#N/A	$0.00	$0	$0
Signs		each		#N/A	$0.00	$0	$0
Block roads		m3		#N/A	$0.00	$0	$0
Berm		m3		#N/A	$0.00	$0	$0
Backfill Portal (NPAG waste rock plug)	At least 5 m deep into 5x4.5m portal and slope at least 2:1 outside of portal	m3	150	PORL	$18.80	$2,820	$2,820
Backfill portal #2		m3		#N/A	$0.00	$0	$0
Cap raise # 1	Concrete plug over 4m-dia. vent raise	LS	28	SRH	$2,132.00	$60,336	$60,336
Cap raise #2		m3		#N/A	$0.00	$0	$0
Cap shaft #1		m3		#N/A	$0.00	$0	$0
Cap shaft #2		m3		#N/A	$0.00	$0	$0
Backfill adits		m3		#N/A	$0.00	$0	$0
Backfill open stope		m3		#N/A	$0.00	$0	$0
Concrete cap over open stope		m3		#N/A	$0.00	$0	$0
Other							
REMOVE HAZARDOUS MATERIALS							
Remove hazardous materials, U/G labor	Two shifts with loader, incl. operator and fuel	manhour	20	load-s	$175.00	$3,500	$3,500
Remove/decontam. stationary & elect. equip		mandays		#N/A	$0.00	$0	$0
Remove/decontam. mobile equipment		each		#N/A	$0.00	$0	$0
Remove misc. haz. mat & explosives	Mining will cease before closure	kg		#N/A	$0.00	$0	$0
Decommission WTP - Goose Lake Pipeline	In Water Management tab	m		#N/A	$0.00	$0	$0
INSTALL BULKHEADS							
Bulkheads to control water flow		each		#N/A	$0.00	$0	$0
Grout bulkhead		m3		#N/A	$0.00	$0	$0
FLOOD MINE							
Supply/install pump	UG mine is expected to be flooded in Year 10 and active flooding will take about a year, relocation of pipelines and flooding will occur as progressive reclamation but cost is provided as a conservative approach	each		#N/A	$0.00	$0	$0
Supply/install piping system	Adjust pipe line to route to Goose UG in Year 10	m	4,500	Sabina	$3.91	$17,575	$17,575
Operate pumps to flood workings		m3	391,630	Sabina	$0.13	$52,259	$52,259
Decommission SWP to Goose UG pipeline		m	10,800	#N/A	$1.90	$20,520	$20,520
Other				#N/A	$0.00	$0	$0
INSTALL GROUNDWATER COLLECTION SYSTEM							
Excavate/install sumps		m2		#N/A	$0.00	$0	$0
Install pumping wells		m3		#N/A	$0.00	$0	$0
Install pumps/pipelines/power supply		LS		#N/A	$0.00	$0	$0
SPECIALIZED ITEMS							
Install water quality monitoring pipes		each		#N/A	$0.00	$0	$0
Install permanent pumping system		each		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
					Total	$157,010	$157,010
					% of Total		100%

Underground Mine Name **Echo** **UG Mine # 4** **4**

ACTIVITY/MATERIAL	Notes	Unit	Qty	Cost Code	Unit Cost	Cost	Total Cost
CONTROL ACCESS							
Fence		m		#N/A	$0.00	$0	$0
Signs		each		#N/A	$0.00	$0	$0
Block roads		m3		#N/A	$0.00	$0	$0
Berm		m3		#N/A	$0.00	$0	$0
Backfill Portal (NPAG waste rock plug)	At least 5 m deep into 5x4.5m portal and slope at least 2:1 outside of portal	m3	150	PORL	$18.80	$2,820	$2,820
Backfill portal #2		m3		#N/A	$0.00	$0	$0
Cap raise # 1	Concrete plug over 4m-dia. vent raise	LS	28	SRH	$2,132.00	$60,336	$60,336
Cap raise #2		m3		#N/A	$0.00	$0	$0
Cap shaft #1		m3		#N/A	$0.00	$0	$0
Cap shaft #2		m3		#N/A	$0.00	$0	$0
Backfill adits		m3		#N/A	$0.00	$0	$0
Backfill open stope		m3	3,550	Sabina	$6.00	$21,300	$21,300
Concrete cap over open stope		m3		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
REMOVE HAZARDOUS MATERIALS							
Remove hazardous materials, U/G labor	One shift with loader, incl. operator and fuel	manhour	10	load-s	$175.00	$1,750	$1,750
Remove/decontam. stationary & elect. equip		mandays		#N/A	$0.00	$0	$0
Remove/decontam. mobile equipment		each		#N/A	$0.00	$0	$0
Remove misc. haz. mat & explosives	Mining will cease before closure	kg		#N/A	$0.00	$0	$0
Decommission Pipeline		m		#N/A	$0.00	$0	$0
INSTALL BULKHEADS							
Bulkheads to control water flow		each		#N/A	$0.00	$0	$0
Grout bulkhead		m3		#N/A	$0.00	$0	$0
FLOOD MINE							
Supply/install pump	Passive flooding of Echo UG in Year 10, complete flooding is expected to occur within a few months.	each		#N/A	$0.00	$0	$0
Supply/install piping system		each		#N/A	$0.00	$0	$0
Operate pumps to flood workings		m3		#N/A	$0.00	$0	$0
Decommission				#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
INSTALL GROUNDWATER COLLECTION SYSTEM							
Excavate/install sumps		m2		#N/A	$0.00	$0	$0
Install pumping wells		m3		#N/A	$0.00	$0	$0
Install pumps/pipelines/power supply		LS		#N/A	$0.00	$0	$0
SPECIALIZED ITEMS							
Install water quality monitoring pipes		each		#N/A	$0.00	$0	$0
Install permanent pumping system		each		#N/A	$0.00	$0	$0
Assess underground stability	Rock mechanics inspection before closure	each	1	Sabina	$10,000.00	$10,000	$10,000
					Total	$96,206	$96,206
					% of Total		100%

1 **Tailings Impoundment Name:** **TSF** **Pond # 1**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	% Land	Land Cost	Total Cost
CONTROL ACCESS									
Fence		m		#N/A	$0.00	$0		$0	$0
Signs		each		#N/A	$0.00	$0		$0	$0
Berm		m3		#N/A	$0.00	$0		$0	$0
Block roads		m3		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
STABILIZE EMBANKMENT(S)									
Toe buttress, drainage layer		m3		#N/A	$0.00	$0		$0	$0
Toe buttress, bulk fill		m3		#N/A	$0.00	$0		$0	$0
Rip rap		m3		#N/A	$0.00	$0		$0	$0
Vegetate		ha		#N/A	$0.00	$0		$0	$0
Raise crest		m3		#N/A	$0.00	$0		$0	$0
Flatten slopes		m3		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
COVER TAILINGS									
Grade/shape tailings surface		m3		#N/A	$0.00	$0		$0	$0
Liner bedding		m3		#N/A	$0.00	$0		$0	$0
Subgrade preparation - compact		m2		#N/A	$0.00	$0		$0	$0
Supply geotextile/geosynthetic		m2		#N/A	$0.00	$0		$0	$0
Install geotextile/geosynthetic		m2		#N/A	$0.00	$0		$0	$0
Soil cover		m3		#N/A	$0.00	$0		$0	$0
Rock cover	Included in the quantity for waste rock pile cover (5m of NPAG). See Rock Pile tab.	m3		#N/A	$0.00	$0		$0	$0
Vegetate		m2		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
BURY PAG ROCK									
Relocate PAG rock		m3		#N/A	$0.00	$0		$0	$0
Place cover over PAG rock		m3		#N/A	$0.00	$0		$0	$0
Raise crest of dam		m3		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
STABILIZE DECANT SYSTEM									
Excavate and replace		m3		#N/A	$0.00	$0		$0	$0
Plug/backfill with concrete or clay		m3		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
REMOVE TAILINGS DISCHARGE									
Cyclones		m3		#N/A	$0.00	$0		$0	$0
Pipe		m3		#N/A	$0.00	$0		$0	$0
Remove reclaim barge		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 (liner)		m2		#N/A	$0.00	$0		$0	$0
FLOOD TAILINGS									
Doze tailings to final contour		m3		#N/A	$0.00	$0		$0	$0
Raise crest of dam		m3		#N/A	$0.00	$0		$0	$0
Other				#N/A	$0.00	$0		$0	$0
UPGRADE SPILLWAY									
Excavate channel on TSF	Breach west end of dam to existing drainage reporting to Goose Main Pit; 100 m channel.	m3	11,000.0	Sabina	$7.30	$80,300		$0	$80,300
Excavate channel, soil		m3		#N/A	$0.00	$0		$0	$0
Concrete		m3		#N/A	$0.00	$0		$0	$0
Rip rap		m3	7,000	RR1L	$13.50	$94,500		$0	$94,500
Other	Geotextile	m2	2,860	GSTL	$3.44	$9,838		$0	$9,838
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
Breach seepage diversion berm		m3	285	Sabina	$7.30	$2,081		$0	$2,081
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		LS		#N/A	$0.00	$0		$0	$0
SPECIALIZED ITEMS									
Install permanent instrumentation, supply & technican		each		#N/A	$0.00	$0		$0	$0
Install permanent instrumentation, drilling		each		#N/A	$0.00	$0			$0
TREAT SEEPAGE - see "Water Management" and "Water Treatment"									
TREAT SUPERNATANT									
Pump water (to pit, U/G)		m3		#N/A	$0.00	$0		$0	$0
Equipment maintenance and parts		allow		#N/A	$0.00	$0		$0	$0
Supply reagents		tonne		#N/A	$0.00	$0		$0	$0
				Annual treatment costs		$0			
Number of years of treatment		years	0						
				Total treatment costs		$0			$0
					Total	$186,719		$0	$186,719
					% of Total			0%	100%

* for construction of passive treatment system refer to "Water Management"

1 **Rock Pile Name:** **Umwelt, Llama, Echo and TSF**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	Total Cost
STABILIZE SLOPES							
Flatten slopes with dozer		m3		#N/A	$0.00	$0	$0
Flatten "bubble dump" areas		m3		#N/A	$0.00	$0	$0
Divert runon, ditch mat'l A		m3		#N/A	$0.00	$0	$0
Divert runon, ditch mat'l B		m3		#N/A	$0.00	$0	$0
Toe buttress, drain mat'l		m3		#N/A	$0.00	$0	$0
Toe buttress, fill mat'l A		m3		#N/A	$0.00	$0	$0
Toe buttress, fill mat'l B		m3		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
COVER ROCK PILE							
Subgrade preparation - doze surface		m3		#N/A	$0.00	$0	$0
Soil cover - excavate,haul,spread&compact		m3		#N/A	$0.00	$0	$0
Rock cover - excavate,haul & spread	Cover 4 rock piles: Umwelt, Llama, Echo and TSF. Note all WRSAs will be covered progressively by direct hauling NPAG during mining; however Sabina is assuming that 48 ha will still require covering at Closure.	m3	2,400,000	Sabina	$6.00	$14,400,000	$14,400,000
Excavate downslope drainage channel & chute		m3		#N/A	$0.00	$0	$0
Rip rap drainage channel and chute		m3		#N/A	$0.00	$0	$0
Vegetate		ha		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
VERY LOW PERMEABILITY COVER (in addition to above)							
Liner subgrade preparation - compact		m2		#N/A	$0.00	$0	$0
Supply geomembrame		m2		#N/A	$0.00	$0	$0
Install geomembrane		m2		#N/A	$0.00	$0	$0
Protective cover - excavate,haul,spread&compact		m3		#N/A	$0.00	$0	$0
Vegetate		ha		#N/A	$0.00	$0	$0
Install infiltration/seepage instrumentation		allow		#N/A	$0.00	$0	$0
CONSTRUCT DIVERSION DITCHES							
Excavate ditches -soil		m3		#N/A	$0.00	$0	$0
Excavate ditches -rock		m3		#N/A	$0.00	$0	$0
Rip rap in channel base		m3		#N/A	$0.00	$0	$0
CONSTRUCT SEEPAGE COLLECTION POND							
Excavate seepage collection pond	See Water Management tab for berm breaching	m3		#N/A	$0.00	$0	$0
Doze & spread excavated material		m3		#N/A	$0.00	$0	$0
Vegetate spread material		ha		#N/A	$0.00	$0	$0
Bedding layer		m3		#N/A	$0.00	$0	$0
Supply geomembrane		m2		#N/A	$0.00	$0	$0
Install geomembrane		m2		#N/A	$0.00	$0	$0
Erosion protection layer		m3		#N/A	$0.00	$0	$0
INSTALL GROUNDWATER COLLECTION SYSTEM							
Excavate/install sumps		m3		#N/A	$0.00	$0	$0
Install pumping wells		m3		#N/A	$0.00	$0	$0
Install pumps/pipelines/power supply		allow		#N/A	$0.00	$0	$0
RELOCATE DUMPS							
Load, haul, dump or doze		m3		#N/A	$0.00	$0	$0
Add lime		tonne		#N/A	$0.00	$0	$0
Contour reclaimed area		ha		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
SPECIALIZED ITEMS							
Install ground temperature monitoring cable	Will be installed during Operations to meet opertional monitoring commitments	each		#N/A	$0.00	$0	$0
Install permanent instrumentation, drilling		each		#N/A	$0.00	$0	$0
TREAT ROCK PILE SEEPAGE - see "Water Management"							
HEAP LEACH SEEPAGE TREATMENT - Cyanide Detox							
Cyanide destruction water treatment pumping		m3		#N/A	$0.00	$0	$0
Reagents		tonnes		#N/A	$0.00	$0	$0
Electrician/mechanic to maintain treatment plant		allow		#N/A	$0.00	$0	$0
Equipment maintenance and parts		allow		#N/A	$0.00	$0	$0
					Annual treatment costs	$0	
Number of years of treatment		years	0				
					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	$14,400,000	$14,400,000
					% of Total		100%

* For construction of passive treatment system refer to "Water Management".

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

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost	Total Cost
DISPOSE MOBILE EQUIPMENT							
Decontaminate and ship off-site		allow		#N/A	$0.00	$0	$0
Decontaminate and dispose on-site	Drive or transport to landfill; drain fluids; NPAG cover cost below	allow	1	Sabina	$20,000.00	$20,000	$20,000
Other				#N/A	$0.00	$0	$0
REMOVE BUILDINGS - see note below							
Accomodation Complex	Goose Admin: Kitchen/camp. Landfill building materials and pad	m2	1,980	BRS1L	$45.00	$89,100	$89,100
Process Facilities		m2	6,464	BRS1H	$65.00	$420,160	$420,160
Crusher		m2	1,630	BRS1H	$65.00	$105,950	$105,950
Power plant		m2	2,040	BRS1H	$65.00	$132,600	$132,600
Emergency power plant		m2	300	BRS1H	$65.00	$19,500	$19,500
Truck Shop/Office	Goose Admin building	m2	2,349	BRS1L	$45.00	$105,725	$105,725
Cold storage	Goose Admin building	m2	840	BRS1L	$45.00	$37,800	$37,800
Storage Facilites	Waste oil storage Goose Site	Lot	1	Sabina	$43,333.33	$43,333	$43,333
Storage Facility	Goose frieght storage	Lot	1	Sabina	$19,250.00	$19,250	$19,250
Water and Wastewater Treatment Facilities	Water treatment plant Goose Building	m2	647	BRS1L	$45.00	$29,115	$29,115
Sewage Treatment Plant	Remove hazardous materials and dispose of at licensed facility, landfill building materials	Lot	1	Sabina	$11,550.00	$11,550	$11,550
Fuel Tanks	Fuel storage and distribution Goose facility	Lot	1	Sabina	$154,000.00	$154,000	$154,000
Offices, Repair, Lab, Warehouse	MLA infrastructure Port Office	Units	5	Sabina	$2,340.00	$11,700	$11,700
Pipeline	MLA Infrastructure	m	10,000	Sabina	$3.90	$39,000	$39,000
Warehouse, Shops and Others	MLA Infrastructure. Includes: Incinerator and waste management, Warehouses, Genset, Maitenance shop, water storage, WTP/STP, camp/office, freaight storage area, waste area, fuel storage. Cost includes grade and contour pads, disposal at designated areas, remove hazard material when applicable.	LS	1	Sabina	$308,683.33	$308,683	$308,683
Freshwater intakes	pipes will be capped at substrate and left in place.	m2		#N/A	$0.00	$0	$0
Reclaim pumps		m2		#N/A	$0.00	$0	$0
Outfall & Diffuser		m2		#N/A	$0.00	$0	$0
Airstrip lighting, navigation, electrician		manhours	20	elecH	$95.00	$1,900	$1,900
Airstrip lighting, navigation, mechanical		manhours	20	mechH	$72.85	$1,457	$1,457
Break foundation slabs		m2		#N/A	$0.00	$0	$0
Consolidate & dump boneyard debris		m3		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
LANDFILL FOR DEMOLITION WASTE							
Place rock cover		m3	25,000	Sabina	$6.00	$150,000	$150,000
Place soil cover		m3		#N/A	$0.00	$0	$0
Vegetate		ha		#N/A	$0.00	$0	$0
GRADE AND CONTOUR PADS							
Accomodation Complex	Goose Admin: Kitchen/camp. no concrete foundation	ha	0.2	SCFYL	$4,300.00	$860	$860
Process Facilities	concrete foundation demolished to ground level	m2	6,464	BRCS	$6.00	$38,784	$38,784
Crusher	concrete foundation demolished to ground level	m2	1,630	BRCS	$6.00	$9,780	$9,780
Power plant	no concrete foundation	ha	0.3	SCFYL	$4,300.00	$1,290	$1,290
Emergency power plant	no concrete foundation	ha	0.10	SCFYL	$4,300.00	$430	$430
Truck Shop/Office	concrete foundation demolished to ground level	m2	2,349	BRCS	$6.00	$14,097	$14,097
Cold storage	no concrete foundation	ha	0.1	SCFYL	$4,300.00	$430	$430
Water and Wastewater Treatment Facilities	no concrete foundation	ha	0.1	SCFYL	$4,300.00	$430	$430
Sewage Treatment Plant	no concrete foundation	m2	33	BRCS	$6.00	$198	$198
Fuel Tanks	Fuel storage and distribution Goose facility; no concrete foundation	ha	2.2	SCFYL	$4,300.00	$9,460	$9,460
Warehouse, Shops and Other	MLA, includes all storage/laydown, Fual Tanks and camp area	ha	20	SCFYL	$4,300.00	$86,000	$86,000
Place rock cover		m3		#N/A	$0.00	$0	$0
Vegetate		ha		#N/A	$0.00	$0	$0
PUNCTURE LINED SUMPS							
Puncture liner and place soil cover		m3		#N/A	$0.00	$0	$0
RECLAIM ROADS							
Restore drainage, remove culverts haul road	Restore drainage including culverts; Roads will remain intact to facilitate long-term access.	m3	1,488	Sabina	$11.00	$16,368	$16,368
Remove bridges		each		#N/A	$0.00	$0	$0
Scarify and install water breaks		ha		#N/A	$0.00	$0	$0
Restore drainage airstrip		m3	1,020	Sabina	$12.00	$12,240	$12,240
Scarify laydown areas		ha		#N/A	$0.00	$0	$0
Scarify Winter Ice Roads	Fill sections on land - 8 km x 10 m wide = 8.0 ha	ha	8	SCFYH	$6,030.00	$48,240	$48,240
Vegetate		ha		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
SPECIALIZED ITEMS							
Dispose of misc. debris and laydown area refuse				#N/A	$0.00	$0	$0
					Total	$1,939,431	$1,939,431
					% of Total		100%

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	Total Cost
HAZARDOUS MATERIALS AUDIT							
Hazardous materials audit		mandays		#N/A	$0.00	$0	$0
Phase 1 audit		each	1	CS1L	$7,500.00	$7,500	$7,500
Phase 2 audit		each	1	CS2L	$50,000.00	$50,000	$50,000
BUILDING DECONTAMINATION & CONSOLIDATION OF HAZARDOUS MATERIALS							
Environmental technician/coordinator		mandays		#N/A	$0.00	$0	$0
Decontaminate: oil, fuel		mandays		#N/A	$0.00	$0	$0
Decontaminate maintenance shop		mandays		#N/A	$0.00	$0	$0
Decontaminate power plant		mandays		#N/A	$0.00	$0	$0
Decontaminate bulk fuel storage		mandays		#N/A	$0.00	$0	$0
Decontaminate ANFO plant		mandays		#N/A	$0.00	$0	$0
Decontaminate offices/warehouse/accom		mandays		#N/A	$0.00	$0	$0
Removal of asbestos siding on buildings		m2		#N/A	$0.00	$0	$0
Removal of friable asbestos on equipment		m2		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
HAZARDOUS MATERIALS REMOVAL							
Waste oils	Consume in a waste oil burner on-site	litre	10,000	ORL	$0.43	$4,300	$4,300
Waste fuel	Consume on-site to power an incinerator, or in a waste oil burner	litre	250,000	ORL	$0.43	$107,500	$107,500
Waste batteries	Assumed 10 20-kg batteries generated in the final year of closure	kg	200	PCRH	$2.50	$500	$500
Assay & environmental lab reagents		kg	500	PCRH	$2.50	$1,250	$1,250
Machine shop paints, solvents etc		litre	200	PCRH	$2.50	$500	$500
Glycol		litre	5,000	PCRH	$2.50	$12,500	$12,500
Process reagents		kg	130,000	PCRH	$2.50	$325,000	$325,000
WTP sludge from Water Treatment	Assumes off-site disposal for 7 years of treatment. If sludge passes leach tests, will consider on-site disposal.	kg	21,000	PCRH	$2.50	$52,500	$52,500
Nuclear sources		allow		#N/A	$0.00	$0	$0
Mobile Equipment	Remove hazardous waste from equipment not being salvaged, clean, landfill equipment	each	41	Sabina	$2,280.00	$93,480	$93,480
HAZARDOUS MATERIALS							
Transportation to disposal facility	Included in hazardous materials removal cost	allow		#N/A	$0.00	$0	$0
Disposal fees	Included in hazardous materials removal cost	allow		#N/A	$0.00	$0	$0
Other				#N/A	$0.00	$0	$0
CONTAMINATED SOILS							
Contam. soil investigation - Phase 1		each		#N/A	$0.00	$0	$0
Contam. soil investigation - Phase 2		LS	1	Sabina	$50,000.00	$50,000	$50,000
CONTAMINATED SOIL REMOVAL							
Excavate and transport to onsite facility		m3	10,000	SB1H	$5.90	$59,000	$59,000
Manage hydrocarbon remediation at facility	Operate landfarms	m3	10,000	CSRL	$47.00	$470,000	$470,000
Reagents/stabilizing agent		m2		#N/A	$0.00	$0	$0
Excavate and transport to offsite facility		m3		#N/A	$0.00	$0	$0
Contour decontaminated area	Decommission 2 landfarms and confirmation soil sampling; estimated 6,000m3 at each of Goose and MLA sites.	m3	12,000	SB1L	$4.30	$51,600	$51,600
CONTAMINATED SOIL VERY LOW PERMEABILITY COVER							
Supply geomembrame, HDPE, ES3, GCL		m2		#N/A	$0.00	$0	$0
Upper and lower bedding layers		m3		#N/A	$0.00	$0	$0
Install geomembrane, HDPE, ES3, GCL		m2		#N/A	$0.00	$0	$0
Erosion protection layer		m3		#N/A	$0.00	$0	$0
Vegetate		m2		#N/A	$0.00	$0	$0
Install infiltration/seepage instrumentation		allow		#N/A	$0.00	$0	$0
Other	Construct landfarm 1 at Goose, 1 at MLA	allow	2	Sabina	$50,000.00	$100,000	$100,000
OTHER							
				#N/A	$0.00	$0	$0
					Total	$1,385,630	$1,385,630
					% of Total		100%

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

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Total Cost
BREACH DYKE EMBANKMENT						
Breach Llama Lake Diversion Berms		m3	665	#N/A	$7.30	$4,855
Breach Llama WRSA Diversion Berm		m3	95	#N/A	$7.30	$694
Breach Llama WRSA Containment Dam		m3	95	#N/A	$7.30	$694
Breach Primary Pond Containment Dam	Breach in Year 2 once Umwelt Pit mining compelte and starts as Umwelt Tailings Facility (TF); Primary Pond will water will gravity flow directly.	m3		#N/A	$0.00	$0
Breach Umwelt WRSA Containment Dam		m3	120	#N/A	$7.30	$876
Breach Umwelt WRSA Diversion Berm		m3	95	#N/A	$7.30	$694
Breach Echo WRSA Containment Dam		m3	190	#N/A	$7.30	$1,387
Breach Echo Diversion Berm (East and West)		m3	190	#N/A	$7.30	$1,387
Breach Echo WRSA Diversion Berm		m3	95	#N/A	$7.30	$694
Breach East Echo Containment Dam		m3	95	#N/A	$7.30	$694
Breach Goose Main Diversion Berm		m3	95	#N/A	$7.30	$694
Breach Ore Stockpile Diversion Berm and Containment Dam		m3	215	#N/A	$7.30	$1,570
Breach SWP Diversion Berms and Containment Dams		m3	430	#N/A	$8.00	$3,440
Remove Liner from all berms	Remove liner from all berms	m2	30,700	Sabina	$0.70	$21,490
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
REDIRECT RUNOFF/CONSTRUCT DIVERSION DITCHES						
Excavate ditches -soil		m3		#N/A	$0.00	$0
Excavate ditches -rock		m3		#N/A	$0.00	$0
Stabilize side slopes		m3		#N/A	$0.00	$0
Rip rap in channel base		m3		#N/A	$0.00	$0
BREACH DITCHES						
Excavate breaches		m3		#N/A	$0.00	$0
Install flow dissipation		m3		#N/A	$0.00	$0
Vegetate remainder of ditch		m2		#N/A	$0.00	$0
DECOMISSION FRESH WATER SUPPLY						
Breach embankment		m3		#N/A	$0.00	$0
Remove pump		LS		#N/A	$0.00	$0
Remove pipelines		m		#N/A	$0.00	$0
DECOMISSION WATER RECLAIM BARGE						
Decomission reclaim barge from Goose Main TF		LS	1	Sabina	$10,000.00	$10,000
WATER CONTROL IN RECLAMATION QUARRY						
Install pumping system		LS		#N/A	$0.00	$0
Remove pumping system		m		#N/A	$0.00	$0
REMOVE PIPELINES						
Decommission Llama pump and pipeline		m	700	Sabina	$6.36	$4,450
Decomission WTP-Goose Lake pipeline		m	1,140	Sabina	$5.42	$6,175
Remove Umwelt Pond pump and pipeline		m	950	Sabina	$6.10	$5,795
Remove Primary Pond pump and pipeline		m	7,250	Sabina	$3.49	$25,325
Remove Echo WRSA Pond pump and pipeline		m	2,400	Sabina	$3.10	$7,440
Remove Echo NCW pond pump and pipeline		m	220	Sabina	$8.28	$1,822
Remove Ore Stockpile pump and pipline		m	4,550	Sabina	$3.10	$14,105
Decommission WTP pump and pipeline		m	7,520	Sabina	$4.60	$34,581
Decommission WTP		LS	1	Sabina	$9,750.00	$9,750
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	Treatment Plant will be constructed as part of operations	LS		#N/A	$0.00	$0
Build sludge containment facility		LS		#N/A	$0.00	$0
					Total	**$158,608**

For details of long-term/post-closure water treatment see "WATER TREATMENT" Worksheet"; costs included in this tab.

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

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Total 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				#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						
Pump from Goose Main TF to WTP	7.5 Mm3 for treatment in total	m3	1,071,429	POCL	$0.12	$128,571
Treat water from Goose Main TF in WTP		m3	1,071,429	TPOL	$0.35	$375,000
Pump from WTP recirc. into Goose Main TF		m3	1,071,429	POCL	$0.12	$128,571
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		#N/A	$0.00	$0
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		$632,143
Number of years of water treatment		years	7			
					Total	$4,425,002

1 **Interim Care and Maintenance**

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Total Cost
INTERIM CARE & MAINTENANCE						
Camp operation	Caretaker and summer personnel	mandays	306	Sabina	110	$33,660
On-site staff	Caretaker and summer personnel	manhours	1,440	ENVCO	74.16	$106,790
extra personnel		manmonths		#N/A	0	$0
-electrician		manmonths		#N/A	0	$0
-mechanic		manmonths		#N/A	0	$0
annual fuel	Fuel for vehicles; fuel for pumping included in water treatment cost	litre	5,000	FCDH	1.39	$6,950
misc. supplies		allow	1	Sabina	20000	$20,000
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	Sampling and lab costs	each	1	WSH	10000	$10,000
geotechnical assessment	Annual geotechnical inspection	each	1	RPTH	20000	$20,000
interim water treatment	Captured under Water Treatment	each	1	#N/A	0	$0
other		each		#N/A	0	$0
			Annual	Interim C&M Cost		$197,400
Number of years of ICM		years	3		**Total**	$592,201

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7 Years (Year 11 to 17)

ACTIVITY/MATERIAL - WATER TREATMENT	Notes	Units	Quantity	Cost Code	Unit Cost	Total Cost
MONITORING & INSPECTIONS						
Total geotechnical inspections (1 yearly)		year	-	#N/A	$0.00	$0
Waste Rock Piles		year		#N/A	$0.00	$0
Pit Walls		year		#N/A	$0.00	$0
WR GTC Monitoring		year		#N/A	$0.00	$0
Survey inspection		each		#N/A	$0.00	$0
Regulatory costs		year		#N/A	$0.00	$0
Site water monitoring		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
Wildlife Effects Monitoring Program (WEMP)		year		#N/A	$0.00	$0
Terrestrial Animal Monitoring		year		#N/A	$0.00	$0
Vegetation Monitoring		each		#N/A	$0.00	$0
Maintain gravel road surface		each		#N/A	$0.00	$0
Maintain airstrip surface		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
POST-CLOSURE WATER TREATMENT						
Annual water treatment cost, from "Water Treatment"	Treatment for Closure Period (7 years)	LS	1	#N/A	$632,143	$632,143
Subtotal, Annual post-closure costs						$632,143
Discount rate for calculation of net present value of post-closure cost, %				3.00%		
Number of years of post-closure activity				7	years	
Present Value of payment stream						$3,938,430
Combined NPV of payment stream						**$5,565,651**

					8 Years (Year 11 to 18)	
ACTIVITY/MATERIAL - GEOTECHNICAL INSPECTIONS OF TSF	**Notes**	**Units**	**Quantity**	**Cost Code**	**Unit Cost**	**Total Cost**
MONITORING & INSPECTIONS						
Total geotechnical inspections (1 yearly)	Annual inspection of the TSF from Closure until embankment breaching in Year 18 (8 years).	year	1	RPTH	$20,000.00	$20,000
Waste Rock Piles		year		#N/A	$0.00	$0
Pit Walls		year		#N/A	$0.00	$0
WR GTC Monitoring		year		#N/A	$0.00	$0
Survey inspection		each		#N/A	$0.00	$0
Regulatory costs		year		#N/A	$0.00	$0
Site water monitoring		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
Wildlife Effects Monitoring Program (WEMP)		year		#N/A	$0.00	$0
Terrestrial Animal Monitoring		year		#N/A	$0.00	$0
Vegetation Monitoring		each		#N/A	$0.00	$0
Maintain gravel road surface		each		#N/A	$0.00	$0
Maintain airstrip surface		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
POST-CLOSURE WATER TREATMENT						
Annual water treatment cost, from "Water Treatment"		LS		#N/A	$0.00	$0
Subtotal, Annual post-closure costs						$20,000
Discount rate for calculation of net present value of post-closure cost, %				3.00%		
Number of years of post-closure activity				8	years	
Present Value of payment stream						$140,394

						10 Years (Year 11 to 20)
ACTIVITY/MATERIAL - WEMP and TERRESTRIAL	**Notes**	**Units**	**Quantity**	**Cost Code**	**Unit Cost**	**Total Cost**
MONITORING & INSPECTIONS						
Total geotechnical inspections (1 yearly)		year		#N/A	$0.00	$0
Waste Rock Piles		year		#N/A	$0.00	$0
Pit Walls		year		#N/A	$0.00	$0
WR GTC Monitoring		year		#N/A	$0.00	$0
Survey inspection		each		#N/A	$0.00	$0
Regulatory costs*		year		#N/A	$0.00	$0
Site water monitoring		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
Wildlife Effects Monitoring Program (WEMP)	Aquatics - Non-contact water basins (10 years)	year	1	Sabina	$4,800.00	$4,800
Terrestrial Animal Monitoring	Terrestrial Animal Monitoring (10 years)	year	1	Sabina	$24,000.00	$24,000
Vegetation Monitoring		each		#N/A	$0.00	$0
Maintain gravel road surface		year		#N/A	$0.00	$0
Maintain airstrip surface		year		#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
POST-CLOSURE WATER TREATMENT						
Annual water treatment cost, from "Water Treatment"		LS		#N/A	$0.00	$0
Subtotal, Annual post-closure costs						$28,800
Discount rate for calculation of net present value of post-closure cost, %				3.00%		
Number of years of post-closure activity				10	years	
Present Value of payment stream						$245,670

13 Years (Year 11 to 23)

ACTIVITY/MATERIAL - Monitoring & Maintenance	Notes	Units	Quantity	Cost Code	Unit Cost	Total Cost
MONITORING & INSPECTIONS						
Total geotechnical inspections (1 yearly)		year		#N/A	$0.00	$0
Waste Rock Piles	Annual inspection of WR piles from closure to post-closure (13 years)	year	1	Sabina	$8,300.00	$8,300
Pit Walls	Annual inspection of pit walls from closure to post-closure (13 years)	year	1	Sabina	$4,000.00	$4,000
WR GTC Monitoring	Umwelt, Llama, and TSF WRSA ground temp cable annual monitoring. No GTCs at Echo WRSA (13 years)	year	1	Sabina	$14,400.00	$14,400
Survey inspection		each		#N/A	$0.00	$0
Regulatory costs	annual reporting, management plans, progress reports (13 years)	year	1	Sabina	$25,000.00	$25,000
Site water monitoring	All pits and WR piles closure and post closure monitoring (13 years)	year	1	Sabina	$9,120.00	$9,120
- Active closure and flooding		each		#N/A	$0.00	$0
- Post pit flooding		each		#N/A	$0.00	$0
Wildlife Effects Monitoring Program (WEMP)		year		#N/A	$0.00	$0
Terrestrial Animal Monitoring		year		#N/A	$0.00	$0
Vegetation Monitoring		each		#N/A	$0.00	$0
Maintain gravel road surface	maintence from closure to post-closure (13 years)	year	1	Sabina	$13,650.00	$13,650
Maintain airstrip surface	maintence from closure to post-closure (13 years)	year	1	Sabina	$3,900.00	$3,900
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
POST-CLOSURE WATER TREATMENT						
Annual water treatment cost, from "Water Treatment"		LS		#N/A	$0.00	$0
Subtotal, Annual post-closure costs						$78,370
Discount rate for calculation of net present value of post-closure cost, %				3.00%		
Number of years of post-closure activity				13	years	
Present Value of payment stream						$833,461

Beyond Post Closure (Long Term 1 to 5, 7, 10, 15, 25)

ACTIVITY/MATERIAL - Long Term Monitoring	Notes	Units	Quantity	Cost Code	Unit Cost	Total Cost
MONITORING & INSPECTIONS						
General Water Sampling and Stability Monitoring	long term general monitoring	year	1	Sabina	$40,000.00	$40,000
Waste Rock Piles		year		#N/A	$0.00	$0
Pit Walls		year		#N/A	$0.00	$0
WR GTC Monitoring		year		#N/A	$0.00	$0
Survey inspection		each		#N/A	$0.00	$0
Regulatory costs		each	1	RPTH	$20,000.00	$20,000
Site water monitoring		year		#N/A	$0.00	$0
- Active closure and flooding		each		#N/A	$0.00	$0
- Post pit flooding		each		#N/A	$0.00	$0
Wildlife Effects Monitoring Program (WEMP)		year		#N/A	$0.00	$0
Terrestrial Animal Monitoring		year		#N/A	$0.00	$0
Vegetation Monitoring		each		#N/A	$0.00	$0
Maintain gravel road surface		year		#N/A	$0.00	$0
Maintain airstrip surface		year		#N/A	$0.00	$0
Other - Site Access	Float plane access	each	1	MWH	$9,100.00	$9,100
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
POST-CLOSURE WATER TREATMENT						
Annual water treatment cost, from "Water Treatment"		LS		#N/A	$0.00	$0
Subtotal, Annual post-closure costs						$69,100
Discount rate for calculation of net present value of post-closure cost, %				3.00%		
Number of years of post-closure activity			See Long Term	years		
Present Value of payment stream						$407,696

Annual Discout Rate:			3%		
Project Phase	Project Year	Closure Year	Post-Closure Monitoring Year	Long Term Monitoring (GTCs, physical, water)	
				One Time Cost	Yearly Total NPV
Operations	1				$0
	2				$0
	3				$0
	4				$0
	5				$0
	6				$0
	7				$0
	8				$0
	9				$0
	10				$0
Active Closure	11	1			$0
	12	2			$0
Passive Closure	13	3			$0
	14	4			$0
	15	5			$0
	16	6			$0
	17	7			$0
	18	8			$0
Post Closure	19	9	1	$69,100	$54,548
	20	10	2	$69,100	$52,959
	21	11	3	$69,100	$51,417
	22	12	4	$69,100	$49,919
	23	13	5	$69,100	$48,465
Beyond Post Closure	24	14	6		$0
	25	15	7	$69,100	$45,683
	26	16	8		$0
	27	17	9		$0
	28	18	10	$69,100	$41,807
	29	19	11		$0
	30	20	12		$0
	31	21	13		$0
	32	22	14		$0
	33	23	15	$69,100	$36,063
	34	24	16		$0
	35	25	17		$0
	36	26	18		$0
	37	27	19		$0
	38	28	20		$0
	39	29	21		$0
	40	30	22		$0
	41	31	23		$0
	42	32	24		$0
	43	33	25	$69,100	$26,834
			Net Present Value:		**$407,696**

1 Mobilization/Demobilization:

ACTIVITY/MATERIAL	Notes	Units	Quantity	Cost Code	Unit Cost	Cost
MOBILIZE HEAVY EQUIPMENT	Assumes mining equipment on abandoned mine site is operable and available.					
Light duty vehicles	Purchase pickups and Vans	each		#N/A	0	$0
Telehandlers	Purchase (standby)	each		#N/A	0	$0
Excavators	Purchase (320 Ex)	each		#N/A	0	$0
Dump trucks	Purchase 30T	each		#N/A	0	$0
Dozers	Purchase (D6T)	each		#N/A	0	$0
Grader	Purchase (140M)	each		#N/A	0	$0
Demolition shears	For a 320 Exc	each		#N/A	0	$0
Crane	Purchase	each		#N/A	0	$0
Loader	Purchase (966 Loader)	each		#N/A	0	$0
Manlifts	Ourchase (standby)	each		#N/A	0	$0
Small Equipment		LS		#N/A	0	$0
Compactor		each		#N/A	0	$0
MOBILIZE MISC. EQUIPMENT	Assumes mining equipment on abandoned mine site is operable and available.					
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						
Build 20 Person Camp	Goose Closure Camp	LS	1	Sabina	$19,250.00	$19,250
Build 20 Person Power Plant	Goose Closure Camp	LS	1	Sabina	$19,250.00	$19,250
Reclamation activities		allow		#N/A	0	$0
Long term reclamation activities (eg pump flooding)		allow		#N/A	0	$0
WORKER ACCOMODATIONS						
Camp operation		mandays	12,000	Sabina	$110.00	$1,320,000
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
Oil & Other		litre		#N/A	0	$0
Fuel freight accomodations		litre		#N/A	0	$0
GENERAL CONSTRUCTION INDIRECT						
Tooling, consumables, office & safety supplies	covered in Summary tab indirects	mandays		#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						
Food and Freight		kg	27,600	Sabina	$12.00	$331,200
Freight		Lot	1	Sabina	$500,000.00	$500,000
Mobilization		tonnes	500	Sabina	$1,500.00	$750,000
MOBILZE & DEMOBILIZE WORKERS						
Crew travel time - inbound & outbound	16 manhours per rotation	manhours	6,864	lab-sh	$49.60	$340,454
Crew transportation - inbound & outbound	28 day rotations - 12,000 man days	each	429	Sabina	$572.46	$245,583
WINTER ROAD						
Construction and operation	Assumes construction and maintance of 2-160 km winter ice roads; once during Active Closure and once in approximately Year 18.	km	320	WRCL	$2,000.00	$640,000
Limited winter use		km		#N/A	0	$0
Winter road tarriff		km		#N/A	0	$0
					Total	**$4,165,738**

Sabina Closure Component Estimating

							Labour					Const Equip Use		Other		Total	
Code	Description	NOTES	EQUIPMENT NUMBER	ESTIMATE SOURCE DOCUMENT	Qty	Unit of Measure	Unit Man-hrs	Prod Fact	Total Man-hrs	Unit Cost	Total Cost	Unit Cost	Total Cost	Unit Cost	Total Cost	Unit Cost	Total Cost
	Open Pit Closure																
	Place Boulder Fence																
	Umwelt Open Pit			x	1,635	m	0.06	1.00	98	95	9,320	175.00	17,168		-	16	26,487
	Echo open pit			x	750	m	0.06	1.00	45	95	4,275	175.00	7,875		-	16	12,150
	Goose open pit			x	1,900	m	0.06	1.00	114	95	10,830	175.00	19,950		-	16	30,780
	Llama open pit	Permieter needed only where pit edge will not abute the final flooded lake footprint. i.e. 400m length.		x	400	m	0.06	1.00	24	95	2,280	175.00	4,200		-	16	6,480
	Remove Pump and Pipeline																
	Umwelt pit sump	Occurs during Operations		x	1,740	m	0.02	1.00	35	95	3,306	175.00	6,090		-	5.40	9,396
	Llama pit sump	Occurs during Operations		x	2,850	m	0.02	1.00	57	95	5,415	175.00	9,975		-	5.40	15,390
	Goose pit sump			x	4,325	m	0.02	1.00	87	95	8,218	175.00	15,138		-	5.40	23,355
	Echo pit sump	Occurs during Operations		x	820	m	0.02	1.00	16	95	1,558	175.00	2,870		-	5.40	4,428
	Breech Pits into Receiving Waters																
	Umwelt open pit			x	1,200	m3	0.12	1.00	144		-	5.00	6,000		-	5.00	6,000
	Llama open pit	Natural drainage connection		x	-	m3	0.12	1.00	-		-	5.00	-		-	-	-
	Echo open pit	Natural drainage connection		x	-	m3	0.12	1.00	-		-	5.00	-		-	-	-
	Goose open pit			x	600	m3	0.12	1.00	72		-	5.00	3,000		-	5.00	3,000
	Landfill Mobile Equipment																
	Goose Site Mobile Equipment			x	41	units	24.00	1.00	984	95	93,480	-	-		-	2,280	93,480
	Underground Closure																
	Saline Water Pond (SWP) / WTP																
	Relocate pipeline to Umwelt UG from Llama UG			x	800	m	1.00	1.00	24	95	2,280	6.00	1,500		-	4.73	3,780
	Dewater SWP to Umwelt UG			x	763,134	m3	1.00	1.00	153	95	14,535		-	0.11	83,945	0.13	98,480
	Decommission SWP to Umwelt UG pipeline			x	1,200	m	0.02	1.00	24	95	2,280	3.00	3,600		-	4.90	5,880
	Adjust pipeline to route to Llama UG	Completed during Operations		x	500	m	0.03	1.00	65	95	6,175		-		-	12.35	6,175
	Dewater SWP to Llama UG			x	324,234	m3		1.00	80	95	7,600		-	0.11	35,666	0.13	43,266
	Adjust pipeline to route to Goose UG			x	4,500	m	0.03	1.00	185	95	17,575		-		-	3.91	17,575
	Dewater SWP to Goose UG			x	391,630	m3		1.00	215	95	20,425		-	0.11	43,079	0.16	63,504
	Decommission SWP to Goose UG pipelines			x	10,800	m	0.02	1.00	216	95	20,520		-		-	1.90	20,520
	Breach SWP Diversion Berms and Containment Dams			x	430	m3	0.12	1.00	52		-	8.00	3,440		-	8.00	3,440
	Decomission WTP-Goose Lake pipeline			x	1,140	m	0.02	1.00	65	95	6,175		-		-	5.42	6,175
	Llama UG																
	Decommission pipeline	Completed during Operations		x	2,700	m	0.02	1.00	54	95	5,130	3.00	8,100		-	4.90	13,230
	Umwelt portal																
	Plug declines with waste rock			x	150	m3	0.05	1.00	8		-	6.00	900		-	6.00	900
	Llama portal																
	Plug declines with waste rock			x	150	m3	0.05	1.00	8		-	6.00	900		-	6.00	900
	Goose portal																
	Plug declines with waste rock			x	150	m3	0.05	1.00	8		-	6.00	900		-	6.00	900
	Echo portal																
	Plug declines with waste rock			x	150	m3	0.05	1.00	8		-	6.00	900		-	6.00	900
	Umwelt vent/circular backfill raises																
	Plug vent raises with concrete plug			x	1	LS	1.00	1.00	60		-	-	-		-	120,000	120,000
	Llama vent/circular backfill raises																
	Plug vent raises with concrete plug			x	1	LS	1.00	1.00	60		-	-	-		-	50,000	50,000
	Goose vent/circular backfill raises																
	Plug vent raises with concrete plug			x	1	LS	1.00	1.00	60		-	-	-		-	50,000	50,000
	Echo vent/circular backfill raises																
	Plug vent raises with concrete plug			x	1	LS	1.00	1.00	60		-	-	-		-	50,000	50,000
	Echo crown pillar																
	Plug UG stopes			x	3,550	m3	0.05	1.00	178		-	6.00	21,300		-	6.00	21,300
	Waste Rock Stockpiles and Landfills																
	WR Pile Closure																
	Cap and Slope WR Piles			x	2,400,000	m3	0.06	1.00	144,000		-	6.00	14,400,000		-	6.00	14,400,000

	Landfill Closure																
	Cap and Reslope Landfills			x	25,000	m3	0.06	1.00	1,500		-	6.00	150,000		-	6.00	150,000
	Water Management Structures																
	Llama Structures																
	Breach Llama Lake Diversion Berms			x	665	m3	0.06	1.00	43		-	7.30	4,855		-	7.30	4,855
	Breach Llama WRSA Diversion Berm			x	95	m3	0.06	1.00	6		-	7.30	694		-	7.30	694
	Breach Llama WRSA Containment Dam				95	m3	0.06	1.00	6		-	7.30	694		-	7.30	694
	Decommission Llama pump and pipeline	24 hrs for pump		x	700	m	0.02	1.00	38	95	3,610	1.20	840		-	6.36	4,450
	Umwelt Structures																
	Breach Primary Pond Containment Dam			x	200	m3	0.06	1.00	13		-	7.30	1,460		-	7.30	1,460
	Breach Umwelt WRSA Containment Dam			x	120	m3	0.06	1.00	8		-	7.30	876		-	7.30	876
	Breach Umwelt WRSA Diversion Berm			x	95	m3	0.06	1.00	6		-	7.30	694		-	7.30	694
	Remove Umwelt Pond pump and pipeline			x	950	m	0.02	1.00	49	95	4,655	1.20	1,140		-	6.10	5,795
	Remove Primary pond pump and pipeline			x	7,250	m	0.02	1.00	175	95	16,625	1.20	8,700		-	3.49	25,325
	Echo Structures																
	Breach Echo WRSA Containment Dam			x	190	m3	0.06	1.00	12		-	7.30	1,387		-	7.30	1,387
	Breach Echo Diversion Berm (East and West)			x	190	m3	0.06	1.00	12		-	7.30	1,387		-	7.30	1,387
	Breach Echo WRSA Diversion Berm			x	95	m3	0.06	1.00	6		-	7.30	694		-	7.30	694
	Breach East Echo Containment Dam			x	95	m3	0.06	1.00	6		-	7.30	694		-	7.30	694
	Remove Echo WRSA Pond pump and pipeline			x	2,400	m	0.02	1.00	48	95	4,560	1.20	2,880		-	3.10	7,440
	Remove Echo NCW pond pump and pipeline			x	220	m	0.02	1.00	16	95	1,558	1.20	264		-	8.28	1,822
	Goose Structures																
	Breach Goose Main Diversion Berm			x	95	m3	1.00	1.00	95		-	7.30	694		-	7.30	694
	TSF Structures																
	Breach TSF Dam			x	11,000	m3	0.05	1.00	550		-	7.30	80,300		-	7.30	80,300
	Breach TSF WRSA Diversion Berm			x	285	m3	0.05	1.00	14		-	7.30	2,081		-	7.30	2,081
	Ore Stockpile Structures																
	Remove pump and pipeline			x	4,550	m	0.02	1.00	91	95	8,645	1.20	5,460		-	3.10	14,105
	Breach Ore Stockpile Diversion Berm and Containment Dam			x	215	m3	0.06	1.00	13		-	7.30	1,570		-	7.30	1,570
	Buildings and Equipment																
	Dissassembly - Goose Plant and Crusher																
	Dismantle Plant			x	6,464	m2	1.00	1.00	3,200	95	304,000	100.00	106,667	-	-	63.53	410,667
	Dismantle Crushers			x	1,630	m2	1.00	1.00	800	95	76,000	100.00	26,667	-	-	62.99	102,667
	Dismantle Power Plant			x	2,040	m2	1.00	1.00	1,000	95	95,000	100.00	33,333	-	-	62.91	128,333
	Dismantle Emergency Power - Fuel			x	300	m2	1.00	1.00	150	95	14,250	100.00	5,000	-	-	64.17	19,250
	Dismantle Fuel Storage and Distribution			x	1	Lot	1.00	1.00	1,200	95	114,000	100.00	40,000	-	-	154,000	154,000
	Goose Admin Buildings																
	Demolish Truck Shop/Office			x	2,349	m2	1.00	1.00	1,000	95	95,000	100.00	33,333	-	-	54.62	128,333
	Demolish Kitchen/Camp			x	1,980	m2	1.00	1.00	900	95	85,500	100.00	30,000	-	-	58.33	115,500
	Demolish Cold Storage			x	840	m2	1.00	1.00	150	95	14,250	100.00	5,000	-	-	22.92	19,250
	Demolish Waste/Waste Oil Storage			x	1	Lot	1.00	1.00	100		-	100.00	3,333	40,000	40,000	43,333	43,333
	Remove Freight Storage			x	1	Lot	1.00	1.00	150	95	14,250	100.00	5,000	-	-	19,250	19,250
	Demolish Water Treatment Plant			x	647	m2	8.00	1.00	100	95	9,500	100.00	3,333	-	-	19.84	12,833
	Demolish Sewage Treatment Plant			x	1	Lot	1.00	1.00	90	95	8,550	100.00	3,000	-	-	11,550	11,550
	MLA Infrastructure																
	Demolish Port Office			x	5	Units	12.00	1.00	60	95	5,700	100.00	6,000	-	-	2,340	11,700
	Remove Pipelines			x	10,000	m	0.02	1.00	200	95	19,000	100.00	20,000	-	-	3.90	39,000
	Demolish Incinerator and Waste Management			x	1	Lot	1.00	1.00	50	95	4,750	100.00	5,000	-	-	9,750	9,750
	Demolish Warehuses			x	1	Lot	1.00	1.00	30	95	2,850	100.00	3,000	-	-	5,850	5,850
	Dismantle Genset			x	1	Lot	1.00	1.00	150	95	14,250	100.00	15,000	-	-	29,250	29,250
	Demolish Maintenance Shop			x	1	Lot	1.00	1.00	50	95	4,750	100.00	5,000	-	-	9,750	9,750
	Demolish Water Storage			x	1	Lot	1.00	1.00	50	95	4,750	100.00	5,000	-	-	9,750	9,750
	Demolish WTP/STP			x	1	Lot	1.00	1.00	50	95	4,750	100.00	5,000	-	-	9,750	9,750
	Demolish camp/offices			x	1	Lot	1.00	1.00	50	95	4,750	100.00	5,000	-	-	9,750	9,750
	Demolish freight storage area			x	1	Lot	1.00	1.00	50	95	4,750	100.00	5,000	-	-	9,750	9,750
	Demolish hazardous wate Area			x	1	Lot	1.00	1.00	50	95	4,750	100.00	5,000	-	-	9,750	9,750
	Dismantle Fuel Storage			x	1	Lot	1.00	1.00	1,600	95	152,000	100.00	53,333	-	-	205,333	205,333
	Goose Closure Camp																
	Build 20 Person Camp			x	1	Lot	1.00	1.00	150	95	14,250	100.00	5,000		-	19,250	19,250
	Build 20 Person Power Plant			x	1	Lot	1.00	1.00	150	95	14,250	100.00	5,000		-	19,250	19,250
	Camp Operation	Over 13 years of Closure and Post-Closure		x	12,000	Man Days	1.00	1.00		-	-	-	-	110	1,320,000	110	1,320,000
	Roads and Airstrips																
	Main Haulroad																
	Maintain Road Surface			x	13	Yr	70.00	1.00	910	95	86,450	100.00	91,000		-	13,650	177,450
	Restore Drainage	Remove Culverts		x	1,488	m3	0.06	1.00	89		-	11.00	16,368		-	11.00	16,368

	Airstrips																
	Maintain Airstrip Surface			x	13	Yr	20.00	1.00	260	95	24,700	100.00	26,000		-	3,900	50,700
	Restore Drainage			x	1,020	m3	0.06	1.00	61		-	12.00	12,240		-	12.00	12,240
	Water Treatment																
	WTP Pipelines and Treatment Plant																
	Pump from Goose Main TF to WTP	Pump and treat water in TF at WTP for 7 years, open water season		x	7,500,000	m3		1.00			-	-	-	0	825,000	0.11	825,000
	Treat water from Goose Main TF in TWP			x	7,500,000	m3		1.00	1,916		-	-	-	0	2,625,000	0.35	2,625,000
	Pump from WTP recirc. into Goose Main TF			x	7,500,000	m3		1.00	-		-	-	-	0	825,000	0.11	825,000
	Decommission WTP pump and pipeline			x	6,700	m	0.02	1.00	158	95	15,010	100.00	15,800		-	4.60	30,810
	Decommission WTP pump and return pipeline			x	820	m	0.02	1.00	40	95	3,838	100.00	4,040		-	9.61	7,878
	Decommission WTP			x	1	Lot		1.00	50	95	4,750	100.00	5,000		-	9,750	9,750
	Contaminated Soil																
	Sitewide Investigation																
	Site Investigation to estimate quantity of contaminated soil	Testpit program with excavator in all parking, fuel storage, washbays truck and maintenance shops and generator areas.		x	1	Lot	1.00	1.00			-	-	-		50,000	50,000	50,000
	Treatment																
	Transport contaminated soil			x	10,000	m3	0.05	1.00	500		-	7.30	73,000		-	7.30	73,000
	Separation plant	Purchase seperation equipment		x	1	Lot	1.00	1.00			-	-	-		100,000	100,000	100,000
	Closure / Post-Closure Monitoring																
	Geotechnical Inspections																
	TSF embankments			x	8	Units	20.00	1.00	160		-	-	-	10,000	80,000	10,000	80,000
	WR piles			x	13	Units	20.00	1.00	260		-	-	-	8,300	107,900	8,300	107,900
	Pit walls			x	13	Units	20.00	1.00	260		-	-	-	4,000	52,000	4,000	52,000
	Ground Temperature Monitoring																
	Umwelt WRSA GTC Monitoring after Closure	Monthly		x	13	Years	24.00	1.00	312	200	62,400	-	-		-	4,800	62,400
	LLama WRSA GTC Monitoring after Closure	Monthly		x	13	Years	24.00	1.00	312	200	62,400	-	-		-	4,800	62,400
	TSF WRSA GTC Monitoring after Closure	Monthly		x	13	Years	24.00	1.00	312	200	62,400	-	-		-	4,800	62,400
	WQ Monitoring - Closure																
	Llama pit	Depends on Breech		x	13	Years	12.00	1.00	156	95	14,820	-	-		-	1,140	14,820
	Llama WR Pile			x	13	Years	12.00	1.00	156	95	14,820	-	-		-	1,140	14,820
	Umwelt pit	Depends on Breach		x	13	Years	12.00	1.00	156	95	14,820	-	-		-	1,140	14,820
	Umwelt WR Pile			x	13	Years	12.00	1.00	156	95	14,820	-	-		-	1,140	14,820
	Echo pit	Depends on Breach		x	13	Years	12.00	1.00	156	95	14,820	-	-		-	1,140	14,820
	Echo WR pile			x	13	Years	12.00	1.00	156	95	14,820	-	-		-	1,140	14,820
	Goose pit	Depends on Breach		x	13	Years	12.00	1.00	156	95	14,820	-	-		-	1,140	14,820
	TSF WR Pile			x	13	Years	12.00	1.00	156	95	14,820	-	-		-	1,140	14,820
	Aquatic Effects monitoring																
	Aquatic effects monitoring	Non-contact Water Basins		x	10	Years	60.00	1.00	600	80	48,000	-	-		-	4,800	48,000
	Terrestrial Animal Monitoring																
	Terrestrial Animal Monitoring			x	10	Years	300.00	1.00	3,000	80	240,000	-	-		-	24,000	240,000
	Total Direct Costs																24,034,589
	CONSTRUCTION INDIRECTS																
	Freight & Transport																
	Food & Freight	Total Mandays factored		x	27,600	kg		1.00		-	-		-	12	331,200	12	331,200
	Freight	Rental equip, offices, etc..		x	1	Lot	-	1.00	-	-	-	-	-	500,000	500,000	500,000	500,000
	Mobilization			x	500	Tonnes								1,500	750,000	1,500	750,000
	General Construction Indirects																
	Site Services Labour			x	16,000	HRS	1.00	1.00	16,000	65	1,040,000	-	-	-	-	65.00	1,040,000
	Accomodations & Travel																
	Camp Accomodations/Operation			x	12,000	Man Days	1.00	1.00		-	-	-	-	110	1,320,000	110	1,320,000
	Airfare & Transportation			x	429	Each	-	1.00		-	-	-	-	572	245,583	572	245,583
	Contractor Profit																
	Total Component Estimate																28,221,373

Appendix H. Vegetation Monitoring Plan

BACK RIVER PROJECT:
Vegetation Monitoring Program

February 2017

BACK RIVER PROJECT
VEGETATION MONITORING PLAN

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1. Introduction

The proposed Back River Project (the Project) lies in western Nunavut in the continuous permafrost zone of the continental Canadian Arctic. It is composed of two main areas: the Marine Laydown Area (MLA) (Figure 1) and the Goose Property Area (Figure 2), with a winter ice road (WIR) connecting the two (Figure 3).

The MLA is located on the western shore of Southern Bathurst Inlet, approximately 130 kilometres (km) north of the Goose Property (Figure 2). Here, the Project will sealift materials and supplies through Bathurst Inlet to the MLA annually during the open-water season only.

The Goose Property includes four open pits and four underground developments and the Project has an estimated mine life of 10 years with a total production of 19.8 million tonnes (Mt) of ore. Key Project infrastructure at the Goose Property includes:

- four open pits, and four underground mines (Umwelt, Llama, Goose Main, and Echo);
- four waste rock storage areas;
- tailings storage facility;
- underground mining pads;
- a stockpile;
- camp;
- process plant; and
- airstrip and roads, including a culvert for the haul road crossing.

A WIR will be utilized between the MLA and Goose property to allow the movement of supplies during the winter months.

This Plan represents an adaptive approach to understanding the effects of the Project on the landscape and the species that live there. In this context, the Plan is part of a continually evolving process that relies not only on the efficacy of data collection and analytical results, but is also dependent on feedback from the communities, government, Aboriginal groups, and the public. Having an adaptive and flexible program allows for appropriate and necessary changes to the design of monitoring studies, and the mitigation and monitoring plans. Some changes may come about through the observation of unanticipated effects or inadequacies in the sampling methods to detect measurable effects. Other changes may result from ecological knowledge acquired through working with Aboriginal community members and discussions with elders, both in the field and through workshops.

1.1 PURPOSE

During the FEIS Final Hearings, Sabina and GN jointly submitted the following commitment (GN-C-25):

> In consultation with the KIA, GN, and other relevant parties the Proponent shall develop and implement a vegetation monitoring plan for the winter road that is designed to quantify the potential impacts on vegetation. The plan shall be submitted to the NIRB prior to winter road

construction. Findings from these studies will be used to inform reclamation planning as appropriate.

Subsequently, the Nunavut Impact Review Board (NIRB) Final Hearing Report encouraged Sabina to consider additional mitigation and monitoring for the protection of vegetation and additional measures to limit potential impacts due to the introduction of invasive species from construction and clearing operations.

Since the FEIS Final Hearing, and in recognition of the NIRB's concerns, Sabina has developed this Vegetation Monitoring Plan (the Plan) which is in line with commitment GN-C-25.

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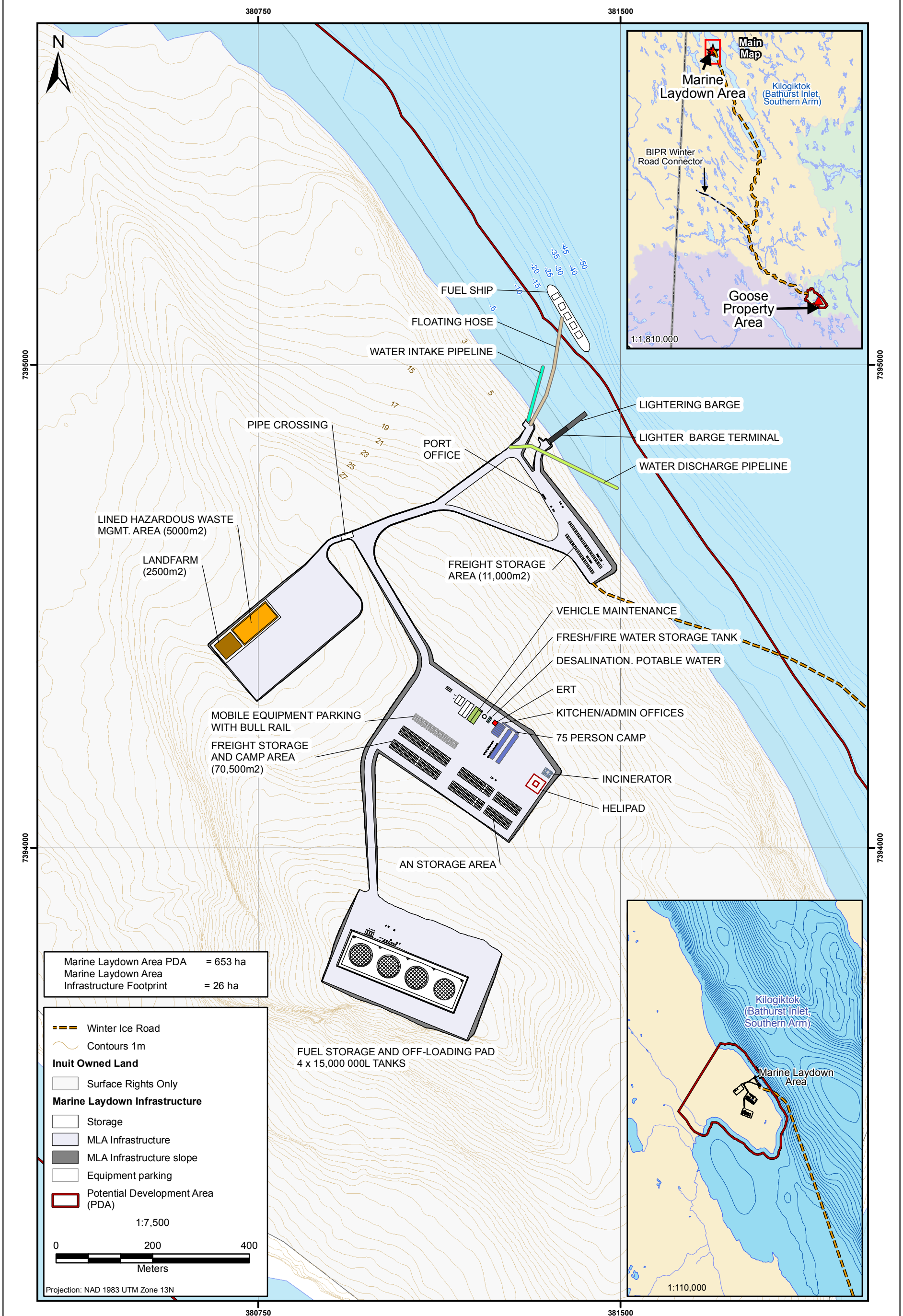

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Figure 1

Potential Development Area and Layout
Marine Laydown Area

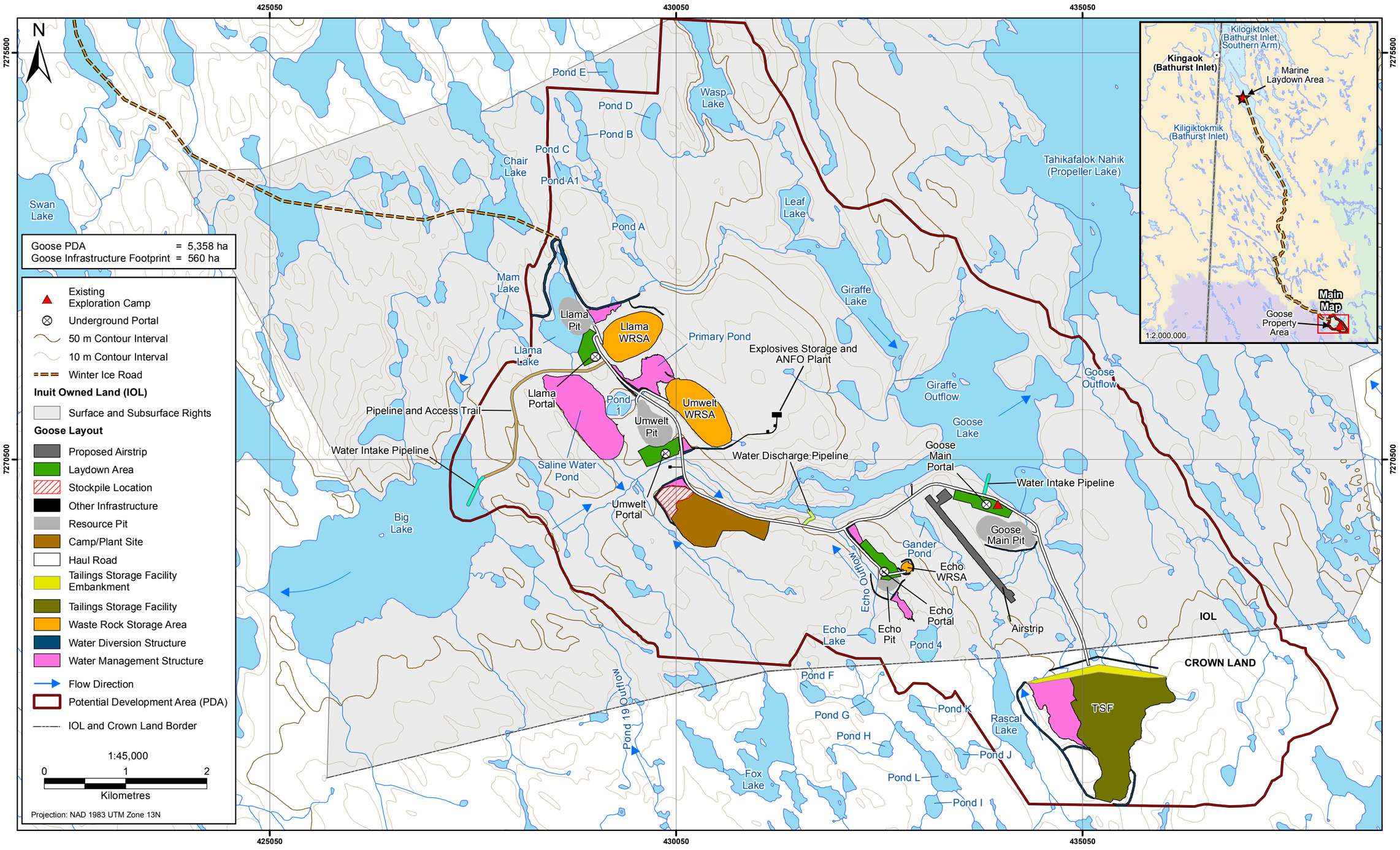

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Figure 2

Potential Development Area and Infrastructure Areas - Goose Property

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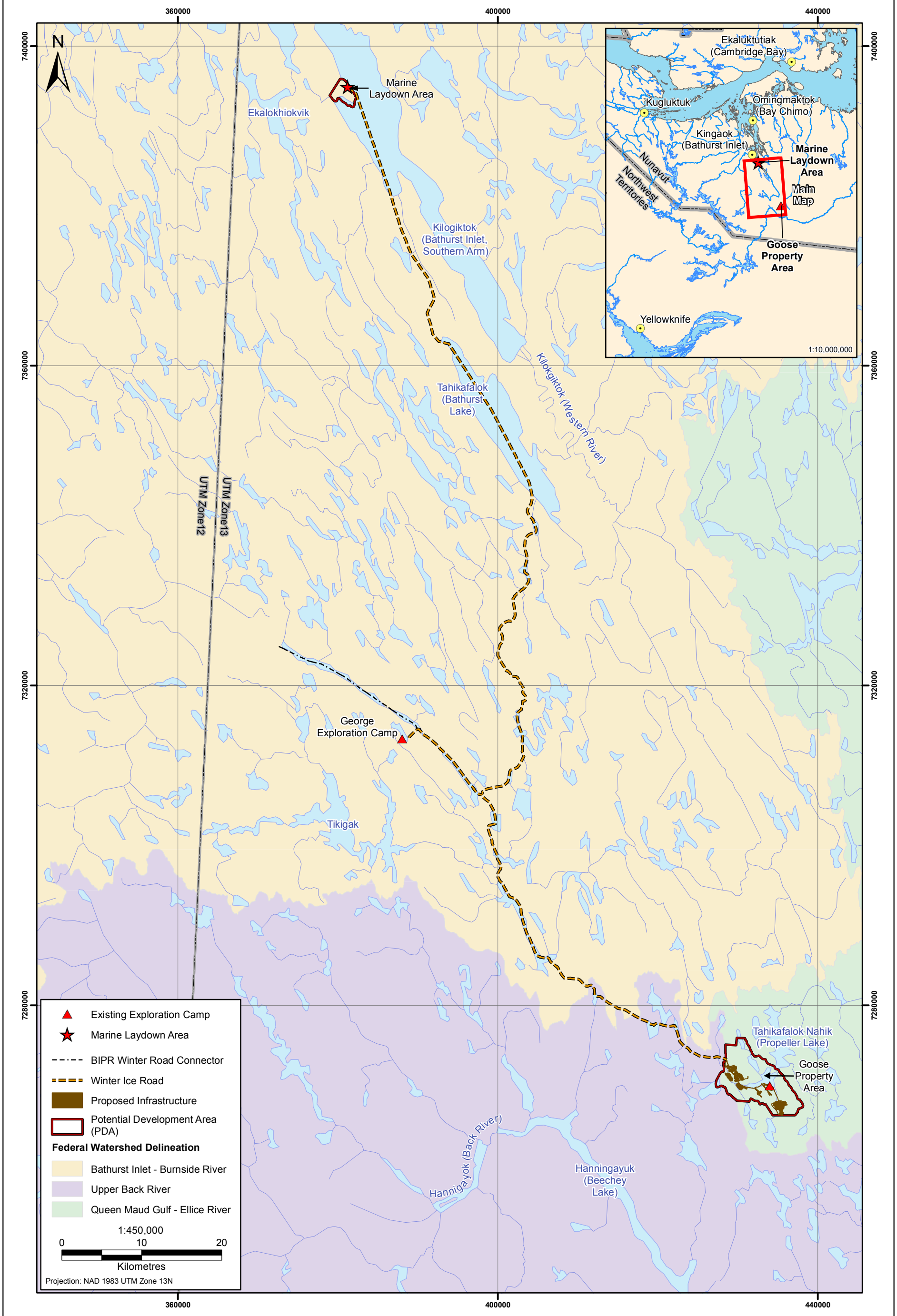

Figure 3

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Winter Ice Road Corridor Overview

2. Incorporation of Inuit Qaujimajatuqangit Principles

Sabina acknowledges the following Inuit Qaujimajatuqangit (IQ) principles, as described by the Government of Nunavut:

1. Inuuqatigiitsiarniq - Respecting others, relationships, and caring for people.
2. Tunnganarniq - Fostering good spirit by being open, welcoming, and inclusive.
3. Pijitsirniq - Serving and providing for family and/or community.
4. Aajiiqatigiinniq - Decision making through discussion and consensus.
5. Pilimmaksarniq/Pijariuqsarniq - Development of skills through practice, effort, and action.
6. Piliriqatigiinniq/Ikajuqtigiinniq - Working together for a common cause.
7. Qanuqtuurniq - Being innovative and resourceful.
8. Avatittinnik Kamatsiarniq - Respect and care for the land, animals, and the environment.

IQ values have helped guide Sabina's decision making for the Project and have been incorporated into the design of the Company's overall Project management approach. Table 3.1-2 in FEIS Volume 3, Chapter 3 outlines the ways in which IQ values have been incorporated into the Project. Furthermore, Sabina actively worked to collect and incorporate regional and Project-specific TK in addition to scientific knowledge throughout the FEIS. This information has also been used to inform Sabina's approach to the terrestrial environment section of the FEIS.

3. Community Engagement and Traditional Knowledge

Sabina initiated a comprehensive community engagement program in the Kitikmeot Region to ensure all regional residents were provided with opportunities to learn about the Project and provide feedback. Likewise, a considerable amount of TK was collected by Sabina and integrated into the FEIS submission. The following reports were prepared by Sabina and later reviewed for TK specific information related to Valued Ecosystem Component (VEC) features:

- *Inuit Traditional Knowledge of Sabina Gold & Silver Corp., Back River (Hannigayok) Project; Naonaiyaotit Traditional Knowledge Project (NTKP)* (KIA 2012) (FEIS Appendix V3-3A);
- *Naonaiyaotit Traditional Knowledge Project - Hannigayok (Sabina Gold & Silver Corp. Proposed Back River Project). Results from Data Gaps Workshops, Final Report (June 2014)* (KIA 2014) (FEIS Appendix V3-3B);
- *Back River Project: Existing and Publically Available Traditional Knowledge from Selected Aboriginal Groups in the Northwest Territories (FEIS Appendix V3-3C); and*
- *Traditional Knowledge Study Report on the Arctic Char Fishery in the Nulahugyuk Creek – Hingittok Lake Area (Bernard Harbour), Nunavut (FEIS Appendix V3-3D).*

Example, in response to TK and a request by the KIA, the WIR north of Tahikafflok Lake (Bathurst Lake) was realigned to address potential impacts to riparian zones identified during two local focus group workshops (Cambridge Bay Hunter Focus Group 2012; Kugluktuk Hunter Focus Group 2012). This request was made during review of the DEIS and was captured, and honoured, in commitment (KIA-5 from PHC Report).

Sabina is committed to considering and incorporating TK into the Plan. The incorporation of TK will occur throughout all stages of the Plan, including identification of mitigation measures, monitoring study design, data collection, and follow-up programs to obtain feedback.

4. Existing Environment and Baseline Information

Vegetation was considered a VEC in the FEIS (Volume 5, Chapter 4). Baseline studies to characterize the baseline vegetation present within the regional and local area of the Project were carried out in 2012. The focus of these studies was on ecosystems, habitat, and vegetation identified by Inuit, scientists, regulators, or the public as ecologically, socially or culturally important. Vegetation information (e.g., rare plant species/communities) was used to inform the operations footprint with the objective to avoid sensitive species-rich plant communities, and areas with high rare plant potential, where possible. For example, as previously mentioned, the WIR north of Tahikafflok Lake (Bathurst Lake) was realigned to address potential impacts to riparian zones in response to TK and a request by the KIA.

The vegetation Local Study Area (LSA) that was established for the baseline study compromises a total of 134,370 ha. The LSA was divided into the following three sub-areas:

- Goose Property Sub-area (32% of LSA);
- Winter Road Sub-area (62% of LSA);
- Marine Laydown Sub-area (6% of LSA);

This information is provided in the 2012 Ecosystems and Vegetation Baseline report (Rescan 2013a, FEIS Appendix V5-4a) and forms the basis for evaluating potential effects of the Project on ecosystems, vegetation, and special landscape features. As outlined in the 2012 Ecosystems and Vegetation Baseline Report (FEIS Appendix V5-4A), extensive baseline studies were conducted; some highlights include:

- Conducting soils and vegetation mapping of a very large local study area of 134,370 ha defined by the local the watersheds;
- Developed an ecological classification system for the area that links soil types with vegetation communities;
- Classified terrain, soils and ecological communities for the entire LSA;
- Conducted 817 field plots to ground truth the mapping, including the project development area, marine laydown area, winter road and control sites; and
- Conducted rare and invasive plant surveys using a qualified botanist.

Table 4-1 provides a summary of ecosystems mapped within the LSA. Table 4-2 provides a list of terrestrial vegetation identified through TK.

Table 4-1. Ecosystem Classes in the Local Study Area

Ecosystem Class	Area (ha)	% of Total LSA
Bedrock	10253	7.6
Disturbed/Barren	190.7	0.1
Esker	1337.1	1.0
Freshwater	24425.1	18.2
Marine	539.9	0.4
Riparian	1445.4	1.1
Riparian (marine)	439.6	0.3
Tundra	74393.6	55.4
Tundra (marine)	7278.4	5.4
Wetland	12760.7	9.5
Wetland (marine)	1305.6	1.0
TOTAL	**134369.1**	**100**

Table 4-2. Ecosystem Classes in the Local Study Area

Inuinnaktun Name(s)	English Name	Latin Name(s)	Specific Use/Part of Plant
Kublak[2]	Bear Berry	*Arctous rubra, A. alpina*	Fruit
Kabluk	Bear Berry	*Arctous rubra, A. alpina*	Fruit
Kublakot	Bear Berry	*Arctous rubra, A. alpina*	Leaves
Akpik; Aaukpik[1]	Cloudberry	*Rubus chamaemorous*	Fruit
Paungak; Paungan[1]; Paurnngait[2]	Crowberry; Blackberries	*Empetrum nigrum*	Fruit
Mahok	Liquorice root	*Hedysarum alpinum*	Root
Qunguliit[2]	Mountain Sorrel	*Oxyria digyna*	Leaves
Kimminait[2]	Bog cranberry	*Vaccinium vitis-idaea*	Fruit
Kigutangirnait[2]	Blueberries	*Vaccinium uliginosum*	Fruit
	Willow	*Salix* spp.	Bark
Qijuktaaqpait[2] (Baffin)	Northern Labrador tea	*Ledum palustre* subsp. *Decumbens*	
Kangayot[1]	Cottongrass	*Eriophorum* spp.	Seed heads
Kablakot[1]	Unknown; plant used for tea	Unknown	
Avalakiak[1]	Unknown; low-growing plant for starting fires	Unknown	
Eehoktin[1]	Unknown; small plant for starting fires	Unknown	
Aatogoayak[1]; igloohoutinnik[1]	Unknown; mushrooms eaten by caribou	Unknown	

[1] From the vocabulary in Section 11 of the NTKP report (KIA 2012). Where only the Inuinnaqtun names are provided, it is difficult to correlate them with corresponding English or Latin names; [2] Inuktitut names from Mallory and Aiken (2004)

5. Objectives

The main objectives of the Vegetation Monitoring Plan are:

- To measure plant species abundance and diversity at vegetation plots along the WIR, MLA, and Goose site;
- Measure direct loss of plant communities as result of the construction and operations of Project infrastructure at Goose Property, the MLA, and WIR;
- Measure plant health (vigour) as part of the vegetation monitoring program;
- Measure distribution and abundance of non-native invasive plant species;
- Monitor and evaluate the effectiveness of mitigation measures;
- Identify unanticipated effects; and
- Provide an early warning of undesirable change in the environment and to inform adaptive management measures.

6. Monitoring Approach

6.1 VEGETATION MONITORING

Vegetation monitoring will occur during Construction, Operations, and Closure of the Project. It will be performed every three years during the flowering period (i.e., July–August) for identification purposes, and for contaminant analysis (presence of berries). The program will focus on objectives noted in Section 5, with heavy focus on vegetation health and invasive plant species. Fugitive dustfall will be documented as part of the Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17) and its relevance considered in the Vegetation Monitoring Plan.

6.1.1 Vegetation Health

Vegetation health monitoring will include two components:

1. Vegetation abundance, richness (diversity), vigour (health); and
2. Contaminant (metal) levels in vegetation.

The first will be conducted through permanent monitoring plots in a variety of habitat types (minimum two plots per habitat type) within the Project area and in control areas within the Regional Study Area. Within each of the plots species richness (diversity), and abundance (percent cover), and vigour of each species (in each strata) will be estimated, in addition to the documentation of any rare plants (if present). The second part of vegetation health monitoring will involve the collection of vegetation samples (lichen and berry-producing plants) which will be sent to accredited laboratories for chemical analysis (Table 6-1).

Table 6-1. Vegetation Monitoring: Vegetation Health

Indicator	Vegetation Health
Measurable Parameter	1) Vegetation diversity (richness), and abundance, and 2) Contaminant (metal) levels in lichen and berry-producing plants.
Key Project Interaction	Effluent, dust and emissions released into the environment have the potential to impact vegetative health. Dust affects the survival of certain plant species (leading to changes in species diversity and abundance). The deposition of contaminants (metals) in the dust, which are absorbed by plants, can enter the food chain via ingestion by animals and humans, and may have an effect on health.
Goal	The project will not result in a significant increase in contaminant uptake in vegetation.
Objective	To quantify through continued monitoring throughout the duration of the Project: 1) vegetation abundance (percent cover), diversity (richness) and vigour (vegetation health), and 2) Contaminant (metal) levels in lichen (caribou forage) and berry-producing plants (traditional use); through continued monitoring throughout duration of the Project.
Threshold	Thresholds for vegetation diversity and abundance to be determined.
Scope of Monitoring Work	Regional Monitoring: Assess baseline vegetation composition/species richness, abundance, and vigour, and contaminant (metal) levels in lichen and berry-producing plants

6.1.2 Invasive Plants

Invasive plant species monitoring will occur during Construction and Operations of the Project. Monitoring will be completed within the Goose Property, MLA and WIR footprint and adjacent habitats to ensure that no invasive plant species are introduced to the Arctic environment. Invasive plant observations will be conducted every three years in conjunction with the vegetation monitoring, and informal observational surveys will occur on an ongoing basis and additional surveys may be triggered by

observations of invasive species (Table 6-2). Prior to Project initiation, staff will be trained on invasive plant establishment pathways, species identification (e.g., photos of common invasive plants in Nunavut) and mitigation measures (see Section 8). Should invasive plant species be found, these will be immediately reported to environment department and be destroyed and, if the pathway of entry can be determined, changes will be made to reduce/eliminate the possibility of further introductions.

Table 6-2. Vegetation Monitoring: Invasive Plant Species

Indicator	Invasive Plant Species
Measurable Parameter	Occurrence of invasive plant species
Key Project Interaction	Introduction of invasive plant species
Goal	The Project will not introduce invasive plant species to the RSA
Objective	To prevent the occurrence/establishment of invasive plant species
Threshold	No introduction of invasive plant species as a result of Project activities
Scope of Monitoring Work	Local monitoring: Surveillance of Project footprint and adjacent habitat, surveys to be conducted every 3 years in conjunction with vegetation monitoring or triggered by observations invasive plants

6.1.3 Dust Monitoring

The Mine is expected to create fugitive dust through various sources, primarily by blasting and crushing rock, and road construction and traffic. As part of the Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17) dustfall monitoring will be conducted via sampling between June and September for a number of experimental and control areas within the LSA to determine the level of dust deposition associated with the mine site and WIR (Table 6-3).

Dust monitoring will be carried out during the Construction and Operation phases of the Project. Sampling locations will be situated at varying distances from the Project site to determine spatial extent of dust fall. Additional details can be found within the Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17).

Table 6-3. Vegetation Monitoring: Dust Fall

Indicator	Dust fall
Measurable Parameter	Surveillance and monitoring
Key Project Interaction	Dust fall has potential to affect vegetation health, as well as forage palatability for caribou
Goal	The Project will not have a significant effect on palatability of vegetation for caribou
Objective	Quantify: The magnitude of dust fall on vegetation surrounding mine infrastructure and WIR; distance from point sources and roadway at which dustfall is measured; and seasonal variation in dust fall through continued monitoring of Project.
Threshold	Refer to Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17)
Scope of Monitoring Work	Refer to Air Quality Monitoring and Management Plan (FEIS Volume 10, Chapter 17)

7. Roles and Responsibilities

Sabina's Environmental Department is responsible for monitoring compliance with applicable regulations and permit requirements. The responsibility of implementation of mitigation measures rests with the VP Operation.

Compliance is achieved through ongoing monitoring, and development and implementation of operational standards, procedures, and employee training.

8. Mitigation and Adaptive Management

The following mitigation measures and best management practices will reduce the potential for loss of vegetation:

- The Project has been designed to employ winter road-only access corridors that travel primarily over lakes and rivers, thereby minimizing potential negative effects on terrestrial vegetation and limiting dust emissions.
- Minimize the Project footprint, thus minimizing the disturbance to the terrestrial environment.
- The clearing of vegetation and removal of soil from unique landscape features will be minimized, including eskers, wetlands, exposed bedrock, cliffs, etc., which often provide high value habitat to wildlife and may support sensitive vegetation communities and growth forms. Exceptions to this management will only be considered after assessing and weighing all implications.

The following mitigation measures and best management practices will reduce the potential for degradation of vegetation:

- The design of the WIR has been optimized to minimize the distance travelled which will minimize emissions.
- All vehicles and machinery will restrict travel to designated road surfaces; thus avoiding creation of ruts in vegetated ecosystems.
- Loads carried by vehicles will be enclosed or covered when possible.
- Regular wheel-cleaning will be undertaken of vehicles travelling around and leaving the site.
- Equipment being brought to site will be inspected for any invasive plant species and be cleaned before being brought on to site.
- Vehicles will be driven at designated speeds on the WIR.

The following mitigation measures will be implemented to prevent the establishment of invasive species:

- Staff education on how invasive plant species can be introduced into an area.
- Staff education on how to identify common invasive plant species.
- Staff education on their individual roles in preventing invasive plant establishment.
- Ensuring vehicles and machinery are clean prior to entry on-site.
- Minimizing ground disturbance, where possible.
- Maintaining a healthy vegetation cover to prevent unwanted vegetation establishment.
- Immediate reporting of any invasive plant sightings to the environmental department.

The need for any corrective actions to on-site management or installation of additional control measures will be determined on a case-by-case basis. Indications of the need for corrective actions and additional control measures may include:

- If vegetation monitoring threshold limits are reached;

- If results from the Site Water Monitoring and Management Plan show non-compliance related to tundra discharges; or
- If results from the Wildlife Mitigation and Monitoring Program Plan, which will monitor select wildlife species and habitat around the mine infrastructure and activities show adverse effects to wildlife or wildlife habitat.

9. Quality Assurance and Quality Control

Quality assurance and quality control will include the following:

- field plant ecologists will be familiar with identification of subarctic plants and plant sampling techniques. Examples of estimating plant cover will be reviewed and rules applied consistently;
- data are to be downloaded from the field immediately upon returning to camp and manually checked by qualified personnel; and
- data will be downloaded consistent with detailed written operating instruction from qualified.

Data analysis will focus on evaluating trends and determining if there are statistical differences in plant species composition and abundance as a function of distance from the Mine and from construction through closure. The variables measured will include the following:

- plant species composition, as defined by plant species richness; and
- plant species abundance, as defined by mean percent species cover.

10. Reporting

An annual Vegetation Monitoring Summary Report for the Project will be completed for the mine, WIR, and associated infrastructure. The purpose of this report is to summarize the annual data collected from the Plan, and to identify and communicate natural variation and potential mine-related changes in vegetation populations and health.

The annual report will provide the objectives, methodology, historical and current year results, as well as a comparison to impact predictions, mitigation and management recommendations of each monitoring program. As the accumulation of data increases, trends will also be reported. The report will be submitted to the KIA, GN, and the NIRB.

11. References

Cambridge Bay Hunter Focus Group. 2012.

Kugluktuk Hunter Focus Group. 2012.

Mallory, C. and S. Aiken. 2004. *Common plants of Nunavut.* Nunavut Department of Education.